Request for Proposals

Corrosion Protection Support Services

July 11, 2018

INTRODUCTION

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

Today, Zone 7 owns about 41 miles of transmission pipeline and provides water to a service area of approximately 425 square miles in eastern Alameda County, via two water treatment plants, ten wells, two pumping facilities, and a terminal reservoir.

As the major water supply and flood control agency in eastern Alameda County, Zone 7 has an ongoing commitment to plan for existing and future needs, implement needed projects, maintain a high quality, reliable water delivery and flood control system, and provide a quality product and service to the community.

Since Zone 7 does not have designated Corrosion Protection staff, we are seeking Proposals from qualified firms to provide Corrosion Protection services as described in the Scope of Work.

I. 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 addressed in writing to John Koltz, Zone 7 Water Agency, 100 North Canyons Parkway, Livermore, California 94551, or e-mailed to jkoltz@zone7water.com. Responses from Zone 7 will be communicated in writing or by e-mail to all recipients of this RFP.

C. Submission of Proposals

All Proposals shall be submitted to John Koltz, Zone 7 Water Agency, 100 North Canyons Parkway, Livermore, California 94551. Proposals must be delivered no later than **2:00 p.m. on July 31, 2018**. Proposals received after this time will not be accepted and will be returned to the Proposers unopened.

The Proposer shall submit four (4) copies of its Proposal in a sealed envelope, addressed as noted above, bearing the Proposer's name and address, and clearly marked as "RFP for Corrosion Protection Support Services."

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 delivering to Zone 7 Water Agency, attention John Koltz, 100 North Canyons Parkway, Livermore, California 94551, a written request for withdrawal signed by, or on behalf of, the Proposer. The time of delivery shall be the time such request is received in hand by Zone 7. The Proposer assumes the risk of any failed delivery.

F. 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.

G. 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. Award a contract to a Proposer other than the one with the lowest rates.
11. Waive informalities and irregularities in Proposals.

H. Contract Type

By submitting a Proposal to Zone 7 in response to this RFP, Proposer agrees that if selected by Zone 7 as the successful consultant, it will enter into this contract with Zone 7 containing the terms and conditions as set forth in the attached sample contract (Attachment A). Proposer shall note in the proposal any terms in the sample agreement including, but not limited to, the insurance requirements that the Proposer may be unable to meet.

Contract will be for Corrosion Protection Services outlined in the Scope of Services: Professional Services Agreement with Fixed Rate Schedules to be used for surveys and with issuance of Work Orders for specific assignments on various projects. The contract is expected to begin on or about July 10, 2018 and end on June 30, 2019. The contract may be amended for two additional one-year periods at Zone 7's discretion.

Work Performed on a Public Work:
It is anticipated that the work performed under this contract will be on Public Works projects. Should the service agreement become work on a "Public Work": A contractor/consultant or subcontractor/sub-consultant shall not be qualified to bid on, be listed in a bid proposal, subject to the requirement of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter [1770-1784 Labor Code], unless currently registered and qualified to perform public work pursuant to Section 7029.1 of the Business and Professional Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor/consultant is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

II. PROPOSER'S MINIMUM QUALIFICATIONS

1. The Proposer shall submit the required Certificate of Insurance (if consultant has been selected).

2. The Proposer is required to list the key individuals who will be assigned to the project, their qualifications and disciplines, and each individual's degree of commitment.

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

- Name and proposed assignment (do not include home addresses or phone numbers)
- Years of experience
- Education – degrees, schools and years obtained
- Professional registration(s)
- Experience directly related to proposed assignment
- At least two client references, including contact names, addresses and telephone numbers
- Description of projects of a similar nature worked on in the past 5 years

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

5. The Proposer shall possess knowledge of regulations and ordinances regarding structural engineering and shall be familiar with local conditions relating to these services in Alameda County.

III. SCOPE OF WORK

The Consultant shall perform the following services:

1. Bi-Monthly Rectifier and Anode Output - Measure and record the voltage and current output of the tank and pipeline rectifiers with a portable digital voltmeter and calibrate the panel meters on the face of the rectifier. The new rectifiers for the Altamont Pipeline will be included in the Bi-Monthly Rectifier Testing. Measure the current output of each impressed current anode using the calibrated shunts in the anode junction box. Inspect the rectifier, anode cables, and anode junction boxes to determine if the components of the cathodic protection system require repair or replacement. Minor repairs or adjustments will be completed by our engineers during the monitoring. Recommendations and cost estimates will be provided for any extensive repairs

2. Pipe-to-Soil Potential Survey – Measure pipe-to-soil potentials at previously established test points on the Zone 7 water transmission pipelines and treatment plant pipelines. Current interrupters will be used to remotely cycle the rectifiers on and off.

3. Interrupted Tank-to-Water Potential Survey – Measure potentials at previously established test points on the Dougherty Reservoir, the Del Valle Clearwell, the Patterson Pass Backwash Tank, the Patterson Pass UF Clarifier and the Patterson Pass Chlorine Contact Tank.

4. On-Call Maintenance & Project Support – Zone 7 has allocated this task to perform additional corrosion assessment of facilities and minor repairs as needed.This task allows for technical CP assessments and minor repairs to be performed when specifically requested by Zone 7 (through Task Order). Consultant shall obtain authorization from Zone 7 prior to performing these corrosion assessments.

5. Prepare drawings as needed (usually 11 x 17 or 22 x 34 inches) using AutoCAD 2017, or approved version. Zone 7 will provide a sample border and logo, and the Consultant shall use the Zone 7 CAD Standards attached to this document as Attachment B.

The following is a Budget Estimate and Project Summary for the Scope of Work Services above:

Project Summary List
FY18/19

	PROJECT NAME	SECTION	BUDGET TOTAL FOR FY15/16	TASK DESCRIPTION
1	Annual Survey	Facilities Engineering	$15,000	Conduct an annual survey/assessment of transmission pipeline ET stations, Dougherty reservoir, PPWTP, and DVWTP tank to water potentials.
2	Bi-Monthly Rectifier/Anode Output	Facilities Engineering	$8,000	Measure and record the voltage and current output of tank and pipeline rectifiers. Calibration as needed.
3	Pipe-to-Soil Potential Survey	Facilities Engineering	$5,000	Measure pipe-to-soil potentials at previously established test points on the Zone 7 water transmission pipelines and treatment plant pipelines.
4	Interrupted Tank-to-Water Potential Survey	Facilities Engineering	$2,000	Measure potentials at previously established test points on the Dougherty Reservoir, the DVWTP Clearwell, the PPWTP Backwash Tank,UF Clarifier, Chlorine Contact Tank.
5	On-Call CP Maintenance and Project Support	Maintenance/Facilities Engineering	$20,000	Additional corrosion assessment of facilities to perform CP assessments and minor repairs as identified by project managers.
TOTAL			**$50,000**	

An example copy of a required Annual Survey Report is provided as Attachment C, for your use in proposal preparation and general information regarding Zone 7 facilities.

<u>Other Related Services</u>

- Provide Zone 7 of first-hand knowledge of project progress.
- Establish a working relationship that will open lines of communication keeping all

responsible parties aware of current and upcoming progress and requirements.

This is a Master Agreement (Contract) for a not-to-exceed amount of up to $50,000 each year. Actual services will vary depending on project needs for the year and could be zero in some years.

Execution of the Master Agreement for Corrosion Protection Services and Task Orders shall obligate Zone 7 to compensate the Consultant only for services provided to Zone 7 for that specific work. Compensation for services will be based on Consultant's submitted fee schedule and as agreed by the Master Agreement.

Zone 7 will contact the Consultant to set up a Task Order for Corrosion Protection related services needed for the individual projects. The Consultant will perform the scope of the Task Order and provide noted deliverables under the agreed to price.

IV. EVALUATION AND SELECTION

A. Evaluation Criteria: The following criteria will be used to evaluate written proposals that are submitted. Quality and experience will be weighted most heavily. All others will be weighted approximately the same.

1. General response to the RFP: Approach and understanding of Zone 7 goals.

2. Quality and experience: Technical experience in performing work of closely similar nature; 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 water supply, flood control or other public agencies; record of completing work on schedule; strength and stability of the firm; technical experience and strength and stability of proposed subcontractors.

3. Comments/suggestions on Preliminary Scope of Work.

4. Demonstrated understanding of the project requirements, potential problem areas, and project approach.

5. Assessments by client references.

B. Evaluation Procedure

A Review Board, generally made up of Zone 7 staff, will review the qualifications submitted, establish a list of finalists based on pre-established review criteria, interview the finalist firms if necessary, and select the successful proposer based on demonstrated competence and necessary qualifications. The names of the Review Board Members and the individual or composite rating and/or evaluation forms prepared by Board Members will not be revealed. Negotiations of the contracts, 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 firms to be invited for an oral interview, if needed. 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. Proposers should also be aware that award might be made without interviews or further discussion.

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.

PROPOSAL FORMAT AND CONTENT

A. Format

Please submit four (4) copies of your Proposal, which 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 listed should be available for, and lead, the oral presentation.

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 Preliminary Scope of Work, local experience, and water supply and flood control projects/issues.

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

4. **Cost/Pricing Information: One (1) copy shall be submitted in a separate, sealed envelope inside the packet.** It should include the complete cost for all Corrosion Protection support services you are proposing for this contract and any subconsultants deemed necessary. It must show proposed staff including, at a minimum, the project manager and price list for typical types of inspections, surveys, and assessment services and corresponding hourly rates for performing the services discussed in the Preliminary Scope of Work. It also needs to state the hourly minimums for services, if any. Write your firm's name on the outside of the envelope.

B. Content

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

2. **Team Personnel** - Identify the key project personnel and their roles associated with the tasks in the Preliminary Scope of Work. Identify the team and individual personnel experience as it relates to the Preliminary Scope of Work, local experience and water supply/flood control projects/issues. List other major projects the team or its personnel are involved with currently including project title, percent workload, and project responsibility.

3. **Comments on the Preliminary 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 Preliminary Scope of Work.

4. **Work Plan** - Describe how the project team will fulfill the Preliminary Scope of Work. Include a matrix of personnel and tasks. To illustrate your strategy, describe tools and techniques you will use, and challenges you anticipate, in addressing specific issues identified in the Preliminary Scope of Work.

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

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

7. **The total proposal length** should not exceed 10 pages, not including resumes. A cover letter of up to 2 additional pages may be included.

PROFESSIONAL SERVICES AGREEMENT

Between

ALAMEDA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT, ZONE 7

And

[Consultant Name]

for the

[Project/Program Name]

(Contract No. _____)

Dated _____

AGREEMENT BETWEEN
ALAMEDA COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT, ZONE 7 AND
_____

THIS PROFESSIONAL SERVICES AGREEMENT (**"Agreement**") is dated this _____ day of _____, 20___, in the City of Livermore, State of California, by and between _____, hereinafter referred to as ("**Consultant**") and the ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, ZONE 7 hereinafter referred to as ("**District**").

