Zone 7 Water Agency

REQUEST FOR PROPOSALS

RFP No. 2025-19

OWNER'S REPRESENTATIVE SUPPORT SERVICES
for
MOCHO PFAS TREATMENT PLANT
and
ELECTRICAL IMPROVEMENTS PROJECT

February 20, 2025

IMPORTANT DATES

Questions due by Friday, February 28, 2025,
3:00 P.M. Pacific

Proposals due by Tuesday, March 18, 2025,
10:00 A.M. Pacific

Request for Proposals

MOCHO PFAS TREATMENT PLANT AND ELECTRICAL IMPROVEMENTS PROJECT

February 20, 2025

I. INTRODUCTION

Zone 7 Water Agency (hereinafter referred to as "Zone 7") is seeking Proposals from qualified Consultants to provide professional services for owner's representative support services and third-party construction management services for the Mocho PFAS Treatment Plant (MTP) and Electrical Improvements Project, with expertise and experience as described in the Scope of Work. The MTP will remove PFAS from Mocho wellfield supplies to meet drinking water standards and to restore production capacity and water supply reliability, and is to be complete and operational by spring 2028. In addition, the project will replace the aging switchgear at Mocho Wells 3 and 4 to improve water production reliability and increase operational flexibility, which is to be complete and operational by September 2027. Proposals must be submitted via email to Mariza Sibal at msibal@zone7water.com in accordance with Section IV, Calendar of Events.

II. DESCRIPTION OF ZONE 7

A. Zone 7 Water Agency

Zone 7 is one of ten active zones of the Alameda County Flood Control and Water Conservation District, and is a special district established by State legislature in 1949. Zone 7 Water Agency was established by popular vote of the residents of the Livermore-Amador Valley in 1957 under an amendment to the District Act.

Zone 7 provides drinking water to approximately 280,000 customers within a service area of approximately 425 square miles in eastern Alameda and Contra Costa Counties. Drinking water is supplied to four retailers: California Water Service Company, City of Livermore, City of Pleasanton and Dublin San Ramon Services District. Approximately 80 percent of Zone 7's drinking water supply is from the State Water Project (South Bay Aqueduct and Lake Del Valle), with the remainder supplied from local groundwater sources (Livermore-Amador Groundwater Basin), which Zone 7 is responsible for managing. Raw water from the South Bay Aqueduct is delivered to agricultural areas primarily located in the City of Livermore.

As the major water supply agency in eastern Alameda County, Zone 7 has an ongoing commitment to planning for existing and future needs, implementing needed projects, maintaining a reliable water delivery system, and providing a quality product and service to the community.

While Zone 7's production wells typically would provide 20 percent of the drinking water supply, wells can become the primary supply for meeting Zone 7 water demands during droughts or emergencies. With the Mocho wells representing a large portion of the Zone 7 total well capacity, PFAS treatment is needed for the reliability of these wells.

B. Project Background

The conceptual design of MTP determined that ion exchange resin was the most suitable media, evaluated options to eliminate PFAS from the Mocho Groundwater Demineralization Plant (MGDP) waste discharge, completed a siting study, and developed initial plant layouts. The siting study determined that the Mocho Well 3 site is well suited for the MTP and is the only viable site given the proximity to the Mocho wells, pipelines, and MGDP. The site is on the southwest corner of Stoneridge Drive and Santa Rita Road, which is owned by the City of Pleasanton and Dublin San Ramon Services District. Coordination of rights-of-way needs will begin in the coming months. Pre-conceptual architectural renderings were prepared to show visions of how the project could work at this site and to facilitate discussions but are not the actual design.

The initial schedule indicated the MTP could take over four years to construct due to the complexity of the project, extended delivery times for electrical equipment, and high competition for PFAS vessels as other agencies work to comply with federal PFAS regulations by April 2029. Progressive design-build delivery is proposed to accelerate the project, reduce potential for conflict and risk of delays, and allow flexibility to work with the contractor to minimize construction impacts at a highly visible, public site, consistent with California Public Contract Code Sections 22170-22174.

The total construction cost was estimated to be approximately $35 million. The estimated construction costs include replacement of the Mocho 3 and 4 switchgear, PFAS treatment of Mocho Wells 2, 3, and 4 of approximately 15 MGD, a building to house the treatment vessels, landscaping, site beautification, and land acquisition. Final capacity and phasing decisions will be made during the design phase.

III. SCOPE OF WORK

A scope of work, as shown in Attachment A, has been developed to assist the Proposer in gaining an understanding of Zone 7's goals as they relate to this effort. The final scope of work will be developed in cooperation with the selected Consultant and included as part of the agreement between Zone 7 and the selected Consultant.

Zone 7 expects that the Consultant will use its experience and knowledge to make recommendations and refine the Scope of Work needed to satisfy Zone 7's objectives for the project.

IV. CALENDAR OF EVENTS

Below are the major events planned to occur during the selection process in order to determine the selected Consultant. The initial consultant contract is anticipated to be through the award of the Guaranteed Maximum Price (GMP) of the design-build contract. The consultant contract for services after GMP award through construction closeout is anticipated to be awarded at a later phase. Please note that the schedule is subject to change.

Event	**Scheduled Date**
RFP Issue Date	February 20, 2025
Questions Due	February 28, 2025, at 3:00 p.m.
Submit Exceptions-Deviations Form (if needed)	March 18, 2025, at 10:00 a.m.
Proposals Due	March 18, 2025, at 10:00 a.m.
Panel Interviews	March 25, 2025
Notify Consultant of Intent to Award	March 2025
Anticipated Board Award for Owner's Representative Support Services through Guaranteed Maximum Price Award	April 16, 2025

V. INSTRUCTIONS TO PROPOSERS

A. Examination of Proposal Documents

By submitting a Proposal, the Proposer represents that it has thoroughly examined and become familiar with the work required under this RFP, and that it is capable of performing timely and quality work to the level of Zone 7's expectations and achievement of its objectives.

B. Addenda/Clarifications

Questions or comments regarding this RFP shall be submitted via email to msibal@zone7water.com no later than the date and time shown in Section IV, Calendar of Events. Responses from Zone 7 will be posted on the Agency's website.

C. Submission of Proposals

All Proposals shall be submitted via email to Zone 7 Project Manager, Mariza Sibal (msibal@zone7water.com). Proposals must be received no later than the date and time shown in Section IV, Calendar of Events. Proposals received after this time will not be accepted. It is the responsibility of the Proposer to ensure that the Proposal was received by the Zone 7 Project Manager. The Proposer shall submit the Proposal, a Cost Proposal (shown as a cost matrix) and the firm's rates.

D. Proposal Documents Inclusion

At the sole discretion of Zone 7, the Proposal Documents may be deemed a part of the contract resulting from this RFP, if awarded.

E. Withdrawal of Proposals

A Proposer may withdraw its Proposal at any time before the expiration of the time for submission of Proposals as provided in this RFP by sending a written request for withdrawal signed by, or on behalf of, the Proposer to the Zone 7 contacts listed above. The time of receipt of email shall be the time such request is received in hand by Zone 7. The Proposer assumes the risk of any failed delivery. It is the responsibility of the Proposer to ensure that the email was received by the Zone 7 Project Manager.

F. Rights of Zone 7

This RFP does not commit Zone 7 to enter into a contract, nor does it obligate Zone 7 to pay for any costs incurred in the preparation and submission of Proposals or in anticipation of a contract.

Zone 7 may investigate the qualifications of any Proposer under consideration, require confirmation of information furnished by the Proposer, and require additional evidence of qualifications to perform the services described in this RFP.

Zone 7 reserves the right to:

1. Reject any or all Proposals.
2. Issue subsequent Requests for Proposals.
3. Postpone opening for its own convenience.
4. Remedy technical errors in the Request for Proposal process.

5. Approve or disapprove the use of particular subcontractors.
6. Negotiate with any, all, or none of the Proposers.
7. Solicit best and final offers from all or some of the Proposers.
8. Award a contract to one or more Proposers.
9. Award a contract to a team created by Zone 7 from the Proposers and/or its subcontractors.
10. Waive informalities and irregularities in Proposals.

G. Contract Type

Selection of a Consultant or Consultants will result in a Standard Agreement for Professional Services for the Owner's Representative Support Services for Mocho PFAS Treatment Plant and Electrical Improvements Project that will begin on the date of execution. The total cost of services shall be proposed by each firm and is subject to negotiation between Zone 7 and the selected Consultant or Consultants. All services are to be billed on a time-and-materials basis.

H. Anticipated Conflict

It is anticipated that the firm and its subcontractors awarded the Owner's Representative Support Services and Third-Party Construction Management Services contract cannot be part of the design-build service contract or team.

No identified conflicts have been made for the Owner's Representative Support Services consultant to provide construction management services. Zone 7 reserves the right to award construction management services separately.

VI. PROPOSER'S MINIMUM QUALIFICATIONS

A. The Proposer shall submit the required Certificate(s) of Insurance (if Consultant has been selected).

B. The Proposer shall comply with applicable federal, state and local regulations concerning equal employment opportunity requirements.

C. The Proposer shall possess expert knowledge and extensive experience in: the progressive design-build (DB) delivery process; land acquisition and right-of-way services; partnering; permitting; public relations; providing technical advisory services for design, construction, operation, and maintenance of public water/recycled water/wastewater treatment plants. Additionally, the Owner's Representative and/or the technical advisor shall have PFAS treatment plant experience and be familiar with local conditions relating to these services in Zone 7's service area.

D. The Proposer shall possess expert knowledge in providing technical

advisory services for building architecture, landscape architectural design, permitting, and construction services.

E. The Proposer shall possess expert knowledge in providing construction management services for public water/recycled water/wastewater treatment plants.

F. The Owner's Representative shall possess a Design-Build Institute of America (DBIA) certificate and have experience working for a California public agency as an Owner's Representative for a project with a design-build (DB) contract value of at least $40 million. The Owner's Representative shall have experience assisting public agency staff to prepare and implement a procurement implementation plan (PIP). The Owner's Representative shall also have experience assisting public agency staff to develop best-value procurement process for a DB contract.

In addition, it is preferrable for the Owner's Representative to hold registration as a California Professional Civil Engineer. Other California Professional Engineering License classifications may be allowed at Zone 7's discretion and depending upon the overall qualification package provided. Furthermore, it is preferrable for the Owner's Representative to hold a Project Management Professional certification, such as from the Project Management Institute (PMI).

G. The Proposer shall possess knowledge of applicable federal, state, and local regulations and ordinances regarding the subject of this RFP and shall be familiar with local conditions relating to these services.

H. The Proposer is required to list the key individuals (including subconsultants) who will be assigned to the project, their qualifications and disciplines, and each individual's degree of commitment. The Proposer shall make it clear if key individuals are subconsultants.

I. The Proposer shall provide a resume for each named key personnel that includes, but is not limited, to the following information:

1. Name and proposed assignment (do not include home addresses or phone numbers)
2. Years of experience
3. Education – degrees, schools and years obtained
4. Professional registration(s)
5. Experience directly related to proposed assignment
6. At least two client references, including contact names, addresses and telephone numbers

7. Description of projects of a similar nature worked on in the past 5 years

J. If Consultant intends to use drones, the following items shall also apply:

1. Drone Insurance (Attachment F) will also be required (in addition to standard insurance).
2. Consultant shall have a Remote Pilot Certification and registration from the Federal Aviation Administration (FAA) per Code of Federal Regulations, Title 14, Part 107 when operating drones on District property. Additionally, drone operators working on District property shall have a certified operator if the drone is less than 55 pounds. If the drone is greater than 55 pounds, Contractor shall have a certified operator and an FAA Section 333 exemption that encompasses the intended operation; Contractor shall also confirm that the District's operations comply with the third party operator's FAA Section 333 exemption. Drone data or video collected on District property shall be provided to the District. Contractor shall have insurance coverage and indemnity for any drone accident or incident that may result in liability.

VII. PROPOSAL FORMAT AND CONTENT

A. Format

The proposal shall be organized and prepared according to the **Content** section that follows, with attention given to the following:

1. The project team including the organization chart and commitment (hours/%) of the team during the course of the project. The Project Manager/Owners Representative listed should be available for, and lead, the oral presentation, if selected to participate in an interview.

2. A record of experience and qualifications of the project members. Zone 7 is interested in the experience of the project members themselves in addition to the firm. Provide relevant examples of the project personnel experience as it relates to the Scope of Work (Attachment A), local experience, and water/recycled water/wastewater treatment projects, including PFAS treatment plant experience.

3. Any additional relevant services performed by your firm that were not outlined in the Scope of Work.

4. Submittals and cost proposals shall be submitted via email to msibal@zone7water.com. Two (2) separate cost proposals shall be included as separate submissions in matrix format with proposed staff and

corresponding hourly rates for performing the services discussed in the Scope of Work. These are as follows:

1) Owner's Representative support services through award of the Guaranteed Maximum Price (GMP) of the design-build contract.
2) Owner's Representative support services from award of the GMP of the design-build contract through construction closeout, and may include construction management services.

Consultant Rate Sheets shall be provided for owner's representative support services through guaranteed maximum price agreement. Hourly rates shall remain the same for the duration of the owner's representative support services through guaranteed maximum price agreement and may be adjusted with the contract amendment for owner's representative support services through construction closeout. Rate Sheets must show proposed job classifications and corresponding hourly rates. Indicate your firm's name on all file names. It must show proposed staff including, but not limited to, the project manager and key staff, and corresponding hourly rates for performing the services discussed in the Scope of Work. The rate information will not be used during the Proposals review.

B. Content

1. **Summary and Overview** - Use this section to summarize your approach to the topics identified in the Scope of Work (Attachment A), the strengths of your project team, and why your firm should be selected.

2. **Team Personnel** – Include a team organization chart and commitment (hours/%) of the team during the course of the project. Identify the key project personnel and their roles associated with the tasks listed in the Preliminary Scope of Work. Include a summary of their qualifications, expertise, certifications, and project experience as it relates to the Scope of Work (Attachment A), with specific emphasis on the proposed project manager and lead design engineer(s). Provide brief summaries of a minimum of three (3) relevant projects of similar size and complexity, completed by the firm and a minimum of two (2) relevant projects of similar size and complexity completed by the proposed project manager, as they relate to the project team, Preliminary Scope of Work, local experience, and experience with providing owner's representative services for public water/recycled water/wastewater facilities. Owner's Representative and/or technical advisor to have PFAS treatment plant experience. Zone 7 is interested in the experience of the project members themselves in addition to the firm. The Proposer's Project Manager and key personnel assigned to the project will be an important factor considered by the Zone 7 selection committee. There shall be no change of key personnel once the Proposal is submitted without

the prior written approval of Zone 7's Project Manager. The Project Manager listed shall lead the oral presentation.

3. **Comments on the Scope of Work** - This may be used as an opportunity to expand upon your team's specific experience and expertise which may be applicable to the Scope of Work (Attachment A).

4. **Work Plan** - Describe how the project team will fulfill the Scope of Work. Include a Microsoft Project Gantt chart showing the work elements and sub-elements with major milestones. To illustrate your strategy, describe tools and techniques you will use, and challenges you anticipate, in addressing specific issues identified in the Scope of Work (Attachment A).

5. **References** - From recent applicable experience of the Project Manager and key project personnel, list three (3) relevant projects, and include the agency name, staff contact name, address, and telephone number for each.

6. **Resumes** of the proposed project team shall also be submitted.

7. **Cost Proposals and Fees** - Consultant must provide an estimate to complete the scope described above as well as a current fee schedule, on company letterhead.

8. **Exceptions or Deviation Form –** Consultant must provide exceptions and/or deviations, if any, to the RFP or its exhibits to the Zone 7 Project Manager no later than the date and time shown in Section IV, Calendar of Events.

9. **The total proposal length** (including cover letter) should not exceed 20 pages, not including resumes, cost proposal and fees. Section dividers that only serve to separate Proposal sections for readability purposes, and that do not include content, are also excluded from the page count.

10. **Proposal page size** - The proposal shall be on 8.5-inch by 11-inch paper size. The cost proposal and fees can be up to 11-inch by 17-inch paper size.

VIII. EVALUATION AND SELECTION

Evaluation and selection will be based on a two-step process. An overview is described below:

a. Proposals have a maximum score of 100 points.
b. Typically, the top three (3) consultants will be invited to an interview.
c. Interviews will have a maximum score of 100 points.
d. The proposals and interviews will be evaluated equally.

A. Evaluation Procedure

A Review Board, generally made up of Zone 7 staff, will review the Proposals, establish a list of finalists based on pre-established review criteria, interview the finalist Consultants, and select the successful Proposer based on demonstrated competence and necessary qualifications. Negotiations of the contract, the detailed scope of work, and the fee are not within the scope of the Review Board.

Members of the Review Board will review the Proposals to determine those Consultants to be invited for an in-person interview. Approximately 45 minutes will be allowed for each oral interview and questions and answers. The proposed Project Manager must lead the presentation before the Review Board.

Interviews are tentatively scheduled as shown above in the Calendar of Events.

B. Evaluation Criteria

The following criteria will be used to evaluate written Proposals that are submitted. Consultant will be evaluated separately for the interview process. Proposals and interviews will be evaluated equally.

Table 1. Proposal Evaluation Criteria

Criteria	Points
Project Understanding: General response to this RFP; adherence to submittal formatting and content requirements; understanding of Zone 7 project requirements, goals, schedule, and objectives.	10
Owner's Representative Team Experience: Technical experience in performing work of closely similar nature to what is described in the RFP and Attachment A; qualifications of key personnel; key personnel's level of involvement in performing related work; adequacy of labor commitment; concurrence in the restrictions on changes in key personnel; experience working with public water supply/recycled water/wastewater agencies and/or municipalities; experience with PFAS treatment facility projects; experience working with public agencies and/or municipalities for land acquisition services; record of completing work on schedule; experience leading progressive design-build projects for public water supply/recycled water/ wastewater agencies and/or municipalities; strength and stability of the firm; technical experience and strength and stability of proposed subconsultants.	25
Construction Management Team Experience: Technical experience in performing work of closely similar nature to what is described in the RFP and Attachment A; qualifications of key personnel; key personnel's level of involvement in performing related work; adequacy of labor commitment;	20

concurrence in the restrictions on changes in key personnel; experience providing construction management support services for public water supply/recycled water/wastewater agencies and/or municipalities; experience with PFAS treatment facility projects; record of completing work on schedule; experience with progressive design-build projects for public water supply/recycled water/ wastewater agencies and/or municipalities; strength and stability of the firm; technical experience and strength and stability of proposed subconsultants.	
Project Manager Qualifications and Expertise: Experience overseeing successful implementation of projects of similar scope, size, and complexity; experience working with public California water supply/recycled water/wastewater agencies and/or municipalities; experience leading progressive design-build projects for public water supply/recycled water/wastewater agencies and/or municipalities; record of completing work on schedule.	20
Technical Approach: Demonstrated understanding of the project requirements; comments on scope and project approach as outlined in Attachment A; proposed project schedule and deliverables.	20
Client References: Assessments by client references. Experience with public agencies will be prioritized over private companies.	5
Total:	**100**

Table 2. Interview Evaluation Criteria

Presentation Criteria	Points
Interest and Enthusiasm: Do the interview participants demonstrate interest and enthusiasm in the project?	5
Demonstration of How the Work Will Be Performed: Is the presentation informative? Does the consultant demonstrate how the work will be performed?	10
Project Manager: Is the firm's project manager present? Does the project manager actively participate in the presentation?	15
Project Team: Does the consultant show how the work will be performed? Does the presentation instill confidence that the project will be successfully executed and completed?	20
Question and Answer Criteria	Points
Responses to Structured Questions	30

Responses to Additional Questions	20
Total:	**100**

C. Award

When the Review Board has completed its review, Proposers will be advised of the number one selection. A contract will then be negotiated with the selected firm for the extent of services to be rendered and for the method of compensation. Agreement awards in excess of $50,000 require Zone 7 Board approval. Zone 7 Board approval is expected to be made at the Board meeting as shown on the Calendar of Events.

IX. Compliance with Laws; Conflict of Interest

Consultant agrees to comply with all applicable federal and state laws, regulations and policies, as amended, including those regarding discrimination, unfair labor practices, collusion and conflicts of interest.

X. Public Records Act Requests

Zone 7 believes that the public interest is served by securing the best quality work at the lowest price. Accordingly, we request information about your company's qualifications, past experience and other similar items. Under California law, if requested to provide a copy of your Proposal to a third party, we will do so in order to comply with the California Public Records Act.

If you believe that any information that you will be providing to Zone 7 is confidential or is subject to protection as a trade secret, please clearly mark that information as confidential in your submittal. You may highlight the confidential information in yellow or otherwise mark it so that Zone 7 personnel clearly know that it is confidential or trade secret information.

Zone 7 will do its best not to disclose confidential or trade secret information that is clearly marked as such, but you should know that you bear the risk of marking the confidential/trade secret information sufficiently clearly so as to allow Zone 7 personnel to redact that information prior to providing it to a requestor. Zone 7 assumes no responsibility for any failure on your part to mark the information sufficiently clearly so as to allow our staff to redact the information at the appropriate time.

Prior to disclosing your Proposal to a requestor, Zone 7 will provide you with reasonable notice of the request and a reasonable opportunity to seek a protective order from a court of competent jurisdiction. Zone 7 will not contest your request for a protective order but will also not contest a request for your response to the request for Proposals. Zone 7 will comply with any order regarding disclosure from a court of competent jurisdiction.

XI. ATTACHMENTS

Attachment A – Detailed Scope of Work
Attachment B – Mocho Wellfield PFAS Treatment Facility Project Conceptual Design Report
Attachment C – Mocho PFAS Treatment Plant Pre-Conceptual Architectural Renderings
Attachment D – Sample Professional Services Agreement
Attachment E – Sample Professional Services Insurance Requirements, Model 2
Attachment F – Sample Professional Services Insurance with Drone Requirements, Model 2
Attachment G – Exceptions-Deviations Form
Attachment H – Zone 7 CAD Standards
Attachment I – Zone 7 Brand Guidelines

ATTACHMENT A

SCOPE OF WORK

A preliminary scope of work, provided below, has been developed to assist the Proposer in gaining an understanding of Zone 7's goals as they relate to this effort. The final scope of work will be developed in cooperation with the selected Consultant and included as part of the agreement between Zone 7 and the selected Consultant. Although a consultant team is allowed, the Consultant shall provide one person to be the Owner's Representative (OR) and the primary interface with Zone 7. This person shall not be replaced without written approval by Zone 7.

Zone 7's intention is that the Consultant will act as the Owner's Representative, serving as an extension of staff. The initial consultant contract is anticipated to commence through the award of the Guaranteed Maximum Price (GMP) of the design-build (DB) contract. The Consultant contract for services after GMP award through construction closeout is anticipated to be awarded at a later phase, and may include construction management services. Zone 7 reserves the right to award construction management services separately.

<u>Overall Project Management</u>

A. Work effectively with all levels of staff, management, and the Zone 7 Board of Directors. Work with all departments within Zone 7, as required.
B. Update the project cost estimate and prepare a detailed schedule of the DB procurement phase of the project.
C. Provide guidance to Zone 7 throughout the project on the design build process.
D. Hold regular project team meetings with Zone 7.
E. Prepare project status updates on a weekly and monthly basis.
F. Document all decisions made and provide the documentation to the Zone 7 Project Manager in a timely manner.
G. Recommend physical and digital documentation that should be used throughout the life of the project for project management. Recommend who should procure and maintain needed project management software licenses (and upgrades) for the project team. Follow Zone 7 Retention Policy.
H. Review Contractor monthly invoices and recommend to Zone 7 acceptability of payment requests.
I. Review Contractor labor compliance documents in accordance with applicable requirements and Labor Code sections.
J. Prepare and give presentations to Zone 7, the Zone 7 Board of Directors, Zone 7 Retailers, regulatory agencies, community organizations and others when requested by Zone 7.

Design-Build Contract Implementation

A. Zone 7 anticipates using the Progressive Design-Build (PDB) project delivery method for this project. The Consultant is to assess alternative project delivery options and confirm that PDB is the appropriate approach for this project.
B. Assist Zone 7 to develop DB Request for Qualifications (RFQ)/Request for Proposals (RFP) and DB contract, including technical design criteria.
C. Assist Zone 7 staff to develop a best-value procurement process as described by the Water Collaborative Delivery Association (WCDA), supplementing with Agency standard contract documents where appropriate.
D. Prepare and implement a Procurement Implementation Plan.
E. Perform marketing outreach and project solicitation to DB firms.
F. Prepare all necessary documents to solicit proposals from DB contractors, including, but not limited to, the proposed scope of work, schedule, and RFQ/RFP.
G. Develop qualifications for the DB contractor.
H. Develop evaluation criteria for DB contractor statements of qualifications and/or proposals.
I. Facilitate the evaluation and selection process of the DB contractor, ensuring that the selection process follows Zone 7 guidelines and industry standards. Assist Zone 7 with evaluation review meetings and interviews.
    a. Review proposals for technical conformance to design criteria.
    b. Prepare an independent cost estimate.
    c. Assist Zone 7 with negotiation of scope, cost, and terms with DB contractor.
    d. Assist Zone 7 with debriefing meetings with DB firms that were not selected.
J. Assist Zone 7 staff with typical project management and DB contract implementation responsibilities for the project including, but not limited to, the following tasks:
    a. Implement the DB contract.
    b. Negotiate changes to cost, scope and/or terms of the DB contract, should they be needed.
    c. Develop a Project Risk Register to document and quantify project risks.
    d. Hold regular project team meetings with Zone 7 and the DB team, and others as appropriate. This includes preparation of the agenda and meeting minutes.
    e. Perform project budget review and assess timing of expenditures.
    f. Perform project schedule reviews and updates.

g. Review project workload and make recommendations about when additional Zone 7 staff may be needed for specific assignments.
h. Coordinate dispute resolutions with the DB contractor.

Technical Advisory Services

A. Review DB contract submittals for conformance to the contract and project intent.
B. Incorporate any agreed-upon change(s) into the technical criteria during the initial phase of the project.
C. Provide design review for all disciplines (e.g., electrical, mechanical, structural, civil, and controls) at agreed upon design submittal phases (e.g., Basis of Design, 30%, 60%, 90%, 99%, and 100%) for both plans and specifications.
D. Assist Zone 7 and the DB contractor with value engineering, modification of design criteria, material/equipment selection and constructability analysis.

Right-of-Way and Land Acquisition Services

A. Right of way assistance.
    a. Prepare fair market assessment. Along with a licensed land surveyor, prepare plats and legal descriptions, perform boundary and record of survey(s), identify the recommended easement or land purchase needed.
    b. Prepare parcel maps, graphics showing land ownership, easements, etc. on the proposed project parcel.
    c. Assist Zone 7 with negotiations with other public agency landowners.
    d. Review existing right-of-way documents, including but not limited to easements, license agreement(s), encroachment permit(s).
B. Conduct meetings with other interested parties concerning land transfers, prepare meeting agendas, minutes, and presentations.
C. Assist Zone 7 with Right-of-Entry negotiation and documentation.

Permitting and CEQA Assistance

A. Understand what permits will be required for the project and assist Zone 7 with applying for and obtaining the necessary permits or permit amendments, including a Drinking Water Supply Permit Amendment from California State Division of Drinking Water (DDW).
B. Assist Zone 7 with development of the appropriate CEQA document; document will be by others.
C. Collaborate with stakeholders, including City of Pleasanton, City residents, and Dublin San Ramon Services Zone 7 (DSRSD) to gain approval of the CEQA document.

D. Assist Zone 7 with project presentations to other public agencies, citizen groups, Zone 7 Board of Directors, and Executive Management concerning the proposed CEQA document.

Architectural Renderings

A. Artistic Renderings: Prepare new and/or update existing 3-D pre-conceptual architectural renderings. The existing renderings, prepared by Siegel & Strain, were developed using the Rhino, Enscape, and Photoshop programs. Consultant shall have licenses for each of the programs listed above. The native files are available upon request. This task shall include, but not be limited to, the following:
    a. Develop up to six (6) design renderings in a photo-simulation style.
    b. Renderings to include:
        i. Two (2) building massing options for each of three (3) viewpoints.
        ii. New landscape elements (tree, shrubs, and groundcover).
        iii. A diverse group of people of differing ages/abilities as well as dogs.
        iv. Site amenities (benches and bike racks).
        v. Each of the three (3) viewpoints will have the same foreground and background imagery and landscape elements, amenities, people, etc.
        vi. Renderings shall consider existing utility conflicts, easements, and other constraints.
        vii. Consultant shall review the existing pre-conceptual architectural renderings and further refine them.
    c. Consultant to assume the following meetings:
        i. Renderings kick off meeting
        ii. Review workshops at each submittal phase (e.g., 30%, 60%, 100%)

Public Relations and Outreach

A. The selected Consultant shall support the Zone 7 Project Manager, Communication Specialist, and third-party Public Relations firm in the Public Relations and Outreach task. All deliverables shall be in accordance with the Zone 7 Brand Guidelines (attached as Attachment I). The Consultant shall provide all services required to fulfill the intent of the scope of work and achieve the project's goals and objectives. The Consultant shall work effectively and in a timely manner to the expectations of Zone 7, including its Board of Directors, Executive Management, and other appropriate Zone 7 staff. Tasks include, but are not limited to, the following:
    a. Task Management

i. Participate in strategy meetings that include the Zone 7 Communication Specialist on an as-needed basis.
ii. Ensure all collateral are brand-aligned and consistent with regular messaging tone, utilizing Zone 7's brand guidelines.

b. Assist Zone 7's third-party Public Relations firm with the following tasks, including, but not limited to:
   i. Provide quarterly website content updates. Zone 7 to upload the updated content on its website. Additional website content to be provided for each community outreach meeting, and for the ribbon cutting ceremony.
   ii. Provide content and graphics for up to four (4) project interpretative signs for contractor installation.
   iii. Assist Zone 7 in facilitating community outreach meetings (eight total at two hours each).
   iv. Prepare content for promotional materials to notify the community about outreach meetings, including but not limited to graphics and informational content for social media posts, newsletters, and postcards.
   v. Assist with in-person presentations and discussions.
   vi. Prepare quarterly email project updates and notifications to the public, starting at the 30% design submittal phase through end of construction phase.
   vii. Provide content and information for up to two (2) project informational videos, up to 10 minutes each. The first video shall be completed prior to construction commencement, and shall explain PFAS, its relevance, project scope, schedule, artist renderings and construction impacts. The second video shall be completed after construction closeout, and shall include construction photos, the PFAS treatment process, and other information.

<u>Construction Management Services</u>

A. Construction Services
   a. Project & Contract Administration:
      i. Coordinate weekly progress meetings with Zone 7 and Contractor, and prepare and distribute agenda and meeting minutes.
      ii. Evaluate the project schedule for actual vs. planned progress, document all scheduling discrepancies and deviations.
      iii. Communicate effectively and coordinate as needed with Zone 7 and Contractor.

iv. Prepare and submit monthly progress reports along with monthly payment invoice. Monthly progress reports should include an overview of work accomplished for the month along with photos, work to be accomplished the following month, an updated schedule of work, and explanations for deviations from the initial schedule and an explanation of any upcoming risks/problem areas and what corrective action should be taken as mitigation.
v. Review Contractor's conduct for compliance with contract documents, Zone 7 requirements, state laws, etc.
vi. Review Contractor submittals for general compliance with contract documents/Zone 7 requirements and coordinate Zone 7's review. Log all submittals and their associated responses.
vii. Review Contractor Requests for Information (RFIs) and provide pertinent information from contract documents to the Contractor and coordinate with Zone 7 for resolution. Log all RFIs and their associated response.
viii. Review Contractor monthly invoices and recommend to Zone 7 acceptability of payment requests.
ix. Relay to Contractor acceptability or deficiencies in work and what mitigating efforts are required for contract compliance.
x. Provide information to Contractor for their creation of system outage and coordination requests in accordance with contract documents. Review all shutdown and coordination requests and contingency plans for feasibility and reliability.
xi. Coordinate all system outage requests and general construction activity with Contractor and Zone 7 to ensure adequate operations of Zone 7 facilities.
xii. Maintain a log of equipment warranty schedules
xiii. Maintain project documents for incorporation into Zone 7 project files.

b. Construction Observation/Inspection:
    i. Inspect/observe Contractor's work for compliance with the contract documents and Zone 7 requirements.
    ii. Maintain inspection reports of contract work including photos of work, descriptions of activities, corrective actions to be taken by Contractor if work is out of compliance, persons and equipment on site, and work to be completed the following day(s).
    iii. Review materials/equipment delivered to site for compliance with applicable submittals and contract documents.
    iv. Provide any required specialty electrical inspections as required for either 480V or 4160V services.

v. Review Contractor's compliance with regulatory permits, storm water regulations and permits (stormwater quality protection plan, SQPP), environmental documents, and mitigation measures.
vi. Review Contractor's compliance with health and safety standards and regulations, along with reporting non-compliance.
vii. Monitor record documents on a monthly basis, at the minimum, to ensure they are being maintained/completed by the Contractor.

c. Change Order Management:
   i. Coordinate, review, and evaluate potential change orders, cost estimates/quotations, and effect on GMP.
   ii. Coordinate, review, evaluate, and recommend course of action for contract change order requests and submittals.
   iii. Inspect and evaluate site conditions that are perceived to be different than shown in contract documents.
   iv. Review and gather information (submittals, inspection reports, contract documents, etc.) in support of Zone 7's position on change order requests.
   v. Coordinate and obtain Zone 7's written approval prior to issuance of change order or extra work.
   vi. Review, gather, and evaluate information for resolution of potential claims or disputes.

d. System Startup, Integration, Commissioning & Training:
   i. Coordinate system integration work (calibration, SCADA, etc.) with Contractor and Zone 7.
   ii. Coordinate training requirements and activities and provide oversight of testing, training, and startup. Contractor to provide startup and training leader.
   iii. Review Contractor's startup, testing, and training plans.
   iv. Develop a startup schedule and coordinate all startup and training activities with Contractor and Zone 7.
   v. Implement procedures and coordinate activities for the orderly and timely completion, acceptance, and transfer of all newly replaced equipment.
   vi. Provide a commissioning agent to oversee the startup and commissioning phase through facility operation use of the new PFAS treatment plant.

B. Substantial and Final Completion Services:
   a. Perform site inspections to determine if facilities are complete and in compliance with contract documents.
   b. Develop corrective item work lists (punchlists) and inspect corrective actions performed.

c. Prepare substantial completion certificate upon completion of corrective actions and compliance with contract documents to the satisfaction of Zone 7 and Construction Manager.
d. Verify all O&M Manual submittals as required by the contract documents.
e. Coordinate final submittal of organized and complete record drawings in accordance with contract documents. Provide AutoCAD and PDF files of the record drawings in accordance with Zone 7 CAD standards.
f. Verify that Contractor has made all payments and that all required releases, including warranty release, lien release(s), and release of claims have been submitted by Contractor.
g. Prepare and submit a final construction report outlining all work complete, budget spent, and time of construction.

ATTACHMENT B

ZONE 7 WATER AGENCY

Mocho Groundwater Demineralization Plant and Mocho Wellfield PFAS Compliance Conceptual Design

FINAL / December 2024

carollo

ZONE 7 WATER AGENCY

Mocho Groundwater Demineralization Plant and Mocho Wellfield PFAS Compliance Conceptual Design

FINAL / December 2024

Digitally signed by Nahel Mohsen Ali
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Date: 2024.12.16 11:48:52-08'00'

REGISTERED PROFESSIONAL ENGINEER
NAHEL MOHSEN ALI
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Abbreviations

µg/L	micrograms per liter
AACE	Association for the Advancement of Cost Engineering
AWWA	American Water Works Association
Brine Line	Inland Empire Brine Line
bv	bed volumes
C	Celsius
Ca^{2+}	calcium ion
$CaCO_3$	calcium carbonate
Carollo	Carollo Engineers
cf	cubic feet
COLTP	Chain of Lakes Treatment Plant
DDW	Division of Drinking Water
DSRSD	Dublin San Ramon Services District
EBCT	empty bed contact time
ED	electrodialysis
FW	finished water
GAC	granular activated carbon
GenX	hexafluoropropylene oxide dimer acid
gpm	gallons per minute
gpm/sf	gallons per minute per square foot
HI	Hazard Index
hp	horsepower
IX	Ion Exchange
kW	kilowatts
kWh	kilowatt-hour
LAVWMA	Livermore Amador Valley Water Management Agency
LLR	liquid loading rate
m	million
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MG	million gallons
mg/L	milligrams per liter
Mg^{2+}	magnesium ion
mgd	million gallons per day
MGDP	Mocho Groundwater Demineralization Plant
min	minutes
NF	nanofiltration

NL	notification level
No.	number
NPDWR	National Primary Drinking Water Regulations
O&M	operations and maintenance
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonic acid
PFD	process flow diagram
PFHxS	perfluorohexane sulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctyl sulfonate
PFSA	perfluoroalkanesulfonic acids
Pleasanton	City of Pleasanton
ppt	parts per trillion
PQL	practical quantitation level
psi	pounds per square inch
RL	response level
RO	reverse osmosis
RSSCT	rapid small scale column test
S.U.	standard units
SAWPA	Santa Ana Watershed Project Authority
SRTP	Stoneridge Treatment Plant
TDH	total dynamic head
TDS	total dissolved solids
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
Zone 7	Zone 7 Water Agency

SECTION 1 EXECUTIVE SUMMARY

Zone 7 Water Agency (Zone 7) has been monitoring the Mocho Wellfield for per- and polyfluoroalkyl substances (PFAS). Data indicate that Mocho Well No. 2, No. 3, and No. 4 have running annual average concentrations of these PFAS in excess of the United States Environmental Protection Agency (USEPA) maximum contaminant levels (MCL). Water sources that have test results exceeding the respective MCLs are required to be taken out of service or provide treatment.

- **Evolving Regulations.** The USEPA has published federal MCLs with more stringent PFAS limits than existing California Division of Drinking Water (DDW) response levels (RL). This study has evaluated treatment for the Mocho Wellfield to USEPA limits for PFAS, including use of the existing Mocho Groundwater Demineralization Plant (MGDP) and the potential impacts of the evolving regulation on the MGDP concentrate stream.
- **Interim Blending Strategy.** Zone 7 has utilized reverse osmosis (RO) membrane treatment at the MGDP and blending to produce water from the Mocho Wellfield compliant with the DDW PFAS RLs. With the implementation of stricter USEPA MCLs, Zone 7 has identified MGDP operational restrictions and offsite blending sources to meet MCLs as an interim strategy.
- **Phased PFAS Treatment Implementation.** Given site constraints of the individual wells, providing a centralized treatment facility at Mocho Well No. 3 is recommended. PFAS treatment with Ion Exchange (IX) pressure filters is recommended based on site footprint constraints and utility familiarity with the process. Pressure filters are also able to accept some of the new and innovative PFAS treatment media being developed, once they become commercially viable, economically attractive, and supported by regulators. The PFAS treatment facility could be constructed in a phased approach. During Phase 1, the new IX treatment facility (5 trains) will remove PFAS from the MGDP bypass in conjunction with PFAS treatment at the MGDP. During Phase 2, the facility will be expanded (7 trains or 10 trains depending on hydraulic loading rate) to treat the entire Mocho Wellfield with the MGDP providing desalting only.
- **Pre-design activities.** A hydraulic analysis of the existing wellfield, MGDP feed pumps, and the new IX treatment facility is needed. For the purposes of this study, it was assumed that additional pumping is required. It is recommended that all design criteria and facility sizing shown in this report be confirmed during preliminary design.
- **Costs to Implementation.** An Association for the Advancement of Cost Engineering (AACE) International Class 5 opinion of probable construction cost developed for relative treatment comparison purposes indicated the facility construction cost is approximately $24.8m (million) (-30 percent/+50 percent) for Phase 1, $12.8m (-30 percent/+50 percent) for Phase 2a, and $17.8m (-30 percent/+50 percent) for Phase 2b.

SECTION 2 INTRODUCTION

2.1 Project Background and Purpose

Zone 7 contracted with Carollo Engineers (Carollo) to conduct a PFAS Treatment Conceptual Study of the Mocho Wellfield to meet the USEPA MCLs for these compounds and develop an approach to implementation.

A conceptual study titled *Technical Memorandum 1 - PFAS and Hexavalent Chromium Treatment Feasibility Study* was completed by Carollo in June 2020 which documented the ability of Zone 7 to meet California DDW PFAS RL for PFAS by using blending and the existing MGDP. With the final ruling of the PFAS MCLs by the USEPA in April 2024, Zone 7 implemented interim water quality goals to meet PFAS MCLs prior to the compliance date.

This study evaluates treatment alternatives to meet PFAS MCLs for the Mocho Wellfield and MGDP.

2.2 Existing Groundwater Supply and Infrastructure

The Zone 7 service area highlighted in Figure 1, encompasses an area of approximately 425 square miles, providing drinking water to four retail water entities, combined serving over 260,000 residents. The retailers include:

- California Water Service Company - Livermore District.
- Dublin San Ramon Services District (DSRSD).
- City of Livermore.
- City of Pleasanton (Pleasanton).

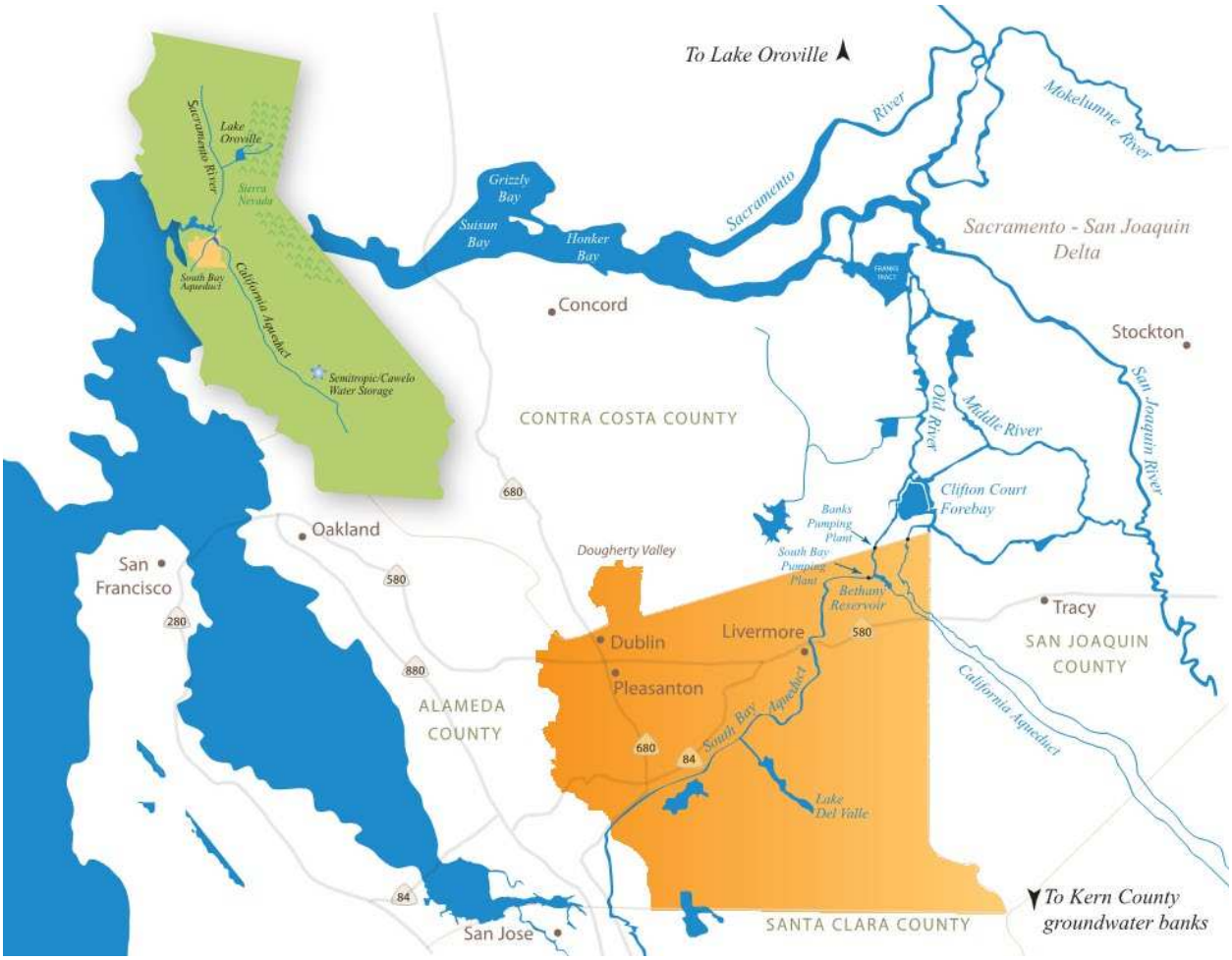

Figure 1 Zone 7 Service Area

2.3 Existing Groundwater Supply

In addition to local and imported surface water, Zone 7's existing water sources include four groundwater wellfields. To prevent over-pumping, the main groundwater basin is cooperatively managed by Zone 7 and its four retailers. A key component of the Livermore Valley Groundwater Basin management strategy to maintain groundwater sustainability is to operate and manage groundwater resources to keep groundwater levels above the historic low level of 130,000 acre-feet (52 percent of the estimated 250,000 acre-feet capacity), even during a multiyear drought.

Table 1 summarizes the capacity of the Mocho Wellfield which is the focus of this study. For the purposes of this evaluation, the capacities as of August 22, 2024, were used and that 25 percent of the well capacity could be used for a basis of estimating average annual operation. The actual production from each well can vary significantly depending on groundwater level.

Table 1 Zone 7 Mocho Wellfield Capacity

Well[1]	Capacity[2] (gpm)	Capacity[2] (mgd)	Assumed Annual Production[3] (MG)
Mocho Well No. 2	2,720	3.9	358
Mocho Well No. 3	4,770	6.9	627
Mocho Well No. 4	4,280	6.2	562
Total	**11,770**	**17.0**	**1,547**

Notes:
gpm – gallons per minute; MG – million gallons; mgd – million gallons per day; No. – number.
(1) Wells included in this evaluation. Does not represent all Zone 7 groundwater wells.
(2) Well capacity based on August 22, 2024, production.
(3) Established for the purposes of developing operations and maintenance (O&M) costs. Value is based on 25 percent of annual production at well capacity.

Figure 2 presents the general location of these wells.

Figure 2 Mocho Wellfield Wells Location

Zone 7 uses Mocho Well No. 2, Mocho Well No. 3, and Mocho Well No. 4 as supply sources for MGDP by the California State Water Resources Control Board DDW Public Water System Permit No. 02-03-24P-0110010. Mocho Well No. 1 is currently held in reserve as an emergency (standby) source and is subject to different operational and monitoring requirements than the other Mocho wells. Zone 7 has conducted an internal evaluation and concluded that Mocho Well No. 1 will not be put back into service as it was constructed in 1966 and has sanding issues. Mocho Well No. 1 was not considered for the interim blending plan analysis, facility sizing, treatment footprint, and implementation cost described in this report.

SECTION 3 WATER QUALITY AND INFRASTRUCTURE

3.1 Regulatory Background and Water Quality Goals

On April 10, 2024, the USEPA finalized National Primary Drinking Water Regulations (NPDWR) for six PFAS in drinking water. The rule includes maximum contaminant level goals (MCLG) and MCLs for perfluorooctyl sulfonate (PFOS) and perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (GenX), and perfluorohexane sulfonic acid (PFHxS) as individual contaminants. The USEPA also finalized an MCL for PFAS mixtures containing at least two or more of PFNA, GenX, PFHxS, and perfluorobutane sulfonic acid (PFBS), using a Hazard Index (HI) to account for combined and co-occurring levels. The MCL requires that the unitless HI be less than one. As shown in Figure 3, the formula for calculating the HI involves dividing the concentration of each of the four individual PFAS compounds by its respective individual Health Based Water Concentration reference value and then summing these four values. Health Based Water Concentrations are determined by the EPA as the highest level of PFAS concentration to not have risk of health effects.

$$\mathrm{HI} = \frac{[\mathrm{PFHxS}]}{10\ \mathrm{ppt}} + \frac{[\mathrm{GenX}]}{10\ \mathrm{ppt}} + \frac{[\mathrm{PFNA}]}{10\ \mathrm{ppt}} + \frac{[\mathrm{PFBS}]}{2{,}000\ \mathrm{ppt}}$$

Figure 3 HI Index Equation

Before the USEPA finalized the NPDWR and established the federal MCLs, Zone 7 was operating using the state of California's RLs and notification levels (NL) issued by DDW. Table 2 summarizes the federally regulated PFAS compounds and their MCLs and MCLGs as compared to the California RLs and NLs. The new USEPA MCLs would require public water systems to monitor these PFAS, notify the public of the levels of these PFAS, and reduce the levels of the PFAS if they exceed the MCLs. The federal limits are more stringent than the state of California's which is the reason for the Mocho Wellfield PFAS treatment evaluation.

Table 2 PFAS Compounds Regulation Summary

Contaminant	Units	Federal MCL (or Health Based Water Concentration)	Federal MCLG	California RL	California NL
PFOA	ppt	4.0	0	10	5.1
PFOS	ppt	4.0	0	40	6.5
PFHxS	ppt	(10)	10	20	3
PFNA	ppt	(10)	10	-	-
GenX	ppt	(10)	10	-	-
PFBS	ppt	(2,000)	2,000	5,000	500
HI	Unitless	1.0	1.0	-	-

Notes:
ppt – parts per trillion.

3.2 Mocho Wellfield Groundwater Quality

Table 3 summarizes the general water quality parameters for Mocho Wellfield. These values are averages of all data provided by Zone 7.

Table 4 summarizes the average PFAS concentrations of the last four most recent quarterly samples provided by Zone 7. The data indicate that the three Mocho wells all have PFAS contaminations greater than the MCLs. While there is additional historical data and variability within these data sets, Zone 7 indicated that the data presented in Table 4 should be used for this evaluation. This was chosen over historical maximums or other values that would limit scenarios only to more conservative options.

Table 3 Mocho Groundwater Wells Average Water Quality

Parameter	Units	Mocho 2	Mocho 3	Mocho 4
Alkalinity(1)	mg/L as $CaCO_3$	238	284	278
Calcium(1)	mg/L as Ca^{2+}	69.2	54.1	59.0
Chloride(1)	mg/L	109	117.4	88.4
Hardness(1)	mg/L as $CaCO_3$	373	337	331
Iron(2)	µg/L	<100	<100	<100
Magnesium(1)	mg/L as Mg^{2+}	47.6	48.2	43.9
Manganese(2)	µg/L	<10	<10	<10
Nitrate(2)	mg/L	0.9	1.9	2.4
pH(1)	S.U.	7.2	7.3	7.3
Potassium(2)	mg/L	1.9	2.2	2.5
Sodium(1)	mg/L	58.5	106	84.4
Sulfate(1)	mg/L	57.2	71.8	63.2
TDS(1)	mg/L	520	584	526
Temperature(1)	degrees C	17.7	18.6	19.9
TOC(2)	mg/L	0.4(3)	0.3(3)	0.3(3)

Notes:
C – Celsius; Ca^{2+} – calcium ion; $CaCO_3$ – calcium carbonate; Mg^{2+} – magnesium ion; µg/L – micrograms per liter; mg/L – milligrams per liter; S.U. – standard units; TDS – total dissolved solids; TOC – total organic carbon.
(1) Samples from 2022 through 2024.
(2) Samples from 2021 through 2024.
(3) Includes values below detection limit. Half the detection limit was assumed for average calculation.

Table 4 Mocho Groundwater Wells Average PFAS Concentrations of Last Four Most Recent Quarterly Samples

Parameter	Units	MCL(1)	PQL(2)	Mocho 2(3)	Mocho 3(4)	Mocho 4(3)
PFOA	ppt	4.0	4.0	5.2	3.7	0.0
PFOS	ppt	4.0	4.0	38.5	45.0	8.4
PFHxS	ppt	10	3.0	30.0	31.8	7.7
PFNA	ppt	10	4.0	0.0	0.0	0.0
GenX	ppt	10	5.0	0.0	0.0	0.0
PFBS	ppt	-	3.0	6.8	7.5	0.0
Hazard Index(5)	Unitless	1	-	3.0	3.2	N/A

Notes:
PQL – practical quantitation level.
(1) MCLs from the USEPA.
(2) Values below the PQL are assumed to be 0 for running average calculation per USEPA MCL guidance.
(3) Average of 23Q4, 24Q1, 24Q2, and 24Q3 samples.
(4) Average of 23Q1, 24Q1, 24Q2, and 24Q3 samples.
(5) Hazard Index is only applicable for PFAS mixtures containing at least two or more of PFNA, GenX, PFHxS, and PFBS.

3.3 Mocho Wellfield Interim PFAS Blending Strategy

Previous evaluation of Zone 7 groundwater wells determined that DDW RLs could be met by a combination of blending and operation of the MGDP. With the updated USEPA MCLs and Zone 7's operational goals, not all blending and operational scenarios are feasible. Based on current PFAS concentrations in the Mocho Wellfield and other water sources directed through the area, Zone 7 has established interim blending strategies to produce a blended water quality that meets the Zone 7 operational goal of 80 percent of the PFAS MCLs during the design and construction of the Mocho Wellfield PFAS treatment facility. Challenges to implementing blending as a long-term solution include untreated PFAS remaining within the watershed, the sensitivity of blending to an increase in PFAS concentrations from the water supplies, and the lack of on-line PFAS monitoring capabilities needed for robust process control.

MGDP is a RO treatment plant consisting of four RO trains that operate independently to remove salt and other constituents from groundwater produced by the Mocho wells. MGDP permeate is treated through a decarbonation process prior to being combined with bypassed groundwater and chlorine for disinfection in the flow equalization tank. A portion of the groundwater goes directly to the flow equalization tank, bypassing the RO elements. Ammonia is then added to the combined waters as MGDP finished water (FW) prior to being sent to the transmission system.

The amount of bypass flow is automatically controlled by an automatic control valve. Operation of the bypass flow control valve is controlled by the following operational limits:

- MGDP consists of four trains, each capable of treating 1,330 gpm.
- MGDP permeate is 80 percent of MGDP feed (80 percent recovery).
- MGDP bypass operates at a minimum of 400 gpm based on system hydraulics. The number of operational trains is based on total incoming flow while maintaining a minimum of 400 gpm in the bypass flow.

MGDP FW has historically been blended with offsite sources. Offsite blending sources with non-detectable PFAS (i.e., concentrations less than the PQL) include the following depending on customer demands and system operation:

- Hopyard Wells No. 6 and 9.
- Stoneridge Treatment Plant (SRTP).
- Del Valle Water Treatment Plant.
- Patterson Pass Water Treatment Plant.

In addition to this list, the Chain of Lakes wellfield feeds to this area of the transmission system. While the wellfield is currently not being operated due to PFAS contamination, the Chain of Lakes Treatment Plant (COLTP) is currently under construction. This facility uses the same technology that is being utilized at the new SRTP to reduce Stoneridge Well water PFAS concentration to below their PQLs. Once placed into service, it is anticipated that the COLTP FW PFAS concentrations will also be less than PQL and will be another source to blend down the MGDP FW PFAS concentrations.

Zone 7 is proposing to move the MGDP point of compliance monitoring location for PFAS to an area that is more representative of PFAS concentrations than the current location. This is discussed further in the *Project Memorandum - Interim Blending Plan for PFAS: Relocation of the Finished Water Compliance Sampling Location* (Carollo 2024).

As all offsite blending sources listed above have PFAS less than the PQL, the blending evaluation identified the total amount of offsite water with non-detect PFAS concentrations to be blended with MGDP FW to meet operational goals. Table 5 shows the results of the blending evaluation. Detailed blending alternatives are included in Appendix A.

Based on discussions with Zone 7, system hydraulics currently allows blending up to approximately 15,000 gpm from offsite sources with the MGDP FW through existing infrastructure. Based on this constraint, Zone 7 can operate the following configurations of the Mocho wellfield while meeting PFAS operational goals:

- Mocho Well No. 3 only with MGDP treatment and blending with offsite sources.
- Mocho Well No. 4 only with MGDP treatment and blending with offsite sources.
- Mocho Well No. 2 and No. 4 with MGDP treatment and blending with offsite sources.

Table 5 Blending Analysis Results

Mocho Wells Running	MGDP FW(1) (gpm)	PFOA(2) (ppt)	PFOS(2) (ppt)	PFHxS(2) (ppt)	PFNA(2) (ppt)	GenX(2) (ppt)	PFBS(2) (ppt)	HI(2) (unitless)	Blending Flow Required to Meet PFAS Water Quality Operational Goal(3) (gpm)
Mocho 2 Only	2,454	3.4	22.2	17.4	1.0	1.0	4.3	2.4	21,239
Mocho 3 Only	3,972	1.5	9.6	7.0	1.0	1.0	2.3	1.1	11,628
Mocho 4 Only	3,748	1.0	6.4	5.9	1.0	1.0	1.0	0.9	5,875
Mocho 2 and 3	6,426	2.1	15.1	11.2	1.0	1.0	3.1	1.6	34,646
Mocho 2 and 4	5,936	1.5	6.4	5.3	1.0	1.0	1.6	0.9	8,635
Mocho 3 and 4	7,986	1.7	13.5	10.0	1.0	1.0	2.6	1.5	37,247
Mocho 2, 3, and 4	10,706	2.2	18.6	14.0	1.0	1.0	3.4	1.9	74,844

Notes:
(1) MGDP FW represents the combination of the MGDP permeate and bypass flow. MGDP permeate assumes 80 percent recovery of MGDP RO feed. Well capacities for Mocho 2, 3, and 4 are assumed to be 2,720, 4,770, and 4,280 gpm. Flows shown in this column represent the combined permeate and bypass flows.
(2) PFAS concentrations in Table 4 were used for blending analysis. PFAS concentrations resulting in reported values of 0 ppt are assumed to be 1 ppt for blending calculations.
(3) Represents the flow required to blend PFOS down to the operational target of 3.2 ppt. Since PFOS has the highest concentration of the regulated PFAS compounds in the source waters and has the lowest operational target concentration, it requires the greatest blending flow. The blending source waters are assumed to have a PFOS concentration of 1 ppt.

SECTION 4 TREATMENT TECHNOLOGIES FOR PFAS REMOVAL

4.1 Treatment Considerations for the Removal of PFAS

PFAS treatment technologies are rapidly evolving, and a variety of treatment technologies have been evaluated for PFAS removal with considerations to both cost and efficacy. Advanced treatment processes that can effectively remove PFAS from drinking water include:

- Granular activated carbon (GAC).
- IX.
- High-pressure membranes.
- Novel adsorbents.

Each of these technologies has its own unique advantages and challenges for application. It should be noted that currently, the USEPA has designated only GAC, IX, and high-pressure membranes as best available technologies for PFAS removal from drinking water based on its review of treatment and cost literature.

4.2 Granular Activated Carbon

GAC is a porous material with a high volumetric surface area that effectively adsorbs many contaminants, including varieties of PFAS. Carbon life for PFAS removal can vary widely depending on the carbon type, target contaminant concentrations, background water quality, and PFAS carbon chain length. In general, GAC adsorbs longer-chain PFAS (e.g., PFOS and PFOA) better than shorter-chain PFAS (e.g., perfluorohexanoic acid and PFBS).

GAC adsorption systems require a backwash supply and equalization and settling provisions. This is to address carbon particle degradation that can occur during this technology's initial loading and normal operation, resulting in carbon fines that require backwashing to remove these particles causing additional pressure loss through the contactors. Backwashing is required to reverse carbon bed compression which occurs during normal operation. It can also be used to remove accumulated sediment generated by wells, particularly as they age.

This study assumes that GAC processes will use pressure contactors in lead/lag configuration to allow water to pass through. The lead/lag series configuration of the pressure vessels means water flows first through one vessel (lead vessel) and then through the second vessel (lag vessel). Piping and valves between the two vessels allow vessels to alternate between the lead and lag position or to bypass the lead vessel if the vessel needs to be offline for media replacement. The lead vessel will always provide treatment, and breakthrough of PFAS will be monitored through the GAC bed and/or between the lead and lag vessels. The lag vessel provides an additional barrier for PFAS treatment and also maximizes media throughput for the lead bed. Once breakthrough is imminent into the lag vessel, the GAC media in the lead vessel will be changed out, and the vessel will then be placed in the lag position.

Figure 4 shows a typical example of a full-scale GAC pressure adsorption lead/lag pressure vessel system.

Figure 4 Example Pressure GAC Adsorption Lead-Lag Pressure Vessels

4.3 Ion Exchange

Synthetic IX resins can also be used for PFAS removal. An IX treatment system uses pressure vessels, like GAC pressure contactors but with an IX resin bed installed instead of GAC media. The single-use PFAS selective resins most frequently used for PFAS removal at municipal facilities provides dual-removal mechanisms of both IX and adsorption to remove these. While these PFAS selective IX resin typically have a higher capacity for PFAS compounds (i.e., last longer) than GAC media, they are more expensive.

Once the resin's removal capacity for the given effluent quality has been reached, it must be sent off-site for disposal and be replaced. Unlike GAC, IX regeneration technology for resins used in PFAS treatment is not yet commercially available. As IX resin beds do not compact during normal use, backwashing IX resin beds is not recommended, as it would disturb the mass transfer zones which can reduce the PFAS removal efficiency. This highlights the need for robust pretreatment to remove sediment, a topic that is discussed in Section 3.4.

Similar to GAC, this study assumes that IX processes will use pressure contactors in lead/lag configuration to allow water to pass through. Figure 5 shows a typical example of full-scale IX vessels. These vessels are similar to those used in GAC applications, with minor differences in the internals for flow distribution and the retention of different media particle sizes and are generally smaller as IX needs less contact time than GAC to remove the PFAS compounds.

Figure 5 Example IX Pressure Vessels

4.4 Reverse Osmosis and Nanofiltration

RO and nanofiltration (NF) are well-established purification processes that use semi-permeable polymeric membranes and a driving force of inlet water pressure to remove dissolved salts. The separation process can reject constituents as small as 0.001 micrometers for RO. Although originally developed for desalination, they have been demonstrated to effectively remove a wide variety of organic constituents, including PFAS.

In RO and NF, the product water (or permeate) can range from 50 percent to approximately 90 percent of the feed flow, depending on the feed water chemistry, and the remainder (or concentrate) that contains the bulk of the constituents must be managed as a waste product. RO and NF removal efficiencies depend on the membrane selected. Measurement of the RO permeate at MGDP has consistently resulted in non-detect PFAS concentrations.

While effective in removing PFAS from the permeate, RO and NF concentrate must be properly disposed. Unlike GAC or IX, the disposal process of the concentrate stream is difficult and requires additional treatment in some situations. Treatment of PFAS in membrane process concentrate streams is discussed in Section 6.

4.5 Treatment Technologies Summary

The previous PFAS feasibility study *Technical Memorandum 1 - PFAS and Hexavalent Chromium Treatment Feasibility Study* (Carollo 2020) included an alternatives analysis for the different treatment options at different wellhead and centralized treatment locations. Based on the results of that study, IX treatment has been implemented at Zone 7's SRTP and is currently being constructed at COLTP. Additional treatment

technology alternative analysis was not included as a part of this study and IX treatment was chosen due to the following considerations:

- IX has a smaller footprint than GAC, and there are space limitations within the Mocho Wellfield.
- The anticipated location for a centralized Mocho Wellfield PFAS treatment system is on property not owned by Zone 7 and would need to be acquired. Smaller property acquisition is preferred.
- Zone 7 has utility and operator familiarity with IX from COLTP and SRTP.

SECTION 5 TREATMENT ALTERNATIVES ANALYSIS

The following sections present a review of the recommended treatment alternatives for the Mocho Wellfield. This includes hydraulic analysis and pumping requirements, pretreatment requirements, IX treatment design criteria, site layouts, schematic process flow diagrams (PFD), and the treatment alternatives summary. As discussed in *Technical Memorandum 1 - PFAS and Hexavalent Chromium Treatment Feasibility Study* (Carollo 2020), there is insufficient space to install a new treatment facility at the existing Mocho Well No. 2 or MGDP. Further site location alternatives analysis was done by Carollo and documented in the project memorandum *Mocho Wellfield PFAS Alternatives Evaluation*. The recommendation of this analysis was to proceed with the centralized treatment location at Mocho Well No. 3.

For the purposes of this study, the area to the north of Mocho Well No. 3 was considered for the location of the new treatment facilities. This property is owned by Pleasanton and DSRSD and discussion of land acquisition is not included in the scope of this report.

The conceptual design is presented in a manner that allows Zone 7 to construct the PFAS treatment facility (or each alternative) in a phased approach with buildout at either phase. This is presented generally as two major phases of construction: partial treatment (IX treatment of the MGDP bypass only) and full treatment (IX treatment of the full Mocho Wellfield). These two phases of construction are presented as three different construction alternatives.

The treatment scenarios are described in Table 6. Under the partial treatment scenario (Phase 1) a new IX treatment facility would be constructed to treat 6,450 gpm of MGDP bypass flow while the remaining flow is treated by RO at MGDP. The full treatment scenario (Phase 2) assumes three Mocho wells (2, 3, and 4) are treated at an IX treatment facility. Treated water from the facility would be returned upstream of the MGDP feed and bypass. Construction duration was not evaluated in the scenario alternatives analysis and should be done as part of the pre-design activities.

Scenario 2 is further broken into sub-scenarios "a" and "b." The size of an IX treatment facility is based on the hydraulic liquid loading rate (LLR), which is the flow divided by the vessel cross sectional area. The American Water Works Association (AWWA) recommends that the LLR not exceed 12 gallons per minute per square foot (gpm/sf); however, manufacturer guidelines allow a maximum LLR of 16 gpm/sf. By increasing the LLR, fewer IX trains and a smaller footprint are required for the same treatment capacity. Further discussion of the benefits and drawbacks of increasing the LLR is included in Section 4.3. Phase 1 is based on a low LLR of <12 gpm/sf, which represents conservative sizing for the facility. Prior to constructing Phase 2, Zone 7 can determine the extent of the facility expansion based on operational experience from the Phase 1 treatment facility and other agency IX treatment plants, capital and budget

constraints, and site availability/footprint constraints. Table 6 summarizes the different scenarios evaluated in this study.

Table 6 Treatment Phases

Phase	Description	Flow Treated (gpm)	LLR[3,4]
Phase 1	MGDP Bypass Treatment	6,450[1]	Low (≤12 gpm/sf)
Phase 2a	Treatment of Mocho 2, 3, and 4	11,770[2]	High (≤16 gpm/sf)
Phase 2b			Low (≤12 gpm/sf)

Notes:
(1) Total well flow rate of Mocho Well No. 2, No. 3 and No. 4 minus the MGDP capacity of 5,320 gpm.
(2) Total well flow rate of Mocho Well No. 2, No. 3 and No. 4.
(3) Low LLR based on AWWA recommendations.
(4) High LLR based on manufacturer recommendations.

5.1 Hydraulic Analysis

Construction of the new IX treatment facility will add additional headloss upstream of the MGDP. A hydraulic analysis was conducted to determine the effect of additional headloss on existing pump capacity and determine pumping requirements for a new booster pump station. The major equipment headloss assumptions for the IX treatment facility are shown in Table 7. These were used as the basis for pump station sizing and existing well capacity loss evaluation shown below. Major and minor piping friction losses were not considered as part of this analysis, and a complete hydraulic analysis is recommended as part of pre-design activities.

Table 7 Major Equipment Headloss Assumptions

Equipment	Clean Headloss		Dirty Headloss	
	(psi)	(feet)	(psi)	(feet)
Sand Separator	12.7	29.3	12.7	29.3
Cartridge Filters	1.0	2.3	20.0	46.1
IX Vessels (LLR <12 gpm/sf)	19.4	44.8	29.7	68.5
IX Vessels (LLR <16 gpm/sf)	31.6	72.9	35.8	82.6
Total System Loss (LLR <12 gpm/sf)	**33.1**	**76.4**	**62.4**	**144**
Total System Loss (LLR <16 gpm/sf)	**45.3**	**104.5**	**68.5**	**158.0**

Notes:
psi – pounds per square inch.
(1) Headloss assumptions are based on manufacturer headloss curves at the anticipated operational loading rates.

The existing Mocho well pump curves were analyzed to predict capacity after additional headloss is added to the system. The results of the worst-case pumping scenarios (dirty headloss) are summarized in Table 8. The new predicted operating point and percent capacity loss are based on the additional headloss described above. An in-depth pump evaluation including pump suction head, efficiency, horsepower (hp), and operation of the pump within the preferred operating range and allowable operating range, or operation of the MGDP RO feed pumps was not included as part of this analysis. A complete well pump analysis is recommended as part of pre-design activities.

Table 8 Mocho Well Pump Analysis

Well	Units	Mocho Well No. 2	Mocho Well No. 3	Mocho Well No. 4
Current pump capacity	gpm	2,720	4,770	4,280
Current pump head	feet	354	410	486
Predicted pump capacity LLR ≤12 gpm/sf	gpm	1,625	3,760	2,850
Predicted pump capacity LLR ≤16 gpm/sf	gpm	1,385	3,600	2,435
Predicted pump capacity loss LLR ≤12 gpm/sf	%	40%	21%	33%
Predicted pump capacity loss LLR ≤16 gpm/sf	%	49%	25%	43%

Preliminary pump station design criteria were developed based on the ability to maintain full well production for each scenario. The design criteria for the pumps are shown in Table 9. For costing purposes, it is assumed that the booster pump station consists of vertical turbine pumps in cans with standard piping, valves, and appurtenances located in a building. Pump duty cycle is assumed at 25 percent. Confirmation of pump station design requirements including sizing, number of pumps, and conformance with Hydraulic Institute standards is recommended as a part of pre-design activities. Actual pump selection is to be determined during detailed design and is to be based on the system curve for designed configuration and operational flow range. The booster pump station will be housed in a CMU block building that matches the architectural aesthetic of the Mocho Well No. 3 building and surrounding area. The building will be large enough to house the pumps from Phase 1 and Phase 2.

Table 9 Booster Pump Design Criteria

Parameter	Units	**Phase 1** MGDP Bypass Treatment	**Phase 2a** Full Wellfield Treatment (High Loading)	**Phase 2b** Full Wellfield Treatment (Low Loading)
Firm Capacity	gpm	6,500	13,000	13,000
No. of Pumps	-	2 duty + 1 standby	4 duty + 1 standby	4 duty + 1 standby
Pump Capacity	gpm	3,250	3,250	3,250
Pump TDH	feet	144	158	144
Pump Efficiency	%	75%	75%	75%
Pump hp	hp	150	150	150
Station hp	hp	300	600	600
Duty Cycle(1)	%	25%	25%	25%
Station Average Demand(1)	kW	179	388	326
Station Demand(1)	kWh	391,000	539,000	486,000

Notes:
kW – kilowatts; kWh – kilowatt-hour; TDH – total dynamic head.
(1) Used to calculate O&M costs.

5.2 Modifications to Existing Infrastructure

Construction of the new PFAS treatment facility to the area north of Mocho Well No. 3 will require construction of a new water transmission pipeline beneath Stoneridge Drive to deliver treated water. Currently, well water from Mocho Well No. 2, No. 3, and No. 4 is blended in a common pipeline before flow is split to the MGDP feed and MGDP bypass in the flush blend vault at the MGDP site.

Phase 1 construction (MGDP bypass treatment) would require a tie-in to the existing 28-inch well collector pipeline at Mocho Well No. 3. The bypass line would then be isolated within the flush blend vault and the existing electrically actuated bypass valve would split flow between the MGDP feed and new IX treatment facility. Treated water from the IX treatment plant would be conveyed beneath Stoneridge Drive in the new water transmission main to a tie-in on the existing MGDP bypass line.

Phase 2 construction (full wellfield treatment) would utilize the new infrastructure implemented in Phase 1. The IX treated water connection would be moved from the MGDP bypass line to the existing raw water pipeline upstream of the bypass connection in the flush blend vault. The raw water pipeline would be isolated from the well collector pipeline further upstream, forcing flow from the entire wellfield to the IX treatment plant. The electrically actuated bypass valve would return to the original purpose of splitting treated water to the MGDP feed and bypass lines for desalting.

For costing purposes, it was assumed that the new water transmission pipeline beneath Stoneridge Drive will be the same size as the existing pipeline and will be installed with jack and bore.

Figure 6 shows the proposed infrastructure modifications for Phase 1 and Phase 2.