Now, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, stipulated and agreed, the parties agree as follows:

1. Scope and Cost of Professional Services. The Consultant shall perform all services described in Appendix A (**"Services"**), for a maximum not-to-exceed amount of $_____ and pursuant to the payment terms as set forth in Appendix B (**"Payments to Consultants"**), which appendixes are attached and made a part of this Contract.

2. Term. This Contract shall expire _____unless otherwise earlier terminated pursuant to Section 9 below or upon completion of all Services**.**

3. Standard of Performance. Consultant represents that it possesses all necessary training, licenses and permits to perform the Services, and that its performance of the Services will conform to the standard of practice of a professional that specializes in performing professional services of like nature and complexity of the Services.

4. Indemnification and Liability. To the fullest extent permitted by law, Consultant shall defend (with legal counsel reasonably acceptable to District), indemnify and hold harmless the District and its officers, agents, departments, officials, representatives and employees (collectively "Indemnitees") from and against any and all claims, loss, cost, damage, injury (including, without limitation, economic harm, injury to or death of any person or employee), expense and liability of every kind, nature and description (including, without limitation, incidental and consequential damages, court costs, attorneys' fees, litigation expenses and fees of expert consultants or expert witnesses incurred in connection therewith and costs of investigation) that arise from (1) Consultant's negligent performance of the Services under this Agreement, or any part thereof, (2) any negligent act or omission of Consultant, any subconsultant, anyone directly or indirectly employed by them, or anyone that they control, or (3) any infringement of the patent rights, copyright, trade secret, trade name, trademark, service mark or any other proprietary right of any person or persons in consequence of the use by District, or any of the other Indemnitees, of articles or Services to be supplied in the performance of this Agreement, or (4) any breach of this Agreement (collectively **"Liabilities"**). Such obligations to defend, hold harmless and indemnify any Indemnitee shall not apply to the extent that such Liabilities are caused by the negligence or willful misconduct of such Indemnitee, but shall apply to all other Liabilities.

5. Insurance. Consultant shall comply with all requirements of Appendix C, which is attached and made a part of this Agreement.

6. Independent Contractor. Consultant shall at all times be deemed an independent contractor wholly responsible for the manner in which it performs the Services, and fully liable for the acts and omissions of its employees, subconsultants and agents. Under no circumstances shall this Contract be construed as creating an employment, agency, joint venture or partnership relationship between District and Consultant, and no such relationship shall be implied from performance of this Contract. Terms in this Contract referring to direction from District shall be construed as providing for direction as to policy and the result of services only, and not as to means and methods by which such a result is obtained. Consultant shall pay all taxes (including California sales and use

taxes) levied upon this Contract, the transaction, or the Services and/or goods delivered pursuant hereto without additional compensation, regardless of which party has liability for such tax under applicable law, and any deficiency, interest or penalty asserted with respect thereto. The Consultant shall pay all other taxes including but not limited to any applicable City of Livermore business tax, not explicitly assumed in writing by District hereunder. The Consultant shall comply with all valid administrative regulations respecting the assumption of liability for the payment of payroll taxes and contributions as above described and to provide any necessary information with respect thereto to proper authorities.

7. 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.

Should services agreement become work on "Public Works": A contractor\consultant or subcontractor\sub-consultant shall not be qualified to bid on, be listed in a bid proposal, subject to the requirement of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter [1770-1784 Labor Code], unless currently registered and qualified to perform public work pursuant to Section 7029.1 of the Business and Professional Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor\consultant is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

Consultant further agrees to comply with all conflict of interest codes adopted by Alameda County, the Alameda County Flood Control and Water Conservation District, Zone 7 and their reporting requirements. Consultant represents that it is familiar with Section 1090 and Section 87100 *et seq*. of the Government Code of the State of California and agrees that Consultant, its officer, partners, associates, agents, and employees, shall not make, participate in making, or in anyway attempt to use the position afforded them by this agreement to influence any governmental decision in which he or she knows or has reason to know that he or she has a financial interest under applicable state, federal and local conflict of interest regulations. Consultant represents and warrants that it presently has no interest, and shall not have any interest, direct or indirect, which would conflict in any manner with the performance of work and services required under this Agreement.

8. Confidentiality. Any information, whether proprietary or not, made known to or discovered by Consultant during the performance of or in connection with this Agreement for District, will be kept confidential and not be disclosed to any other person. Consultant will immediately notify District in writing if it is requested to disclose any information made known to or discovered by during the performance of or in connection with this Agreement. These conflict of interest, confidentiality and future service provisions and limitations shall remain fully effective indefinitely after termination of services to District hereunder.

9. Suspension and Termination of Services. (i.) District may direct Consultant to suspend, delay or interrupt Services, in whole or in part, for such periods of time as District may determine in its sole discretion. District may issue such directives without cause. District will issue such directives in writing. Suspension of Services shall be treated as an excusable delay. (ii.) District may terminate performance of Consultant's right to proceed with the Services under this Contract in whole, or from time to time in part, for default, should Consultant commit a material breach of this Contract, or part thereof, and not cure such breach within ten (10) calendar days of the date of District's written notice to Consultant demanding such cure. In the event District terminates Consultant's right to proceed under this Contract for default, Consultant shall be liable to District for all loss, cost, expense, damage and liability resulting from such breach and termination. (iii.) District may terminate performance of the Services under this Contract in whole, or from time to time in part, for convenience, whenever District determines that such termination is in District's best interests. In the event District terminates this Contract for convenience, Consultant shall be entitled to recover its costs expended up to the termination plus reasonable profit thereon to the termination date, but may recover no other cost, damage or expense.

10. Ownership of Work Product. Any interest (including copyright interests) of Consultant or its subconsultants, in studies, reports, memoranda, computational sheets, drawings, plans or any other documents (including electronic media) prepared by Consultant or its subconsultants at any time in connection with the

Services, shall be, immediately upon its creation, the property of District. To the extent permitted by Title 17 of the United States Code, work product produced under this Contract shall be deemed works for hire and all copyrights in such works shall be the property of District. In the event that it is ever determined that any works and any former works created by Consultant or its subconsultants under this Agreement are not works for hire under U.S. law, Consultant hereby assigns to District all copyrights to such works when and as created. With District's prior written approval, Consultant may retain and use copies of such works for reference and as documentation of experience and capabilities.

11. Audit/Inspection of Records. Consultant shall maintain all documents and records prepared by or furnished to Consultant during the course of performing the Services for at least three (3) years following completion of the Services, except that all such items pertaining to hazardous materials shall be maintained for at least thirty (30) years. Such records include, but are not limited to, correspondence, internal memoranda, calculations, books and accounts, accounting records documenting its work under its Contract, and invoices, payrolls, records and all other data related to matters covered by this Contract. Consultant shall permit District to audit, examine and make copies, excerpts and transcripts from such records. The State of California or any federal agency having an interest in the subject of Contract shall have the same rights conferred to District by this section. Such rights shall be specifically enforceable.

12. Non-discrimination. Consultant shall not discriminate against any employee or applicant for employment, nor against any subconsultant or applicant for a subcontract, on the basis of race, color, religion, age, sex, actual or perceived sexual orientation, national origin, disability as defined by the ADA or veteran's status, and shall comply with all applicable laws regarding non-discrimination and equal employment opportunity.

13. Non-Judicial Administrative Claim Settlement Procedure For Consultant Claims. In the event of any dispute between Consultant and District regarding any claim, demand or request by Consultant for time, money, or additional compensation for any reason whatsoever (including, without limitation, any alleged failure of District to make a decision), Consultant shall submit to the District a written and fully documented administrative claim that shall provide a narrative of the pertinent events, Consultant's theory of entitlement, pricing calculations and attaches supporting documentation. District will then review Consultant's fully documented administrative claim and may, in its discretion, conduct an administrative hearing (in which case Consultant shall attend, present documentation and information as requested.) District will then make a final administrative decision on the claim. Pursuant to Government Code section 930.2: (i.) Consultant shall initiate this non-judicial settlement procedure by presenting its administrative claim within 60 days of the first event giving rise to the claim or dispute, (ii.) Consultant's timely submittal of the administrative claim and District's decision thereon shall be an unwaivable condition precedent to Consultant thereafter filing a Government Code Claim under the California Government Code Section 901 *et seq*. (iii.) any and all such Government Code Claims in connection with this Agreement shall be presented to the District no later than 120 days following substantial completion or termination of this Agreement (whichever first occurs); and (iv.), except as so modified, the Government Code claims presentation requirements remain unchanged (e.g., Govt. Code §945.4.) Consultant shall continue its work throughout the course of any dispute, and Consultant's failure to continue work during a dispute shall be a material breach of this Contract.

14. No Special or Incidental Damages. Notwithstanding any other provision of this Agreement, in no event shall District be liable, regardless of whether any claim is based on contract or tort, for any special, consequential, indirect or incidental damages, including, but not limited to, lost profits or revenue, arising out of or in connection with this Agreement or the Services performed in connection with this Agreement.

15. California Law. This Contract shall be deemed to have been executed in the City of Livermore, Alameda County, California. Enforcement of this Contract shall be governed by the laws of the State of California, excluding its conflict of laws rules. Both parties hereby waive their rights under California Code of Civil Procedure Section 394 to file a motion to transfer any action or proceeding arising out of this Contract to another venue. The exclusive venue for all litigation arising from or relating to this Contract shall be in Alameda County, California. Should any clause, provision or aspect of this Contract be determined at any time to be unenforceable or in contravention of law, then the remaining clauses and provisions of this Contract shall be enforceable to the fullest extent permitted by law and construed to give effect to fullest extent possible the intent of this Contract.

16. No Third Party Beneficiaries. Except as expressly provided in this Contract, nothing in this Contract shall operate to confer rights or benefits on persons or entities not party to this Contract. Time is of the essence in the performance of this Contract.

17. Entire Contract. This Contract and any written modification shall represent the entire and integrated agreement between the parties hereto regarding the subject matter of this Contract, shall constitute the exclusive statement of the terms of the parties' agreement, and shall supersede any and all prior negotiations, representations or agreements, written or oral, express or implied, that relate in any way to the subject matter of this Contract or written modification. All prior negotiations are merged into this Contract and shall be inadmissible in any enforcement of this Contract.

18. No Waiver. The granting of any payments, and any inspections, reviews, approvals or oral statements by any District representative, or certification by any governmental entity, shall in no way limit Consultant's obligations under this Contract. Either party's waiver of any breach, or the omission or failure of either party, at any time, to enforce any right reserved to it, or to require strict performance of any provision of this Contract, shall not be a waiver of any other right to which any party is entitled, and shall not in any way affect, limit, modify or waive that party's right thereafter to enforce or compel strict compliance with every provision hereof. This Contract may not be modified, nor may compliance with any of its terms be waived, except by written instrument executed and approved by fully authorized representatives of District and Consultant.