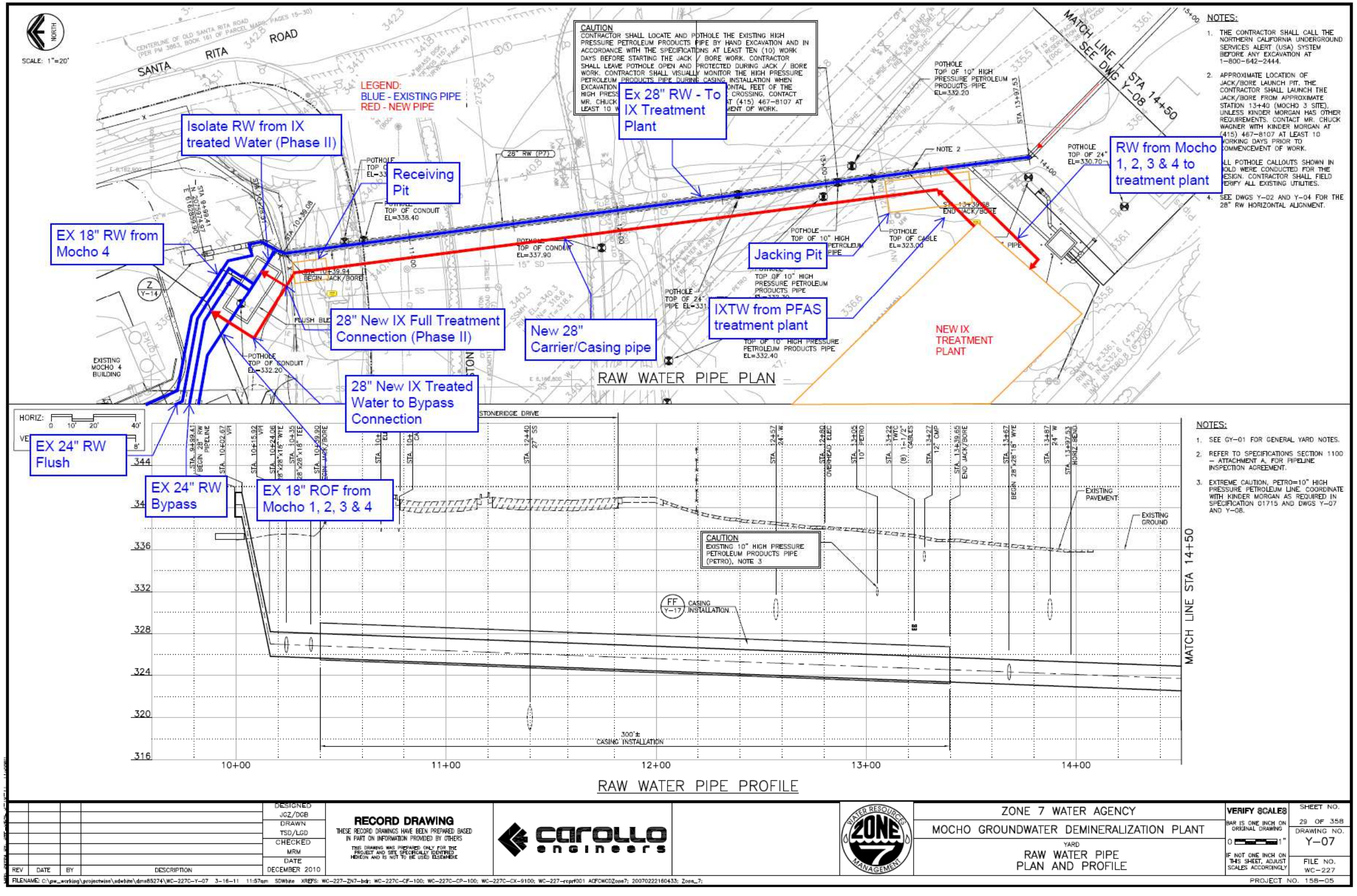

Figure 6 Phase 1 and Phase 2 Proposed Infrastructure Modifications

5.3 Pretreatment Design Criteria

IX resin can become fouled by inorganic precipitation (e.g., iron, manganese) or sediment retention, negatively impacting performance since the adsorption sites are mainly located within media pores. Therefore, pretreatment to remove solids is important for these groundwater treatment systems to protect downstream process equipment. This step is particularly important in the event of a well casing failure or if sand, gravel, or other sediment is present in the well discharge.

Pretreatment helps mitigate potential damage from sediment, which can increase differential pressure across IX resin beds, leading to more frequent changeouts. Frequent changeouts will impact O&M costs and should be avoided. Unlike with GAC, IX media cannot be backwashed due to the uniform size and low density of the beads, which fluidize at low hydraulic loading rates, and do not restratify to generally preserve the PFAS removal mass transfer zone. Therefore, a robust pretreatment system is necessary upstream of these treatment systems. This study assumes the inclusion of high-flow cartridge filters, configured in duty and standby units, for the influent stream of IX groundwater treatment systems. The design criteria for the cartridge filters are shown in Table 10.

Table 10 Sediment Removal Design Criteria

Parameter	Units	**Phase 1** MGDP Bypass Treatment	**Phase 2a/2b** Full Wellfield Treatment
Design Flow	gpm	6,450	11,770
Quantity	-	2 (1 duty, 1 standby)	3 (2 duty, 1 standby)
Design Flow per Housing	gpm	6,450	5,885
Cartridge Type	-	High flow cartridge type	High flow cartridge type
Cartridge Diameter	inches	6	6
Cartridge Length	inches	60	60
No. of Cartridges per Vessel	-	24	24
Design Flow per Cartridge	gpm	269	245
Filter Cartridge Rating	micron	5	5
Cartridge Replacement Frequency(1)	months	12	12

Notes:
(1) Used to calculate O&M costs.

The site layouts and hydraulic analysis included additional footprint and headloss to add sand separators to the treatment system in the future should the existing wells degrade or future wells produce too much coarse sediment for the cartridge filters to effectively manage. The sand separator units would be added to the system, if required, after initial operations of the PFAS Treatment Facility indicate their need.

5.4 Ion Exchange Design Criteria

The critical design parameters for IX systems are summarized in Table 11. The LLR is the flow through the vessel divided by the vessel cross section area and is one of the primary considerations when determining the number of vessels. The empty bed contact time (EBCT) is the time for the water to travel from the top of the media to the bottom of the media. The EBCT is important to ensure efficient removal of PFAS since if the EBCT is too short, the IX media will not be fully utilized when breakthrough occurs. These two

parameters are explained further in Figure 7. The benefits to having a higher LLR is a minimized site footprint and lower capital cost. The disadvantages are that the media changeouts will need to be more frequent and the system will be operating at a higher-pressure loss, which can lead to more frequent maintenance events. The IX design criteria are summarized in Table 12.

Table 11 Critical Design Parameters

Parameter	Typical Values	Design Considerations
EBCT (minutes)	2-3	Maximize PFAS removal and meet minimum bed depth.
LLR (gpm/sf)	6-16	AWWA guidance: ≤12 gpm/sf. Manufacturer recommendation: ≤16 gpm/sf.
Vessel diameter (feet)	12	8, 10, and 12 feet are common diameters. 12 feet is standard size and reduces the number of pressure vessels.

Notes:
min – minutes.

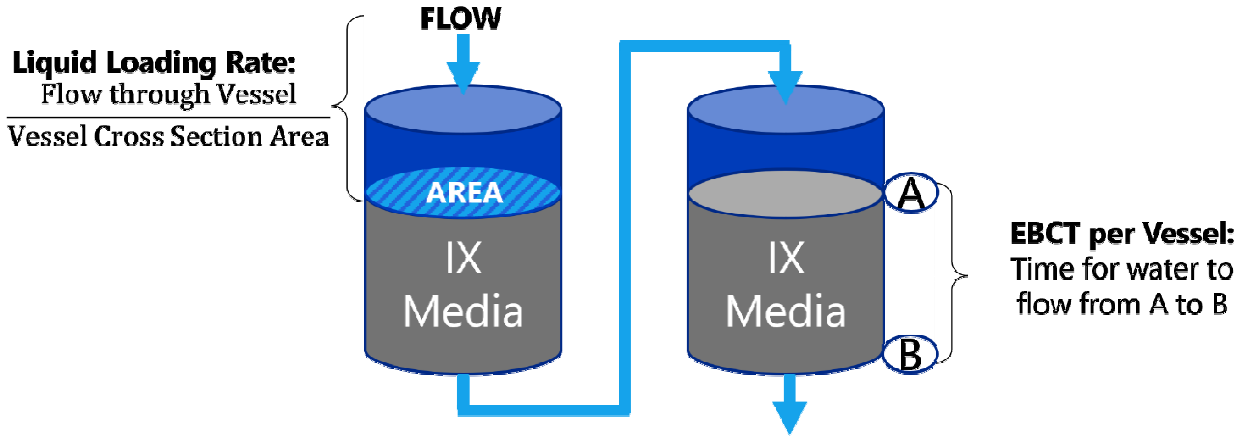

Figure 7 LLR and EBCT Diagram

Table 12 IX Conceptual Design Criteria

Parameter	Units	**Phase 1** MGDP Bypass Treatment	**Phase 2a** Full Wellfield Treatment (High Loading)	**Phase 2b** Full Wellfield Treatment (Low Loading)
Design Flow	gpm	6,450	11,770	11,770
Configuration	-	Lead-Lag	Lead-Lag	Lead-Lag
No. of Treatment Trains	-	5	7	10
No. of Contactors per Train	-	2	2	2
No. of Contactors	-	10	14	20
Vessel Diameter	feet	12	12	12
Vessel Height	feet	16.3	16.3	16.3
Design Flow per Train	gpm	1,290	1,681	1,177
IX Bed Surface Area/Vessel	sf	113.1	113.1	113.1
LLR	gpm/sf	11.4	14.9	10.4

Parameter	Units	Phase 1 MGDP Bypass Treatment	Phase 2a Full Wellfield Treatment (High Loading)	Phase 2b Full Wellfield Treatment (Low Loading)
Media Type	-	Single-use anion exchange resin	Single-use anion exchange resin	Single-use anion exchange resin
Volume of Resin/Vessel	cf	378	546	378
IX Resin Bed Depth	feet	3.3	4.8	3.3
EBCT, Lead+Lag	min	2.2	2.4	2.4
Media Changeout Frequency(1)	bv	300,000	300,000	300,000

Notes:
bv – bed volumes; cf – cubic feet.
(1) Based on results of rapid small scale column tests (RSSCT) with a safety factor. Changeout costs assume 25 percent facility operational cycle.

5.5 Schematic Process Flow Diagrams

Figure 8 and Figure 9 show the PFD for the treatment strategies considered for Phase 1 and Phase 2a/2b, respectively. For Phase 1, the PFD shows IX lead/lag vessel treatment of the MGDP bypass in parallel to PFAS treatment by the MGDP. For Phase 2a/2b, the PFD shows IX lead/lag vessel treatment of the full wellfield flow with the MGDP returning to its original operation as a desalting plant.

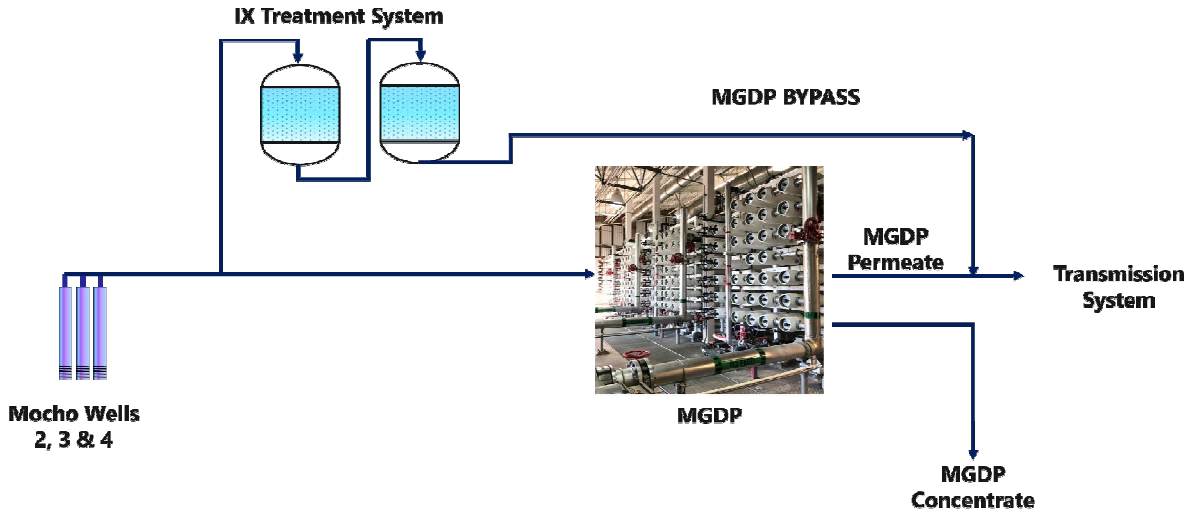

Figure 8 Phase 1 PFD

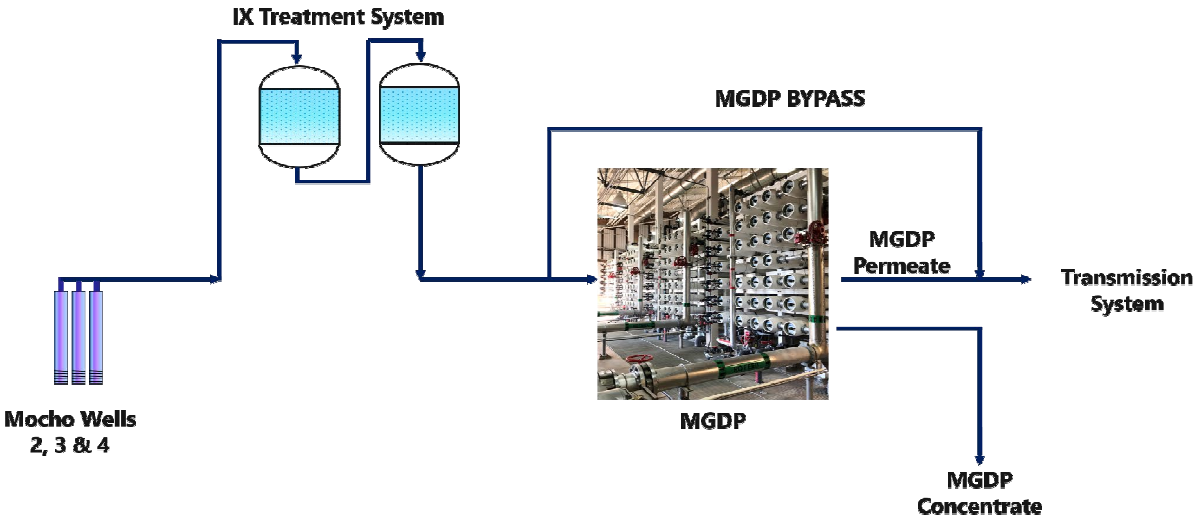

Figure 9 Phase 2a/2b PFD

5.6 Site Layouts

Conceptual site layouts were developed showing the infrastructure requirements and footprint for both proposed phases. The illustrated treatment systems include a new booster pump station and booster pump station building, solids pretreatment using high flow cartridge filters, space reserved for future sand separators, IX treatment vessels, a new electrical building, and a 16-foot tall privacy wall. Zone 7 has stated that treatment facilities are to be enclosed within a building or behind a site wall to both protect the equipment and serve as a "good neighbor" to the surrounding community. Site layouts of the facilities selected by Zone 7 to be developed for preliminary and detailed design should be updated to endose the treatment processes with the selected alternative. Figure 10, Figure 11, and Figure 12 show the site layouts for Phase 1, Phase 2a, and Phase 2b.

5.7 Treatment Alternatives Summary

The alternative scenarios described in this report are intended to be implemented under a phased construction approach. The phased approach allows Zone 7 to construct the initial PFAS treatment for MGDP bypass to provide Mocho Wellfield treatment with a combination of IX and RO. After initial construction and operation of the bypass treatment, Zone 7 can evaluate performance and build additional treatment infrastructure depending on changes in water quality, hydraulic performance of the system, and address future development of PFAS discharge regulations. By this time, Zone 7 will have operational experience operating IX treatment plants at different LLRs and can make a decision about which expansion scenario is preferred. It is recommended that Zone 7 construct the treatment infrastructure proposed in Scenario 1 with provisions to expand treatment as shown in Scenarios 2a/2b in the future. Note that the maximum capacity of ten trains in the full treatment scenario has an estimated capacity of 18,000 gpm at the maximum allowable LLR (16 gpm/sf) so treatment could be expanded in the future if needed.

The recommendations above are based on the premise that treatment would be provided to achieve the water quality goals selected by Zone 7 and expand operational flexibility (i.e., no longer be required to

blend MGDP FW). If the cost and schedule impacts are not desirable or other challenges arise, the impacted wells could be shut down; their production would need to be replaced with other water sources on a temporary or permanent basis.

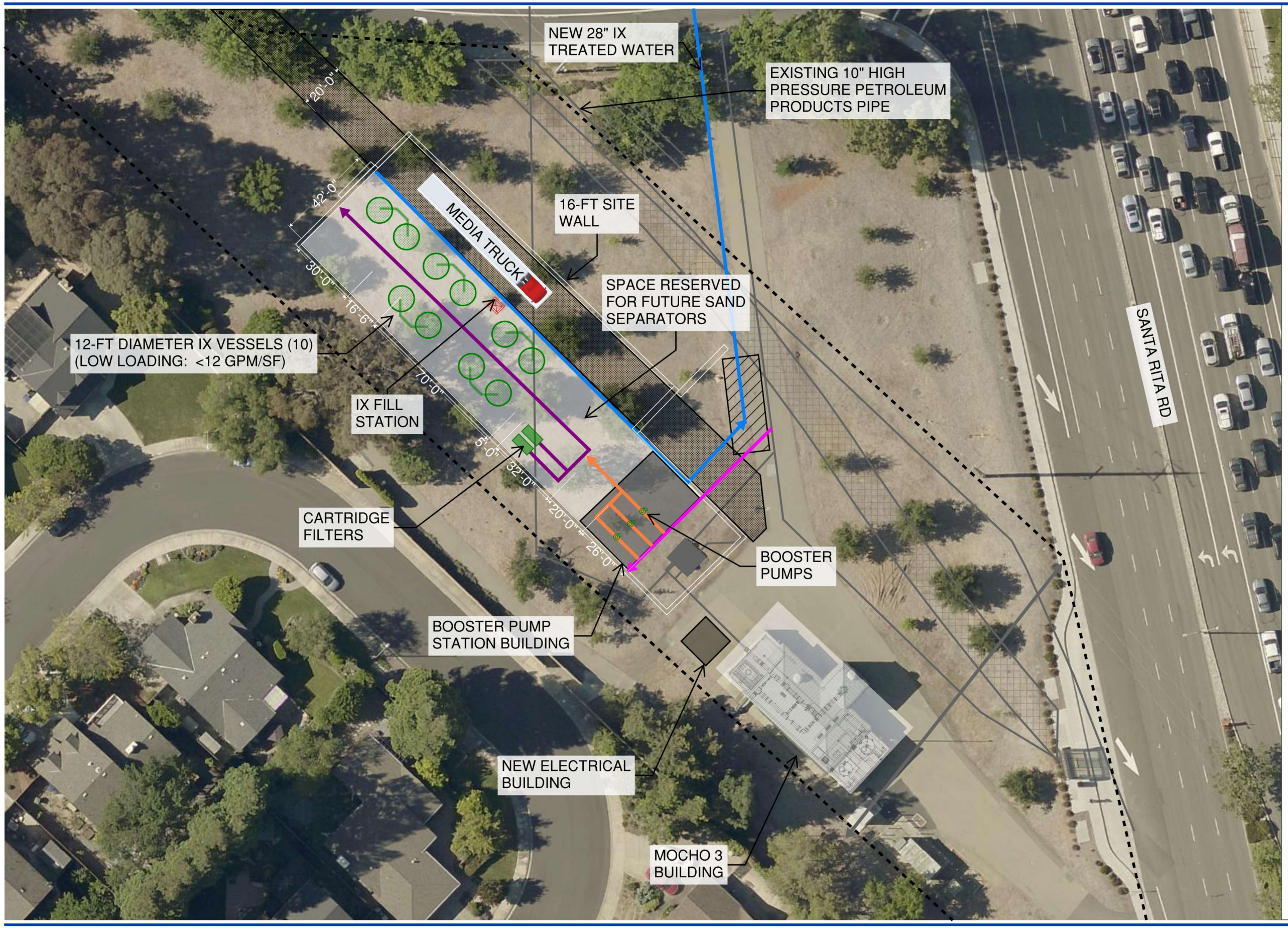

Figure 10 Phase 1: MGDP Bypass Treatment (6,500 gpm, 5 IX Trains)

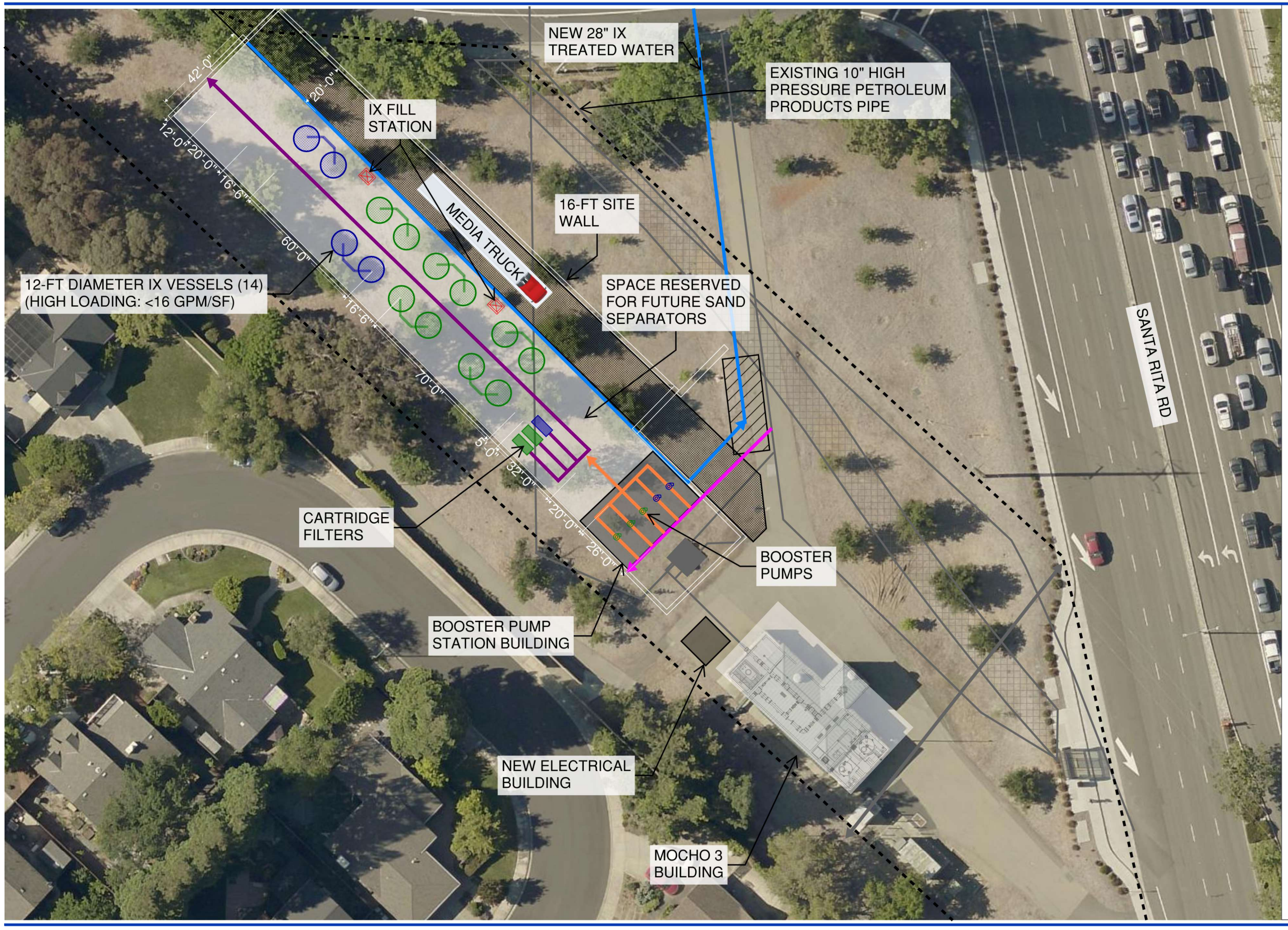

Figure 11 Phase 2a: Full Wellfield Treatment (11,770 gpm, 7 IX Trains)

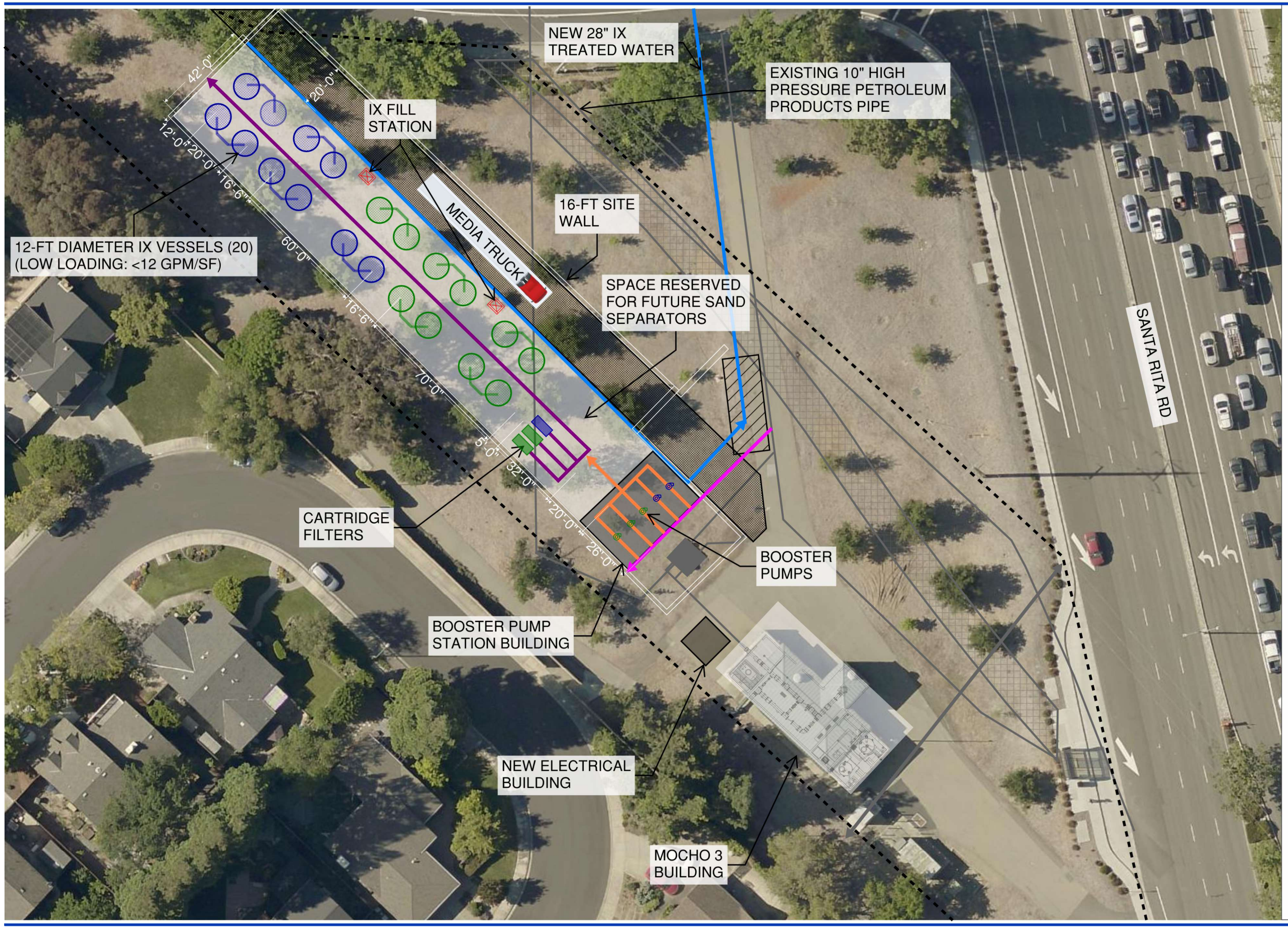

Figure 12 Phase 2b: Full Wellfield Treatment (11,770 gpm, 10 IX Trains)

SECTION 6 COSTS TO IMPLEMENTATION

6.1 Permitting

Zone 7 has engaged with DDW to leverage blending as an interim solution to meet Zone 7's distributed PFAS goals (*Project Memorandum - Interim Blending Plan for PFAS: Relocation of the Finished Water Compliance Sampling,* Carollo 2024). Zone 7 will continue discussions with DDW to gain permit amendment approval for the treatment facility. Because the project progress will require DDW input, timely meetings are important to maintaining the overall project schedule. The application submittal will consist primarily of California Environmental Quality Act documents, design plans and specifications, and the operations plan.

To aid in the DDW permit amendment approval process and system procurement, RSSCTs were conducted on three IX media, shown in Appendix B. A meeting with DDW is recommended to present and discuss the design documents during the treatment plant design phase.

Additional coordination and permitting with other agencies will be required for construction of the IX treatment facility. A preliminary list of regulatory agencies and associated permitting requirements that may be required as part of the project are listed below:

- Livermore-Pleasanton Fire Department: Review of fire suppression, fire alarm, and fire protection systems.
- DSRSD and Livermore-Amador Valley Water Management Agency (Livermore Amador Valley Water Management Agency [LAVWMA]): Coordination with agencies about evolving PFAS discharge limitations in MGDP brine waste stream.
- Pleasanton Development Services: Encroachment permit(s), and tree removal permit.

6.2 Construction Schedule

A preliminary project schedule was developed for the recommended preferred scenarios and is presented in Figure 13. Long lead items may have a significant impact to the construction schedule and should be confirmed during preliminary and final design but is likely to include electrical components and IX vessels. Depending on the IX vessels supplier, times of up to 34 weeks after submittal approval have been communicated. To reduce the overall schedule, the pressure vessels could be pre-purchased. Depending on the schedule for electrical systems, desired level of treatment, and preferred degree of automation, a phased (manual/automatic) start-up could be leveraged to accelerate the PFAS treatment of MGDP bypass water.

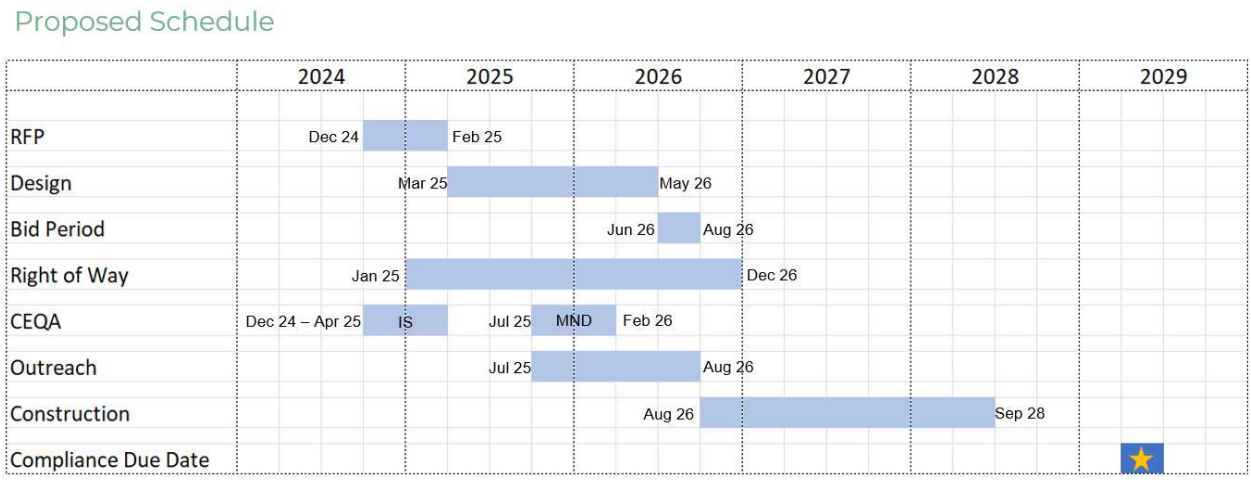

Figure 13 Preliminary Project Schedule

6.3 Operations and Maintenance Activities

O&M of IX systems primarily consists mainly of monitoring pressure and flow and taking samples to determine the progression of the mass transfer zone through the media bed. The following sections discuss the general operation of these three systems including labor, monitoring, and shutdowns; general maintenance requirements; and residual management. This section is not intended to be an O&M manual. Operations should refer to the systems O&M manual to perform any work on the full-scale system.

6.3.1 General Operational Activities

If the treatment system is to be permitted as a new treatment facility and not included as a part of the MGDP, the new treatment facility will require a certified operator certificate. An operator with only a distribution operator certification is not allowed to operate an IX system. The treatment facility will be individually classified based on a calculation of total points for the entire facility. The required certificate is based on the total points and shown in Table 13.

Table 13 Water Treatment Facility Class

Total Points	Class
Less than 20	T1
20 through 39(1)	T2
40 through 59	T3
60 through 79	T4
80 or more	T5

Notes:
(1) Class is currently estimated to be T2.

DDW does not look at the treatment alone to determine the treatment facility class, but also considers the source type (groundwater or surface water), the contaminant to be treated, the level of contaminant, flow rate, and type of disinfectant used. It's recommended to coordinate with DDW to determine the actual class of the treatment facility.

6.3.2 System Monitoring

Monitoring of IX systems is established and straightforward. The following is the primary list of suggested information for an operating log. This information should be recorded each day for the IX system:

1. Recording the date and time when each item is logged.
2. Record the flow to and pressure drop across each system to indicate if any foreign objects have entered the system.
3. Record all maintenance, calibration, cleaning, repairs, and replacement of parts.
4. Record any unusual occurrences such as shutdowns and leaks.

The progression of PFAS through the IX systems should be monitored on a regular basis. While quarterly sampling will likely be required for regulatory compliance, monthly sampling may be initially recommended to gain familiarity with the system and the rate at which PFAS will move through the installed IX resin given the wells operated and their water qualities.

6.3.3 Media Changeout

The media changeout is the most important aspect of IX system operation. For lead-lag systems, a media changeout is initiated when a predetermined concentration of a contaminant of concern (in this case PFOS) is detected (typically) between the lead and lag vessels. At that point, media is changed out in the lead vessel, the system is switched so that the lag vessel becomes the lead vessel, and the fresh IX resin is now positioned in the lag position. When the media changeout is initiated, the media service provider is contacted, and they will deliver the new media, remove the exhausted media, fill the new media, inspect the empty vessel, and make any necessary repairs.

The RSSCT in Appendix B shows the performance of the different tested IX media and their number of simulated and estimated bv before a changeout is anticipated.

6.3.4 Maintenance

Maintenance of IX can be divided into two categories: minor and major. Minor maintenance can be performed by operations to provide continuous and effective operation. This maintenance includes a visual check of pressure gauges, adjustments to valves, and tightening flanges and connections to eliminate leakage. During scheduled IX resin change-outs, service vessel internal parts should be inspected (underdrain screens, vessel lining, nozzles, etc.) to ensure they are in good working condition. During cartridge filter change outs, the type of filter foulant should be identified and tracked, generally to help determine if there are changes to the wells' quality. Major maintenance includes equipment repair or replacement for continued system operation. The need for major maintenance would result from a major malfunction causing the system to be inoperative.

6.3.5 Residual Management

Residual management is an important aspect for IX systems. The main residual is the spent media generated through the life of the system. The spent resin will have to be replaced on a periodic basis depending on the target water quality and actual well flowrates. The spent resin would be hauled to a waste disposal facility for incineration to destroy the PFAS and limiting end-of-life concerns.

6.4 Cost Opinions

The opinion of probable construction cost presented in Table 14 represents a Class 5 budgetary estimate as defined by AACE International. Bids would be expected to fall within a range of 50 percent over the estimate to 30 percent under the estimate. The opinion of probable construction cost is based on preliminary quantity take-off for IX systems. The capital and O&M costs were developed using:

- Equipment quotes for major components.
- Percentage multipliers for electrical, instrumentation, and mechanical portions of the project based on recently bid projects of similar scope. Conceptual cost opinions and present worth analysis for each scenario are summarized in Appendix C. Present worth analyses represent the sum of the capital cost opinions and the present worth of annual O&M cost projections assuming a discount rate of 3.5 percent and a term of 30 years. Appendix C includes detailed cost opinions and quantity takeoffs for each alternative considered.

Table 14 Conceptual Cost Opinion Factors

Cost Parameters	Factor	Assumptions
Direct Cost Factors		
Site Work	25%	Applied to equipment cost
Yard Piping and Valves	25%	Applied to equipment cost
Site Complexity	5%	Applied to equipment cost
Installation	30%	Applied to equipment cost
Electrical, Instrumentation, and Control	30%	Applied to equipment cost
Conceptual Level Design Detail Contingency	30%	Applied to direct cost
Indirect Cost Factors		
General Conditions, Overhead, Profit and Risk	27%	Applied to direct cost with contingency
Bonds and Insurance	3%	Applied to direct cost with contingency
Sales Tax (65% of Pleasanton 10.25% Rate)	6.7%	Applied to direct cost with contingency
Client Specific Cost Factors		
Construction Contingency	25%	Applied to total construction cost
Planning	10%	Applied to total construction cost
Design and Engineering	10%	Applied to total construction cost
Construction Administration	10%	Applied to total construction cost
Annual O&M		
General Operations Overhead	0.50%	Applied to direct cost with contingency
Labor	$15,386	Monthly cost from Zone 7 provided projections
Cost per kWh	$0.14	Based on 2021/2022 average electrical rate from Mocho 3, Mocho 4, and MGDP
Economic Analysis		
Present worth term (n, years)	30	
Present worth discount rate (i)	3.5%	

Table 15 Conceptual Cost Opinion and Economic Analysis Summary

Costs[1,4,5]	Phase 1 MGDP Bypass Treatment	Phase 2a Full Wellfield Treatment (High Loading)	Phase 2b Full Wellfield Treatment (Low Loading)
Construction Cost ($m)	$24.8	$12.8	$17.8
Total Project Cost[2] ($m)	$38.5	$19.8	$27.6
Annual O&M Cost ($m)	$0.6	$0.8	$0.8
Present Worth[3] ($m)	$49.1	$33.9	$41.9
Equivalent Annual Cost[3] ($m)	$2.7	$1.8	$2.3

Notes:
(1) All costs are shown in 2024 dollars and do not account for inflation or phased construction schedule.
(2) Total project estimate includes Zone 7 specific cost factors for construction contingency, planning, design and engineering, and construction administration.
(3) Present worth and equivalent annual cost based on a discount rate of 3.5 percent and a term of 30 years.
(4) Scenario 2a and 2b costs represent the additional cost to construct that phase and not the total to date.
(5) Costs do not include property/easement acquisition.

SECTION 7 PFAS TREATMENT OF REVERSE OSMOSIS CONCENTRATE NEED EVALUATION

7.1 PFAS Treatment in Reverse Osmosis Concentrate

Treatment of PFAS using RO is effective at removing PFAS from the source water but produces a highly concentrated stream of PFAS in the RO concentrate. This becomes a problem due to the difficulty in disposing of brine streams with high concentrations of PFAS. This issue can be addressed by either removing PFAS upstream of an RO treatment train or by removing PFAS from the RO concentrate. Removing the PFAS from the concentrate can be done in three ways: separation, defluorination, and sequestration (Tow et al. 2021).

7.1.1 Separation

Separation works by further concentrating the RO concentrate into a more manageable form. This method of treatment can be used prior to destruction or sequestration. These methods include closed-circuit RO and NF, emerging membrane processes, electrodialysis (ED)-RO hybrid systems, foam fractionation, electrocoagulation, evaporation ponds, brine concentration with crystallization, or adsorption. These treatment methods were categorized by their ability to successfully remove PFAS in their current technological state, and their technological readiness (Tow et al. 2021). Based on these metrics, emerging membrane processes, ED-RO hybrid systems, and evaporation ponds are not recommended for PFAS-laden RO concentrate management.

7.1.1.1 Further Treatment Using Reverse Osmosis and Nanofiltration

Given the success of membrane treatment in PFAS removal, further treatment using RO and NF can be utilized to produce a more manageable volume of RO concentrate. This method utilizes closed-circuit desalination in which the feed is pumped at the same rate as the permeate is discharged and the concentrate is continuously recycled until the desired recovery is achieved. Afterwards, the concentrate is purged, and the process is repeated. This method is effective at PFAS removal, has a small footprint, and is relatively energy efficient. The downside of this method is the resulting membrane scaling (Tow et al. 2021).

7.1.1.2 Foam Fractionation

Foam fractionation utilizes PFAS' surfactant properties to accumulate the PFAS in foam at the air-water interface. It bubbles a gas such as ozone or air and increases the interfacial surface area. The foam can be collected and then disposed of treated with an emerging technology that destroys PFAS (see Section 6.1.2). Some studies have demonstrated the effectiveness of creating and capturing PFAS-laden aerosol from the foam. This process has demonstrated success in capturing long-chain PFAS, including PFOS, but proves ineffective for short-chain PFAS given their low surface activity (Buckley et al. 2023; Burns et al. 2021). Adding non-PFAS surfactants can enhance foam fractionation effectiveness particularly

for short-chain PFAS but raises issues of the fate of the added surfactant particularly in drinking water contexts (Buckley et al. 2023).

7.1.1.3 Electrocoagulation

Electrocoagulation utilizes the hydrophobic interaction of PFAS and metal hydroxide flocs. This interaction allows the PFAS to coagulate in these flocs and be removed via precipitation. This process has high removal, low energy consumption, easy operation, and low sludge production. However, the practical application of electrocoagulation has issues with the dissolution and passivation of the anode plate resulting in lower efficiency (Liu et al. 2018; Bao et al. 2020).

7.1.1.4 Brine Concentration With Crystallization

Brine concentration with crystallization uses thermal concentration or heat driven distillation to further concentrate PFAS in RO brine. This process is able to achieve near zero liquid discharge and can be further evaporated using a crystallizer or spray dryer. The disadvantage is that it has a high energy requirement and may result in PFAS emission to the air (Tow et al. 2021).

7.1.1.5 Adsorption

Adsorption can be used in sequence with RO to remove the PFAS from RO brine. It is the most adopted PFAS treatment technology for drinking water due to its reliability and ease of operation. GAC is the most common adsorbent but is less effective for short-chain PFAS. Adsorption is a non-steady-state process so it requires monitoring and occasional replacement of adsorbents. GAC would likely require much more frequent replacement in RO brine compared to most drinking water contexts because of interference from TOC (Gonzalez 2021).

7.1.2 Destruction

Destruction processes attempt to degrade or destroy PFAS to remove the hazard all together. Incomplete PFAS destruction can transform long-chain PFAS to short-chain PFAS or other organofluorine byproducts. The term mineralization is used to refer to successful complete destruction to fluoride. This option is favorable since it does not allow for reintroduction of PFAS into water systems and would reduce hazards to human health and the environment. However, destruction technologies are in the early stages of development. Many are ineffective in complex waters like RO brine, or are not yet commercially available at the capacities required to treat the MGDP concentrate or full Mocho Wellfield flows. Defluorination technologies include vacuum ultraviolet irradiation, advanced reduction processes, photocatalysis, electrochemical oxidation, plasma-based treatment, electron beam, sonochemical treatment, and thermal technologies (Tow 2021). Due to their current state of effectiveness, biological treatment, ultraviolet irradiation, photocatalysis, and advanced oxidation methods are not recommended.

7.1.2.1 Electrochemical Oxidation

Electrochemical oxidation uses a high voltage to provide direct oxidation of the PFAS at the anode. It can also generate hydroxyl radicals that are believed to contribute to the further breakdown or "unzipping" of PFAS that have had headgroups removed by oxidation at the anode. This process does not require high pressures or temperatures and can destroy short-chain PFAS provided sufficient voltage, time, and mixing.

(Lin et al. 2012; Liang et al. 2018). This technology has yet to be used at a scale equal to the RO brine flow at Mocho Wellfields but there are current pilot studies being conducted on contaminated groundwater in Tucson, Arizona. There is concern that this technology will have difficulties with scalability due to the limited anode sizes that are available and will have high energy consumption due to the long reaction time. This process also forms toxic chlorate and perchlorate byproducts (Barisci and Suri 2022).

7.1.2.2 Plasma-Based Treatment

Plasma-based treatment utilizes the radical aqueous species that result from plasma formation to degrade organic compounds, including PFAS. The technology is new but has demonstrated effective PFAS treatment in multiple different water sources varying in water quality. This method also has relatively low byproduct formation compared to other destructive technologies. There is little information on large scale applications of this technology (Stratton et al. 2017; Singh et al. 2021).

7.1.2.3 Electron Beam

Electron beam technology uses electron radiation for PFAS destruction. Electrons are accelerated and delivered as aqueous electrons to attack the fluorine-carbon bond. Like other electrochemical oxidation, other radicals may form, assisting further breakdown. Electron beam technology has proven successful in PFOA and PFOS degradation. It is currently used on a commercial scale for sterilization and in pilot scales for groundwater and wastewater but has a high capital cost and price per volume treated. It also requires further research in the application of membrane concentrate (Lassalle et al. 2021).

7.1.2.4 Sonochemical Treatment

Sonochemical treatment uses high-frequency ultrasound to cause cavitation, which creates micro-zones of high temperature, high pressure, and various radicals. It has been hypothesized that this technology could be relatively effective for PFAS due to PFAS' tendency to partition to water-gas interfaces such as the cavitation bubbles. While capable of destroying PFAS, this method has yet to be demonstrated at scale and requires a high energy input. The estimated energy for sonochemical treatment is also higher than for other destructive technologies (Nzeribe 2019).

7.1.2.5 Thermal Technologies

Thermal technologies includes two major types: incineration and supercritical water oxidation:

- Incineration uses heat to defluorinate PFAS. It is a consensus from studies about PFAS in biosolids are adsorbed to spent GAC that temperatures over 1,000 degrees C generally quickly degrade even relatively resistant PFAS. However, to each such temperatures for PFAS in RO brine would require evaporating the water in the brine, which would require either auxiliary fuel or mixing with a larger percentage of other, more combustible wastes (Wang et al. 2022).
- Supercritical water oxidation occurs when the water temperature is greater than 705 degrees Fahrenheit and the pressure is greater than 221.1 bar. These conditions change the properties of water and which states of chemicals are soluble, facilitating the oxidation of otherwise recalcitrant contaminants including PFAS. This technology has shown promise particularly for PFAS in biosolids. However, the extreme operating conditions can create operational difficulties such as scaling, corrosion, and high energy requirements (Bar Engineering Co. and Hazen and Sawyer 2023).

7.1.3 Sequestration

PFAS sequestration is an alternative to PFAS defluorination. Sequestration uses disposal methods that can include surface water discharge, discharge to sewer, deep well injection, land application, landfilling, or evaporation. Surface water discharge falls within the National Discharge Elimination System permitting and sewer disposal creates issues with increased flows and PFAS typically are not removed during wastewater treatment (Tow et al. 2021).

7.1.3.1 Deep Well Injection

Deep well injection utilizes confined aquifers to contain harmful contaminants. These confined aquifers are isolated from drinking water aquifers. The USEPA considers this method low risk. This method is a reliable way to contain PFAS, however, it's non-destructive and can be difficult to implement due to permitting requirements, limited number of certified wells, and associated costs (USEPA 2024).

7.1.3.2 Landfilling

Landfilling PFAS contaminated solids must be done in hazardous waste landfill system which employ environmental controls such as double liner systems, leachate collection/treatment, and leak detection. Hazard waste landfills are much more successful at minimizing the environmental release of PFAS. There are a lot of potential recontamination issues with this method including through PFAS leachate and landfill gas. This method is also not permanent due to the landfill barrier systems degrading over time, and like deep well injection, this method is non-destructive. It is not a preferred method by the USEPA (USEPA 2024; Lin et al. 2022).

7.2 Current Concentrate Disposal

Currently, MGDP concentrate is conveyed to DSRSD and is then disposed through the LAVWMA pipeline. This pipeline is used to dispose of treated wastewater for DSRSD, Pleasanton, and the City of Livermore. The LAVWMA pipeline transports the effluent from DSRSD, 16 miles to San Lorenzo, where it is discharged into East Bay Dischargers Authority's dechlorination facility and then a deep water outfall in San Francisco Bay.

Carollo coordinated with DSRSD to determine if they anticipated any changes related to PFAS discharges to the LAVWMA pipeline. DSRSD has no current plans to affect MGDP concentrate discharges based on PFAS. DSRSD will continue to monitor for the development of regulatory discharge limitations, and then determine the appropriate course of action to take at that time. The USEPA is currently conducting research to better understand the different alternatives for PFAS destruction and disposal and plans to revise their guidance in upcoming years.

7.3 Other Agency Approaches

Table 16 shows examples of how other agencies are addressing PFAS discharges from their facility.

Table 16 Other Facility Responses to PFAS Discharges

Agency	Location, Facility	Approach to PFAS
City and County of San Francisco	San Francisco Airport (California), Mel Leong Wastewater Treatment Plant	Remove PFAS through media in pressure vessels from stormwater and wastewater prior to discharge to San Francisco Bay. Currently under design.
Chino Basin Desalter Authority	Ontario (California), Chino I Desalter and Chino II Desalter	RO concentrate from Chino Basin Desalter Authority's desalting facilities is discharged to the Inland Empire Brine Line (Brine Line) owned and operated by the Santa Ana Watershed Project Authority (SAWPA). The brine pipeline carries the waste directly to specially equipped treatment plants operated by the Orange County Sanitation District. After treatment, the waste is discharged to the Pacific Ocean. SAWPA does not currently limit the amount of PFAS users can dispose to the Brine Line but has advised that PFAS will be addressed in future contracts. A limit of 40 ppt for PFAS concentrations has been proposed as a limit. They do not know if this will be a hard limit or if there will be fees for exceeding this concentration.
Eastern Municipal Water District	Perris (California), Perris II Desalter	Currently designing PFAS removal treatment facility RO bypass flow but does not include comprehensive planning to include RO feed for future construction phasing. RO concentrate is disposed of through SAWPA Brine Line.
City of Sunrise, City of Boynton Beach, Florida Keys Aqueduct Authority, City of Riviera Beach, Broward County, and others	South East Florida, various facilities	RO and NF facilities that are existing, under construction, and in design, are all planning on utilizing deep well injection for the disposal of PFAS laden concentrate without additional treatment.

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APPENDIX B

RSSCT TEST RESULTS

PROJECT MEMORANDUM

ZONE 7 WATER AGENCY

Mocho Groundwater Demineralization Plant and Mocho Wellfield PFAS Compliance Conceptual Design

Project No.: 203226
Date: October 14, 2024
Prepared By: Téa Iwai and Krish Venkatesh
Reviewed By: Tom Gillogly and Jim Dettmer
Subject: Rapid Small Scale Column Test (RSSCT) Results

1.0 PURPOSE

RSSCTs were conducted by Carollo's Water Applied Research Center, to evaluate the effectiveness of ion exchange (IX) resin media for removal of per- and polyfluoroalkyl substances (PFAS) from Mocho 3 well groundwater.

2.0 RAPID SMALL SCALE COLUMN TEST RESULTS SUMMARY

The RSSCTs were conducted as outlined in the test plan (Attachment A). Three alternative IX media were tested (Table 1) using the RSSCTs performed to evaluate removal of PFAS from Mocho 3 well groundwater.

Table 1 RSSCT Test Summary

Parameter	Column 1	Column 2	Column 3
Water Source	Mocho 3		
Media	Purolite PFA694EBF	Dowex PSR2+	CalRes 2301
Resin Type	Gel	Gel	Macroporous
EBCT Simulated	2 minutes	2 minutes	2 minutes
BVs Tested	452,000	470,000	438,000

Notes:
BV – bed volume; EBCT – empty bed contact time.

The average influent water quality data of raw water used in testing summarized in Table 2. Attachment B presents detailed water quality analyses performed. The RSSCT results are shown as breakthrough curves.

- Figure 1, Figure 2, and Figure 3 exhibits the breakthrough of PFAS compounds regulated by the United States Environmental Protection Agency (USEPA) and the hazard index (HI), for Purolite PFA694EBF, Dowex PSR2+, and CalRes 2301, respectively. The compounds regulated by the USEPA are perfluorooctyl sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (GenX), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). Data includes results published by the lab that are below

reporting limits but above detection limits. Attachment C presents additional breakthrough data for unregulated and short-chain PFAS compounds.

- Zone 7 has set the following operational goals for PFAS: 3.2 parts per trillion (ppt) for PFOA and PFOS, 8 ppt for PFHxS, PFNA, and GenX, and a HI goal of 1.0.
- All three IX resins effectively removed PFAS below operational goals for a substantial number of bed volumes (>350k). CalRes 2301 was the best performing resin, followed by Dowex PSR2+ and Purolite PFA694EBF, respectively.
- The affinity for PFAS removal varied among the tested media types. Compared to Purolite PFA694EBF and Dowex PSR2+, CalRes 2301 showed greater effectiveness in removing sulfonated compounds (PFBS, PFHxS, and PFOS), likely due to its microporous structure, which enhances PFAS adsorption in this source water.
- For all three resins, the PFOA was identified as the compound leading the breakthrough and will likely serve as the driver for media changeout in full-scale.
- The full-scale IX system conceptual design and operational parameters with a lead-lag configuration are presented in Table 3 for Phase I and buildout conditions.

Table 4 summarizes the estimated changeout frequencies for the lead vessel in the full-scale IX system. The number of bed volumes at which PFOA reached 2 ppt was estimated using a 20 percent safety factor and an EBCT of 2.2 minutes for Phase I conditions, except for CalRes 2301, which did not reach a 2 ppt breakthrough

Table 2 RSSCT Raw Water Quality

Parameter	Units	Count	Average Raw Water(1)
pH	S.U.	4	7.70
UVA 254 nm	cm^{-1}	4	0.004
Turbidity	NTU	4	0.3
Alkalinity	mg/L as $CaCO_3$	4	243
TOC	mg/L	4	0.5
DOC	mg/L	2	0.7
Chloride	mg/L	4	120
Sulfate	mg/L	4	68.5
Nitrate	mg/L	4	1.9
Regulated PFAS			
PFOA	ppt	7	5.3
PFOS	ppt	7	42.9
PFHxS	ppt	7	38.7
PFNA	ppt	7	0
GenX	ppt	7	0
PFBS	ppt	7	7.4
HI	Unitless	7	3.9

Parameter	Units	Count	Average Raw Water(1)
Non-Regulated PFAS			
PFBA	ppt	7	5.0
PFPeA	ppt	7	2.9
PFHxA	ppt	7	4.7

Notes:
$CaCO_3$ – calcium carbonate; cm^{-1} – reciprocal centimeter; DOC – dissolved organic carbon; mg/L – milligrams per liter; nm – nanometers; NTU – nephelometric turbidity unit; PFBA – perfluorobutanoic acid; PFPeA – perfluoropentanoic acid; PFHxA – perfluorohexanoic acid; TOC – total organic carbon; S.U. – standard units; UVA – ultraviolet absorbance.
(1) Water quality represents the average water quality of Drum 1 raw and filtered water and Drum 2 raw and filtered water, except for PFAS compounds, which also includes the concentrations measured at each column feed, see Attachment B.

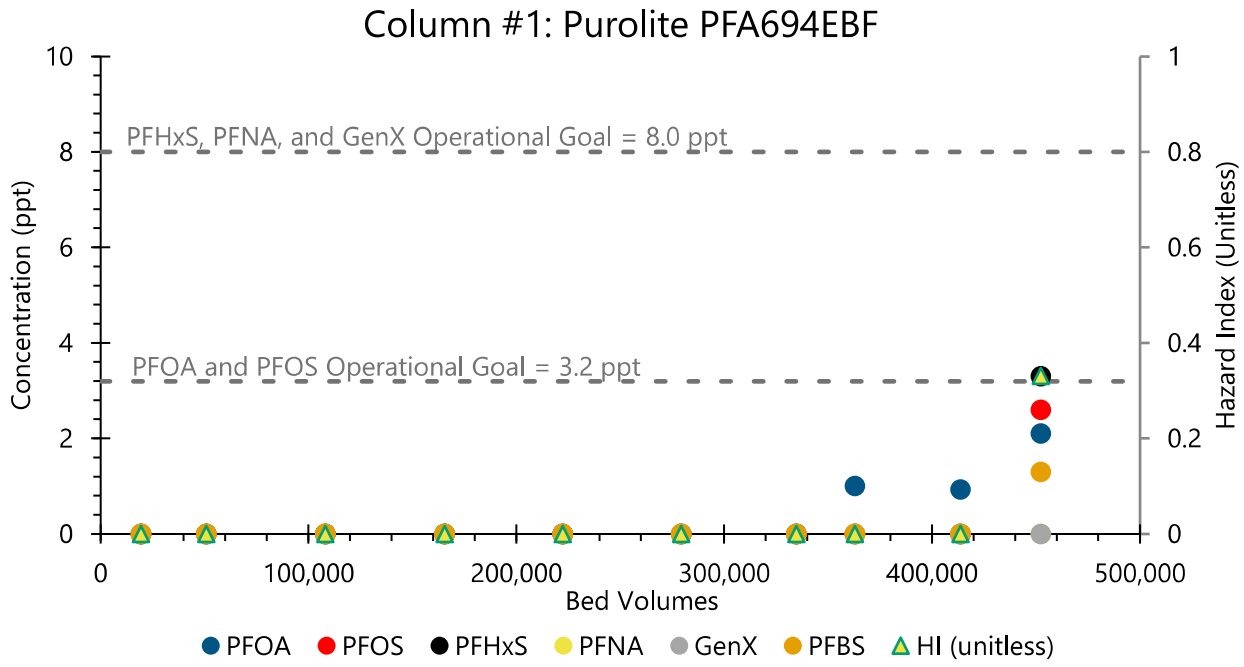


Figure 1 RSSCT PFAS Breakthrough for Purolite PFA694EBF (Test 1)

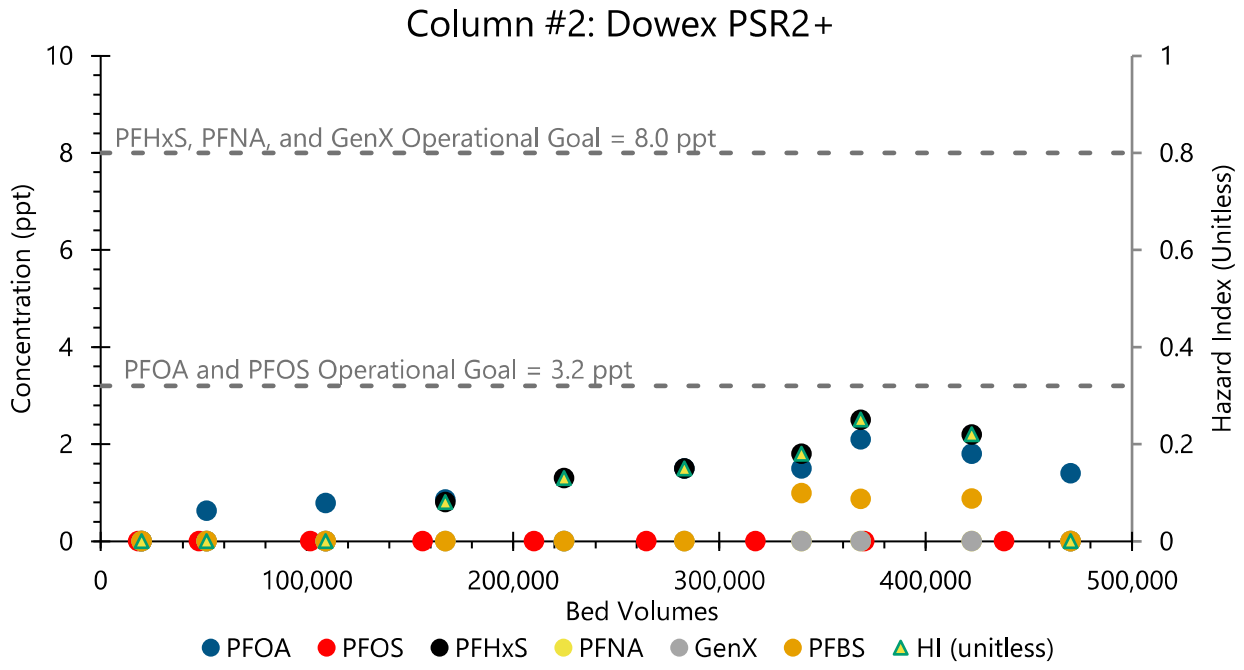


Figure 2 RSSCT PFAS Breakthrough for Dowex PSR2+ (Column 2)

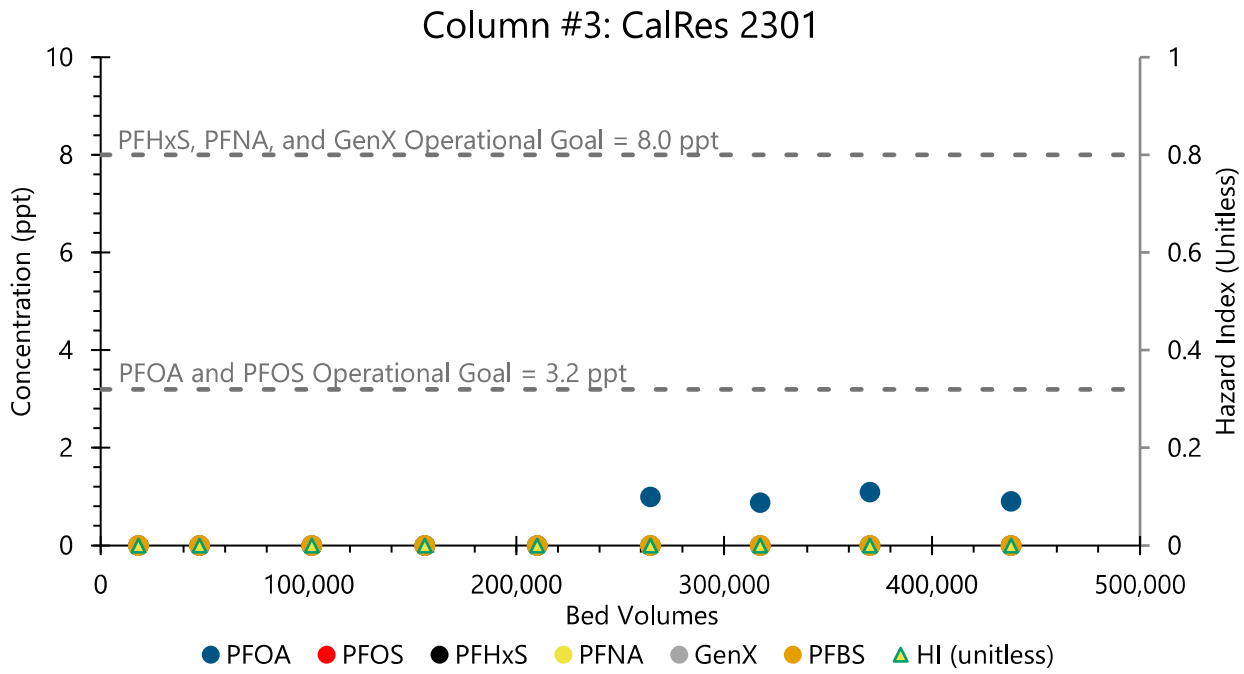


Figure 3 RSSCT PFAS Breakthrough for CalRes 2301 (Column 3)

Table 3 Full Scale IX System Conceptual Design Parameters

Table Header	Unit	Initial Phase(1)	Buildout(2)
Design Flow	gpm	6,450	13,770
Number of Trains	No.	5	10
Column Diameter	feet	12	12
Loading Rate	gpm/sf	11.4	12.2
EBCT per Vessel	min	2.2	2.1
EBCT per Train	min	4.4	4.2

Notes:
gpm/sf – gallons per minute per square foot; No. – number.
(1) Initial phase assumes IX treatment of Mocho-2, -3, and -4 MGDP bypass flow.
(2) Buildout assumes IX treatment of Mocho-1, -2, -3, and -4 well flow.

Table 4 Estimated Changeout Frequencies at Full Scale

Media	Changeout Triggering Compound(1)	BVs(2)	Lead Vessel Estimated Media Life With 20% Safety Factor (months)(3)
Purolite PFA694EBF	PFOA	452,000	18
Dowex PSR2+	PFOA	369,000	15
CalRes 2301	PFOA	440,000(4)	18

Notes:
(1) First regulated PFAS compound to reach 2 ppt.
(2) Approximate BVs to reach 2 ppt.
(3) Assumes 2.2 minutes EBCT per vessel with 20 percent safety factor.
(4) Test 3 effluent concentrations did not reach 2 ppt for any regulated compound. PFOA was the only regulated compound with concentrations above the detection limit; therefore, the last tested BV was assumed for the changeout frequency.

ATTACHMENT A

RSSCT TEST PLAN

ZONE 7 WATER AGENCY

Mocho Groundwater Demineralization Plant and Mocho Wellfield PFAS Compliance Conceptual Design

Project No.: 2032263
Date: October 14, 2024
Prepared By: Krish Venkatesh
Subject: Rapid Small Scale Column Test (RSSCT) Test Plan

1.0 PURPOSE

The purpose of the RSSCT test plan is to outline the design criteria and sampling schedule for testing IX resins at the Mocho wellfield. Three resins will be evaluated using water from the Mocho 3 well, representative of other wells in the Mocho wellfield. The collected data will compare the relative performance of the tested resins to support the selection of compatible media(s) for the PFAS compliance conceptual design.

2.0 TESTING METHOD

The RSSCTs will be conducted at Carollo Engineer's (Carollo) Water Applied Research Center lab, following similar design and methodologies of previous RSSCTs performed for Zone 7 Water Agency's (Zone 7) Chain of Lakes and Stoneridge wells (Carollo, March 2022; Carollo, December 2022).

3.0 MEDIA

The ion exchange (IX) resins selected for testing are listed in Table A.1.

Table A.1 Selected Test Media

Vendor	Product	Material
Purolite	PFA694EBF	PFAS Selective IX Resin
Dowex	PSR2+	PFAS, Nitrate, and Perchlorate Selective IX Resin
Calgon	CalRes 2301	PFAS Selective IX Resin

Notes:
PFAS – per-and polyfluoroalkyl substances.

4.0 BENCH TESTING

RSSCT design criteria used for this round of testing are summarized in Table A.2.

Table A.2 Proposed Column Design for Bench-Scale Testing

Parameter	Test 1	Test 2	Test 3
Water Source	Mocho Well 3	Mocho Well 3	Mocho Well 3
GAC or IX Media	Purolite PFA694E	Dowex PSR2+	CalRes 2301
Column Diameter	0.48 cm	0.48 cm	0.48 cm
Media Depth	1.04 cm	0.96 cm	1.12 cm
Bed Volume	0.18 mL	0.17 mL	0.20 mL
Media Weight	0.19 g	0.18 g	0.22 g
Media Effective Size	0.048 mm	0.048 mm	0.048 mm
Equivalent Mesh Size	100x200	100x200	100x200
Density	1.05	1.07	1.10
Simulated EBCT (lead only)	2 (lead only)	2 (lead only)	2 (lead only)
Flow per Column	3.82 mL/min	3.82 mL/min	3.82 mL/min
Loading Rate – RSSCT	5.26 gpm/ft^2	5.26 gpm/ft^2	5.26 gpm/ft^2
Simulated Loading Rate – Full Scale	11.8	11.8	11.8
Reynold's Number (R)	1.12	1.12	1.12
Schmidt's Number (S)	893.7	893.7	893.7
R*S	1000	1000	1000
Estimated Operation Time	17 days	16 days	18 days
Estimated Sample Volume	24 gal	23 gal	26 gal
BV to be processed	500,000	500,000	500,000

Notes:
cm - centimeter; EBCT - empty bed contact time, g - gram, GAC - granular activated carbon; gal - gallon, gpm/ft^2 - gallons per minute per square foot, mL - milliliter; mL/min - milliliters per minute; mm - millimeter.

The proposed RSSCT sampling schedule for obtaining PFAS, ultraviolet (UV)-254, pH and conductivity, from RSSCT effluents is presented in Table A.3. The pH, conductivity, and UV-254 analysis will be done immediately after sample collection and reported to the project team to monitor the column(s) performance.

Table A.3 RSSCT Effluent PFAS, pH, Conductivity and UV-254 Sampling Schedule

Days Elapsed	Test 1 (Purolite PFA694EBF)		Test 2 (Dowex PSR2+)		Test 3 (Calgon CalRes 2301)	
	Collect	Ship (PFAS only)	Collect	Ship (PFAS only)	Collect	Ship (PFAS only)
Day 1	1	1	1	1	1	1
Day 1	1		1		1	
Day 2	1	1	1	1	1	1
Day 2	1		1		1	
Day 3	1		1		1	
Day 4	1	1	1	1	1	1

Days Elapsed	Test 1 (Purolite PFA694EBF)		Test 2 (Dowex PSR2+)		Test 3 (Calgon CalRes 2301)	
	Collect	Ship (PFAS only)	Collect	Ship (PFAS only)	Collect	Ship (PFAS only)
Day 5	1		1		1	
Day 6	1	1	1	1	1	1
Day 7	1		1		1	
Day 8	1	1	1	1	1	1
Day 9	1		1		1	
Day 10	1	1	1	1	1	1
Day 11	1		1		1	
Day 12	1	1	1	1	1	1
Day 13	1	1	1	1	1	
Day 14	1		1		1	1
Day 15	1	1	1	1	1	
Day 16	1		1	1	1	1
Day 17	1	1			1	
Day 18					1	1
Total Samples	19	10	18	10	20	10

Table A.4 shows the sampling frequency of other general water quality parameters tested.

Table A.4 Sampling Frequency of Water Quality (WQ) Analysis

WQ Parameter	Sampling Frequency
Dissolved Organic Carbon	Once for each raw water barrel (feed).
UV-254	Once in the beginning, and once at the end for each raw water barrel (feed) and effluent per sampling schedule in Table A.3.
Anions (USEPA 300.1)	Once for each raw water barrel (feed).
PFAS (USEPA 533)	Once in the beginning, and once at the end for each raw water barrel (feed) and effluent per sampling schedule in Table A.3.
pH and conductivity	Once in the beginning, and once at the end for each raw water barrel (feed), and effluent per sampling schedule in Table A.3.

5.0 REFERENCES

Carollo. March 23, 2022. *Project Memorandum - Rapid Small Scale Column Test (RSSCT) Test*. Prepared for Zone 7 Chain of Lakes PFAS Treatment System.

Carollo. December 2022. *Project Memorandum - Rapid Small Scale Column Test (RSSCT) Test*. Prepared for Zone 7 Stoneridge Well PFAS Treatment System.