19. Severability and Survival. Any provision or portion thereof of this Contract prohibited by, or made unlawful or unenforceable under any applicable law of any jurisdiction, shall as to such jurisdiction be ineffective without affecting other provisions or portions thereof of this Contract. If the provisions of such applicable law may be waived, they are hereby waived to the end that this Contract may be deemed to be a valid and binding agreement enforceable in accordance with its terms to the greatest extent permitted by applicable law. Except as otherwise separately and expressly provided by the District in writing, the provisions of this Agreement, including but not limited to, its limitations and definitions of liability and claim presentation procedures, shall survive and remain in effect notwithstanding the negligence or breach of this Agreement by either party, or the expiration or termination of this Agreement, or any completion of the Services.

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of the day first mentioned above.

ALAMEDA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT, ZONE 7

By _____
Valerie Pryor, General Manager

[Consultant Name],
a _____ corporation,

By _____

_____
Print Name and Title
(If Corporate: Chairman, President or Vice President)

Attest _____

_____
Print Name and Title
(If Corporate: Secretary, Assistant Secretary,
Chief Financial Officer, or Assistant Treasurer)

[Consultant Address]
_____
_____
_____

LIST OF APPENDICES AND SCHEDULES

Appendix A	Scope of Services
Appendix B	Payments to Consultant
Appendix C	Insurance

APPENDIX A – SCOPE OF SERVICES

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

1. Project Description.

1.1 Conceptual Program.

[insert the requirements for Consultant's Services or reference an attachment. This should be a detailed description of the Project with explanations of what the Consultant will be doing and what the end product that is expected will be. If a consultant generated Scope of Work is used and referenced as an attachment, it must fully set forth and describe the services to be provided, the deliverables and schedule.

The Scope of Work must include a Work Breakdown Structure **t**o assist District in monitoring and determining progress. The Consultant must provide an itemization of its fee under this Agreement that defines all project tasks, along with a project schedule defining the time line for each task, a project budget defining the planned man-hours and costs for each task, and a schedule of deliverables defining each deliverable to be provided to District

1.2 Criteria Governing Consultant's Service.

1.2.1 The Project shall be developed and designed to meet all applicable and the most current codes, laws, regulations, and professional standards.

1.2.2 Unless otherwise permitted in writing by District, Consultant shall not propose or recommend any design that has the effect of shifting design responsibilities from Consultant to a Contractor through performance specifications or any other means. Performance specifications will be allowed only when necessary to preclude single vendor sources or when specifically requested by District.

1.2.3 Unless otherwise permitted in writing by District, Consultant shall not specify unique, innovative, proprietary or sole source equipment, systems or materials. In the event Consultant requests a proprietary or sole source design or equipment, Consultant shall provide District with a written evaluation of whether all periodic maintenance and replacement of parts, equipment or systems, can be performed normally and without excessive cost or time. District will consider such evaluation in making its decision.

1.3 Deliverables Required Under This Agreement.

Required Deliverables are listed in Appendix D and/or in attached Scope of Work. Each deliverable shall be reviewed with representatives of District. Consultant shall promptly correct deficiencies in deliverables and shall promptly make modifications to conform with Project requirements and modifications to achieve acceptability of deliverables to District, and the cost thereof included in the fee for Basic Services.

1.4 Monthly Progress Report.

Consultant shall provide District with a Monthly Progress Report, in writing, reporting on Consultant's progress and any problems in performing the Services of which Consultant becomes aware. The Monthly Progress Report may be submitted with the monthly payment application and shall include, but not be limited to: (i.) a narrative of the work performed (including a list of any contract deliverables) and identification of areas of concern, actions and approvals needed, (ii.) a schedule assessment and proposed ways to work around any problems that arise, (iii.) monthly schedule status reports clearly identifying actual performance with respect to the current approved version of the schedule.

END OF APPENDIX A

APPENDIX B – PAYMENTS TO CONSULTANT

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

1. Basic Services. District will pay Consultant for Services, a maximum compensation of $_____ (**"Contract Price"**), which sum includes costs for reimbursable expenses as identified below. Such payment shall be full compensation for all Services required, performed or accepted under this Agreement.

2. Payment for Services shall be made as follows:

2.1 Consultant shall be paid for its Services (and for services of its Subconsultants) rendered based upon the hourly "Billing Rates" of each Consultant and Subconsultant employee as set forth in the attached "Billing Rate Sheet". In no event shall Consultant invoice or receive (including Subconsultants) any payment exceeding the maximum compensation amount set forth in Section 1 herein. The Billing Rates shall remain constant throughout this Agreement, and shall not be adjusted for inflation, salary adjustments, cost changes, or any other reason.

2.2 Consultant shall submit monthly invoices with reasonable detail of the daily time incurred by personnel assigned to the Project, along with a schedule of Subconsultant and eligible Reimbursable Expenses incurred, supported by invoices and appropriate backup documentation. Each invoice shall report on Consultant's total billings and eligible Reimbursable Expenses to date. Reimbursable Expenses shall be billed at the amount billed to Consultant therefore times **[1.1]** for general and administrative expenses. Subconsultants shall be billed at the amount billed to Consultant therefore times **[1.05]** for general and administrative expenses.

3. Additional Services. District will pay the Consultant for services requested that are beyond the scope of the Scope of Work ("Additional Services") as agreed to in a written addendum or amendment (**"amendment"**) to this Agreement executed by District and the Consultant. Payment for all such Additional Services shall be in an amount and upon the terms set out in such amendment. Each such amendment shall provide for a fixed price; or, where payment for such Additional Services is to be on an hourly basis, for a maximum amount plus Costs and Reimbursables. Each amendment shall also provide for a method of payment (i.e., partial payments or lump sum) and whether it will be based upon percentage of completion or for services billed. Amendments must be negotiated and signed by the Consultant and District prior to commencing work of Additional Services; otherwise, such costs are deemed within the existing Scope of Services.

4. Costs and Reimbursables.

4.1 Additional Services. District will pay Consultant for "Costs and Reimbursable Expenses" in connection with Additional Services as set forth below. All costs not listed will not be allowed in connection with Additional Services.

4.1.1 Travel Costs. The reasonable expense of travel costs incurred by Consultant when requested by District to travel to a location more than 50 miles from the project site, the Consultant's office(s), or District's office, incurred performing Additional Services.

4.1.2 Long Distance Telephone Costs. Long distance telephone calls and long distance telecopier costs incurred performing Additional Services.

4.1.3 Delivery Costs. Courier services and overnight delivery costs incurred performing Additional Services.

4.1.4 Reproduction Costs. Reproduction and postage costs of required plans, specifications, bidding and Contract Documents, if any, incurred performing Additional Services.

5. **Invoices.** All payments shall require a written invoice from Consultant in a form acceptable to District. District shall make payment on approved amounts within each invoice within 30 days of receipt.

END OF APPENDIX B

APPENDIX C - INSURANCE

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

1. Consultant's Duty to Show Proof of Insurance. Prior to the execution of this Agreement, Consultant shall furnish to District satisfactory proof that Consultant has taken out for the entire period required by this Agreement, as further described below, the following insurance, in a form satisfactory to District and with an insurance carrier satisfactory to District, authorized to do business in California and rated by A. M. Best & Company **[____A-_____]** or better, financial category size **[__VII_____]** or better, which will protect those described below from claims described below which arise or are alleged to have arisen out of or result from the acts or omissions of Consultant for which Consultant may be legally liable, whether performed by Consultant, or by those employed directly or indirectly by it, or by anyone for whose acts Consultant may be liable:

1.1 Commercial General Liability Insurance

Commercial general liability insurance, written on an "occurrence" basis, which shall provide coverage for bodily injury, death and property damage resulting from operations, products liability, blasting, explosion, collapse of buildings or structures, damage to underground structures and utilities, liability for slander, false arrest and invasion of privacy arising out of construction management operations, blanket contractual liability, broad form endorsement, a construction management endorsement, products and completed operations, personal and advertising liability, with per location limits of not less than $**[2,000,000]** general aggregate and $**[1,000,000]** each occurrence. Deductible limits payable by Consultant, shall be approved by the District

1.2 Business Automobile Liability Insurance

Business automobile liability insurance with limits not less than $**[1,000,000]** each occurrence including coverage for owned, non-owned and hired vehicles. Deductible limits payable by Consultant, shall be approved by the District

1.3 Workers' Compensation Insurance

Workers' Compensation Employers' Liability limits not less than $**[1,000,000]** each accident, $**[1,000,000]** per disease and $**[1,000,000]** aggregate. Consultant's Workers' Compensation Insurance policy shall contain a Waiver of Subrogation. In the event Consultant is self-insured, it shall furnish Certificate of Permission to Self-Insure signed by Department of Industrial Relations Administration of Self-Insurance, State of California.

1.4 Professional Liability Insurance

Professional Liability Insurance, with limits not less than $2,000,000 each claim and aggregate, all with respect to negligent acts, errors or omissions in connection with services to be provided under this Agreement, and with a deductible amount satisfactory to District for each claim. The policy shall be maintained for a period of five (5) years after the completion of the Services.

2. Insurance policies shall contain an endorsement containing the following terms:

2.1 Status of Alameda County Flood Control and Water Conservation District as Additional Insured.

On Consultant's Commercial General Liability policy and Automobile Liability Policy ALAMEDA COUNTY, THE ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, its ZONE 7 WATER AGENCY and its affiliates, directors, officers, officials, partners, representatives, employees, consultants, subconsultants and agents, shall be named as additional insureds, but only with respect to liability arising out of the activities of the named insured, and there shall be a waiver of subrogation as to each named and additional insured.

2.2 The policies shall apply separately to each insured against whom claim is made or suit is brought except with respect to the limits of the company's liability.

2.3 Written notice of cancellation, non-renewal or of any material change in the policies shall be mailed to District thirty (30) days in advance of the effective date thereof.

2.4 Insurance shall be primary insurance and no other insurance or self insured retention carried or held by any named or additional insureds other than that amount Consultant shall be called upon to contribute to a loss covered by insurance for the named insured.

2.5 Certificates of Insurance and Endorsements shall have clearly typed thereon the title of the Agreement, shall clearly describe the coverage and shall contain a provision requiring the giving of written notice described above in subsection 2.3.

2.6 Nothing herein contained shall be construed as limiting in any way the extent to which Consultant or any of its permitted subcontractors or subconsultants may be held responsible for payment of damages resulting from their operations.

2.7 If Consultant fails to maintain any required insurance, District may take out such insurance, and deduct and retain amount of premium from any sums due Consultant under this Agreement.

END OF APPENDIX C

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.

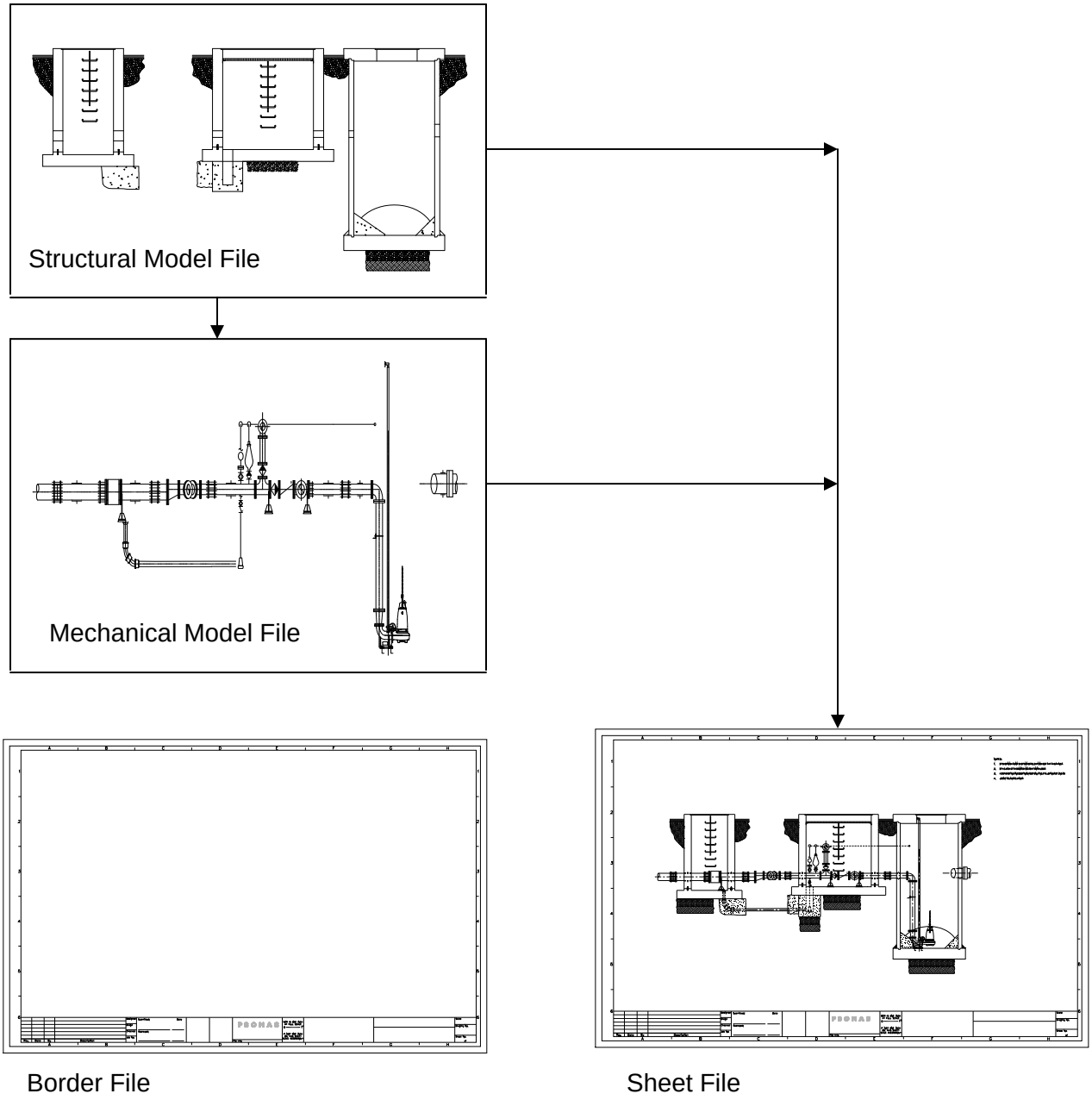


Fig 2-2

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.

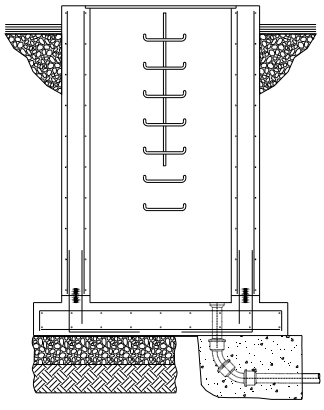


Fig 5-1

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.

Zone 7 Water Agency

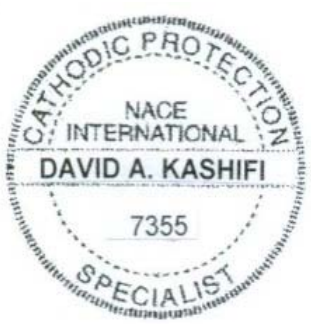
System-Wide Processing and Distribution

2016 DRAFT Annual Survey and Cathodic Protection Condition Assessment Report

Livermore, Dublin, Pleasanton, CA

Respectfully submitted,

J. Darby Howard, Jr., P.E.
JDH Corrosion Consultants, Inc.
Principal



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Zone 7 Water Agency
Draft Report
Annual Survey and Cathodic Protection Condition Assessment

Table of Contents

REFERENCES

1. NACE Standard Practice SP0169-2013, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems" (Houston, TX: NACE).

2. NACE Standard Practice SP0177–2007, "Mitigating Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems" (Houston, TX: NACE).

3. NACE Standard Practice SP0100-2008, "Cathodic Protection to Control External Corrosion of Concrete Mortar-Coated Steel Pipelines for Water or Waste Water Service" (Houston, TX: NACE).

4. V&A Consulting Engineers, "Zone 7 Water Agency 2010 Cathodic Protection Monitoring and Maintenance Program" (Oakland, CA: V&A Consulting Engineers, 2010).

5. JDH Corrosion Consultants, Inc., "Annual Survey: Water Transmission Pipelines" (Concord, CA: JDH Corrosion Consultants, Inc., 2005).

6. JDH Corrosion Consultants, Inc. & City of Napa, "How to Protect Aging Water Mains: A City of Napa Case History" (Concord, CA: JDH Corrosion Consultants, Inc. & City of Napa, 2010).

EXECUTIVE SUMMARY

In the winter of 2016 and spring of 2017, JDH Corrosion Consultants, Inc. conducted a comprehensive agency-wide survey of Zone 7 Water Agency's existing cathodic protection and corrosion monitoring systems. As part of this survey, JDH collected field data from various metallic structures and their cathodic protection systems in order to determine the condition and effectiveness of the Agency's existing corrosion control and cathodic protection facilities.

JDH followed initial testing with additional testing at selected locations, and adjusted rectifiers as necessary in order to optimize the level of cathodic protection on selected systems.

The corrosion protection systems associated with the subject-piping network and treatment plants owned and operated by the Agency have been documented, adjusted and optimized. In order to ensure that the impressed current cathodic protection systems are functioning properly, the Agency should ensure bi-monthly rectifier monitoring, and annual impressed current system surveys.

JDH has identified additional high priority tests and repairs that are required to further maintain and optimize the cathodic protection systems. The Agency should conduct these additional tests and repairs during the next phase of work. The high-priority recommendations include:

- Design and install cathodic protection on 20" CCP Hopyard pipeline within three years.
- Generate a project to investigate electrical shorting and isolation between 48" Del Valle B, and building/metering and/or DAF pipeline(s) and develop possible remediation methods.
- Replace lost test stations on Cross Valley PL near Isabel overpass.
- Replace external rectifier in kind at Dougherty Water Tank.

JDH has included a full accounting of both high priority and delayed corrosion control recommendations in Section II of this report.

Bi-monthly (i.e. every other month) rectifier measurements were performed by JDH during impressed current surveys for several years.

SECTION I – INTRODUCTION & SYSTEM DESCRIPTIONS

1.0 BENEFITS OF CATHODIC PROTECTION SURVEYS

Zone 7 Water Agency owns and operates a sizeable network of piping systems and treatment facilities in the Valley, and the Agency has been proactive in preserving its assets. By continuing to provide cathodic protection to buried pipelines and water storage tanks, where warranted, the Agency will continue to benefit from extended life, and reduced costs.

Several independent studies have established a benefit/cost analysis of cathodic protection. These studies generally agree that the value of installing and maintaining cathodic protection systems provides approximately $7 saved in for every $1 spent on corrosion prevention measures.

Cathodic protection has proven, over decades of use in the oil & gas industry, and in water & wastewater infrastructure, that they can help maintain the integrity of protected structures for an indefinite period. More stable systems result in significant cost savings through reductions in maintenance repair & lost water resources, reduction in replacement costs, as well as improved public safety.

1.1 PIPELINE, TREATMENT & PUMPING PLANT DESCRIPTION

1.1.1 General

The primary concern of this survey is to determine the condition of the cathodic protection and corrosion monitoring systems installed on tanks and buried pipelines. Where possible, JDH has also conducted visual inspections of tanks, pipes, and appurtenances, noting coating conditions and corrosion issues.

Where needed, JDH has compiled paper documents and electronic files related to Zone 7's cathodic protection systems. In some cases, however, no existing documents were located for review. Further, we conducted interviews of Zone 7 personnel for clarification when required. Structures, such as casings and concrete encasements, generally cannot be field verified. During our survey, wherever possible, rectifiers and test station records were field verified for continued accuracy.

JDH has recently discovered that the Agency owns and operates an unknown number of turnout pipelines for which there is no previous accounting in the cathodic protection work scope. JDH is currently collecting information regarding the undocumented pipelines that will need to be included in future corrosion control surveys.

The remainder of Section 1.1 describes the assets for which JDH evaluated the corrosion control systems during this survey. In order to ensure accuracy and provide a complete accounting of the corrosion control systems installed on the Agency's infrastructure, we ask that the Agency notify JDH of any critical pipeline infrastructure that may be missing from this report.

A cost estimate for recommended repairs is included in Appendix I, and data sheets for structure potentials and rectifier output are included in Appendices II & III at the end of this report. The Agency also warehouses digital cathodic protection system files, including excel data sheets and .kml formatted Google Map files, on their servers for reference by Agency and Consultant personnel.

1.2 PIPELINES WITH CATHODIC PROTECTION

1.2.1 Altamont Pipeline

Pipe Material	Limits	Connections	No. of Rectifiers
36/42" Cement Mortar Coated Welded Steel	Sta. 331+70 to Sta. 612+51	Vasco #2 and Cross Valley PL	3 (40 V, 34 A @ Sta. 332+90, 483+00, and 607+00)

The Altamont Pipeline, installed in 2009, provides water from a planned Altamont Pass well site in the future.

The following pipeline assets are significant elements of the Altamont Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifiers:
332+90 – At Vasco Rate Control Station-Northfront Road backing On-Ramp to I-580
483+00 – Off Las Positas Road and Hilliker Place on hillside
607+00 – At Airport Rate Control Station-E. Airway Blvd. and Isabel Ave.

Electrical Isolation (Insulating) Joints:
331+70 - (Beginning of Altamont Pipeline) Connection with Vasco #2 (Rate Station)
612+51 - (End of Altamont Pipeline) Connection with Cross Valley at Isabel Ave.

Steel Casings:
409+70 – Currently in an open pasture North of I-580
413+43 – In a pasture South of I-580, East of Target store loading dock
496+62 – West of N. Livermore Ave. and South of intersection of Las Positas Rd.