ATTACHMENT B

WATER QUALITY DATA

Table B.1 General Water Quality Parameters for RSSCTs

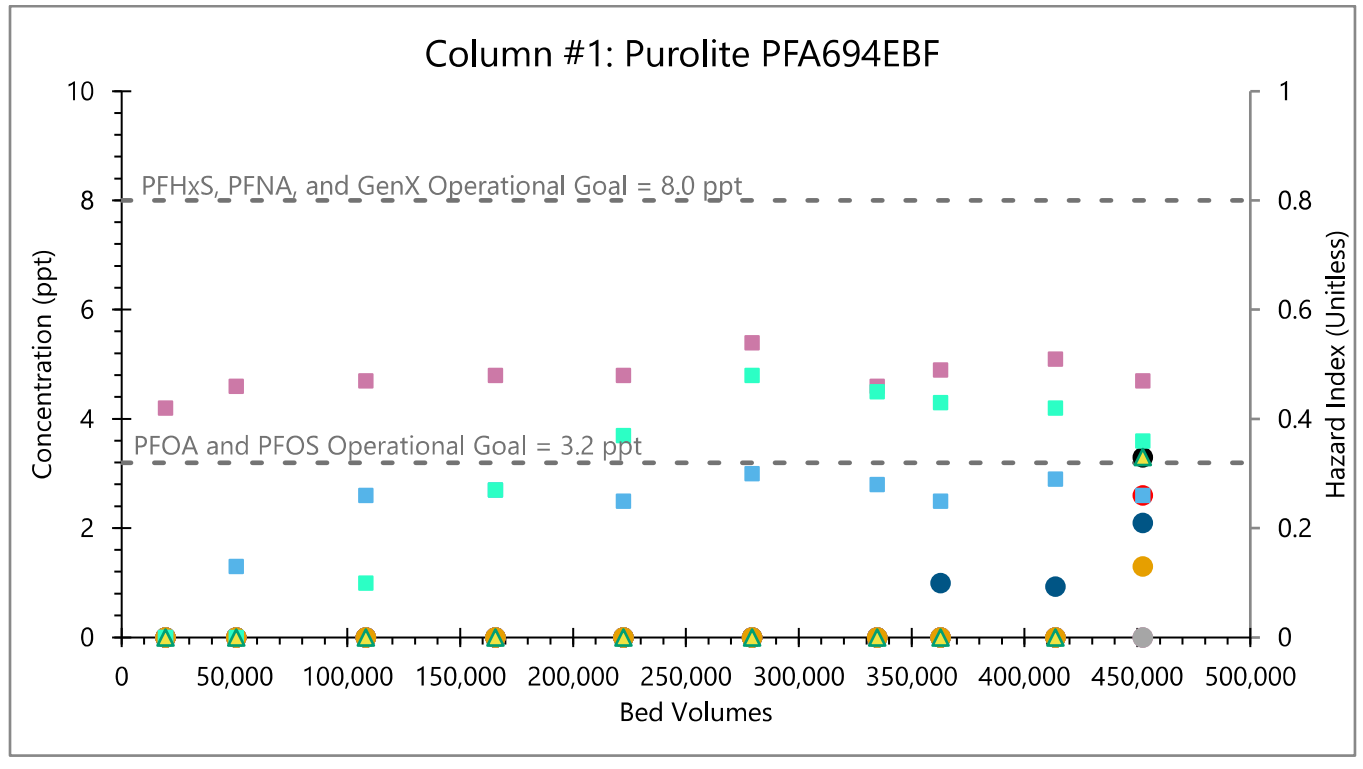
Parameter	Unit	Drum 1 RAW	Drum 1 Filtered	Drum 2 Raw	Drum 2 Filtered
pH	S.U.	7.82	7.65	7.72	7.59
UVA 254 nm	cm-1	0.005	0.004	0.005	0.003
Turbidity	NTU	0.3	0.2	0.7	0.2
Alkalinity	mg/L as $CaCO_3$	239	233	252	249
TOC	mg/L	0.5	0.6	0.5	0.5
DOC	mg/L	0.6	--	0.8	--
Chloride	mg/L	120	120	120	120
Sulfate	mg/L	69	68	1.9	1.9
Nitrate	mg/L	1.9	1.9	68	69

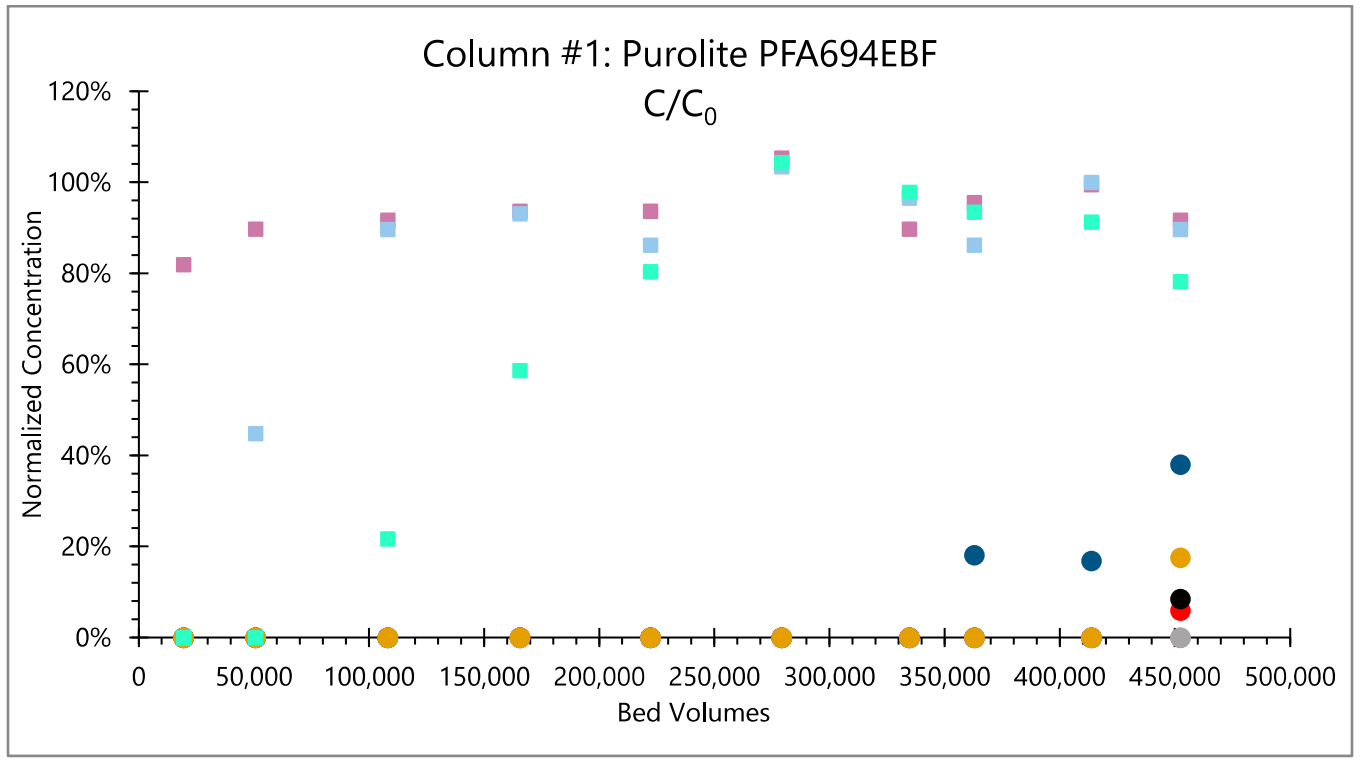
Table B.2 General Water Quality Parameters for RSSCTs

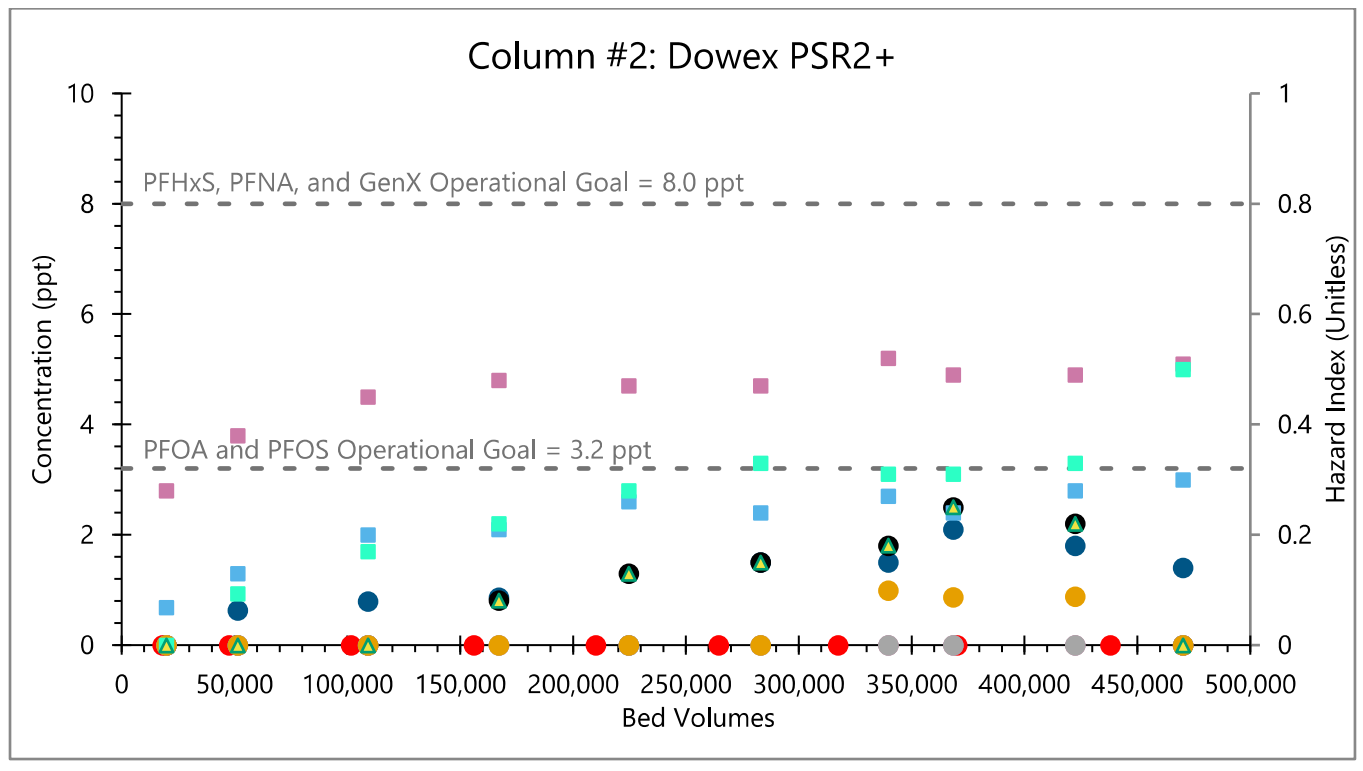
Sample Name	Drum 1 Raw	Drum 1 Filtered	Drum 2 Raw	Drum 2 Filtered	Column 1 Feed	Column 2 Feed	Column 3 Feed
PFOA (ppt)	5.0	6.1	6.3	6.1	4.7	4.3	4.4
PFOS (ppt)	42	54	42	44	36	44	38
PFHxS (ppt)	41	42	39	45	33	36	35
PFNA (ppt)	0	0	0	0	0	0	0
GenX (ppt)	0	0	0	0	0	0	0
PFBS (ppt)	7.9	7.5	7.4	8.2	6.8	7.0	7.0
PFBA (ppt)	5.2	5.2	5.3	5.7	4.8	4.8	4.2
PFPeA (ppt)	3.1	2.9	3.1	3.7	2.5	2.6	2.5
PFHxA (ppt)	4.7	4.7	4.7	5.3	4.3	4.4	4.5

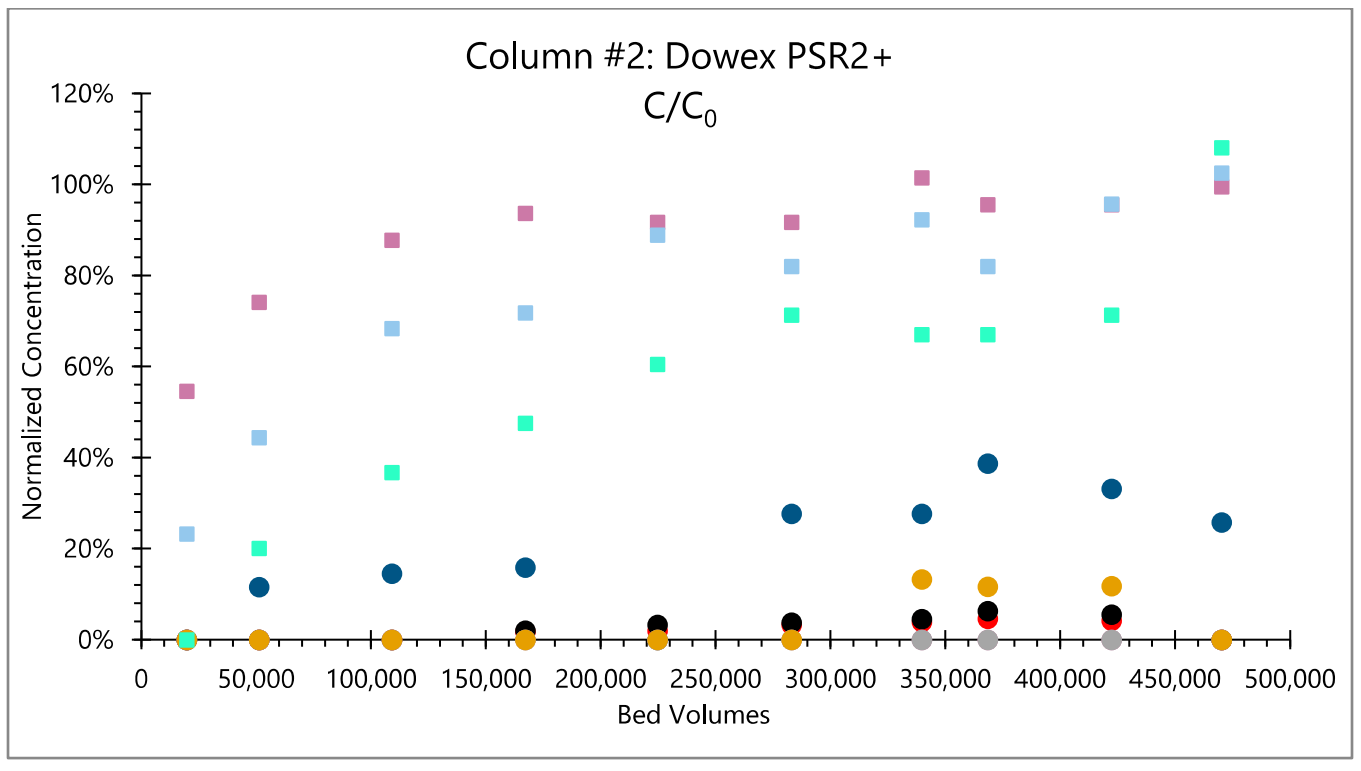
ATTACHMENT C

BREAKTHROUGH CURVES

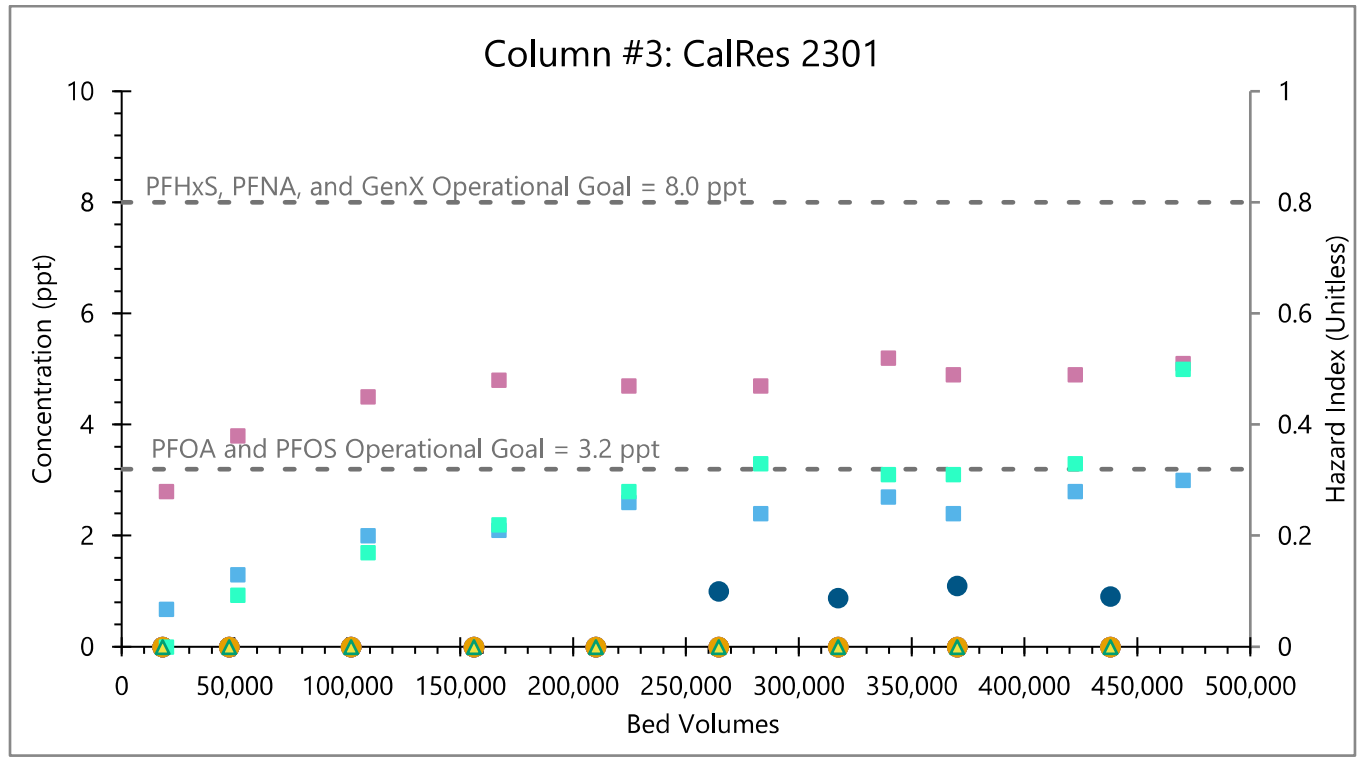


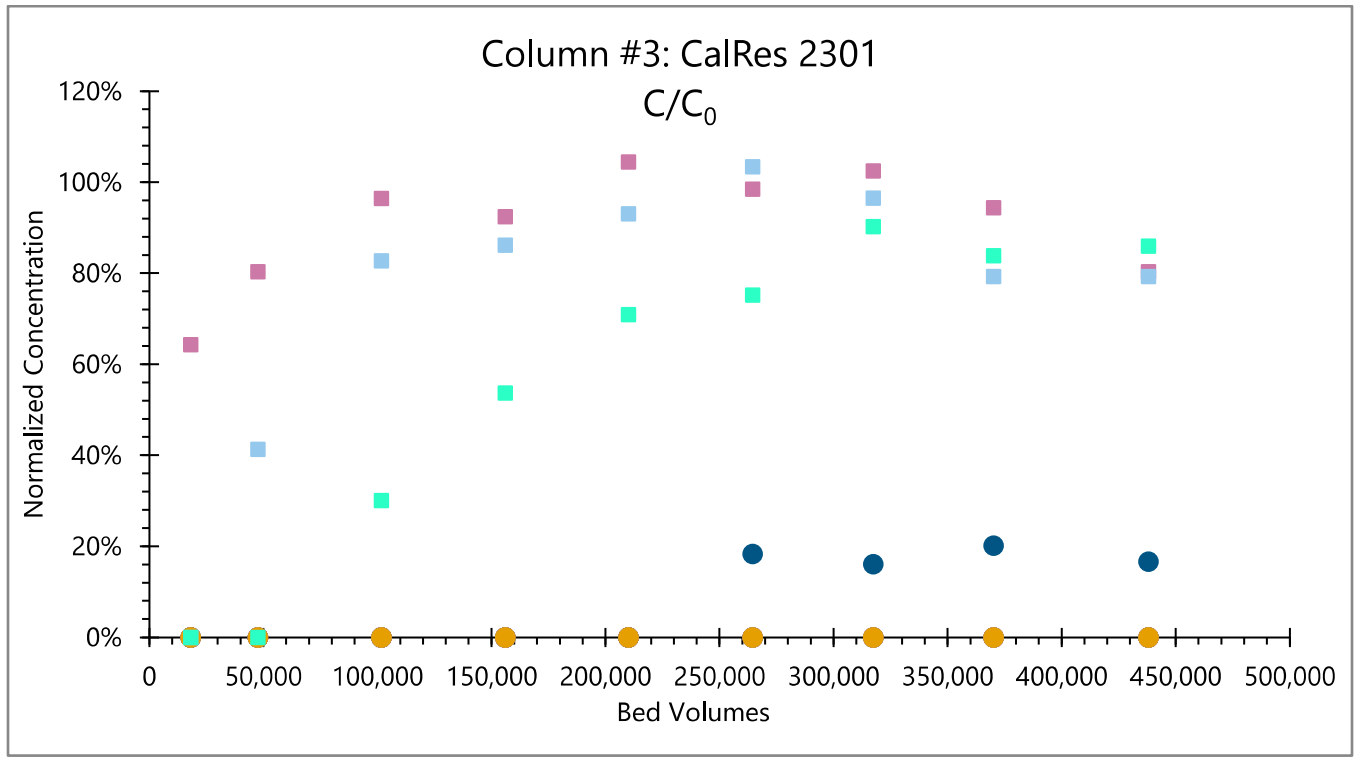






PFOA PFOS PFHxS PFNA GenX PFBS PFBA PFPeA PFHxA HI (unitless)


Column #3: CalRes 2301
PFHxS, PFNA, and GenX Operational Goal = 8.0 ppt
PFOA and PFOS Operational Goal = 3.2 ppt
Concentration (ppt)
Hazard Index (Unitless)
Bed Volumes
0
2
4
6
8
10
0.2
0.4
0.6
0.8
1
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000


Column #3: CalRes 2301
C/C0
Normalized Concentration
Bed Volumes
0%
20%
40%
60%
80%
100%
120%
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000


PFOA
PFOS
PFHxS
PFNA
GenX
PFBS
PFBA
PFPeA
PFHxA
HI (unitless)

APPENDIX C

DETAILED COST OPINIONS AND QUANTITY TAKEOFF

AACE International Class 5 Estimate (expected Accuracy Range of +50/-30 percent)	Factor	Phase 1 MGDP Bypass Treatment 5 Trains 6,450 gpm	Phase 2a Full Wellfield Treatment 7 Trains 11,770 gpm	Phase 2b Full Wellfield Treatment 10 Trains 11,770 gpm
CAPITAL COST[1]				
DIRECT COST				
Site Work[2]	25%	$1,127,000	$716,000	$1,045,000
Yard Piping & Valves[2]	25%	$1,127,000	$716,000	$1,045,000
Foundation		$775,000	$397,000	$397,000
Offsite Pipeline to MGDP Tie-in[3]		$1,074,000	$0	$0
Site Exterior Wall[4]		$945,000	$649,000	$649,000
New Site Electrical Building		$407,000	$0	$0
New Pump Station Building		$1,084,000	$0	$0
Site Complexity[2]	5%	$225,000	$143,000	$209,000
Process Equipment				
IX Vessels		$2,250,000	$900,000	$2,250,000
IX Resin		$1,455,000	$1,488,000	$1,455,000
Cartridge Filter Housings		$338,000	$169,000	$169,000
Catridge Filter Elements		$30,000	$15,000	$15,000
Vertical Sand Separators				
Sand Separator Recyle System				
Vertical Turbine Booster Pumps in Cans[5]		$436,000	$291,000	$291,000
Installation[2]	30%	$1,353,000	$859,000	$1,254,000
Electrical and I&C[2]	30%	$1,353,000	$859,000	$1,254,000
TOTAL DIRECT COST		**$13,980,000**	**$7,200,000**	**$10,030,000**
Conceptual Level Design Detail Contingency[6]	30%	$4,194,000	$2,160,000	$3,009,000
TOTAL DIRECT COST WITH CONTINGENCY		**$18,170,000**	**$9,360,000**	**$13,040,000**
INDIRECT COST				
General Conditions, Overhead, Profit & Risk[7]	27%	$4,906,000	$2,527,000	$3,521,000
Bonds and Insurance[7]	3%	$545,000	$281,000	$391,000
Sales Tax[7]	6.66%	$1,211,000	$624,000	$869,000
TOTAL INDIRECT COST		**$6,660,000**	**$3,430,000**	**$4,780,000**
TOTAL CONSTRUCTION COST		**$24,830,000**	**$12,790,000**	**$17,820,000**
Construction Contingency[8]	25%	$6,208,000	$3,198,000	$4,455,000
Planning[8]	10%	$2,483,000	$1,279,000	$1,782,000
Design and Engineering[8]	10%	$2,483,000	$1,279,000	$1,782,000
Construction Administration[8]	10%	$2,483,000	$1,279,000	$1,782,000
TOTAL CAPITAL COST		**$38,490,000**	**$19,830,000**	**$27,620,000**
ANNUAL OPERATION AND MAINTENANCE COST				
IX Media Changeout (including spent media management)[9]		$183,000	$334,000	$334,000
Pump Power Cost[10]	$ 0.14	$55,000	$75,000	$68,000
Cartridge Filter Changeout[11]		$61,000	$122,000	$122,000
General[7]	0.5%	$91,000	$47,000	$65,000
Labor[12]	$15,386	$185,000	$185,000	$185,000
TOTAL ANNUAL O&M		**$575,000**	**$763,000**	**$774,000**
ECONOMIC ANALYSIS				
Present Worth of Annual O&M[13]		$10,575,000	$14,033,000	$14,235,000
PRESENT WORTH[13]		**$49,070,000**	**$33,860,000**	**$41,860,000**
Annualized Capital Cost		$2,090,000	$1,080,000	$1,500,000
EQUIVALENT ANNUAL COST[13]		**$2,670,000**	**$1,840,000**	**$2,270,000**

Table Notes

[1]Cost opinions shown in Jan 2024 dollars (Handy-Whitman Average Water Infrastructure Index = 1357).

[2]Applied to equipment costs.

[3]New 28-inch carrier/casing pipe to convey treated water across Stoneridge drive to the connection point at the MGDP.

[4]New 16-ft tall perimeter wall enclosing the PFAS treatment plant.

[5]New pumps assumed to be 2,500 gpm @ 140-ft total dynamic head. A standy pump was assumed for each scenario.

[6]Applied to direct costs.

[7]Applied to direct costs with contingency.

[8]Applied to total construction cost.

[9]Media changeout frequencies are representative of operational target of <2 ppt for PFOS based on a 25% operational cycle. Changeout frequency was estimated RSSCT results.

[10]Pump power costs based on 25% operational cycle, $0.14/kWh electricity costs, and average headloss across the process equipment.

[11]Cartridge filter costs assume 25% operational cycle with one changeout per year based on full scale data from Stoneridge Well.

[12]Assumed 80 hours per week.

[13]Assumes discount rate of 3.5% per year and term of 30 years.

PROJECT :	**MGDP and Mocho Wellfield PFAS Compliance Conceptual Design**		
JOB # :	**203226**	**Date:**	November-24
CLIENT :	**Alameda County Flood Control and Water Conservation District, Zone 7**	**By:**	DWS
ELEMENT :	**Phase 1: MGDP Bypass Treatment (6,450 gpm, 5 IX Trains)**	**Reviewed:**	J. Dettmer

	DESCRIPTION	QUAN/ FACTOR	UNIT	MATERIAL & LABOR	SUBTOTAL	TOTAL
DIRECT COST	**DIRECT COSTS**					
	Site Work (applied to equipment costs)	25%	-	-	$ 1,127,000	
	Yard Piping & Valves (applied to equipment costs)	25%	-	-	$ 1,127,000	
	Process Equipment Foundation	454	CY	$ 1,706	$ 775,000	
	Offsite Pipeline to MGDP Tie-in (Jack and Bore)	300	LF	$ 3,580	$ 1,074,000	
	Site Exterior Wall	510	LF	$ 1,853	$ 945,000	
	New Site Electrical Building	1	LS	$ 407,345	$ 407,000	
	New Pump Station Building	1	LS	$ 1,083,788	$ 1,084,000	
	Site Complexity (applied to equipment costs)	5%	-	-	$ 225,000	
	Process Equipment					
	IX Vessel Trains	5	EA	$ 450,000	$ 2,250,000	
	IX Resin	3,780	CF	$ 385	$ 1,455,000	
	Cartridge Filter Housings	2	EA	$ 169,107	$ 338,000	
	Cartridge Filter Elements	64	EA	$ 476	$ 30,000	
	150 HP Vertical Turbine Booster Pumps in Cans	3	EA	$ 145,333	$ 436,000	
	Installation (applied to equipment costs)	30%	-	-	$ 1,353,000	
	Electrical and I&C (applied to equipment costs)	30%	-	-	$ 1,353,000	
	TOTAL DIRECT COST					**$ 13,980,000**
	Conceptual Level Design Detail Contingency (applied to direct costs)	30%	-	-	$ 4,194,000	
	TOTAL DIRECT COST WITH CONTINGENCY					**$ 18,170,000**
INDIRECT COSTS	General Conditions, Overhead, Profit & Risk (applied to direct costs with contingency)	27%	-	-	$ 4,906,000	
	Bonds and Insurance (applied to direct costs with contingency)	3%	-	-	$ 545,000	
	Sales Tax (applied to direct costs with contingency)	6.7%	-	-	$ 1,211,000	
	TOTAL INDIRECT COST					**$ 6,660,000**
	TOTAL CONSTRUCTION COST					**$ 24,830,000**
	Construction Contingency	25%			$ 6,208,000	
	Design and Engineering	10%			$ 2,483,000	
	Construction Administration	10%			$ 2,483,000	
	Construction Support	10%			$ 2,483,000	
	TOTAL CAPITAL COST					**$ 38,490,000**

PROJECT :	**MGDP and Mocho Wellfield PFAS Compliance Conceptual Design**		
JOB # :	**203226**	**Date:**	November-24
CLIENT :	**Alameda County Flood Control and Water Conservation District, Zone 7**	**By:**	DWS
ELEMENT :	**Phase 2a: Full Wellfield Treatment (11,770 gpm, 7 IX Trains)**	**Reviewed:**	J. Dettmer

	DESCRIPTION	QUAN/ FACTOR	UNIT	MATERIAL & LABOR	SUBTOTAL	TOTAL
DIRECT COST	**DIRECT COSTS**					
	Site Work (applied to equipment costs)	25%	-	-	$ 716,000	
	Yard Piping & Valves (applied to equipment costs)	25%	-	-	$ 716,000	
	Process Equipment Foundation	233	CY	$ 1,706	$ 397,000	
	Offsite Pipeline to MGDP Tie-in (Jack and Bore)	0	LF	$ 3,580	$ -	
	Site Exterior Wall	350	LF	$ 1,853	$ 649,000	
	New Site Electrical Building	0	LS	$ 407,345	$ -	
	New Pump Station Building	0	LS	$ 1,083,788	$ -	
	Site Complexity (applied to equipment costs)	5%	-	-	$ 143,000	
	Process Equipment					
	IX Vessel Trains	2	EA	$ 450,000	$ 900,000	
	IX Resin	3,864	CF	$ 385	$ 1,488,000	
	Cartridge Filter Housings	1	EA	$ 169,107	$ 169,000	
	Cartridge Filter Elements	32	EA	$ 476	$ 15,000	
	150 HP Vertical Turbine Booster Pumps in Cans	2	EA	$ 145,333	$ 291,000	
	Installation (applied to equipment costs)	30%	-	-	$ 859,000	
	Electrical and I&C (applied to equipment costs)	30%	-	-	$ 859,000	
	TOTAL DIRECT COST					**$ 7,200,000**
	Conceptual Level Design Detail Contingency (applied to direct costs)	30%	-	-	$ 2,160,000	
	TOTAL DIRECT COST WITH CONTINGENCY					**$ 9,360,000**
INDIRECT COSTS	General Conditions, Overhead, Profit & Risk (applied to direct costs with contingency)	27%	-	-	$ 2,527,000	
	Bonds and Insurance (applied to direct costs with contingency)	3%	-	-	$ 281,000	
	Sales Tax (applied to direct costs with contingency)	6.7%	-	-	$ 624,000	
	TOTAL INDIRECT COST					**$ 3,430,000**
	TOTAL CONSTRUCTION COST					**$ 12,790,000**
	Construction Contingency	25%			$ 3,198,000	
	Design and Engineering	10%			$ 1,279,000	
	Construction Administration	10%			$ 1,279,000	
	Construction Support	10%			$ 1,279,000	
	TOTAL CAPITAL COST					**$ 19,830,000**

carollo

PROJECT :	**MGDP and Mocho Wellfield PFAS Compliance Conceptual Design**		
JOB # :	**203226**	**Date:**	November-24
CLIENT :	**Alameda County Flood Control and Water Conservation District, Zone 7**	**By:**	DWS
ELEMENT :	**Phase 2b: Full Wellfield Treatment (11,770 gpm, 10 IX Trains)**	**Reviewed:**	J. Dettmer

	DESCRIPTION	QUAN/ FACTOR	UNIT	MATERIAL & LABOR	SUBTOTAL	TOTAL
DIRECT COST	**DIRECT COSTS**					
	Site Work (applied to equipment costs)	25%	-	-	$ 1,045,000	
	Yard Piping & Valves (applied to equipment costs)	25%	-	-	$ 1,045,000	
	Process Equipment Foundation	233	CY	$ 1,706	$ 397,000	
	Offsite Pipeline to MGDP Tie-in (Jack and Bore)	0	LF	$ 3,580	$ -	
	Site Exterior Wall	350	LF	$ 1,853	$ 649,000	
	New Site Electrical Building	0	LS	$ 407,345	$ -	
	New Pump Station Building	0	LS	$ 1,083,788	$ -	
	Site Complexity (applied to equipment costs)	5%	-	-	$ 209,000	
	Process Equipment					
	IX Vessel Trains	5	EA	$ 450,000	$ 2,250,000	
	IX Resin	3,780	CF	$ 385	$ 1,455,000	
	Cartridge Filter Housings	1	EA	$ 169,107	$ 169,000	
	Cartridge Filter Elements	32	EA	$ 476	$ 15,000	
	Vertical Sand Separators	0	EA	$ 302,550	$ -	
	Sand Separator Recycle System	0	LS	$ 46,579	$ -	
	150 HP Vertical Turbine Booster Pumps in Cans	2	EA	$ 145,333	$ 291,000	
	Installation (applied to equipment costs)	30%	-	-	$ 1,254,000	
	Electrical and I&C (applied to equipment costs)	30%	-	-	$ 1,254,000	
	TOTAL DIRECT COST					**$ 10,030,000**
	Conceptual Level Design Detail Contingency (applied to direct costs)	30%	-	-	$ 3,009,000	
	TOTAL DIRECT COST WITH CONTINGENCY					**$ 13,040,000**
INDIRECT COSTS	General Conditions, Overhead, Profit & Risk (applied to direct costs with contingency)	27%	-	-	$ 3,521,000	
	Bonds and Insurance (applied to direct costs with contingency)	3%	-	-	$ 391,000	
	Sales Tax (applied to direct costs with contingency)	6.7%	-	-	$ 869,000	
	TOTAL INDIRECT COST					**$ 4,780,000**
	TOTAL CONSTRUCTION COST					**$ 17,820,000**
	Construction Contingency	25%			$ 4,455,000	
	Design and Engineering	10%			$ 1,782,000	
	Construction Administration	10%			$ 1,782,000	
	Construction Support	10%			$ 1,782,000	
	TOTAL CAPITAL COST					**$ 27,620,000**

Attachment C- Mocho PFAS Treatment Plant
Pre-Conceptual Architectural Renderings

ATTACHMENT D

SERVICES AGREEMENT

between

**ALAMEDA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT, ZONE 7**

and

Consultant Name

for

Project/Program Name

Contract No. _____

Dated _____

This Professional Services Agreement ("**Agreement**") is made effective as of _____, by and between the Alameda County Flood Control and Water Conservation District, Zone 7 commonly known as ZONE 7 WATER AGENCY, hereinafter referred to as ("**Agency"**), a public body, corporate and politic, duly organized and existing under and by virtue of the laws of the State of California and _____, a DESCRIBE BUSINESS ENTITY, E.G., PROFESSIONAL CORPORATION ("Consultant") (collectively, the "Parties"), at Livermore, California, with reference to the following facts and intentions:

WHEREAS, The Agency is engaging in _____ ("Project"); and

WHEREAS, The Agency requires a highly qualified consultant with the requisite knowledge, skill, ability and expertise to provide the necessary services for the Project ("Services"); and

WHEREAS, Consultant represents to the Agency that it is fully qualified and available to perform the Services for and as requested by the Agency.

NOW, THEREFORE, in consideration of the mutual promises, covenants, and terms and conditions herein, the Parties agree as follows:

1. SCOPE OF WORK

1.1. Consultant shall provide all services set out in Appendix A, Scope of Work, attached and incorporated here to the satisfaction of the Agency.

1.2. **Independent Contractor; Agency** - The Consultant is acting hereunder as an independent contractor and not as an agent or employee of the Agency. The Consultant is thus not eligible to receive workers' compensation, medical, indemnity or retirement benefits, including but not limited to enrollment in the Alameda County Employees' Retirement Association (ACERA). Except as expressly provided herein, the Consultant is not eligible to receive overtime, vacation or sick pay. The Consultant shall not represent or otherwise hold out itself or any of its directors, officers, partners, employees, or agents to be an agent or employee of the Agency.

1.3. **Extra Services -** Before performing any services outside the scope of this Agreement ("Extra Services"), Consultant shall submit a written request for approval of such Extra Services and receive written approval from the Agency. The Agency shall have no responsibility to compensate Consultant for any Extra Services provided by Consultant without such prior written approval.