Concrete Encasements:
No information available.

1.2.2 Del Valle A & B Pipelines

Pipe Material	Limits	Connections	No. of Rectifiers
Del Valle A			
48" Concrete cylinder	Sta. 142+40 to Sta. 181+45	From Del Valle Treatment Plant to Del Valle – Livermore & Vineyard connection	0
Del Valle B			
48" Concrete cylinder	Sta. 4+50 to Sta. 13+64	From DWR south of Del Valle TP to approx. 200ft north of east sludge basin	0
Booster Pump Station			
48" Concrete cylinder	Sta. 6+14 to approx. Sta. 7+40	Manifold pump intake piping on the west side of the booster station	0

Zone 7 installed Del Valle A and B pipelines in 1973 with corrosion monitoring test stations. In 1999, a subsequent

retrofit project on the Del Valle B Pipeline added a second meter installation, a booster station, and cathodic protection on the booster station manifold piping near the south end of the Del Valle Treatment Plant. In 2013, a metering vault was installed approximately 30' south of the booster station intake riser.

A LINE

Line A Outfall Pipeline from the Del Valle Treatment Plant runs approximately 3,900 feet from the treatment plant clarifier to the Vineyard Road junction structure connection to Del Valle-Livermore Pipeline and Vineyard Pipeline.

The following pipeline assets are significant elements of the Del Valle A pipeline, and require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No Rectifiers.

Insulating Joints:
345+92 (Vineyard Stationing) At Vineyard Pipeline

Steel Casings:
No information available.

Concrete Encasements:
No information available.

B LINE (with Booster Station)

Connecting to DWR south of the Del Valle Treatment Plant, the B Line runs approximately 1,350 feet northward, terminating approximately 200 feet north of the east sludge basin, near the middle of the plant at the plant's original inlet meter station.

There is some indication in the Agency documents, that the original B-line may be pre-stressed concrete cylinder pipe (PCCP) and an attempt to confirm that is the case. A finding of PCCP will inform critical corrosion protection decisions in the future.

48" Concrete Cylinder Pipe with Corrosion Monitoring

The Agency has installed monitoring test stations at three (3) locations along the Del Valle B inlet pipeline from DWR.

Booster Pump Station

The booster pump station, located at the Del Valle Treatment Plant, was installed Cir. 2000. As-built records indicate electrical isolation below grade on the intake manifold piping, and electrical isolation installed above grade on the pump station risers for both the original and manifold piping. Galvanic cathodic protection systems, using five (5) vertically installed 17-lb. magnesium anodes at each anode bed, protect the buried, 48" intake bypass and discharge piping at the pump station.

The following pipeline assets are significant elements of the Del Valle B Pipeline, and require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No Rectifiers.

Insulating Joints:
13+64 – (Line B) DWR vault number 19.34 on south facing wall south of Del Valle WTP
ATS location Nos. 1, 2, 3, and 4 at the booster station installed on buried flex couplings
Above grade near ETS location No. 2 and 3, and at the bypass riser.

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.2.3 Livermore #1 Pipeline

Pipe Material	Limits	Connection	No. of Rectifiers
24" & 27" Coal-tar-enamel coated steel	Sta. 7+48 to Sta. 220+04	Patterson Pass Water Treatment Plant to Silver Oaks Pump & Rate Control Station	1 (Sta. 1+42 on Vasco #1)

One rectifier, installed on the Vasco #1 pipeline, provides cathodic protection to the Livermore #1 pipeline (1961) and part of the Livermore #2 pipeline. Cathodic protection on the west end of the Livermore #1 pipeline. A failed electrical insulating joint (IJ) is allowing cathodic protection current from the Vasco #1 rectifier to pass from the west end of Livermore #1; however, the lone rectifier is providing adequate protection to all of Vasco #1 pipeline, Livermore #1 pipeline, and portions of Livermore #2 pipeline.

The following pipeline assets are significant elements of the Livermore #1 Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifiers:
1+42 – (Vasco #1) ACE Commuter parking lot at the south end off of South Vasco Road

Insulating Joints:
7+53 – South of clear well at Patterson Pass W.T.P. and north of Patterson Pass Road
220+00 – North of Silver Oaks Drive and west of Silver Oaks Pump Station

Steel Casings:
108+31 – Southwest corner of Patterson Pass Road and South Vasco Road
166+86 – North side of Southern Pacific Railroad tracks near Contractors Circle
218+96 – North side of Southern Pacific Railroad tracks and Silver Oaks Pump Sta.
219+60 - South of Western Pacific Railroad tracks and north Silver Oaks Pump Sta.

Concrete Encasements:
No information available.

1.2.4 Livermore #2 Pipeline

Pipe Material	Limits	Connection	No. of Rectifiers
24" Concrete cylinder pipe; With approx. 750ft of polyethylene encased, ductile iron	Sta. 220+04 to Sta. 255+80 (Concrete cylinder pipe)	From Livermore #1 to Cross Valley	1 (Sta. 1+42 on Vasco #1)
	Sta. 255+80 to Sta. 263+17 (Ductile iron; re-stationed Sta. 0+85 to Sta. 8+22)		
	Sta. 263+17 to Sta 315+82 (Concrete cylinder)		

The Agency has not installed cathodic protection on the mortar-coated sections of the Livermore #2 Pipeline, constructed in 1962. In 2004, the Agency relocated a portion of the Livermore #2 pipeline between station 255+80 and 263+17. The new pipe is a 24-inch is polyethylene encased and cathodically protected with magnesium anodes, with electrical isolation at each end of the ductile iron pipe. The Agency has stationed the ductile iron pipe section separately from the original Livermore #2 pipeline.

There appears to be resistive, and perhaps intermittent, electrical shorting between the ductile iron section of Livermore #2 pipeline and the adjacent mortar coated section of pipe to the east. There is also electrical shorting between Livermore #1 and Livermore #2 at the Silver Oaks Pump Station. Influence from the Vasco #1 rectifier is evident as far east as station 243+00 or 248+75.

The following pipeline assets are significant elements of the Livermore #2 Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifiers:
1+42 – (Vasco #1) ACE Commuter parking lot at the south end west of South Vasco Road

Insulating Joints:
220+00 – Silver Oaks Pump Station at the end of Silver Oaks Drive
243+00 – Behind 1st apartment complex east of Advanced Auto Shop
248+96 – In Advanced Auto Shop parking lot at the int. of Silver Oaks Dr. & School Dr.
255+80 – New STA 8+22 – At the corner of Inman St. and First St.
263+17 – New STA 0+85 – In front of 2755 First St. across from 2654 & 2752 First St.
404+47 – (Cross Valley Pipeline) Off E. Stanley Blvd. and South S Street near flagpoles

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.2.5 Santa Rita – Dougherty Pipeline

Pipe Material	Limits	Connection	No. of Rectifiers
24" Coal-tar-enamel coated steel	Sta. 22+12 to Sta. 148+00	Mocho Well 1 to Dougherty Reservoir	1 (20 V, 16 A @ Sta. 148+00)

The Santa Rita – Dougherty Pipeline, installed in circa 1961, is electrically shorted to Dougherty Reservoir Pipeline, Vineyard Pipeline, and Cross Valley Pipeline. The following list indicates the approximate extent of electrical continuity between the Santa Rita – Dougherty Pipeline and its neighboring mortar coated pipelines:

1. Dougherty Reservoir Pipeline is electrically continuous with Santa Rita, from 150+05 (Isolation Joint on Dougherty Road) to 199+40 (Dougherty Reservoir Tank).
2. Vineyard Pipeline is electrically continuous from 1+65 (at Mocho 1 Well Site) to 2+15 (driveway into Mocho 1 Well Site).
3. Cross Valley Pipeline is electrically continuous from station 997+50 to approximately 6+91 (vault east of Santa Rita Road on Mocho Canal Trail).

In coordination with Zone 7 Water Agency, the City of Dublin is relocating the Santa Rita – Dougherty rectifier and anode well to Houston Place (approx. 1100 ft. east of its current location) in order to facilitate a Dougherty Road widening project. The City expects construction to begin on the road-widening project in 2015, and be completed in 2016; however, the rectifier and anode well relocation should be completed during the 2015 calendar year.

The following pipeline assets are significant elements of the Santa Rita - Dougherty Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifier:
148+00 – On Dougherty Road East of 6305 (pending destruction)
137+00 – West of Houston Place, behind sidewalk (pending construction)

Insulating Joints (failed):
150+05 – Off Dougherty Road and West of 6012 (Start Of Dougherty Reservoir Pipeline)

Steel Casings:
106+80 – North of BART Station, south of Demarcus Boulevard

Concrete Encasements:
No information available.

1.2.6 Vasco #1 Pipeline

Pipe Material	Limits	Connection	No. of Rectifiers
18" Coal-tar-enamel coated steel line	Sta. 0+00 to 27+92	Livermore #1 to Vasco #2	1 (24 V, 16 A @ Sta. 1+42)

Installed in 1966, Vasco #1 pipeline runs a straight route along the west side of South Vasco Road. In 1992, the Agency installed the currently operating Goodall rectifier under the same project in which they installed the Santa Rita – Dougherty rectifier. This rectifier has been in service since its installation according to the documentation provided to JDH Corrosion.

The turnout pipeline connection at 3+25 is not electrically isolated. Some service piping at this location is electrically isolated from customer structures by plastic service piping; however, JDH did not test service piping during this evaluation.

Additional turnout piping exists on the Vasco #1 pipeline, which JDH has not previously tested. Document discovery, and Agency personnel interviews are underway, and JDH will include findings for the turnout pipeline in the data tables after we have evaluated the available information.

Like the Santa Rita – Dougherty Pipeline, the Vasco #1 rectifier shares electrical continuity with multiple pipelines. The following list indicates the approximate extent of electrical shorting on the pipelines:

1. Vasco #2 is electrically continuous with Vasco #1 from 0+00 to 37+50 where the pipeline is isolated from Altamont Pipeline.
2. Livermore #1 is electrically continuous with Vasco #1 along its entire length, from Patterson Pass Water Treatment Plant to 220+03 at the Rate Control Station on Silver Oaks Pump Station lot.
3. Livermore #2 appears to be electrically continuous with Vasco #1 from the connection to Livermore #1, at the Rate Control Station at Silver Oaks Drive, to test station 243+00 or 248+75.

The following pipeline assets are significant elements of the Vasco #1 Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifiers:
1+42 – In the ACE Commuter parking lot at the south end off of South Vasco Road

Insulating Joints:
No insulating joints.

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.2.7 Vasco #2 Pipeline

Pipe Material	Limits	Connection	No. of Rectifiers
18" Coal-tar-enamel coated steel line	Sta. 0+00 to Sta. 37+50	Vasco #1 to termination at North Vasco Road	1 (Sta. 1+42 on Vasco #1)

Constructed in 1968, the Vasco #2 Pipeline is electrically continuous with Vasco #1 Pipeline. The Vasco #1 rectifier, located at Sta. 1+42, protects both pipelines. According to the historical data, this system has operated normally since 2002. As discussed earlier, Vasco #2 is also electrically continuous with Livermore #1, and a portion of Livermore #2.

The following pipeline assets are significant elements of the Vasco #2 Pipeline, and require consideration during any evaluation of its cathodic protection system:

Rectifiers:
1+42 – (Vasco #1) ACE Commuter parking lot at the south end off of South Vasco Road

Insulating Joints:
331+70 - (Altamont Pipeline) Connection at Vasco Rate Control Station
37+74 – Northwest intersection of Northfront Road and North Vasco Road

Steel Casings:
19+91 – North of Southfront Road and south of I-580 off-ramp to Vasco Road
23+15 – North of collector distributor for off-ramp north of I-580 for Vasco Road
24+20 – North of on-ramp from North Vasco Road heading westbound on I-580

Concrete Encasements:
No information available.

1.3 PIPELINES WITH CORROSION MONITORING

1.3.1 Chain of Lakes Pipeline

Pipe Material	Limits	Connection
24" & 27" Concrete cylinder pipe	Well #1 to Well #2	El Charro Pipeline to Chain of Lakes Well #1 to Chain of Lakes Well #2

Installed in 2010, the Chain of Lakes Pipeline is routed between El Charro Road and Haul Road connecting Chain of Lakes Well #1 and #2 to El Charro Pipeline. The Agency has installed four (4) monitoring test stations on this pipeline.

The following pipeline assets are significant elements of the Chain of Lakes Pipeline, and require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Insulating Joints:
100+00 – (El Charro Pipeline) Intersects Haul Road at 2633 & 2655 El Charro Road

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.3.2 Cross Valley Pipeline

Pipe Material	Limits	Connection
36" Concrete cylinder pipe	Sta. 997+36 (approx. 280ft); Equation 0+00 to 404+47	Mocho Well #1 to Livermore #2

Cross Valley Pipeline, constructed in 1973, is shorted to Santa Rita – Dougherty Pipeline through their shared connection at the Mocho Well #1 site. The Cross Valley Pipeline is electrically continuous from the well site to a location between 6+91 and 11+52.

The following pipeline assets are elements of the Cross Valley Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers

Insulating Joints:
61+77 – On Canal Road north of Los Positas Road (north of Pleasanton #3)
125+32 – West of El Charro Road and south of I-580 near Old Freisman Road
270+55 – Off of Isabel Ave (Could not be located with new alignment)
404+47 – Off of E. Stanley Blvd. and South S Street near flagpoles

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.3.3 Del Valle – Livermore Pipeline

Pipe Material	Limits	Connection
36" Concrete cylinder pipe	Sta. 1+32 to Sta. 142+40	Cross Valley to Sycamore to Vineyard to Del Valle A

Del Valle - Livermore Pipeline is 36-inch, concrete cylinder pipe constructed in 1974. Del Valle - Livermore connects to Cross Valley Pipeline, Del Valle A Pipeline, Vineyard Pipeline, and Sycamore Pipeline.

The following pipeline assets are elements of the Del Valle - Livermore Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Insulating Joints:
No information available.

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.3.4 Dougherty Reservoir Pipeline

Pipe Material	Limits	Connection
24" Concrete cylinder pipe	Sta. 148+02 to Sta. 199+40	Santa-Rita Dougherty Reservoir Pipeline to Dougherty Reservoir

The Dougherty Reservoir Pipeline, constructed in 1983, is shorted to the Santa Rita – Dougherty Pipeline, however, was not part of the design for the rectifier system, which was installed in 1992. The pipeline is shorted at the I.J. at

150+05, which will be discussed in more detail later.

The following pipeline assets are elements of the Dougherty Reservoir Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifies. Pipeline is electrically shorted to 148+00 – (Santa Rita – Dougherty Pipeline) On Dougherty Road East of 6305

Insulating Joints:
150+05 – Off Dougherty Road and West of 6012
199+40 – In front of Dougherty Reservoir Tank

Steel Casings:
169+90 – At the end of Stagecoach Road on hillside of Altamont Creek

Concrete Encasements:
No information available.

1.3.5 El Charro Pipeline

Pipe Material	Limits	Connection
30/36" Cement mortar lined and coated steel	Sta. 100+00 to Sta. 146+52	Chain of Lakes to Cross Valley

El Charro Pipeline is a 30/36-inch, cement mortar lined and coated, steel pipe.

The following pipeline assets are elements of the El Charro Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifier:
No rectifiers.

Insulating Joints:
100+00 – Off Haul Road at the driveway of 2633 & 2655 El Charro Road
146+64 – West of El Charro Road near water manhole by Old Freisman Road

Steel Casings:
128+10 – Off Haul Road after bridge connecting to El Charro Road
131+50 – To the west of El Charro Road after intersection with Haul Road

Concrete Encasements:
No information available.

1.3.6 Hopyard Pipeline

Pipe Material	Limits	Connection
18" & 24" Concrete cylinder pipe	Sta. 0+00 to Sta. 115+69	Hopyard Well #1 to Camp Parks Turnout

The Agency installed the Hopyard Pipeline in 1984, and upgraded the pipeline under two separate projects in 1991 & 1993. The pipe now follows a new alignment just east of the previous alignment, across I-580.

The pipeline is isolated from Santa Rita – Dougherty Pipeline. The insulating joint located at station 103+50, which is south of Dublin Road and Santa Rita – Dougherty Pipeline appears to be operating properly.

The following pipeline assets are elements of the Hopyard Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Insulating Joints:
103+50 – In Airness north east of building in bushes near parking lot
115+83 – Camp Parks Turnout in Army Base

Casings:
89+32 – At the end of Owens Court south of I-580
93+32 – At 6055 Scarlett Court north of I-580 near VW and Hyundai dealerships

Concrete Encasements:
No information available.

1.3.7 Mocho Pipeline

Pipe Material	Limits	Connection
24" Concrete cylinder pipe	Sta. 5+00 to Sta. 85+06	Hopyard Well #1 to Cross Valley Pipeline

Built in 1991, the Mocho Pipeline is electronically isolated from the Cross Valley Pipeline at its sta. 85+00 connection point.

The following pipeline assets are elements of the Mocho Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Insulating Joints:
No information available.

Casings:
No information available.

Concrete Encasements:
No information available.

1.3.8 DSRD Turnout #4 Pipeline (formerly, Santa Rita Turnout Pipeline)

Pipe Material	Limits	Connection
16" Polyethylene encased, ductile iron pipe	Sta. 103+83 to Sta. 107+56 (original D.I. PL), and Sta. 0+00 to Sta. 1+08 (new 16" D.I. PL)	24" Tar Coated Santa Rita – Dougherty Pipeline, and 30" CMCL replacement DSRSD Turnout #4 section.
Intermediate section of 30" CMCL Pipe	Sta. 0+00 to Sta. 7+11	Santa Rita Turnout connection at each end.
16" Polyethylene encased, ductile iron pipe	Sta. 7+11 to Sta. 8+20	30" CMCL pipe section and #4 DSRSD Turnout to DSRSD at Arnold Road.

DSRSD turnout #4 is electrically continuous with the Santa Rita – Dougherty Pipeline until sta 8+20, and the Santa Rita Pipeline rectifier provides cathodic protection current as far as the turnout station 1+08 connection to 30" CMCL pipe section. The 30" CMCL section of pipe is discontinuous with the ductile iron at each end. The eastern run of ductile iron pipe has been orphaned from the cathodic protection system, and the rectifier at Dougherty Road is no longer providing protective CP current.

The following pipeline assets are elements of the Santa Rita Turnout Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers. Pipe is electrically continuous with 148+00 – (Santa Rita – Dougherty Pipeline) On Dougherty Road East of 6305.

Insulating Joints:
No information available.

Casings:
No information available.

Concrete Encasements:
No information available.

1.3.9 Sycamore Pipeline

Pipe Material	Limits	Connection
24" & 27" PVC pipe w/ductile iron fittings	Sta. 7+53 to Sta. 218+96	Del Valle – Livermore to Veteran's Affairs Turnout

Sycamore Pipeline is a polyvinyl chloride (PVC) pipeline with ductile iron valves fittings appurtenances. JDH tested the pipe appurtenances at a few selected locations to confirm that the metallic structures currently do not have cathodic protection systems installed. JDH assumes that the Agency installed the pipeline without cathodic protection.

The following pipeline assets are elements of the Sycamore Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Isolated Valves/Fittings/Appurtenances:
No information available.

Insulating Joints:
No information available.

Steel Casings:
No information available.

Concrete Encasements:
No information available.

1.3.10 Vineyard Pipeline

Pipe Material	Limits	Connection
36" Concrete cylinder pipe	Sta. 1+00 to Sta. 346+33	Mocho Well #1 to Del Valle - Livermore & Del Valle A Pipelines

The Vineyard Pipeline has several casings installed on it by The Agency. Many are located where the pipeline crossed the railroad right-of-way from east to west.

The following pipeline assets are elements of the Vineyard Pipeline that require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers. Pipeline is electrically shorted to 148+00 – (Santa Rita – Dougherty Pipeline) On Dougherty Road East of 6305

Insulating Joints:
2+00 – In Mocho Well No. 1 pump station yard
23+90 – Corner of Mohr Road and Iron Horse Trail (West)
55+24 – Off Valley Road north of intersection with Busch Road
58+40 – West of Valley Road and north of intersection with Busch Road (In Road)
73+06 – Off Valley Road South of Boulder Street across from 3101
75+30 – Off Valley Road across from electrical sub station
85+36 – In Bernal Road south of intersection with Stanley Blvd. near 3001
98+60 – In 3550 Bernal Road at Hypo Building
107+00 – Across from Smoketree Commons Drive off Vineyard Ave
132+24 – In Vineyard Ave up from Whitney Park
158+52 – On East Old Vineyard Ave next to Yolanda Court
177+16 – On East Old Vineyard Ave near line valve and air valve
188+46 – On East Old Vineyard Ave and Brozosky Hill
198+44 – On East Old Vineyard Ave and Frog Hill Road
209+00 – On East Old Vineyard Ave before Mingoia Street
216+55 – On East Old Vineyard Ave near Fire Department
244+73 – On East Vineyard Ave near Ruby Hill Blvd. – Post 6444
249+70 – On East Vineyard Ave near Ruby Hill Blvd.
257+60 – On East Vineyard across from 446 and 444
271+10 – On East Vineyard and Isabel near Casa Real

273+68 – In Vineyard Ave east of intersection with Isabel Ave near Casa Real
294+02 – On East Vineyard Ave after Chevron gas station
310+23 – On East Vineyard Ave near pole 482T40874664
320+55 – On East Vineyard Ave near Vallecitos Road
330+55 – On East Vineyard Ave east of intersection of Vallecitos Road
345+99 – On East Vineyard Ave near 801

Steel Casings:
3+95 – East of Santa Rita Road near Public Storage
25+00 – Corner of Mohr Avenue and Iron Horse Trail near petroleum pipeline
26+22 – Corner of Mohr Avenue and Iron Horse Trail near air valve
58+20 – Off Valley Avenue north of intersection with Busch Road
73+21 – Off Valley Avenue south of intersection with Boulder St. across from 3101
75+00 – Off Valley Avenue across from electrical sub station
81+36 – In Valley Avenue north of Stanley Blvd. and north of overpass
81+60 – In Valley Avenue north of Stanley Blvd. under overpass
82+30 – In Valley Avenue just north of intersection with Stanley Blvd.
328+50 – Off Vineyard Avenue and Vallecitos Road (west of intersection)
330+40 – Off Vineyard Avenue and Vallecitos Road (east of intersection)

Concrete Encasements:
99+31 Through 101+86 – Arroyo Del Valle Canal (No Test Stations)

1.4 TREATMENT PLANTS AND RESERVOIRS

1.4.0 General

JDH has completed an evaluation on all existing operational cathodic protection and monitoring systems during this survey. Underground piping systems, which typically are not monitored at the various treatment facilities and pump stations, were not evaluated during this survey, however, in order to determine the possible need for additional corrosion control measures JDH recommends that the Agency commission a more exhaustive review of the record documents related to treatment facilities and plant piping, along with soil corrosivity testing.