1.4. **Methods -** Consultant shall have the sole and absolute discretion in determining the methods, details and means of performing the Services

required by the Agency. The Agency shall not have any right to direct the methods, details and means of the Services; however, Consultant must receive prior written approval from the Agency before assigning or changing any assignment of Consultant's project manager or key personnel and before using any Sub-consultants ("Sub-consultants") or Sub-consultant agreements for services or materials under this Agreement and any work authorizations.

1.5. **Review -** Consultant shall furnish the Agency with reasonable opportunities from time to time to ascertain whether the Services of Consultant are being performed in accordance with this Agreement. All work done and materials furnished shall be subject to final review and approval by the Agency. The Agency's review and approval of the Services shall not; however, relieve Consultant of any of its obligations under this Agreement.

2. COMPENSATION

2.1. **Amount –** As consideration for the Services described above, THE AGENCY will pay the Consultant an amount not to exceed $_____ ("Maximum Amount"). DESCRIBE ANY PERIODIC BILLING REQUIREMENTS, EXPECTATIONS OR OTHER PARTICULARS, E.G., NOT TO EXCEED $_____ PER MONTH, OR CONSULTANT SHALL NOTIFY THE AGENCY WHEN TOTAL INVOICED AMOUNT EQUALS 80% OF MAXIMUM AMOUNT.

Payments will be made at the rates set forth in the Fee Schedule which is attached hereto within and incorporated herein as though fully set forth ("Fee Schedule" – Appendix B). Consultant shall submit an invoice within ten (10) days after the end of each month during the term of this Agreement describing the Services performed for which payment is requested.

2.2. **Invoicing –** The invoice shall identify and describe the activities performed by Consultant and state the total cost of the Services for the period of the invoice; the hours worked; the name and title of the person(s) performing the work; the hourly rate for the person(s) performing the work; the accrued reimbursable expenses; and the budget amount and percentage remaining (after invoice payment), without reduction for retentions. The invoice shall also identify expenses for which reimbursement is requested and attach supporting documentation, including original receipts and/or bills. Any expenses exceeding $500 shall require written approval from the Agency. Reimbursable costs shall not include any administrative or overhead expenses and shall be reimbursable as described in the Fee Schedule.

Costs or expenses not designated or identified in the Fee Schedule shall not be reimbursable unless otherwise provided in this Agreement. Only actual time in providing the Services will be charged. The Agency will not make any payments for Consultant's travel time incurred in providing the Services, and

Consultant agrees not to invoice the Agency for any travel time incurred in providing the Services.

The Agency shall review and approve all invoices prior to payment. Consultant agrees to submit additional supporting documentation to support the invoice if requested by the Agency. If the Agency does not approve an invoice, the Agency shall send a notice to the Consultant setting forth the reason(s) the invoice was not approved. Consultant may re-invoice the Agency to cure the defects identified in the Agency notice. The revised invoice will be treated as a new submittal. If the Agency contests all or any portion of an invoice, the Agency and the Consultant shall use their best efforts to resolve the contested portion of the invoice.

The Agency shall pay approved invoice amounts within thirty (30) days of receipt. The Agency's determinations regarding verification of Consultant's performance, accrued reimbursable expenses, and percentage of completion shall be binding and conclusive. Consultant's time records, invoices, receipts and other documentation supporting the invoices shall be available for review by the Agency upon reasonable notice and shall be retained by Consultant for three (3) years after completion of the Project.

All invoices submitted for payment must indicate the Agreement number and either are to be emailed to accountspayable@zone7water.com or a hard copy mailed to Zone 7 Water Agency, 100 North Canyons Parkway, Livermore, CA 94551, Attention: Accounts Payable.

2.3. **Withholding Payment –** In the event the Agency has reasonable grounds for believing Consultant will be unable to materially perform the Services under this Agreement or unable to complete the Services within the Maximum Amount described in this Agreement, or if the Agency becomes aware of a potential claim against Consultant or the Agency arising out of Consultant's negligence, intentional act or breach of any provision of this Agreement, including a potential claim against Consultant by the Agency, then the Agency may withhold payment of any amount payable to Consultant that the Agency determines is related to such inability to complete the Services, negligence, intentional act, or breach.

3. TAXES; INSURANCE; PERMITS; LICENSES

3.1. **Taxes** - Consultant shall be solely responsible for the payment of all federal, state and local income tax, social security tax, worker's compensation insurance, state disability insurance, and any other taxes or insurance Consultant, as an independent contractor, is responsible for paying under federal, state or local law. Consultant is aware of the provisions of Section 3700 of the California Labor Code, which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and Consultant

shall comply with such provisions before commencing the performance of the Services under the Agreement. Consultant and its Sub-consultants shall maintain applicable workers' compensation insurance for their employees in effect during all work covered by the Agreement.

3.2. **Permits and Licenses** - Consultant shall procure and maintain all permits, and licenses and other government-required certification necessary for the performance of the Services, all at the sole cost of Consultant. None of the items referenced in this section shall be reimbursable to Consultant under the Agreement. Consultant shall comply with any and all applicable local, state, and federal regulations and statutes including Cal/OSHA requirements.

4. RISK TRANSFER PROVISIONS

4.1. **Workers' Compensation Insurance** - By his/her signature hereunder, Consultant certifies that he/she 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 he/she will comply with such provisions before commencing the performance of the work of this Agreement.

4.2. **Indemnification** - To the fullest extent permitted by law, Consultant will immediately defend, indemnify and hold harmless the Agency, its directors, officers, employees, or authorized volunteers, and each of them (collectively "the Agency") from and against:

4.2.1. All claims, demands, liabilities and losses arising out of the performance (or actual or alleged non-performance) of the services by Consultant, including its agents and employees, under this Agreement, for damages to persons or property arising, pertaining to or relating to the Consultant's negligent acts or omissions or willful misconduct or the failure of Consultant to comply with any professional standard of care applicable to Consultant's services.

4.2.2. Any and all actions, proceedings, damages, costs, expenses, penalties or liabilities, in law or equity, of every kind or nature whatsoever, arising out of, resulting from, or on account of the intentional or negligent violation of any governmental law or regulation, compliance with which is the responsibility of Consultant.

4.2.3. Any and all losses, expenses, damages (including damages to the work itself), attorneys' fees, and other costs, including all costs of defense, including but not only costs of counsel acceptable to the Agency, which the Agency may incur with respect to the failure, neglect, or refusal of Consultant to perform the Services or its obligations under the Agreement. Such costs, expenses, and damages shall include all costs,

including attorneys' fees, incurred by the Agency in any lawsuit to which it is a party. Upon the Agency's tender, Consultant shall immediately defend, at its own cost, expense and risk, any and all such suits, actions or other legal proceedings, with counsel acceptable to the Agency. Consultant shall further defend itself against any and all liabilities, claims, losses, damages, and costs arising out of or alleged to arise out of performance or non- performance of the work hereunder, and shall not tender such claims to the Agency nor to its directors, officers, employees, or authorized volunteers, for defense or indemnity.

4.2.4. Consultant shall pay and satisfy any judgment, award or decree that may be rendered against the Agency or its directors, officers, employees, or authorized volunteers, in any and all such aforesaid suits, actions, or other legal proceedings if arising as provided in the previous subsections of this Section.

4.2.5. Consultant shall reimburse the Agency or its directors, officers, employees, or authorized volunteers, for any and all legal expenses and costs incurred by each of them in connection therewith.

Consultant's indemnification obligations shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Consultant, its agents, employees under any applicable Worker Compensation Act, Disability Benefits Act, or other employee benefit act. Consultant's obligation to defend and indemnify shall not be restricted by the insurance requirements of this Agreement or to insurance proceeds, if any received by the Agency, or its directors, officers, employees, or authorized volunteers.

Notwithstanding the foregoing obligations, Consultant shall not at any time be responsible for any claims, liabilities or demands to the extent that they arise from the negligence or willful misconduct of the Agency, provided, however, that contributory negligence will not relieve Consultant of its obligation to defend unless the claims, liabilities or demand are the result of the sole negligence or willful misconduct of Agency.

The indemnity provided under this indemnification provision is intended to and will survive the expiration or termination of the Agreement and remain in full force and effect until barred by the applicable statute of limitations.

5. GENERAL CONDITIONS

5.1. **Laws, Regulations and Permits** -The Consultant shall give all notices required by law and comply with all laws, ordinances, rules, and regulations pertaining to the conduct of the work. The Consultant shall be liable for all violations of the law in connection with work furnished by the Consultant. If the Consultant performs any work knowing it to be contrary to such laws,

ordinances, rules and regulations, the Consultant shall bear all costs arising therefrom.

5.2. **Safety** - The Consultant shall execute and maintain his/her work so as to avoid injury or damage to any person or property.

In carrying out his/her work, the Consultant shall at all times exercise all necessary precautions for the safety of employees appropriate to the nature of the work and the conditions under which the work is to be performed, and be in compliance with all applicable federal, state and local statutory and regulatory requirements including State of California, Department of Industrial Relations (Cal/OSHA) regulations, and the U.S. Department of Transportation Omnibus Transportation Employee Testing Act. Safety precautions, as applicable, shall include but shall not be limited to: adequate life protection and life-saving equipment; adequate illumination; instructions in accident prevention for all employees, such as the use of machinery guards, safe walkways, scaffolds, ladders, bridges, gang planks, confined space procedures, trenching and shoring, fall protection, and other safety devices; equipment and wearing apparel as are necessary or lawfully required to prevent accidents, injuries, or illnesses; and adequate facilities for the proper inspection and maintenance of all safety measures.

5.3. **Labor Compliance Requirements -** Labor Compliance requirements (Prevailing Wage, SB 854): Contractor/Vendor must comply with all labor compliance requirements including but not limited to prevailing wage requirements, SB 854, Labor Code sections 1771.1(a) & 1725.5, Public Works Contractor Registration Program, and Electronic Certified Payroll Records to Labor Commissioner. Additional information about these requirements and the new public works program regarding compliance monitoring, administration and enforcement are available at the Department of Industrial Relations. **[For Public Works Contracts]** Copies of the rate of per diem prevailing wage shall be on file at the principal office of the Agency, and shall be made available to any interested party upon request.

6. REQUIRED INSURANCE

Liability Insurance - The Consultant shall provide and maintain at all times during the performance of the work under this Agreement, the following commercial general liability, professional liability and automobile liability insurance. All of the insurance shall be provided on policy forms and through companies satisfactory to the Agency.

6.1. **Coverage** - Coverage shall be at least as broad as the following or as provided in Appendix C:

6.1.1. Coverage for Professional Liability appropriate to the Consultant's profession covering Consultant's wrongful acts, negligent actions, errors

or omissions. **If Claims Made Policies**: the Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work; insurance must be maintained and evidence of insurance must be provided **for at least five (5) years after completion of the contract of work**; and if coverage is canceled or non-renewed, and not **replaced with another claims-made policy form with a Retroactive Date** prior to the contract effective date, the Consultant must purchase "extended reporting" coverage for a minimum of **five (5)** years after completion of contract work.

6.1.2. Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 0001).

6.1.3. Insurance Services Office (ISO) Business Auto Coverage (Form CA 0001), covering Symbol 1 (non-owned and hired automobiles).

6.2. **Limits** - The Consultant shall maintain limits no less than the following:

6.2.1. Professional Liability – One million dollars ($1,000,000) per claim and Two million ($2,000,000) annual aggregate.

6.2.2. Commercial General Liability – Two million dollars ($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 and products & completed operations liability. If Commercial General Liability Insurance or other form with a general aggregate limit or products-completed operations aggregate limit is used, either the general aggregate limit shall apply separately to the project/location (with the ISO CG 25 03, or ISO CG 25 04, or insurer's equivalent endorsement provided to the Agency) or the general aggregate limit and products-completed operations aggregate limit shall be twice the required occurrence limit.

6.2.3. Automobile Liability – One million dollars ($1,000,000) for bodily injury and property damage each accident limit.

6.2.4. Excess Liability – 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 insurance 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.

6.3. **Required Provisions** - The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

6.3.1. The Agency, its directors, officers, employees, and authorized volunteers are to be given insured status at least as broad as ISO endorsement CG 20 10 10 01 specifically naming all of the Agency parties required in this Agreement, or using language that states "as required by contract"). All Sub-consultants hired by Consultant must also have the same forms or coverage at least as broad; as respects: liability arising out of activities performed by or on behalf of the Consultant; products and completed operations of the Consultant; premises owned, occupied or used by the Consultant; and automobiles owned, leased, hired or borrowed by the Consultant. The coverage shall contain no special limitations on the scope of protection afforded to the Agency, its directors, officers, employees, or authorized volunteers.

6.3.2. Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the Agency. Additionally, Consultant shall give Agency thirty (30) days written notice prior to any material change or cancellation of said coverage.

6.3.3. For any claims related to this project, the Consultant's insurance shall be primary insurance as respects the Agency, its directors, officers, employees, or authorized volunteers, using the ISO CG 20 01 04 13 or coverage at least as broad. Any insurance, self-insurance, or other coverage maintained by the Agency, its directors, officers, employees, or authorized volunteers shall be in excess of the insurance required under this Agreement, and shall not contribute to it.

6.3.4. Any failure to comply with the reporting or other provisions of the policies including breaches and warranties shall not affect coverage provided to the Agency, its directors, officers, employees, or authorized volunteers.

6.3.5. Such liability insurance shall indemnify the Consultant and his/her Sub-consultants against loss from liability imposed by law upon, or assumed under contract by, the Consultant or his/her Sub-consultants for damages on account of such bodily injury (including death), property damage, personal injury, completed operations, and products liability.

6.3.6. The general liability policy shall cover bodily injury and property damage liability, owned and non-owned equipment, blanket contractual liability, completed operations liability.

6.3.7. The automobile liability policy shall cover all owned, non-owned, and hired automobiles.

6.4. **Workers' Compensation and Employer's Liability Insurance** - The Consultant and all Sub-consultants shall cover or insure under the applicable laws relating to workers' compensation insurance, all of their employees employed directly by them or through Sub- consultants in carrying out the

work contemplated under this Agreement, all in accordance with the "Workers' Compensation and Insurance Act", Division IV of the Labor Code of the State of California and any Acts amendatory thereof, with statutory limits. The Consultant shall provide employer's liability insurance with limits of no less than $1,000,000 each accident, $1,000,000 disease policy limit, and $1,000,000 disease each employee. **Waiver of Subrogation:** The insurer(s) named above agree to waive all rights of subrogation against the Agency, its elected or appointed officers, officials, agents, authorized volunteers and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the Agency; but this provision applies regardless of whether or not the Agency has received a waiver of subrogation from the insurer.

6.5. **Deductibles and Self-Insured Retentions** - Any deductible or self-insured retention must be declared to and approved by the Agency. At the option of the Agency, the insurer shall either reduce or eliminate such deductibles or self-insured retentions. Policies containing any self-insured retention (SIR) provision shall provide or be endorsed to provide that the SIR may be satisfied by either the named or additional insureds, co-insurers, and/or insureds other than the First Named Insured.

6.6. **Acceptability of Insurers** - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A:VII or equivalent or as otherwise approved by the Agency.

6.7. **Evidences of Insurance** - Prior to execution of the Agreement, the Consultant shall file with the Agency a certificate of insurance (Acord Form 25 or equivalent) signed by the insurer's representative evidencing the coverage required by this Agreement. Such evidence shall include (1) attached additional insured endorsements with primary & non-contributory wording, (2) Workers' Compensation waiver of subrogation. The Agency reserves the right to obtain complete, certified copies of all required insurance policies, at any time. Consultant shall maintain the Insurance required by this Agreement throughout the term of the Agreement and for a period of not less than 5 years following the termination of completion of this Agreement. Consultant further waives all rights of subrogation under this Agreement. Failure to continually satisfy the Insurance requirements is a material breach of contract.

The Consultant shall, upon demand of the Agency, deliver to the Agency such policy or policies of insurance and the receipts for payment of premiums thereon.

6.8. **Continuation of Coverage** - If any of the required coverages expire during the term of this Agreement, the Consultant shall deliver the renewal certificate(s) including the general liability additional insured endorsement to the Agency at least ten (10) days prior to the expiration date. Failure to

comply with any of the Insurance requirements shall constitute material breach of contract. The insurance requirements in this Agreement do not in any way represent of imply that such coverage is sufficient to adequately cover the Consultant's obligations under this Agreement. All Insurance or self-insurance coverage and limits applicable to a given loss or available to the named insured shall be available and applicable to the additional insured. The insurance obligations under this Agreement are independent of and in addition to the defense and indemnity obligations contained elsewhere in this Agreement and shall not in any way act to limit or restrict the defense or indemnity or additional insure obligations of the Consultant or the Consultant's insurance carrier, and shall be for (1) the full extent of the insurance or self-insurance overages and limits carried by or available to the Consultant, or (2) the minimum insurance coverage and amounts shown in this Agreement; whichever is greater. Agency reserves the right to add such other parties as may be required in the future to the indemnity and additional insured requirements of this Agreement.

6.9. **Sub-Consultants** - In the event that the Consultant employs other consultants ("Sub-consultants") as part of the services covered by this Agreement, it shall be the Consultant's responsibility to require and confirm that each Sub-consultant meets the minimum insurance requirements specified above.

7. LABOR AND MATERIALS

Consultant shall furnish, at its own expense, all labor, materials, equipment, tools, transportation and services necessary for the successful completion of the Services to be performed under this Agreement. Consultant shall give its full attention and supervision to the fulfillment of the provisions of this Agreement by its employees and Sub-consultants and shall be responsible for the timely performance of the Services required by this Agreement. Consultant's standard schedule of fees and charges is attached, which is incorporated herein as though fully set forth in the Fee Schedule attached hereto (Appendix B). All compensation for Consultant's Services under this Agreement shall be pursuant to the Fee Schedule.

8. TERM OF THE AGREEMENT

8.1. **Period of Services –** This Agreement between the Agency and Consultant begins upon its execution by both Parties and ends DATE, subject to the termination provisions herein.

8.2. **Termination** – The Agency may terminate this Agreement for any reason by giving Consultant at least thirty (30) days or earlier (depending on nature of services) prior written notice of such termination. Such termination shall not relieve the Agency from responsibility for payment for Services rendered by Consultant prior to the date of termination but shall relieve the Agency of

its obligations for the full payment of compensation due under the Agreement for the Services of Consultant after the notice of termination.

8.3. **Termination for Cause** – The Agency may terminate the Agreement for cause, effective immediately upon written notice of such termination to Consultant, based upon the occurrence of any of the following events:

8.3.1. Material breach of the Agreement by Consultant

8.3.2. Cessation of Consultant to be licensed, as required by law

8.3.3. Failure of Consultant to substantially comply with any applicable federal, state or local laws or regulations

8.3.4. The voluntary or involuntary filing of any petition under any law for the relief of debtors with respect to Consultant

8.3.5. Conviction of Consultant of any crime other than minor traffic offenses

8.4. **Compensation Upon Termination** - If the Services of Consultant are terminated, in whole or in part, Consultant shall be compensated as provided herein for all Services and approved Extra Services performed prior to the date of such termination.

9. CALIFORNIA LABOR CODE REQUIREMENTS

9.1. Consultant is aware of the requirements of California Labor Code Sections 1720 et seq. and 1770 et seq., which require the payment of prevailing wage rates and the performance of other requirements on certain "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, if applicable. Consultant shall defend, indemnify and hold the Agency, its elected officials, officers, employees and agents free and harmless from any claims, liabilities, costs, penalties or interest arising out of any failure or alleged failure to comply with the Prevailing Wage Laws. It shall be mandatory upon the Consultant and all sub-consultants to comply with all California Labor Code provisions, which include but are not limited to prevailing wages, employment of apprentices, hours of labor and debarment of contractors and subcontractors.

9.2. **Effective March 1, 2015**, if the services are being performed as part of an applicable "public works" or "maintenance" project, in addition to the foregoing, then pursuant to Labor Code sections 1725.5 and 1771.1, the Consultant and all sub-consultants 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 sub-consultants. This project may also be subject to compliance monitoring and enforcement by the DIR. 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.

10. INTERESTS OF CONSULTANT

10.1. Consultant represents and warrants that it presently has no interests, and covenants that it will not acquire any interests, direct or indirect, financial or otherwise, that would conflict with the performance of the Services to be provided by Consultant under the Agreement. Consultant further covenants that, in the performance of the Agreement, it will not employ any Sub-consultant or employee with any such interest. Consultant certifies that no one who has or will have any financial interest under this Agreement or within Consultant is a director, officer or employee of the Agency.

10.2. Although Consultant is retained as an independent contractor, Consultant's employees or agents may still be required under the California Political Reform Act and the Agency Conflict of Interest Code to file annual financial disclosure statements. Consultant agrees that its employees and/or agents will file with the Agency in a timely manner those financial disclosure statements that the Agency determines Consultant is required to file pursuant to the Political Reform Act. Failure to file such financial disclosure statements by Consultant and any of its employees or agents is grounds for termination of this Agreement.

11. COMPLETED WORK AND WORK PRODUCT

In the event of termination or completion of the Services under the Agreement, Consultant shall, at the Agency's request, promptly surrender to the Agency all completed work and work in progress and all materials, records and notes developed, procured, or produced pursuant to the Agreement. Consultant may retain copies of such work product as a part of its record of professional activity.

12. CONFIDENTIALITY AND RESTRICTIONS ON DISCLOSURE

12.1. **Confidential Nature of Materials** - The Consultant understands that all documents, records, reports, data, or other materials (collectively "Materials") provided by the Agency to the Consultant pursuant to the Agreement, including but not limited to draft reports, final report(s) and all data, information, documents, graphic displays and other items that are not proprietary to the Consultant and that are utilized or produced by the Consultant pursuant to the Agreement are to be considered confidential for all purposes.

12.2. **No Disclosure of Confidential Materials** - The Consultant shall be responsible for protecting the confidentiality and maintaining the security of the Agency documents and records in its possession. All Materials shall be deemed confidential and shall remain the property of the Agency. The Consultant understands the sensitive nature of the above and agrees that neither its officers, partners, employees, agents or Sub-consultants will release, disseminate, or otherwise publish said reports or other such data, information, documents, graphic displays, nor other materials except as provided herein or as authorized, in writing, by the Agency. The Consultant agrees not to make use of such Materials for any purpose not related to the performance of the Services under the Agreement. The Consultant shall not make written or oral disclosures thereof, other than as necessary for its performance of the Services hereunder, without the prior written approval of the Agency. Disclosure of confidential Materials shall not be made to any individual, agency, or organization except as provided for in the Agreement or as may be required by law, or by a court of competent jurisdiction.

12.3. **Protections to Ensure Control over Materials** - All confidential Materials saved or stored by the Consultant in an electronic form shall be protected by adequate security measures to ensure that such confidential Materials are safe from theft, loss, destruction, erasure, alteration, and any unauthorized viewing, duplication, or use. Such security measures shall include, but not be limited to, the use of current virus protection software, firewalls, data backup, passwords, and internet controls.

The provisions of this Section survive the termination or completion of the Agreement.

13. OWNERSHIP OF DOCUMENTS AND DISPLAYS

All original written or recorded data, documents, graphic displays, reports or other materials which contain information relating to the Consultant's performance hereunder and which are originated and prepared for the Agency pursuant to the Agreement shall be "work for hire" and shall be the property of the Agency. The Consultant hereby assigns all of its right, title and interest therein to the Agency, including but not limited to any copyright interest. In addition, the Agency reserves the right to use, duplicate and disclose in whole, or in part, in any manner and for any purpose whatsoever all such data, documents, graphic displays, reports or other materials delivered to the Agency pursuant to this Agreement and to authorize others to do so.

To the extent that the Consultant utilizes any of its property (including, without limitation, any hardware or software of Consultant or any proprietary or confidential information of Consultant or any trade secrets of Consultant) in performing services hereunder, such property shall remain the property of Consultant, and the Agency shall acquire no right or interest in such property.

14. ASSIGNMENT PROHIBITED

The Consultant shall not assign, transfer, convey, or otherwise dispose of its rights, title or interest in or to this Agreement or any part thereof without the previous written consent of the Agency.

15. REPRESENTATIVES OF THE PARTIES AND SERVICE OF NOTICES

15.1. **Designated Representatives** – The Agency representative designated below shall be the principal representative of the Agency for purposes of the Services that are the subject of this Agreement. Consultant shall designate, in writing, Consultant's project engineer and/or project manager for the performance of the Services under this Agreement, which designation shall be subject to the Agency's reasonable approval.

The representatives of the Parties who are authorized to administer this Agreement and to whom formal notices, demands and communications shall be given are as follows:

ZONE 7 WATER AGENCY Representative:

Name
Title
Zone 7 Water Agency
100 N. Canyons Parkway
Livermore, CA 94551

Consultant:

Name
Title
Firm Name
Address
Firm Tax ID

15.2. **Notices** - Formal notices, demands and communications to be given hereunder by either Party shall be made in writing and may be effected by personal delivery or fax or by registered or certified mail, postage prepaid, return receipt requested to the address set out below and shall be deemed communicated as of the date of mailing. If the name or address of the person to whom notices, demands or communications shall be given changes, written notice of such change shall be given, in accordance with this section within five (5) working days.

16. MISCELLANEOUS PROVISIONS

16.1. Integration – This Agreement represents the complete Agreement of the parties and supersedes any other Agreements between the parties, whether written or oral.

16.2. No Waiver – No waiver by either parties of any term or condition of this Agreement shall be a continuing waiver thereof.

16.3. Modification – This Agreement only may be amended in writing, signed by all parties.

16.4. Attorneys' Fees – In any proceeding to enforce this Agreement, the prevailing party shall be entitled to attorneys' fees and costs in any amount determined by the court.

16.5. Choice of Laws/Venue – This Agreement shall in all respects be governed by the laws of the State of California applicable to Agreement executed and to be wholly performed with the State. Any action regarding this Agreement shall be brought in Alameda County Superior Court.

16.6. Counterparts – This Agreement may be executed in separate counterparts that, together, shall constitute and be one and the same instrument.

16.7. No Third Party Beneficiaries – This Agreement is for the sole benefit of the parties hereto and their permitted assigns (if any), and nothing herein expressed or implied shall give or be construed to give to any person, other than the parties hereto and such assigns any legal or equitable rights hereunder.

16.8. No Presumption Regarding Drafter – The parties to this Agreement acknowledge that its terms and provisions have been negotiated and discussed among them and that it reflects their mutual agreement regarding its subject matter. Therefore, neither party shall be deemed to be the drafter of this Agreement nor shall there be no presumption for or against the drafter in its interpretation or enforcement.

IN WITNESS WHEREOF, the Parties have executed this Agreement at the place and as of the date first written above.

ALAMEDA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT, Zone 7, commonly known as ZONE 7 WATER AGENCY ("Agency")

_____

Valerie L. Pryor Date
General Manager

_____

Consultant

_____

Signature Date

_____

Print Name & Title

_____

_____

Address

_____

Telephone

_____

TIN or SS Number

APPROVED AS TO FORM: – (check with GM or Assistant General Manager if needed to be reviewed by legal. If not, delete this legal section)

Downey Brand LLP

By: _____
Rebecca Smith, General Counsel

Date: _____

Attachment E - Sample Professional Services Insurance Requirements

APPENDIX D
INSURANCE

This is an appendix attached to, and made a part of, the Services Agreement dated _____ ("Agreement") between THE ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, ZONE 7 commonly known as ZONE 7 WATER AGENCY ("District") and _____ ("Consultant"), for the provision of services agreement ("Services").

Minimum Insurance Requirements: Consultant shall procure and maintain for the duration of the contract insurance against claims for injuries or death to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Consultant, his agents, representatives, employees or sub-contractors.

Coverage - Coverage shall be at least as broad as the following:

1. **Commercial General Liability (CGL**) - Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including products and completed operations, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars ($2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to the District) or the general aggregate limit shall be twice the required occurrence limit.

2. **Automobile Liability** - Insurance Services Office (ISO) Business Auto Coverage (Form CA 00 01), covering Symbol 1 (any auto) or if Consultant has no owned autos, Symbol 8 (hired) and 9 (non-owned) with limit of one million dollars ($1,000,000) for bodily injury and property damage each accident.

3. **Workers' Compensation Insurance** - as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than $1,000,000 per accident for bodily injury or disease. Waiver of Subrogation: The insurer(s) named above agree to waive all rights of subrogation against the District, its elected or appointed officers, officials, agents, authorized volunteers and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the Agency; but this provision applies regardless of whether or not the District has received a waiver of subrogation from the insurer.

4. **Professional Liability** - (Also known as Errors & Omission – *Technology Exposure – Other Contractual Considerations) Insurance appropriates to the Consultant profession, with limits no less than $1,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

   If Claims Made Policies:

   1. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.

   2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.

   3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Consultant

must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

If the Consultant maintains broader coverage and/or higher limits than the minimums shown above, the District requires and shall be entitled to the broader coverage and/or higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the District.

Other Required Provisions - The general liability policy must contain, or be endorsed to contain, the following provisions:

1. **Additional Insured Status:** Zone 7 Water Agency, its directors, officers, employees, and authorized volunteers are to be given insured status (at least as broad as ISO Form CG 20 10 10 01), with respect to liability arising out of work or operations performed by or on behalf of the Consultant including materials, parts, or equipment furnished in connection with such work or operations.

2. **Primary Coverage:** For any claims related to this project, the Consultant's insurance coverage shall be primary at least as broad as ISO CG 20 01 04 13 as respects to the Zone 7 Water Agency, its directors, officers, employees and authorized volunteers. Any insurance or self-insurance maintained by the Member Water Agency its directors, officers, employees and authorized volunteers shall be excess of the Consultant's insurance and shall not contribute with it.

Notice of Cancellation: Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the District.

Self-Insured Retentions - Self-insured retentions must be declared to and approved by the District. The District may require the Consultant to provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or the District.

Acceptability of Insurers - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A: VII or as otherwise approved by the District.

Verification of Coverage – Consultant shall furnish the District with certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the District before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Consultant's obligation to provide them. The District reserves the right to require complete, certified copies of all required insurance policies, including policy Declaration pages and Endorsement pages.

Sub-contractors - Consultant shall require and verify that all sub-contractor maintain insurance meeting all the requirements stated herein, and Consultant shall ensure that Zone 7 Water Agency, its directors, officers, employees, and authorized volunteers are an additional insured are an additional insured on Commercial General Liability Coverage.

Other Contractual considerations:

Professional Services – Professional Liability coverage is normally required if the Consultant is providing a professional service regulated by the state (Examples of service providers regulated by the state are insurance agents, doctors, certified public accountants, lawyers, etc.). However, other professional Consultants, such as computer or software designers, and services providers such as claims administrators, should also have professional liability. If in doubt, consult with your risk management or JPIA Member Services.

If Technology Vendor Provider - include:

Cyber Liability Insurance (Technology Professional Liability – Errors and Omissions), with limits not less than $2,000,000 per occurrence or claim, and $2,000,000 aggregate or the full per occurrence limits of the policies available, whichever is greater. Coverage shall be sufficiently broad to respond to the duties and obligations as is undertaken by Vendor in this Agreement and shall include, but not be limited to, claims involving infringement of intellectual property, including but not limited to infringement of copyright, trademark, trade dress, invasion of privacy violations, information theft, damage to or destruction of electronic information, release of private information, alteration of electronic information, extortion and network security. The policy shall provide coverage for breach response costs as well as regulatory fines and penalties as well as credit monitoring expenses with limits sufficient to respond to these obligations.

END OF APPENDIX D

Attachment F - Sample Professional Services Insurance with Drone Requirements

APPENDIX C – INSURANCE

This is an appendix attached to, and made a part of, the Services Agreement dated _____ ("Agreement") between THE ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, ZONE 7 commonly known as ZONE 7 WATER AGENCY ("District") and _____ ("Vendor"), for the provision of services agreement ("Services").

Minimum Insurance Requirements: Design Professional shall procure and maintain for the duration of the contract insurance against claims for injuries or death to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Design Professional, his agents, representatives, employees or sub-contractors.

Coverage - Coverage shall be at least as broad as the following:

1. **Commercial General Liability (CGL**) - Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including products and completed operations, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars ($2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to the District) or the general aggregate limit shall be twice the required occurrence limit.

2. **Automobile Liability** - Insurance Services Office (ISO) Business Auto Coverage (Form CA 00 01), covering Symbol 1 (any auto) or if Design Professional has no owned autos, Symbol 8 (hired) and 9 (non-owned) with limit of one million dollars ($1,000,000) for bodily injury and property damage each accident.

3. **Workers' Compensation Insurance** - as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than $1,000,000 per accident for bodily injury or disease. Waiver of Subrogation: The insurer(s) named above agree to waive all rights of subrogation against the District, its elected or appointed officers, officials, agents, authorized volunteers and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the Agency; but this provision applies regardless of whether or not the District has received a waiver of subrogation from the insurer.

4. **Professional Liability** - (Also known as Errors & Omission – Insurance appropriates to the Design Professional profession, with limits no less than $1,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

   If Claims Made Policies:

   1. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.

2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.

3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Design Professional must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

5. Aviation Liability Insurance - on an "occurrence" basis, including products and completed operations, property damage, bodily injury with limits no less than $1,000,000 per occurrence, and $2,000,000 in the aggregate or the full per occurrence limits of the policies available, whichever is greater. This coverage may also be provided by endorsement to a **Commercial General Liability** policy. In that event then: **Commercial General Liability (CGL) -** Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars ($2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to Member Water Agency) or the general aggregate limit shall be twice the required occurrence limit.

If the Design Professional maintains broader coverage and/or higher limits than the minimums shown above, the District requires and shall be entitled to the broader coverage and/or higher limits maintained by the Design Professional. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the District.

Other Required Provisions - The general liability policy must contain, or be endorsed to contain, the following provisions:

1. **Additional Insured Status:** Zone 7 Water Agency, its directors, officers, employees, and authorized volunteers are to be given insured status (at least as broad as ISO Form CG 20 10 10 01), with respect to liability arising out of work or operations performed by or on behalf of the Design Professional including materials, parts, or equipment furnished in connection with such work or operations.

2. **Primary Coverage:** For any claims related to this project, the Design Professional 's insurance coverage shall be primary at least as broad as ISO CG 20 01 04 13 as respects to the Zone 7 Water Agency, its directors, officers, employees and authorized volunteers. Any insurance or self-insurance maintained by the Member Water Agency its directors, officers, employees and authorized volunteers shall be excess of the Design Professional 's insurance and shall not contribute with it.

Notice of Cancellation: Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the District.

Self-Insured Retentions - Self-insured retentions must be declared to and approved by the District. The District may require the Design Professional to provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the

retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or the District.

Acceptability of Insurers - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A: VII or as otherwise approved by the District.

Verification of Coverage – Design Professional shall furnish the District with certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the District before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Design Professional 's obligation to provide them. The District reserves the right to require complete, certified copies of all required insurance policies, including policy Declaration pages and Endorsement pages.

Sub-contractors - Design Professional shall require and verify that all sub-contractor maintain insurance meeting all the requirements stated herein, and Design Professional shall ensure that Zone 7 Water Agency, its directors, officers, employees, and authorized volunteers are an additional insured are an additional insured on Commercial General Liability Coverage.

Attachment G
Exceptions or Deviations

List below exceptions and/or deviations, if any, to the RFP and its exhibits and submit with your proposal.

The District is under no obligation to accept any exceptions and/or deviations and may be used in the evaluation of proposals.

Item No.	Reference To:		Description
	Page No.	Paragraph No.	

Bidder Name	**Bidder Signature**	**Date**

1 INTRODUCTION

This manual describes the application of Computer Aided Design (CAD) standards and procedures for **ZONE 7 Water Agency**.

The quality and consistency of drafting on drawings and exhibits is important to the overall satisfaction with the project. The purpose of this manual is to establish CAD drafting standards and procedures that will help maintain uniformity throughout the set of drawings. There shall be no deviation from this set of standards without permission of the ZONE 7 PROJECT CAD LEAD. Any deviations from the set standards my cause production deficiencies and may cause delays in meeting project deadlines.

This manual is intended to provide **ZONE 7** CAD staff and ZONE 7 CONSULTANTS with the necessary information required to provide a consistent and thorough product to ZONE 7.

This manual assumes CAD fluency by the user. This manual is not intended to substitute for specific training in the use of CAD or CAD related software packages.

ZONE 7 will NOT allow deviations from the standard requirement specified and/or referenced in this manual.

2 DRAWING ORGANIZATION

PURPOSE

This section details the strategies for the organization of CAD files to support the various stages and multi-discipline projects that we produce. The procedures described here are used extensively in the design industry to gain the greatest productivity from CAD users.