1.4.1 Del Valle Water Treatment Plant

The Del Valle Water Treatment Plant receives raw water from DWR for processing prior to distribution. Galvanic and impressed current cathodic protection systems provide corrosion protection to the steel clearwell tank at the north side of the treatment plant, and the underground DAF piping.

Steel Clearwell

The clearwell is a 4.6 million gallon steel tank, located on the north edge of the treatment plant.

Discrete impressed current cathodic protection systems protect both the exterior tank bottom, and interior tank surfaces and structures below the water line.

Exterior (soil-side) Cathodic Protection

An impressed current cathodic protection system with twelve (12) anodes, distributed evenly outside the perimeter of the tank, protects the exterior tank bottom. The junction boxes are located on the foundation ring-wall of the tank, while the rectifier is located near the tank ladder.

Internal (wetted surfaces) Cathodic Protection

The interior CP system utilizes an auto-potential controlled rectifier with 114 ea., 5-lb. cast iron anodes, and a zinc reference electrode, while the rectifier is mounted on the tank exterior adjacent to the tank ladder.

Rectifiers:
Steel Clarifier (External)
Steel Clarifier (Internal)

DAF Pipeline

The DAF Pipeline runs from the Del Valle Booster Pump Station at the southern end of the Water Treatment Plant and crosses a Coagulant Injection Vault (CIV) (indicated in some drawings as Inlet Screening and Overflow) before delivery to the Dissolved Air Flotation Basins (DAF).

The Overflow (OF) pipeline runs from inside the DAF building and begins as 24-inch pipe. It then makes a 90 degree bend and up-sizes to a 48-inch pipe and terminates approximately 160-feet from the DAF at the Inlet Screening and Overflow structure.

The raw water (RW) section of the pipeline begins outside of the DAF with 24-inch pipe, and then tee's into a 30-inch pipe running east before making a 90 degree turn south and upsizing again to the 48-inch pipe. Here the 48-inch pipe connects with the CIV structure. From the CIV, the pipe continues south until it makes a 45 degree bend and terminates approximately 180-feet from the CIV at the booster pump station MOV.

The following pipeline assets are significant elements of the Del Valle DAF Pipeline, and require consideration during any evaluation of its corrosion monitoring system:

Rectifiers:
No rectifiers.

Insulating Joints:
OF Piping;
1+00 (DAF)
3+15 (North CIV)
RW Piping;
1+00 (2) (DAF)
2+20 (North CIV)
2+55 (South CIV)
5+00 (MOV test point at BPS)

Casings:
No casings.

Concrete Encasements:
No encasements.

Treatment Plant Yard Piping

JDH did not evaluate or analyze corrosion risks for unprotected yard process structures during this survey. Pressurized ductile iron or steel fire and domestic water pipelines, for example, generally require cathodic protection in order to mitigate risk of corrosion related failure. Within the plant's process piping system there may be other critical structures that require corrosion/cathodic protection as well, and the Agency should continue its efforts to identify and protect these structures.

1.4.2 Dougherty Reservoir Tank

The Dougherty Reservoir Tank is a 4 million gallon steel tank, located in Dougherty Hills Park open space approximately 500 feet east of Topaz Circle in Dublin, CA. The access road gate to the tank is located at the intersection of Sapphire Street and Coral Way.

The exterior tank bottom, and interior (submerged/wetted) tank surfaces and structures below the water line, are protected by discrete impressed current cathodic protection systems.

Exterior (Soil-Side) Cathodic Protection

An impressed current cathodic protection system with eight (8) anodes, distributed evenly outside the perimeter of the tank, protects the exterior tank bottom. The junction boxes are located outside the ring path surrounding the tank. The rectifier is located near the tank ladder, and is on the right side of the rectifier pair mounted on the tank's south-facing wall.

Internal Cathodic Protection

The interior CP system utilizes an auto-potential controlled rectifier with 114 ea., 5-lb. cast iron anodes, and a zinc reference electrode. Mounted on the tank exterior, the rectifier is located approximately 15 feet east of the tank ladder, and is the left side of the rectifier pair mounted on the tank's south-facing wall. The rectifier is out of service, and in need of replacement, as indicated in the Executive Summary, and Section II of this report.

Above the water line, the internal surfaces of the tank have undergone significant corrosion. The photos below are examples of such surfaces, as viewed from the roof entry at the interior ladder.

Ladder rungs have undergone significant corrosion where coatings have failed.

Difficult areas to prepare and coat have failed. The top of the ladder is an example of particularly poor condition.

As is commonly the case, coating at edge and corner locations are failing.

Seams between structural elements are also a typical failure point on the Dougherty Tank. This photo also indicates that blistering has developed on some broader surfaces.

The effects of corrosion do not appear to have brought the tank to a critical stage of material loss due to corrosion attack, however, the Agency should address this issue before coating problems do lead to significant material loss and structural failures. The 2010 V&A corrosion evaluation provides comment on this matter as well, and references a pending January 2011 coating evaluation. If the scheduled coating evaluation was completed, JDH recommends remediating based on the findings of that evaluation.

1.4.3 Patterson Pass Water Treatment Plant (PPWTP)

The PPWTP receives raw water from DWR for processing and distribution. Cathodic protection systems are installed on various structures including Del Valle line A (discharge) and line B (original DWR intake), DAF pipeline, and the clearwell tank at the north side of the treatment plant.

Chlorine Contact Tank

The steel chlorine contact tank, located on the north edge of the treatment plant is protected by two impressed current cathodic protection systems. The exterior tank bottom, and interior tank surfaces and structures below the water line, are protected by discrete impressed current cathodic protection systems.

Exterior Cathodic Protection

A 40V/5A rectifier and high-silicon, cast iron anodes, protects the tank bottom. Mounted on the north side of the exterior tank wall, the rectifier is located just east of the exterior tank ladder.

Internal Cathodic Protection

The interior CP system is an auto-potential controlled rectifier. The rectifier is located approximately 10 feet east of the exterior tank ladder.

Rectifiers:
Steel Clarifier (Internal)
Steel Clarifier (External)

Conventional Clarifier

The floc sedimentation clarifier is located on the east side of the PPWTP, and uses a newly installed impressed

current system to provide cathodic protection to the steel structures located below the water line. The concrete super-structure is not intended to be cathodically protected,

Rectifier:
Located on clarifier's NW external wall (Internal structures)

Washwater Tank

The washwater tank, located near the reservoir north of the treatment plant, is an above grade steel tank with a galvanic cathodic protection system installed on the interior. The CP system includes three (3), 25 lb. magnesium anodes.

UF Clarifier

The UF Clarifier is a concrete structure with internal steel mechanical structures and process piping. The bulk of the steel structures inside the clarifier are protected by a galvanic cathodic protection system. Some areas around the launder brackets are not receiving full cathodic protection.

Treatment Plant Yard Piping

JDH did not evaluate or analyze corrosion risks for unprotected yard process structures during this survey. Pressurized ductile iron or steel fire and domestic water pipelines, for example, generally require cathodic protection in order to mitigate risk of corrosion related failure. Within the plant's process piping system there may be other critical structures that require protection as well.

SECTION II – STATUS AND RECOMMENDATIONS

2.1 GENERAL

A majority of the cathodically protected pipelines indicate adequate levels of protection. According to NACE standard SP-0169-13, Section 6.2; however, levels of cathodic protection for some structures, including the Del Vale B intake and DAF pipelines are inadequate, and preliminary investigation indicates electrical shorting issues that require further document review and testing.

JDH identified trends toward elevated pipe-to-soil potentials on some of the older mortar coated pipelines for which CP systems are not providing corrosion control. This may indicate deterioration of the protective mortar coatings. Due to the age of the pipelines, and the general trend toward higher (more electro-negative) pipe-to-soil potentials, JDH recommends that the Agency begin planning for cathodic protection upgrades of these pipelines.

The Agency should coordinate CP system surveys on an annual basis.

2.2 PIPELINES WITH CATHODIC PROTECTION

2.2.1 Altamont Pipeline

Status
The anodes installed at 357+50 and 357+80 appear to be working properly in conjunction with the impressed current system, and the potentials at these two locations are adequate with respect to the surrounding pipeline.

Casings potentials were found to be higher (more negative) at the east end of the pipeline, which indicates increased polarization.

Recommendations
Many of the pipelines casings are not provided with cathodic protection. If the casings are not mortar filled, and the Agency intends to utilize the casings indefinitely, JDH recommends designing & installing cathodic protection systems for the unprotected steel casings.
If time is available during future testing, JDH recommends testing all appurtenances to determine electrical continuity, and protection levels on these structures.

2.2.2 Del Valle A Pipeline

Status:
Del Valle A pipe-to-soil potentials have been relatively stable for many years; however, those levels indicate a statistically elevated risk of corrosion, and are significantly higher than the potentials recorded in previous surveys. In some cases, the test data indicates pipe-to-soil potentials greater than 200mV more electronegative than “native” measurements with respect to a copper-copper sulfate reference cell.

Recommendations:
Del Valle A is a candidate for cathodic protection due to elevated pipe-to-soil potentials since the pipeline’s installation, and JDH recommends that the Agency provide cathodic protection within five (5) years.

2.2.3 Del Valle B Pipeline

Status:
Del Valle B pipe-to-soil potentials indicate that adequate cathodic protection is not providing to the pipeline manifold at the booster station. JDH conducted additional continuity and current requirement testing along the alignment, and found that the pipeline is not electrically continuous between the valve at 8+15 and the riser at 6+95. JDH suspects that several of the pipe sections in the area of the Booster Station on Del Valle B and the DAF pipelines are electrically continuous to electrical ground, or shorted through structures. Such shorting can be difficult to locate; however, JDH is hopeful that additional testing will clarify the cause(s) and possible remedial approach.