2.1 File Types

To minimize repetitious drafting, information shall be organized into two file types, “Model Files” and “Sheet Files”.

2.1.1 Model (Base) Files

Project model files contain project specific geometry currently being designed such as structures, piping, equipment and sections. A “Model File” contains all the line work for a specific discipline on the project (see **2.4** Separation of Information). The “Model Files” created will be combined into one or more “Sheet Files” to obtain a project deliverable. All elements of the “Model File” are drawn at “real world” size (1:1) and at “real world” coordinates, based on the site drawing provided for the project. This method assures that all “Model Files” are referenced in at 0,0,0.
“Model Files” shall not contain borders, leaders, dimension or annotations. Plan and profiles created with Autodesk Civil 3D or another Advanced CAD package may keep all data required to maintain the intelligence of the file in the “Model Files”.

2.1.2 Sheet (Layout) Files

A “Sheet File” represents one plotted drawing. Multiple layout tabs will **NOT** be allowed. “Sheet Files” are plotted at full size (1:1) and the origin of each sheet is 0,0. Sheet files contain drawing specific information such as borders, north arrows, graphic scales, dimensions and annotations as well as the “Model Files” needed to create the plotted sheet. Xrefs, annotations and dimensions shall be placed in the model space of the “Sheet File”. North arrows, graphic scales, sheet titles and sheet notes can be placed in paperspace of the “Sheet File”. A “Sheet File” shall not be reference to another “Sheet File” to create a final product.

2.1.3 Project Border Files

A “Project Border File” will be established at the beginning of each project.

2.2 Reference Files

Model Files and Project borders are reference files (XREF). Reference files are the single most powerful capability of CAD and therefore it is important to understand what they are and how they are to be used.

AutoCAD (XREF) function allows graphic information in one file to be reference into other files. The value in referencing these files is that information will only need to be added once and edited in one place. The information can be distributed to multiple

drawings, and as the base information changes, each of the associated drawings will be updated automatically. (Fig 2-2)

On a multi-discipline project, this allows disciplines to work on their respective drawings without delaying others. As there work is completed the other disciplines files will automatically update with the changes. The benefit of this is a consistent and organized design that minimizes on redundancy that impacts a projects schedule.

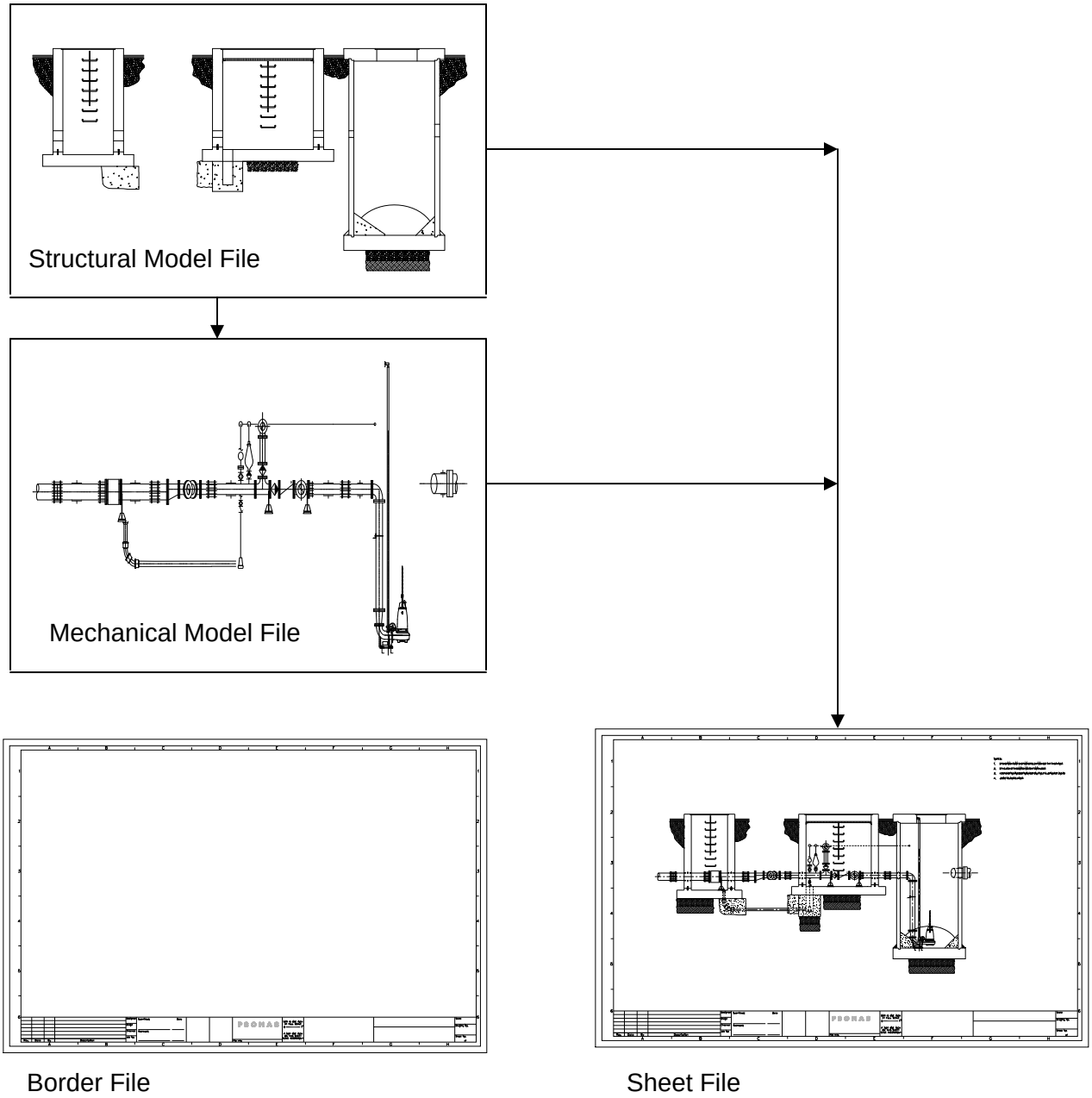


Fig 2-2

2.3 Reference File Attachments

AutoCAD has two options for attaching reference files, “attach” and “overlay”. ALL reference files are to be loaded using the “overlay” method. This will avoid circular xrefs and problems caused by nested xrefs. All xrefs will be inserted on the G-ANNO-XREF layer.

2.4 Separation of information

Each” Model File” shall contain information associated with one discipline (i.e. Civil, Structural, Mechanical, etc.). On a given project, there shall be one “Model File” per discipline per structure. It is important to note that this separation of information is to be maintained even if the same person is working on more than one discipline. For example, if a mechanical CAD designer is working on both the mechanical and structural portions of a structure, he/she must create a “Model File” for the mechanical information and a “Model File” for the structural information. Both files are referenced, as necessary, to create “Sheet Files”, but the information is never combined into one “Model File”.

2.5 Scales, Units and Coordinates

“Model Files” are always drawn 1:1. Civil Plans are to use decimal units and building plans are to use architectural units (yard piping, although plotted at a civil scale, are to be created using architectural units). Civil “Model Files” are created so that the information contained in the file is in its proper geographical position in the design plane. This position is defined by X and Y coordinates or Northing and Easting.
Schematic drawings such as Process & Instrumentation Drawings (P&ID’s) shall be developed using a grid. The grid is a pattern of dots that extend over the drawing area. Grid spacing of.10” and a snap of 0.05” is preferred.

2.6 Rotation

Views may be rotated to create a more desirable display without affecting the actual coordinates of the design data. “Model File” design data shall not be rotated from their real world coordinates. View rotation does not affect the way a design file appears when referenced to another file.
When referencing a file into a space that has a rotated view, remember to set the UCS to world.

2.7 Linetypes

All lines shall be drawn “bylayer”, except for single line piping. All typical piping shall be placed on the same layer (color “bylayer”) but will utilize the linetypes provided.

3 FILE NAMING CONVENTION

PURPOSE

This section details the strategies for the naming of “Model Files” and “Sheet Files” to support multi-discipline projects. The naming convention allows for easy identification on the contents of a CAD file without the need to view it. It also provides a convenient and clear structure for organizing files. The procedures described here are used extensively in the design industry to gain the greatest productivity from CAD users.

3.1 Model, Reference and Image Files

Names for “Model Files” are derived from the discipline, the facility and the type of information contained in the files. It is preferred that 4 characters be used for all groups but due to the number of facilities in larger treatment plants and the need to be desciptive, a modified NCS guideline will be used for all projects. All “Model File” names shall be capitalized.

A-BBBB-CCCC-DDDD-EEEE.dwg

A - Discipline Code
B - Major Group (8 characters max)
C - Minor Group (8 characters max)
D – Sub Group
E – Status Code (optional)

Discipline Code:

A	Architectural	**L**	Landscape
C	Civil	**M**	Mechanical (Process)
E	Electrical	**P**	Plumbing
G	General	**S**	Structural
H	HVAC		
I	Instrumentation		

Major Group

The major group field refers to the facility being designed. For each facility, the naming shall be consistent between disciplines. All facility names shall be finalized before detailed design begins. A maximum of 8 characters can be used to describe the facility being designed.

Examples of Major Group:

PRETREAT	Pretreatment	ACTIFLO	Actiflo
DRYBED	Drying Beds	FILTERS	Filters
LAB	Laboratory	ADMIN	Administation
SITE	Sitework	GRADPAVE	Grading & Paving

Minor Group

The minor group field will be used to identify the different models belonging to the same facility, i.e. operating floor plan and foundation plan. The minor group is an option and does not need to be used. A maximum of 8 characters can be used to describe the facility being designed.

Examples of Minor Group:

ROOF	Roof
FNDN	Foundation
FLOR	Floor

Sub Group

The sub group field will be used to identify the different types of models belonging to the same facility, i.e. plan and sections. The minor group is an option and does not need to be used. Names should be reduced to 4 characters

Examples of Sub Group:

PLAN	Plans
SECT	Sections

Status

The status field is a single character designator the differentiates the type of file.

DEMO	Demolition
EXST	Existing
FUTR	Future

3.2 Sheet Files

The naming convention for “Sheet Files” is determined on a project basis. Two methods are available to use and are described below.
Method 1 is preferred on projects that will have multi-discipline input. This method is required for large treatment facilities.
Method 2 is for single discipline project, such as pipelines, which have plan and profiles in sequential order.

Method 1

Names for “Sheet Files” are derived from the discipline, building code, drawing type and sequence number.

ABCDD.dwg

A – Discipline Code
B – Building Code
C – Drawing Type
D - Sequence No. for 01-99

Discipline Code:

A	Architectural	**L**	Landscape
C	Civil	**M**	Mechanical (Process)
E	Electrical	**P**	Plumbing
G	General	**S**	Structural
H	HVAC		
I	Instrumentation		

Building Code

Please note that the building code must be identified before “Sheet Files” can be created.

Drawing Type

0	Discipline Specific General
1	Plans, Enlarged Plans – Horizontal Views
2	Elevations – Vertical Views
3	Sections
4	User Defined
5	Details
6	Electrical One-Lines
7	Electrical Schematics
8	User Defined
9	User Defined
-	Not associated with a facility

Sequence No.

Sequential numbering from 01 – 99

Examples:

G-001	General, (not associated with a facility) General, Sheet 2
SM101	Structural, Membrane Building, Plan, Sheet 1

Method 2

The names for the “Sheet Files” are constructed from the discipline and the sequence number. (See Method 1 for discipline codes)

A-BB.dwg

A – Discipline Code
B – Sequential numbering from 01 – 99

4 LAYERING GUIDELINES

PURPOSE

This section details a modified AIA CAD layer guideline. The guideline incorporates five components – discipline designator, major group, minor group, minor group and color code.

A-BBBB-CCCC-DDDD-EEE

A - Discipline Designator
B - Major Group
C - Minor Group (optional)
D – Minor Group (optional)
E – Color Code

4.1 Discipline Designator:

A	Architectural	**L**	Landscape
C	Civil	**M**	Mechanical
E	Electrical	**P**	Plumbing
G	General	**S**	Structural

4.2 Major Group

The major group designation identifies the building system. Although major groups are logically grouped with specific discipline codes, it is possible to combine major groups with any of the discipline designators.

4.3 Minor Group (optional)

This group is used for further differentiation of major groups. The minor group can be defines by the user, which allows additional layers to be added to accommodate special project requirements. This should only be done if a defined layer does not apply to a project.

4.4 Minor Group (optional)

To ensure that all linetypes are drawn bylayer, this group will be used to identify the linetype used. (Continuous linetype is considered the default linetype).

4.5 Color Code

To properly show depth on drawings, one layer name may be needed to produce different plotted lineweights. To ensure that all entities are drawn bylayer the color number will append all layers. The code will be 3 digits (i.e. color red will be 001). The number will correspond with the color being used.

4.6 Common Layers

This is not intended to represent all the layers that will be used on a project. The layers shown are common examples and should be used as a guideline when creating layers for your project. Some CAD programs will automatically assign layer names for object to be drawn on; it is not the intent of this section to create more work for the user. The layers provided by the CAD program will not be modified, but additional layers that the user creates shall follow this guideline.

* Represents discipline code **** Represents any major group

4.6.1 Annotation Layers

Layer Name	Color	Linetype	Description
*-ANNO-TEXT			Text
*-ANNO-WIPE	255		Wipeouts
*-ANNO-REDL			Redline
*-ANNO-SYMB			Symbols
*-ANNO-SEAL			Engineers seal
*-ANNO-DIMS			Dimensions
*-ANNO-TTLB			Border and Title Block
*-ANNO-NPLT			Construction lines, non-plotting info
*-ANNO-REVS			Revisions
*-ANNO-XREF	6		Referenced model files

4.6.2 Common Layers

Layer Name	Color	Linetype	Description
*-LNWK			Miscellaneous linework

4.6.3 Common Modifiers

Layer Name	Color	Linetype	Description
*-****-PATT			Cross-hatching, poche
*-****-IDEN			Identification tags
*-****-ELEV			Elevation (vertical surfaces)
*-****-DASH			Dashed/hidden linework
*-****-MATC			Match lines
*-****-SPCL			Special lines
*-****-CNTR			Center lines
*-****-OTLN			Outlines

4.7 Architectural

4.7.1 Drawing Type: Ceiling plan

Layer Name	Color	Linetype	Description
A-CLNG			Ceiling information
A-CLNG-GRID			Ceiling grid

4.7.2 Drawing Type: Elevation

Layer Name	Color	Linetype	Description
A-ELEV			Interior & exterior elevations

4.7.3 Drawing Type: Floor plan

Layer Name	Color	Linetype	Description
A-FLOR-AREA			Area calculation boundary lines
A-FLOR-COLS			Columns
A-FLOR-DOOR			Doors
A-FLOR-DOORJAMB			Door jamb
A-FLOR-DOOROTLN			Door outlines
A-FLOR-EQPM			Equipment
A-FLOR-EQPMIDEN			Equipment identification numbers
A-FLOR			Floor plan information
A-FLOR-IDEN			Room numbers, names, etc.
A-FLOR-OTLN			Floor or building outline
A-FLOR-FURN			Furniture
A-FLOR-GLAZ			Windows, glazed partitions
A-FLOR-GRID			Planning grid or column grid
A-FLOR-PMFN			Materials and finish plan
A-FLOR-STRS			Stairs
A-FLOR-WALL			Exterior/Interior walls
A-FLOR-WALLCNTR			Wall centerlines

4.7.4 Drawing Type: Roof plan

Layer Name	Color	Linetype	Description
A-ROOF			Roof information
A-ROOF-OTLN			Roof outline

4.8 Civil

4.8.1 Drawing Type: Topo (Grading)

Layer Name	Color	Linetype	Description
C-TOPO-ALGN			Horizontal Alignment
C-TOPO-MAJR			Proposed major contour lines
C-TOPO-MNOR			Proposed minor contour lines
C-TOPO-TEXT			Contour elevations
C-TOPO-SPOT			Proposed spot elevations
C-TOPO-SURV			Benchmarks, survey control lines
C-TOPO-BORW			Borrow/spoil area

4.8.2 Drawing Type: Site improvements

Layer Name	Color	Linetype	Description
C-SITE-AREA			Area code boundary (process areas)
C-SITE-BLDG			Bldg., primary structures
C-SITE-FNCE			Fencing
C-SITE-MNHL			Manholes
C-SITE-PAVE			Edge of pavement
C-SITE-PKNG			Parking lots
C-SITE-PKNG-DRAN			Parking lot drainage slope indictors
C-SITE-PKNG-ISLD			Parking islands
C-SITE-PKNG-STRP			Parking lot striping, handicapped
C-SITE-PROP			Property lines, survey benchmarks
C-SITE-PROP-ESMT			Easements, right-of-ways, setbacks
C-SITE-RAIL			Railroad outlines, centerlines
C-SITE-ROAD			Roadway
C-SITE-ROAD-CNTR			Roadway Center lines
C-SITE-CURB			Curbs
C-SITE-STAG			Construction staging
C-SITE-STRM			Storm drainage, catch basins, inlets
C-SITE-SWAL			Swale
C-SITE-TUNL			Tunnel outlines
C-SITE-TUNL-CNTR			Tunnel centerlines
C-SITE-VEGE			Vegetation
C-SITE-WALK			Walkway
C-SITE-WATR-FIRE			Fire water
C-SITE-WRKA			Work area, project boundary

4.9 Electrical

4.9.1 Drawing Type: Site improvements

Layer Name	Color	Linetype	Description
E-SITE-ALRM			Alarm systems
E-SITE-AUXL			Auxiliary systems
E-SITE-CCTV			Closed circuit TV
E-SITE-COMMFOC			Fiber optic cable, telecommunications
E-SITE-COMMVALT			Fiber optic vaults, telecommunications
E-SITE-DUCT			Electrical conduit, duct bank
E-SITE-VALT			Electrical vaults
E-SITE-GRND			Ground system
E-SITE-HDHL			Handhole
E-SITE-LITE			Lighting
E-SITE-LITEEQPM			Major lighting equipment
E-SITE-LITEPNLS			Lighting panels
E-SITE-LITEPOLE			Lighting pole
E-SITE-MNHL			Electrical/communications manhole
E-SITE-SERT			Security
E-SITE-SOUN			Sound/PA Systems
E-SITE-POWRPOLE			Power pole
E-SITE-POWREQPM			Major power equipment

4.9.2 Drawing Type: Floor plan

Layer Name	Color	Linetype	Description
E-GRND			Ground system
E-LITE-CLNG			Ceiling mounted lights
E-LITE-EXIT			Exit signs
E-LITE-EXTR			Exterior lighting
E-LITE-EQPM			Miscellaneous lighting equipment
E-LITE-JBOX			Lighting junction box
E-LITE-FLOR			Floor mounted lighting
E-LITE-PANL			Lighting panel
E-LITE-SPCL			Special
E-LITE-SWCH			Light switches
E-LITE-WALL			Wall mounted lighting
E-POWR-CABL			Cable tray
E-POWR-DUCT			Electrical conduit, duct bank
E-POWR-EQPM			Miscellaneous Power equipment

E-POWR-JBOX			Electrical junction box
E-POWR-PANL			Power Panel

4.10 Instrumentation

4.10.1 Process & Instrumentation Diagrams

Layer Name	Color	Linetype	Description
I-PID-MAJR	8		Major Process Lines
I-PID-SECD	5		Secondary Process Lines
I-PID-MISC	2		Miscellaneous Process Lines
I-PID-ELEC	1	Cedashed	Electrical Connection Lines
I-PID-LNWK			Miscellaneous Line Work

4.10.2 Instrument Loop Diagrams (ILD)

Layer Name	Color	Linetype	Description
I-LOOP-LNWK			Major Process Lines

4.11 Landscape

4.11.1 Drawing Type: Site Improvements

Layer Name	Color	Linetype	Description
L-DEMO			Demolition
L-IRRI			Irrigation
L-PLNT			Plant and landscape materials
L-WALK			Walks and steps
L-HYDR			Hydroseeding, seed, sod
L-TURF			Mulching outline
L-SEED			Seed, sod

4.12 Mechanical

4.12.1 Drawing Type: Piping and Equipment

Layer Name	Color	Linetype	Description
M-CHEM-UNKN			Unknown chemical
M-****-EQPM			Equipment
M-****-PIPE			Pipe
M-****-PIPE-CNTL			Pipe centerline

**** indicates pipe contents. Code abbreviation shall be four (4) characters and shall be consistent with projects P&ID system codes.

4.12.2 Drawing Type: HVAC

Layer Name	Color	Linetype	Description
H-CONT-THER			Thermostats
H-CWTR			Cold water system
H-CWTR-EQPM			Cold water equipment
H-CWTR-PIPE			Cold water piping
H-DAMP			Dampners
H-SDFF			Supply diffusers
H-DUCT-SPLY			HVAC ductwork (supply)
H-RDFF			Return diffusers
H-DUCT-RTRN			HVAC ductwork (return)
H-HOTW			Hot water heating system
H-HOTW-EQPM			Hot water equipment
H-HOTW-PIPE			Hot water piping
H-REFG			Refrigeration systems
H-REFG-EQPM			Refrigeration Equipment
H-REFG-PIPE			Refrigeration Piping
H-PADS			HVAC equipment pads

4.12.3 Drawing Type: Mechanical systems

Layer Name	Color	Linetype	Description
M-GATE			Sluice Gate
M-MACT			Motorized actuator
M-MOTR			Motors
M-****-PANL			Mechanical control panels
M-****-PUMP			Pumps
M-****-SAMP			Sample
M-SUMP			Sump

4.12.4 Drawing Type: Plumbing

Layer Name	Color	Linetype	Description
P-DOMW			Domestic hot/cold water system
P-DOMW-EQPM			Domestic hot/cold water equipment
P-DOMW-CPIP			Domestic cold water pipe
P-DOMW-HPIP			Domestic hot water pipe
P-DRAN-FLOR			Floor drains
P-EQPM			Plumbing miscellaneous equipment
P-FIXT			Plumbing fixtures
P-NPWR			Non-potable water
P-SANR			Sanitary system
P-SANR-EQPM			Sanitary equipment
P-SANR-FIXT			Sanitary fixtures
P-SANR-FLDR			Sanitary floor drains
P-SANR-PIPE			Sanitary pipe
P-SANR-RISR			Sanitary risers
P-WASH			Emergency shower, eyewash

4.13 Structural

4.13.1 Drawing Type: Elevation

Layer Name	Color	Linetype	Description
S-ELEV			Interior & exterior elevations

4.13.2 Drawing Type: Foundation plan

Layer Name	Color	Linetype	Description
S-STEL(CONC)-BEAM			Beams
S-STEL(CONC)-COLS			Primary & secondary columns
S-CONC			Concrete
S-CONC-CURB			Curb
S-CONC-ENCS			Concrete encasement
S-CONC-FNDN			Footings, grade beams, piles
S-GRAD			Elevated grading, floor grading
S-STEL(ALUM)-GRAT			Elevated grating, catwalks
S-GRID			Grid lines, column tags
S-STEL(ALUM)-HRAL			Handrails
S-JOIN			Construction joints, expansion joints
S-STEL(ALUM)-LADR			Ladders
S-METL			Miscellaneous metal
S-CONC-OPNG			Opening

S-CONC-PADS			Support pads
S-PIPE			Piping within structural elements
S-PIPE-WFTG			Pipe wall fitting
S-POST			Posts
S-CONC-RAMP			Ramps
S-RBAR			Rebar
S-SLAB			Slab outline, control joints
S-SPPT			Miscellaneous fasteners, anchor bolts
S-STEL			Structural steel
S-STRS			Stair control joints, ladders
S-TRCH			Trench
S-VALT			Vaults
S-CONC-WALL			Concrete walls, CMU walls
S-WALL-RETG			Retaining wall
S-WEIR			Weir

5 GRAPHICAL/SHEET STANDARDS

PURPOSE

This section discusses the basic sheet layout and symbols that will be used on all projects to create the sheet files. There is a tendency to show more or duplicated information on a set of drawings. Over detailing shall be avoided.

5.1 Drawing Layout

The following criteria shall be followed on sheet files:

Sheet Annotations

- Scale bar shall be used on all drawings using a Civil Scale.
- "SEE" shall only be used when referencing another drawing. "SEE" shall not be used in conjunction with a detail bubble.
- "SHT" "SHEET" shall NOT be used when referring to drawing numbers.
- Drawing notes shall be placed in the upper right corner. Section and detail specific notes shall be placed above the section/detail callout.
- "DIA" or the diameter symbol shall only be used when the shape of the object is not clear (i.e. do not use on pipes or bolts).
- Section and detail callouts in notes shall be expressed X/XXXXX. (i.e. SEE DETAIL 4/MM501).
- Wipeouts and background masks shall be used. Place wipeouts on layer G-ANNO-WIPE, with color 255. Background masks are used for text. Set the fill color to "use background".
- Typical shall be abbreviated as (TYP) when used in a note and TYP when used with a detail bubble.

Elevations

Show the following:

- Concrete Substructures – corbels, projections and footings.
- Finish Grade, retaining walls, fences and walkways.
- Key elevations – Architectural – operating floor, etc.
  Structural – top of slab, top of steel.
  These elevations shall match wall sections
- Exterior materials – limited delineation.

- Column centerlines with bubble callout.

- Miscellaneous information:
  - Gas mask cabinets
  - Dock bumpers
  - Splash blocks and downspouts
  - Ladders
  - Handrails
  - Monorail systems

- If project is an addition to an existing structure, show enough of existing structure to denote tie in between old and new.

Plans

- Preferred scale for plans is 1/4”=1’-0”.

- All plans shall be displayed with north oriented to the top or left of the drawings. The preferred location of north arrows on all plans is the upper left corner of the drawing. Drawings with multiple plans will require a north arrow for each plan. All plans of a facility will be oriented the same across all disciplines.

- All enlarged plans shall have the same north orientation as the smaller scaled plans.

- Do not annotate or dimension information that is called out in the small scale plan.

- All plans of the same facility shall be plotted at the same scale.

- Number and give each room a designation. Provide finish floor elevation under designation if at different elevations.

- If equipment is outlined (bold) indicate what it is.

- Show all section cuts

- Roof plans shall indicate all openings in roof for power ventilators, skylights, hatches, drawings and expansion joints.

Sections

- Preferred minimum scale for sections shall be 3/8” = 1’-0”

- Cross sections and longitudinal sections shall show structural system, key elevations and materials. All mechanical sections shall indicate the elevation of all pipes in the view.

- Show in background – all structural and architectural information. Be sure cut placement reflects view shown.

- Elevations to the nearest 100th shall be used instead of vertical dimensions. (Exception: a vertical dimension shall be used for slab/foundation thickness.)

- Sections shall be arranged with equal elevations in alignment.

- Sections are letters and shall be placed on the drawings from left to right. Do not use the letters “I” or “O”.

Structural Sections

- Reinforcement abbreviations:
  Abbreviations shall be placed immediately after bar size and spacing. Bar size shall not contain a space. Example: #5@12”EWEF.

  - EF – Each Face
  - EW – Each Way
  - EWEF – Each Way Each Face
  - T&B – Top & Bottom
  - EWT&B – Each Way Top & Bottom

  EW and EWEF shall be used for vertical reinforcing
  T&B and EWT&B shall be used for horizontal reinforcing

- Callouts using “EWEF” or “EWT&B” requires only one leader pointing to the middle of the wall or slab. Callouts using “EF” or T&B shall point to steel being described.

- Reinforcing callouts shall be placed on the side nearest the bar that is being described. Avoid crossing to opposite face if possible.

- Special bar identification tags and abbreviations shall be placed immediately after the bar size. Example: #5DWLS@12”.

  - DWLS – Dowels
  - TIES – Horizontal reinforcing in vertical elements
  - STIRRUPS – Vertical reinforcing in horizontal elements.

  TIES & STIRRUPS set a pattern of multiple bars referenced by pointing at one of the bars in the pattern.

- The word LAP shall be included in all lap dimensions.

- The length of bar shall be called out after the bar spacing, e.g. #5@12”x1’-0”.

- The abbreviation “CTRD” shall be added following the spacing if reinforcing is to be centered in the wall or slab, e.g. #5@12”EW CTRD.

- The use of bar bend diagrams should be limited to cases where actual shapes cannot be seen in section. When required, the diagram shall be placed at the end or below the callout.

- Concrete anchors shall have the depth of the embedment included at the end of the callout, e.g. 1" EXP ANCHORS @2'-0" (W/5" EMBED).

- If the word WATERSTOP (WS) is spelled out, it will be one word. BOND BREAKER will be two.

Details

- Do not repeat detail information. Mark as (TYP).

- Keep dimensions on one side and notes, in line, on the other.

- Details are numeric and shall be placed on the drawings from left to right. Do not use the number "0".

- Do not crowd details.

Dimensions

It is the responsibility of the CAD technician to ensure that all objects are drawn to scale so that the dimension are correct. If a change to an object is required, the object shall be modified. DO NOT just modify the dimension.

- Column grid bubbles shall have alpha characters in the horizontal and numerical in the vertical. Preferred method is to place the bubbles across to top and down the left side.

- Overall dimensions are out to out of masonry, where masonry occurs, or out to out of concrete for structural walls and foundation.

- Whenever possible, keep dimensions in a continuous string.

- Reference from a common fixed point, such as column lines, foundations etc. When masonry occurs around columns, do not dimension each column or pilaster. If it is typical, mark as (TYP).

- Place dimension lines so they will not run through equipment or other congested areas.

- Do not repeat dimensions.

- Dimension openings in interior masonry walls. Be sure masonry courses.

- Use nominal wall thickness.

Screening and Wipeouts

Visual representation is the job of all CAD technicians, the project is being built on what we produce and it is our goal to provide clear, easy to follow drawings to the engineer and the client.

We all know that screening is used for existing objects and linework. To increase the look and feel of our drawings, screening will also be used when creating sheet files by referencing drawings from other disciplines. Example: when a mechanical sheet is being created it will require a structural and mechanical xref. The structural xref is supporting the mechanical xref; our sheet file will only contain annotations on the mechanical elements. Therefore the structural xref would be screened, to highlight the mechanical, but is still visible for the contractor. Another way of thinking about it is that by the time the mechanical is going to be put in; the structure will already be completed, so it actually exists.

Wipeouts and text masks are to be used to clean up drawings. These are mainly used when we have notes and callouts that have linework running through them. If we are putting a note or call out on the drawing, then the contractor must be able to read it. If the note or callout is over something important, move the note or callout.

Hatching

Hatching, when used correctly, will enhance the look of the drawings sets. Although over use of hatch can create larger and slower files that are distracting to the contractor. Common hatching used that will be presented on multiple discipline drawings shall be placed in the xrefs. This will decrease the amount of hatching in each sheet file and maintain a consistency between files. The hatch that is in the xref must be placed on the correct layer so that the disciplines using the xref can toggle it on and off as needed for the creation on their sheets.

- Concrete hatch shall only be used in existing concrete (screened) and concrete that is not part of a structure, i.e. concrete fill, concrete encasement.

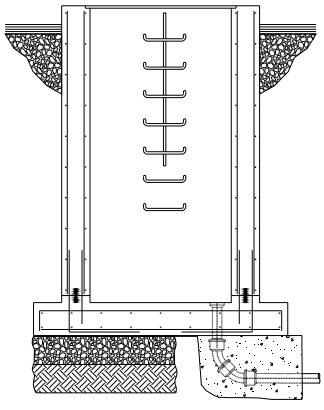


Fig 5-1

Standard Drawing Requirements

This section establishes additional standards and procedures.

- Repetitious drafting should be avoided. Only the information associated with the work being performed should be detailed

- All objects will be drawn at 1=1 scale in model space of the “XREF”. These files will contain all the geometry and linework. Each discipline can have multiple “XREF” files per building, and/or per floor.

- There will be **“NO”** text, annotations or dimensions in the “XREF” file. “Xref” files will be referenced into the sheet files. All text, annotations and dimensions will be placed in the model space of the sheet file at the correct plotting scale.

- All referenced files will be “overlayed” into the sheet file at 0,0,0 and placed on layer G-ANNO-XREF. In general, data that will be shared between multiple disciplines will be contained in separate files. Xrefs are always referenced by other files, sheet files are never referenced by other files.

- **Drawings created by Civil 3D will contain information automatically generated by the software, this includes text and cross-sections. It is the responsibility of the CAD technician to ensure that these items are controllable by the other disciplines and DO NOT impact the way other drawing are viewed.**

- All discipline plans of the same area shall have the same plotting scale. However, if any area requires only minimal information, a smaller, more efficient plotting scale may be used.

- The north orientation of the general layout and all building plans will be straight up or to the left and this orientation will be used on similar plans of the other disciplines. The north arrow will be placed in the upper left hand of the drawing.

- In plan views, the viewport will extend .5” (in paperspace) beyond any matchline. Objects between the matchline and the edge of the viewport window will not be called out.

- All new elevations will be indicated to two decimal places except finish grade, which will be one decimal place and a +/-.

- All sanitary sewer (drain) waste lines and storm sewer profile/section information shall be based upon the invert elevations; all other pipeline information will be based upon centerline elevations.

- Floor drain elevations are to be shown on plans, or called out in a note on the drawing where floor drains are shown.

- Plant Piping
    - Mechanical process piping 4” and smaller will be drawn as single line. All piping 5” and larger shall be double line.
    - All piping materials and connection joints shall be determined y the Engineer prior to drafting.
    - Where piping is shown in different elevations, the section should be cut to show all piping. However, if this is not possible, the piping of least importance shall be omitted to show important fittings.
- All wall pipes and wall sleeves shown on plans and sections will be drawn as if not in section.
- Operator positions, on valves 12” and larger, are to be shown in plans larger than 3/16” plotting scale and in section views. For special operators, or where conflicts may occur, operators may be shown on smaller valves.
- The current Edition of AISC will govern for structural steel callouts and weld symbols.
- Section cuts on plan sheets are to be looking up or to the left. Show horizontal dimension on sections only if they are not clearly apparent on the plan views.
-

5.2 Plotting Lineweights

The eight line weights defined below are considered sufficient and should not be expanded unless an appreciable improvement in drawing clarity or contrast can be realized.

AutoCAD Color	Plotted Width (In.)		AutoCAD Colors (Screening)	Plotted Width (In.)
1 (Red)	0.005		9	0.005
2 (Yellow)	0.010		10	0.010
3 (Green)	0.015		11	0.015
4 (Cyan)	0.020		12	0.020
5 (Blue)	0.025		13	0.025
6 (Magenta)	0.030		14	0.030
7 (White)	0.035		15	0.035
8 (Gray)	0.040		16	0.040

The following are typical usage for the line widths shown:

- 1 (Red) Used for depicting dimension lines, dimension leader/witness lines, note leader lines, line terminators, phantom lines, hidden lines, center lines, long break lines, schedule grid lines, and other object lines seen at a distance.
- 2 (Yellow) Used for depicting minor object lines, text for notes, callouts, and schedule text.
- 3 (Green) Medium lines should be used for depicting minor object lines.
- 4 (Cyan) Used for major object lines, cut lines, section cutting plane lines, and titles.
- 5 (Blue) Used for Match lines.
- 8 (Gray) Used for Electrical One-Line Diagrams (BUS)

Note: *The use of AutoCAD Polylines with a variable width is discouraged.*

5.3 Plotting Scales

Table 0-1

Drawing Type	**Preferred Drawing Scale**	
Site plans	1” = 10’ 1” = 20’ 1” = 40’ 1” = 100’	
Floor plans	1/4” = 1’ – 0”	
Plan and Profiles	Horizontal 1” = 50’	Vertical 1” = 5’
Sections	3/8” = 1’ – 0”	
Details	1/4” = 1’ – 0” 3/8” = 1’ – 0” 1/2” = 1’ – 0” 3/4” = 1’ – 0” 1” = 1’ – 0”	
Schematics	NTS	

All scales are subjective. The intent of this chart is to show the baseline standard. It is the CAD Professional’s responsibility to ensure that the drawing is clear and complete, based on the Engineer’s design.

5.4 Text Styles/Fonts

Zone 7 uses Simplex for all drawing text.

- **All General text shall be**:

  0.10” Plotted Height

- **All Subtitle text shall be**:

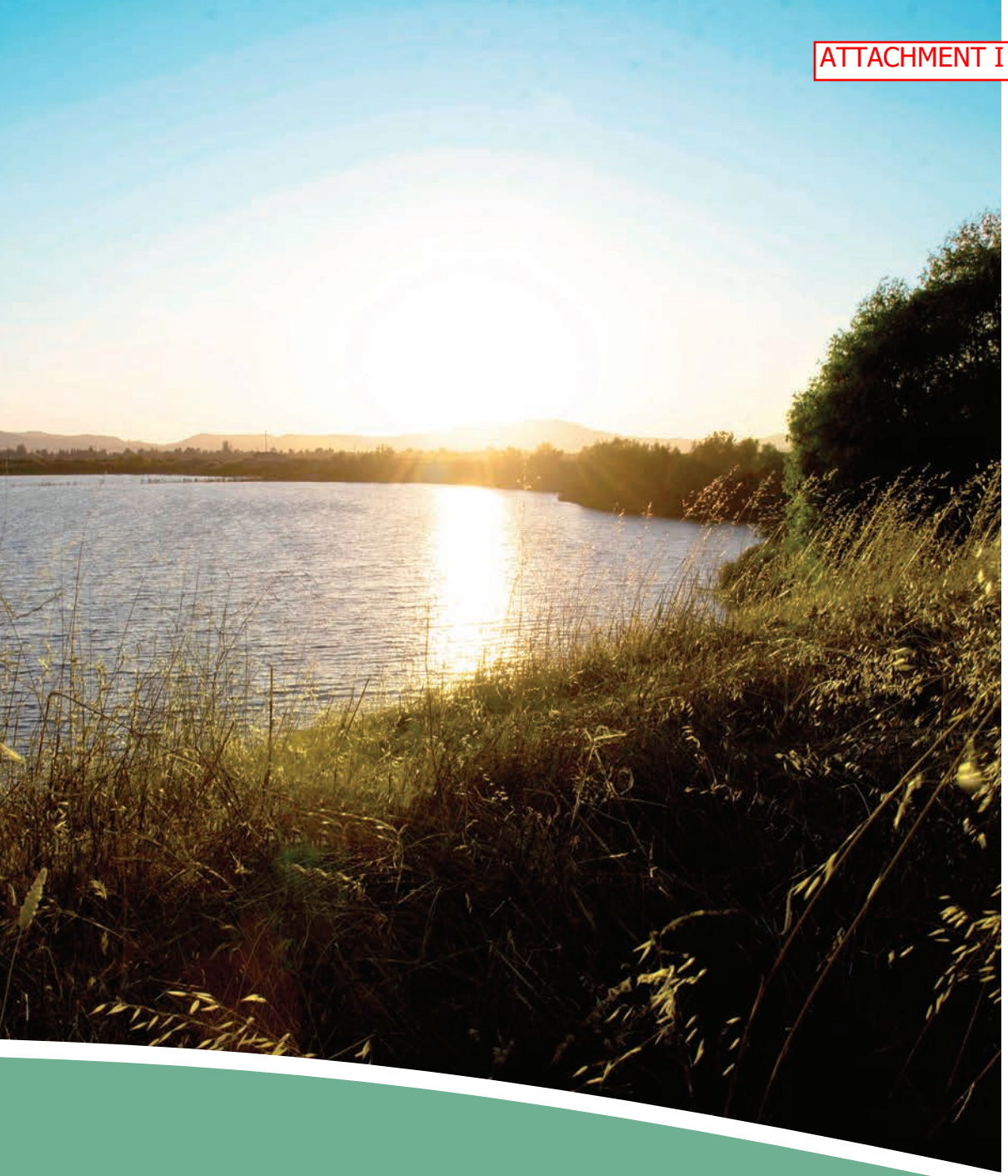
  Underlined
  0.15” Plotted Height

- **All Title text shall be**

  Underlined
  0.1875” Plotted Height

Text callouts are left justified. Periods will not be used after an abbreviation.

ATTACHMENT I



Brand & Design Guidelines

September 2020

ZONE 7 WATER AGENCY

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The Zone 7 Brand

The Zone 7 Promise

We deliver quality, reliability and safety to our own, highers standards – compliance is not enough. Being a Zone 7 customer means you can be assured we have not just met regulations, but we have exceeded them.

The Zone Story

Zone 7 provides excellent water and flood protection services because we believe our community deserves nothing less. We deliver high-quality drinking water that not only meets, but exceeds, regulatory standards. We invest in diversifying our water supply so our community can rely on us to provide the water they need. We proactively manage 37 miles of flood channels to ensure homes, businesses, and habitats are protected in the 425 square miles in our care.

As the Tri Valley region's water wholesaler, we work collaboratively with our water retailers in the City of Livermore, City of Pleasanton, the Dublin-San Ramon Services District, and California Water Supply to ensure the people of Eastern Alameda County have exceptional water and flood protection services. Our team works to ensure our performance moves beyond compliant to excellence because that is what it means to be in Zone 7.

Service Delivery Focus Areas

Water Quality

Water Reliability

Flood Protection

Guiding Principles

- Exceptional Service Delivery
- Regional Economic Benefit
- Informative Educational Outreach
- Balanced Environmental Care
- Responsible Financial Management
- Prioritize Community Safety

Zone 7 Organization Wide
Key Messages

Exceptional Quality

Zone 7 provides clean, high-quality water for residences and business use throughout the Tri Valley area.

Unwavering Reliability

Zone 7 maintains a reliable water supply to meet the Tri Valley area's needs.

Proactive Preparedness

We proactively support the Tri Valley community with flood preparedness efforts in homes, at businesses and as a region.

Sound Financial Strategy

Zone 7 is committed to providing a high level of service at a reasonable price through responsible and strategic fiscal practice.

Collaborative Partnership

As a water wholesaler, Zone 7 is wholly committed to working in partnership with our retailers and other regional stakeholders.

Environmental Responsibility

Zone 7 delivers services with sensitivity and care to our environmental resources.

Water Quality
Key Messages

Exceptional Service Delivery

Zone 7 delivers exceptional water quality:

- Zone 7's water meets not only state and federal health standards, it outperforms many of them – which inspired us to create the more stringent Zone 7 standard.
- Zone 7 moves beyond regulatory compliance to provide an additional margin of safety, and to address local concerns for taste, odor and water hardness.
- Zone 7 uses innovative water quality practices, such as the addition of ozone treatment, to exceed our community's expectations.

Regional Economic Benefit

There are regional economic benefits to high-quality water:

- Zone 7 is proud to be a part of the Tri Valley community, doing our part to ensure our economy thrives.
- Zone 7 provides clean water from the tap that enables businesses to thrive – from restaurants and coffee shops to salons and spas.
- Zone 7's direct customers include vineyards and golf courses that use untreated water for irrigation, helping fuel industries that bring hundreds of millions of dollars a year into the wine and tourism sectors of our economy.

Informative Educational Outreach

We provide water quality outreach that is accessible and understandable:

- Zone 7 is committed to transparency and providing our community with timely and relevant information that helps them understand our water quality process.
- Not only does Zone 7 release an annual consumer confidence report, we make updates and sampling data easily accessible online throughout the year.

Water Quality
Key Messages

Balanced Environmental Care

We strive for balanced environmental care within water quality:

- We believe that delivering quality water and caring for the environment go hand-in-hand.
- Zone 7's water treatment operations and our agreements with partner agencies integrate energy efficiency, alternative power and renewable energy to reduce greenhouse gas emissions and environmental impact.

Responsible Financial Management

We steadfastly provide responsible financial planning for water quality:

- Zone 7 takes an integrated approach to financial planning to ensure we are considering the costs of long-term water treatment infrastructure while proactively managing our financial position.

Prioritize Community Safety

Delivering safe water is our top priority::

- Zone 7's top priority is to provide our customers with the safest water available.
- Zone 7 holds itself to more stringent water-quality standards that exceed state and regulatory compliance.
- Zone 7 builds safety measures into every step of the water sourcing, treatment and delivery processes.

Water Reliability
Key Messages

Exceptional Service Delivery

Zone 7 provides exceptional water reliability services

- Zone 7 is proud to be the trusted conveyor of surface water for the region from the State Water Project, and the chosen guardian of our groundwater basin.
- We embrace the responsibility to our region of supplying today's residents with reliable water – and making sure future generations can have the same level of trust in Zone 7.
- With strategic planning and sound investment, Zone 7 is well-prepared to provide the Tri Valley area water it can rely on, now and into the future.

Regional Economic Benefit

Water reliability is a regional economic driver

- The reliability of water provided by Zone 7 allows the Tri Valley economy to flourish.
- We have earned the confidence of businesses and families who plan to stay and grow in the Tri Valley area and who trust in the reliability of our water supply.
- Our retailers and their customers can feel confident that we are continually working to secure our water supply – even in our ever-changing environment of water rights and availability.

Informative Educational Outreach

Keeping our community informed about our water supply

- We welcome the community to understand and participate in the decision-making process at Zone 7.
- Zone 7 supports educating future generations about our water supply, which is why we have provided schools with a comprehensive curriculum for children in first through eighth grades.
- In partnership with our retailers, Zone 7 is undertaking a public education program to ensure the public stays informed about all water supply capital improvement planning needs.

Balanced Environmental Care

Balancing people and planet in the delivery of a reliable water supply

- Zone 7 is focused on maintaining water resources for the people of Tri Valley – while being mindful of maintaining our natural resources for future generations.
- At Zone 7, conservation is not only for drought years – it is a way of life.
- Zone 7's integrated watershed and water supply programming help us ensure we are balancing the needs of our community with long-term environmental sustainability.

Responsible Financial Management

Sound investment strategy for long term sustainability

- Sound investment strategy for long term sustainability
- Zone 7 conducts proactive planning to inform our planning for the risk of a water supply shortage in the Tri Valley area.
- We are looking at multiple opportunities to diversify our water supply, invest in our infrastructure, and support our community when they need us the most.

Prioritize Community Safety

Ensuring safe water is always available

- Zone 7 is committed to ensuring safe water is always available to the Tri Valley area, and that's why we prioritize careful strategic planning and sound investments in our region's future.
- We are investing in long-term capital improvement projects that will replace infrastructure and ensure safe water for generations to come.

Water Reliability
Key Messages

Flood Protection Key Messages

Exceptional Service Delivery

Exceptional flood channel management and maintenance

- Zone 7 proactively manages a 37-mile network of streams and flood channels that protect the Tri Valley community should storms strike.
- We are continuously improving our level of preparedness and resiliency in managing our watershed to protect the Tri Valley community from flooding.

Regional Economic Benefit

Economic benefits of flood protection

- Zone 7 Water is committed to Tri Valley and takes flood preparedness seriously to ensure our businesses are as protected as possible so that our economy can continue to thrive, even in extreme weather.
- The best way that we can support our economy is through the preservation of a healthy watershed – by supporting the stream and channel banks, arroyos and reservoirs, and fisheries that make up the delicate balance of flood protection.

Informative Educational Outreach

Community outreach and education enhances flood protection

- Tri Valley residents can each play a role in flood protection – not only for their own homes and businesses, but for our community as a whole.
- Zone 7 wants to empower our community to be prepared for rains and emergency situations, and to engage our residents in caring for our watershed.
- Through our school partnership program, we are preparing the next generation of committed watershed caretakers.

Flood Protection Key Messages

Balanced Environmental Care

Flood protection integrated with environmental care

- At Zone 7, we believe we can not only provide exceptional flood protection service, but we can take care of our environment while doing so.
- We embrace an eco-friendly approach to stormwater conveyance, along with pollution prevention outreach, proactive debris removal and many other programs to care for our environment.

Responsible Financial Management

Creative financial solutions for flood protection services

- Zone 7's flood protection program leverages funding from diverse sources to provide excellent value for our customers.
- Integrated operations ensure we provide the highest value for the community.

Prioritize Community Safety

Focus on flood protection for the safety of the Tri Valley community

- The best way for us to ensure the entire Tri Valley area remains as safe as possible during flood events is by focusing on strategic, long-term flood channel maintenance.
- Zone 7 engages our community in flood preparedness, aligning with state and federal readiness goals – proactively providing preparatory items and useful information to ensure community safety.

Brand Identity

The Zone 7 logo is an integrated representation of the Tri Valley community and the work of the agency. The signature hilltop background combined with the flowing water below are local to the area and depict the primary services of the organization. The unique type helps to convey the singularity of the agency and desire to stand alone with exceptional service and standards.

HILLS + FLOWING WATER + UNIQUE TYPE = LOGO

Logo Options and Usage

Original Logo

The original circular logo is the agency's all-encompassing logo with name and mark combined into one symbol. The original logo should be used in instances where the horizontal logo does not fit or where the round representation fits better with other design elements.

Horizontal Logo

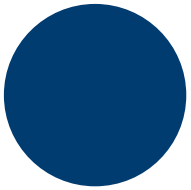
The horizontal logo is the agency's primary logo. The horizontal alternative has two options: Water Agency on two lines with no tagline or department, or Water Agency on a single line, with divider under which the tagline or a specific department name can be placed. The Water Agency type should not be altered and should not be combined with the original logo, so as not to be repetitive. Rather, the mark should be used with no type in the outer blue ring whenever it is combined with the type.

Avatar

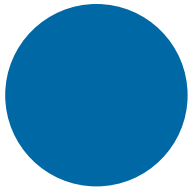
For special purposes, the circle mark without the text in the outer ring can be used. This mark can only be used when the full logo or text is seen with it or before it such as for social media avatars or for identification purposes in video lower-thirds.

Color Palette

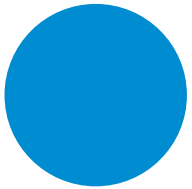
Primary Colors



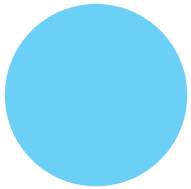
DEEP BLUE	
CMYK	C: 100 M: 75 Y: 15 K: 30
RGB	R: 0 G: 61 B: 113
WEB	003D71
Pantone	DS 213-1U



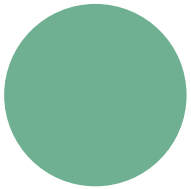
DARK BLUE	
CMYK	C: 100 M: 40 Y: 0 K: 20
RGB	R: 0 G: 104 B: 166
WEB	0068A6
Pantone	DS 216-1U



MEDIUM BLUE	
CMYK	C: 91 M: 30 Y: 0 K: 0
RGB	R: 0 G: 140 B: 208
WEB	008CD0
Pantone	DS 222-3U



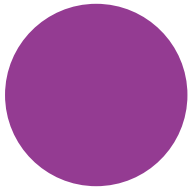
LIGHT BLUE	
CMYK	C: 50 M: 0 Y: 0 K: 0
RGB	R: 109 G: 207 B: 246
WEB	6DCFF6
Pantone	DS 225-4U



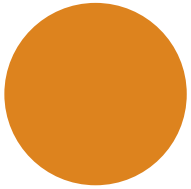
GREEN	
CMYK	C: 50 M: 0 Y: 45 K: 15
RGB	R: 112 G: 177 B: 145
WEB	70B191
Pantone	DS 227-6U

Color Palette

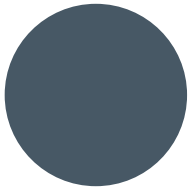
Accent Colors



PURPLE	
CMYK	C: 45 M: 90 Y: 0 K: 4
RGB	R: 147 G: 60 B: 146
WEB	933C92
Pantone	7656



DARK ORANGE	
CMYK	C: 4 M: 53 Y: 100 K: 8
RGB	R: 219 G: 130 B: 31
WEB	DB821F
Pantone	DS 216-1U



DARK GRAY	
CMYK	C: 45 M: 25 Y: 16 K: 59
RGB	R: 73 G: 103 B: 101
WEB	495965
Pantone	431

Graphic Elements

Wave

The wave graphic follows the same curve pattern used in the water portion of the Zone 7 logo. The two-color representation using green and light blue from the brand color palette may be used as a footer graphic in a variety of Zone 7 materials. A white rule separates the two colors from each other and from background colors.

Composition Division

Use the intersection of the two wave color blocks as a visual vertical division in layouts.

CORRECT

INCORRECT

Gradient Blends

Two gradient blends may be used in Zone 7 materials.

Gradient One

CMYK mix blue
92 / 58 / 10 / 1
to
CMYK mix green
47 / 0 / 43 / 0

Gradient Two

CMYK mix
light blue
50 / 0 / 0 / 0
to
CMYK mix
medium blue
91 / 30 / 0 / 0

Typography

Primary Font

Montserrat

Montserrat is a geometric sans-serif typeface designed by Argentinian designer Julieta Ulanovsky. It is available in multiple weights and easily found on a variety of font websites.

ZONE 7 WATER AGENCY

Montserrat Bold

Montserrat Light
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Montserrat Regular
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Montserrat Medium
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Montserrat Semibold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Montserrat Bold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Montserrat Extra Bold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Supporting Fonts

When Montserrat is unavailable or when a condensed font is needed, the Avenir Next family of fonts may be used.

Avenir Next Regular
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir Next Demibold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir Next Bold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir Next Condensed Regular
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir Next Condensed Semibold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir Next Condensed Bold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Icons

Three icons have been developed for the Service Delivery Focus Areas.

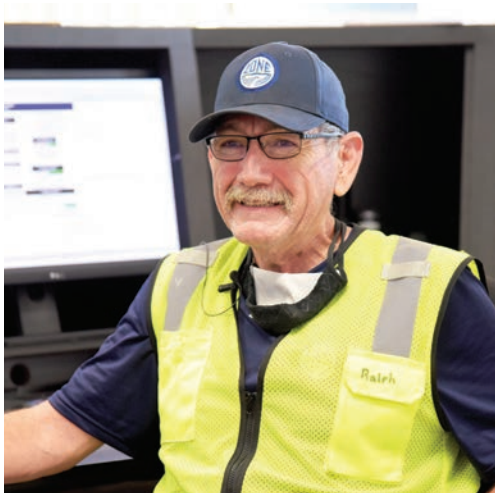
Stacked Version:

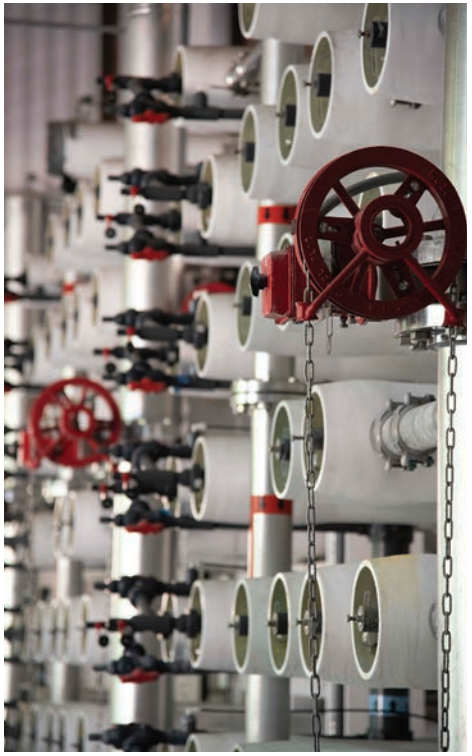
Horizontal Version:

Reversed One-Color Version:

Photo Direction

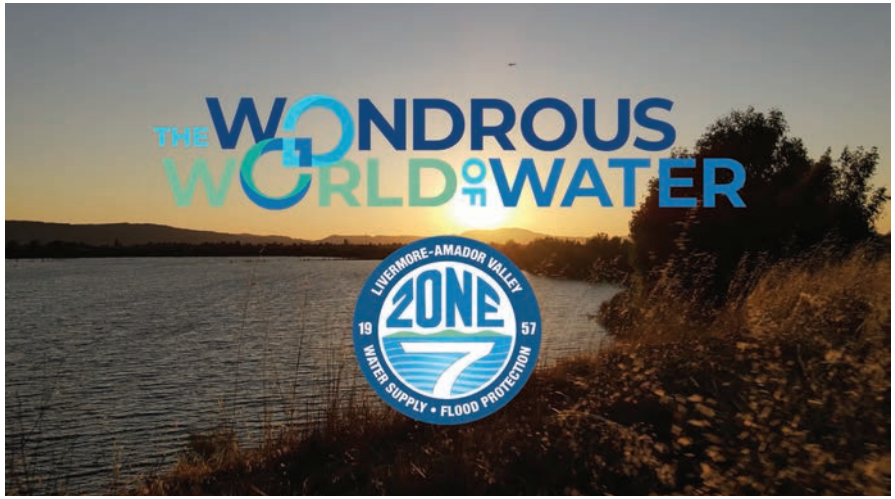
Zone 7 manages a vast array of beautiful, scenic trails and waterways, juxtaposed with highly technical equipment and facilities. As often as possible, these areas should be shown in harmony. Equipment and facilities should show surrounding environment and include unique angles and perspectives, rather than straight forward shoots, to help convey context. Pictures should be bright and show smiling faces with careful attention given to eye contact and shadow removal.





Video Direction

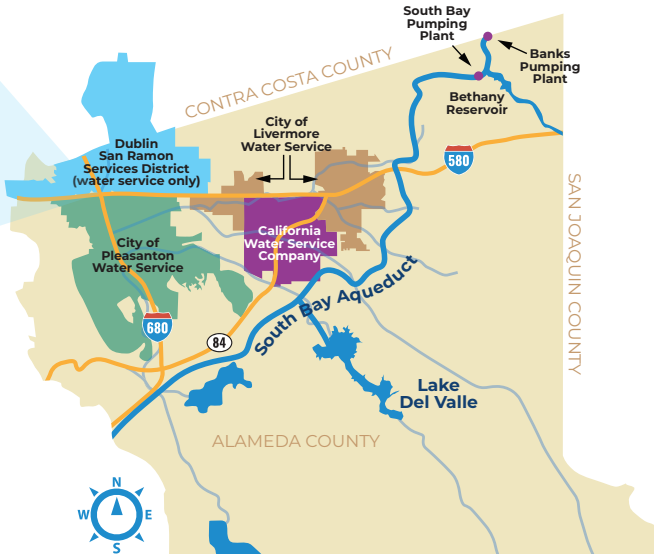
Zone 7 videos should portray the same combination of scenic footage and technical equipment as outlined in the photography section with surrounding environment and unique angles included for context and perspective. Straightforward “talking heads” should be minimized in favor of short on-screen lines, combined with voice over to illustrate key ideas. Lower-third names and titles should be shown when representatives are speaking into the camera.



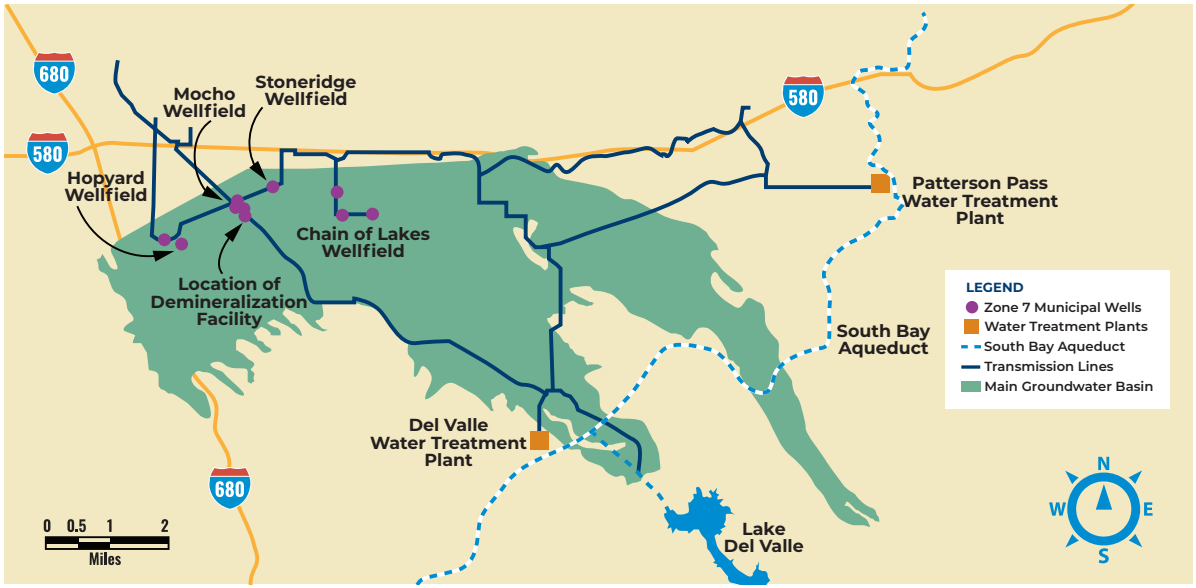
Map Options

When the location or jurisdiction of Zone 7 is needed, the following map options are available. Maps should be shown with north pointed upward, and cropped to show the full state of California, or the full jurisdiction. If smaller areas are needed for detail, one of the larger map areas should be referenced for context.

Waterways Detail



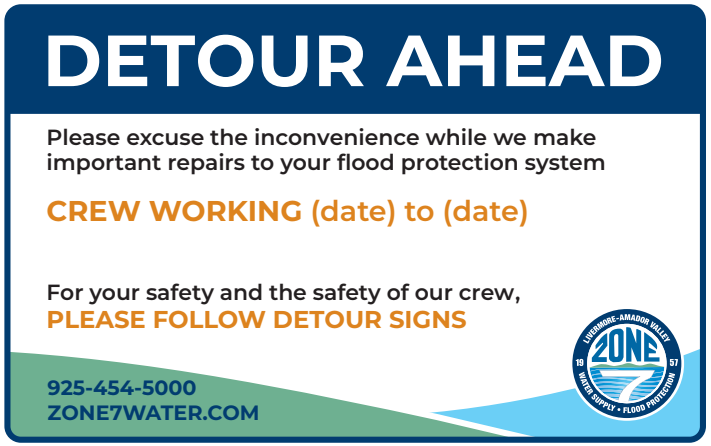
Service Map

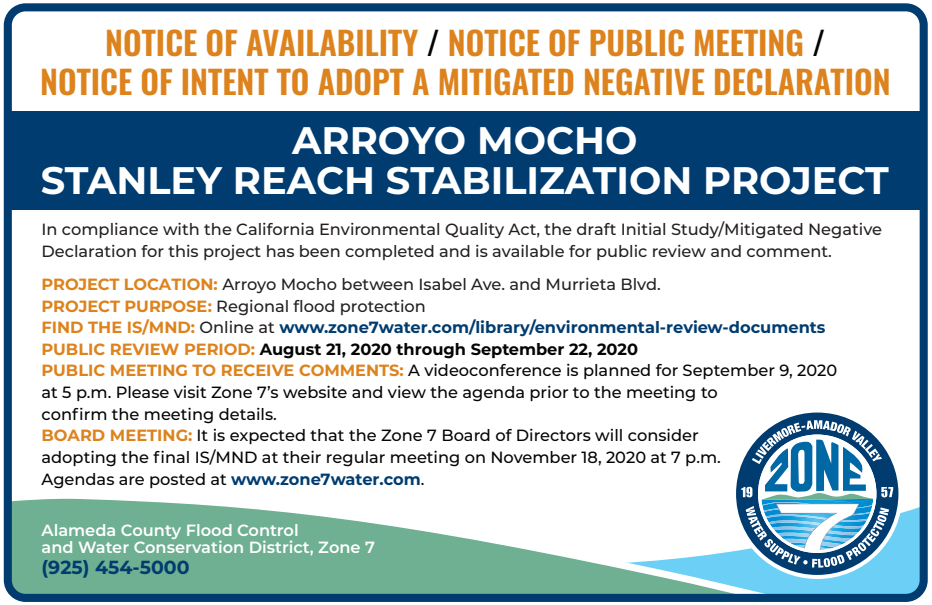


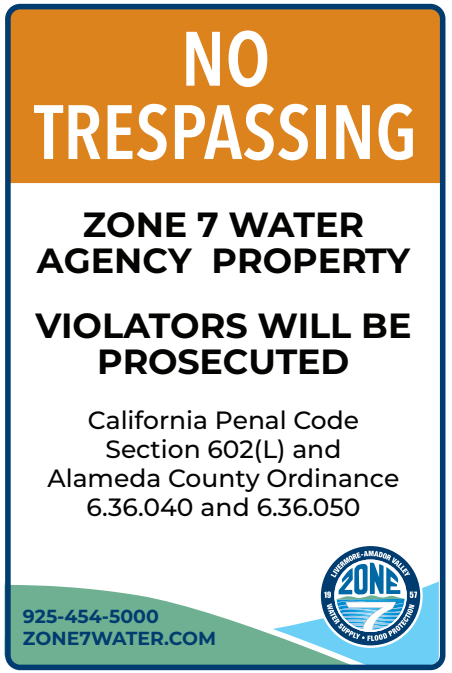
Facilities Map

Signage Guidelines

All signage should be branded in alignment with guidelines, utilizing the orange accent to signify construction or caution. Copy should be minimized where possible, to help increase font size and improve visibility from a distance. Signs should use minimal color and take advantage of icons to improve legibility and simplify content for ease of understanding.







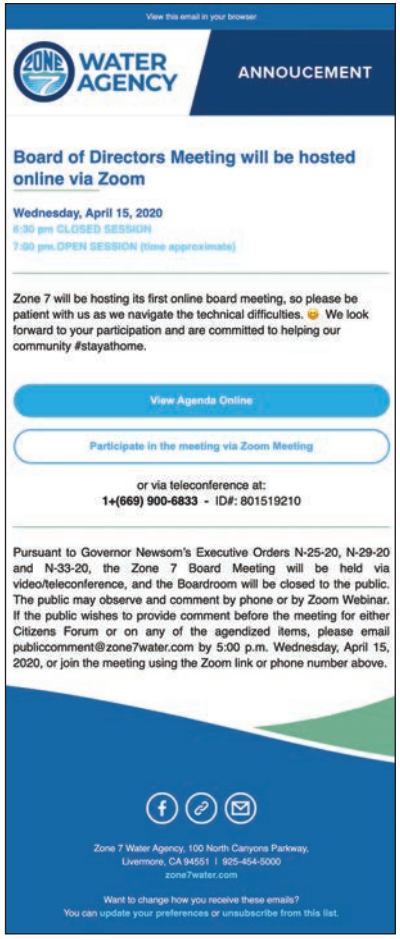
Samples of the Brand in Action

General Branding

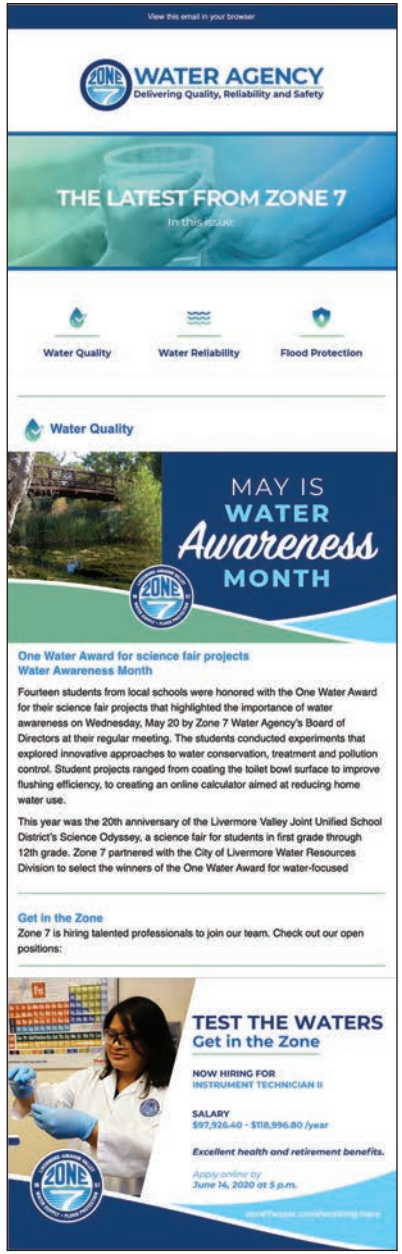
All general materials should include current brand elements which can be adapted to a variety of needs and messages.

Print Letterhead

PowerPoint Presentation



Announcement

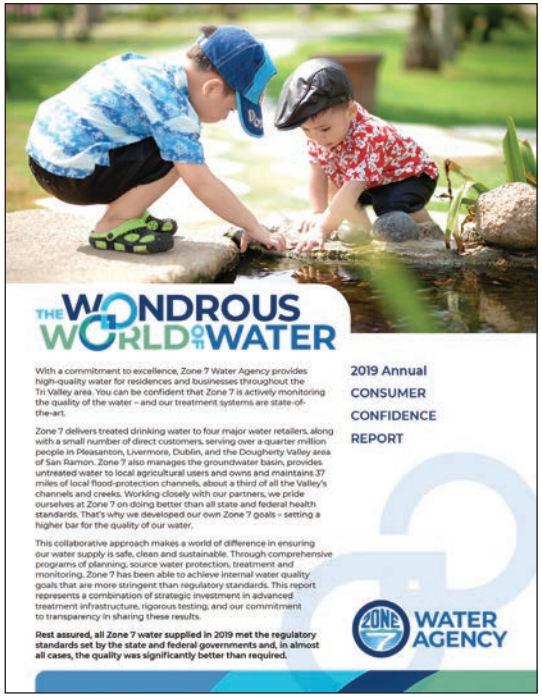


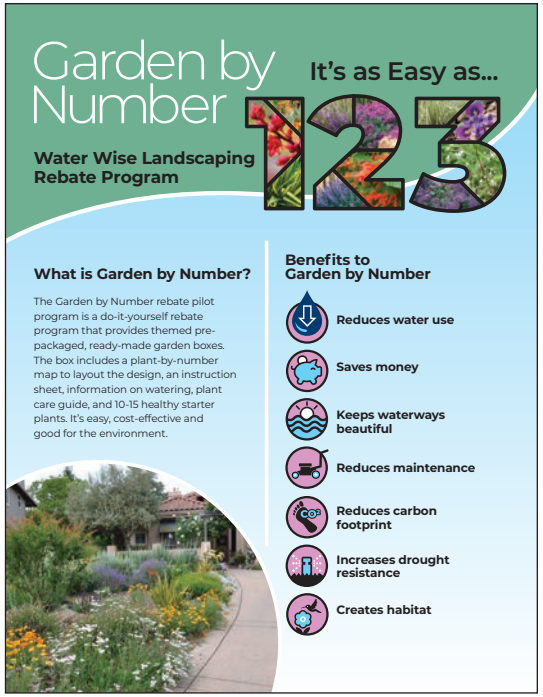
Newsletter

Samples of the Brand in Action

Campaign Alignment

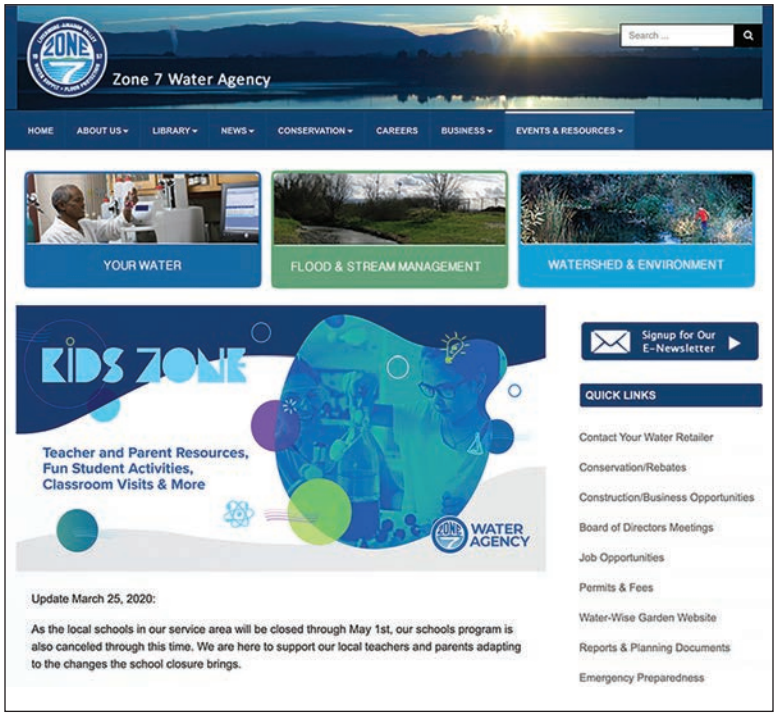
Specific outreach efforts may have a unique campaign design and accompanying elements. Campaigns should be developed in concert with the brand, so elements work well together.





Program Alignment

Special programs may need branded identities in alignment with the Zone 7 master brand that offers individual program brands clearly endorsed and associated with the master brand. For example, the Kid Zone schools program is a contracted program, requiring its own identity, but with clear alignment to Zone 7.



Contact Us

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