There is some indication in the Agency documents, that the older B-line may be pre-stressed concrete cylinder pipe (PCCP) and an attempt to confirm that is the case. A finding of PCCP will be critical for corrosion protection decisions in the future.

Recommendations:
JDH recommends performing additional testing in order to determine electrical continuity among the various structures.

Survey data indicates that the Booster Pump Station (BPS) manifold piping is not receiving adequate cathodic protection. The anode wire connections inside the G-5 traffic boxes were cleaned and repaired, and because potentials were climbing follow-up testing will be conducted during the next annual survey.

Del Valle B is in need of repair to its corrosion monitoring test stations to determine the condition of the pipe-to-soil potentials on the pipeline. Test leads need to be re-installed at 4+60, 7+70, 8+20, and 12+60. With the installation of these test stations, adequate data can then be measured and recorded.

Conduct an investigation to confirm that the original Del Valle B is pre-stressed concrete cylinder pipe (PCCP) as indicated in the record documents. Del Valle A should be researched as well since it is of the same vintage.

2.2.4 Livermore #1 Pipeline

Status:
The Vasco #1 rectifier cathodically protects the Livermore #1 Pipeline. The pipeline does not meet the NACE -850 mV off pipe-to-soil potential criterion; however, Livermore #1 Pipeline meets the NACE criterion for 100-mV polarization criterion (Instant Off minus native potentials) in all cases.

Livermore #2 potentials were elevated during the 2016 survey, at foot stations 229+47, 236+40, and 243+00. This is likely the result of shorting across the insulating joint at the Livermore #1/Livermore #2 connection, outside of the Silver Oaks Pump Station. At this time, the potentials do not indicate that the additional pipeline material is detrimental to protection levels on Livermore #1.

Recommendations:
JDH recommends reestablishing electrical isolation at the connection vault in order to prevent additional cathodic protection current demand to the Vasco rectifier from Livermore #2.

2.2.5 Livermore #2 Pipeline

Status:
At station 263+17 and 255+80 the anodes for the ductile iron pipe were found to be disconnected. These were re-connected and left to polarize for a month and retested. Final data is included at the end of this report.

Pipe-to-soil potentials along the east end of Livermore #2 indicate an electrical short at the connection Silver Oaks connection vault to Livermore #1.

Recommendations:
See recommendations from Livermore #1, Recommendation 2 (above).

2.2.6 Santa Rita - Dougherty Pipeline

Status:
The Santa Rita – Dougherty Pipeline is electrically continuous. As well, this pipeline is electrically continuous with Cross Valley Pipeline, Vineyard Pipeline, and Dougherty Reservoir Pipeline. The single-rectifier system for the Santa Rita – Dougherty Pipeline appears to be adequately cathodically protecting the pipeline; however, the rectifier unit is operating at a maximum DC output capacity of 16 Amperes. The City of Dublin replaced the rectifier in 2016 under its Dougherty Road widening project with a larger unit, allowing greater DC current output and increased protection levels.

The pipeline is currently receiving cathodic protection levels slightly higher than those that were recorded in the 2014 survey.

Recommendations:
The Agency should monitor the pipe-to-soil trend during upcoming surveys, and adjust current output on the new rectifier as needed.

After the new rectifier unit is installed, the Agency should conduct further testing in the area of the Mocho well, to determine whether protection levels are adequate. If they are not adequate, the Agency should consider repairing insulating joints in the area of the well site in order to preserve current for the Santa Rita-Dougherty Pipeline.

2.2.7 Vasco #1 Pipeline

Status:
The Vasco #1 rectifier is providing adequate cathodic protection across the three pipelines that the system is shorted between (Vasco #1, Vasco #2, Livermore #1, and part of Livermore #2).

The pipeline meets the NACE criterion for cathodic protection.

The turnout at 3+25 is not electrically isolated from Vasco #1. This turnout pipeline, owned and operated by Zone 7, is not believed to be a significant drain on the ICCP system for the Vasco and Livermore pipelines; however, JDH recommends investigating the turnout service in order to determine the scope of the electrical shorting and remediating if warranted.

Recommendations:
No cathodic protection remediation is required for Vasco #1 at this time.

2.2.8 Vasco #2 Pipeline

Status:
Vasco #2 Pipeline is adequately protected and meeting both the NACE -850 mV instant off pipe-to-soil potentials and the 100-mV Polarization Criteria (NACE SP 0169-13) for cathodic protection with the use of the Vasco #1 and Altamont #3 rectifiers.

Following on previous testing that indicated electrical isolation of the Vasco #2 pipeline north of its connection to the

Altamont Pipeline, JDH performed an investigation of the CP system, finding that electrical isolation was likely installed on the system during the Altamont Pipeline installation project. JDH reestablished cathodic protection on the north end of Vasco #2 by bonding the insulating joint test station near the Altamont Pump station.

Recommendations:
No cathodic protection remediation is required for Vasco #2 at this time.

2.3 PIPELINES WITH CORROSION MONITORING

2.3.1 Chain of Lakes Pipeline

Status:
JDH has not determine whether the buried untreated groundwater (UGW) and treated water (TW) pipelines are mortar coated or dielectric coated steel. The pipelines are electrically shorted, increasing risk of an accelerated corrosion rate if one of the pipes is dielectric coated pipe and the other is mortar coated.

Recommendations:
JDH recommends that the Agency confirm the pipeline construction types to determine whether there is a risk of bimetallic corrosion on the pipelines. If the pipelines are both mortar coated pipe, no action is necessary. If one pipeline is mortar coated, and another is dielectric coated, JDH recommends that the Agency attempt to locate and clear the short, and determine whether corrosion risk warrants cathodic protection for the dielectric coated pipeline.

2.3.2 Cross Valley Pipeline

Status:
Cross Valley Pipeline is electrically shorted to Santa Rita – Dougherty pipelines from the Mocho Well site through foot station 11+52.

Station 23+52 has a broken test lead, and test points are not accessible over a span of approximately 4,000-ft along Isabel.

The insulating joint at 404+47 connection to Livermore #2 indicates a possible dead short or resistive short condition. JDH does not consider the short to be a critical issue, since the pipes are both mortar coated, and the resulting driving voltage will not develop a strong corrosion cell.

Recommendations:
If a section of the pipeline is removed in the area near the pipeline interconnections at Mocho Well, such as for installation of a valve or meter, JDH recommends installing an insulating flange and test station at that time.

JDH recommends adding test stations at several locations in the area around Isable Avenue and E. Jack London Blvd.

2.3.3 Del Valle – Livermore Pipeline

Status:
Station 20+64 has been buried and needs to be located for adequate testing purposes for the pipeline.

Pipeline pipe-to-soil potentials have trended more electro-negative in recent years, indicating that the mortar coating is becoming a less effective source of corrosion control.

Recommendations:
JDH recommends installing a cathodic protection system on the pipeline in order to prevent soil side corrosion of the pipe.

JDH also recommends that the Agency locate the blowoff at 20+64, or, if the blow off is no longer accessible, JDH recommends that a test station is installed near foot station 15+00.

2.3.4 Dougherty Reservoir Pipeline

Status:
This pipe is shorted from 155+50 to 192+20 on Santa Rita – Dougherty Pipeline due to a failed I.J. at station 150+05 located beneath Dougherty Road. This does not present a corrosion risk for the pipeline; however, it does drain additional current from the Santa Rita - Dougherty impressed current cathodic protection system. The Dougherty Reservoir tank is isolated from the pipeline at station 199+40.

No wires remain in the test station at Station 183+34 near the Dog Park on Amador Valley Road.

Recommendations:
The Agency should replace the test station at 183+34.

2.3.5 El Charro Pipeline

Status:
El Charro Pipeline pipe-to-soil potentials do not indicate a high risk for corrosion. The ductile iron, untreated groundwater pipeline is electrically isolated from the 36" CMCL treated water pipeline.

The casing installed on the 36" CMCL pipeline is electrically shorted to the pipeline. This introduces a risk of accelerated corrosion on the casing; however, it does not increase corrosion on the pipeline itself.

Recommendations:
If the casing on the 36" CMCL pipeline requires extended life, the Agency should provide the casing with a cathodic protection system to mitigate the present corrosion risk. Such a project will require a cathodic protection system sufficient to protect both the casing and the pipeline, since there is no reasonable method for decoupling the casing from the pipeline.

2.3.6 Hopyard Pipeline

Status:
At station 77+67, the pipe-to-soil potential trend has been more electronegative. This may be an indication that the pipeline is consuming the I-580 casing, which will corrode to protect the pipeline due to electrical shorting between the pipe and the casing, or it may be an indication that the pipeline's mortar coating is degrading due to age and stress mechanical stresses.

Several sections of the pipe are missing test stations over the standard recommended distances of 800-1000 ft.

Recommendations:
Due to the age of the pipe, and the trend to more electronegative pipe-to-soil potentials, JDH recommends that the Agency install a cathodic protection system on the Hopyard Pipeline.

In order to allow collection of a more complete pipe-to-soil data set for the pipeline, JDH also recommends installation

of additional test stations as indicated in the "Cost Estimate" worksheet included with this report.

2.3.7 Mocho Pipeline

Status:
Pipe-to-soil potentials at Station 75+90 have been difficult to measure in recent surveys.

Recommendations:

The Agency should install test wires on the pipe inside the vault at Station 75+90.

2.3.8 DSRSD #4 Turnout (formerly known as Santa Rita Turnout Pipeline)

Status:
2011 record documents for the relocation of the turnout pipeline conflict with respect to the location of the insulating joint installation at the west end of the 30" section at station 1+08. There, the insulating flange kit should be installed on the between the 30" mortar coated pipe and the 30"-16" ductile iron reducer. The drawing set plan sheet indicates the insulating kit is installed on the 16" side of the reducer, while the detail indicates installation on the 30" side of the reducer.

The eastern run of ductile iron pipe is orphaned from the Santa Rita – Dougherty ICCP system following installation of the 30" mortar coated pipe section; however, sacrificial magnesium anodes were installed on the orphaned section of pipe in 2016, and the pipe line is currently under cathodic protection per NACE SP0169-13.

Recommendations:

No cathodic protection remediation is required for DSRSD #4 Turnout at this time.

2.3.9 Sycamore Pipeline

Status:
The Agency did not install cathodic protection on the ductile iron fittings and appurtenances.

Recommendations:
Since it is not cost effective to expose each fitting for installation of anodes, JDH recommends installing cathodic protection on each valve or accessible appurtenance. The Agency should remain aware that the risk of corrosion related failures for unprotected fittings will rise in the future, and the Agency should consider CP installation or fitting replacement with cathodic protection if the failure rate reaches an unacceptable level.

2.3.10 Vineyard Pipeline

Status:
At Foot Station 3+95, the pipe is shorted to the casing. When this condition occurs, there is generally no feasible remediation option available.

Roadwork contractors have paved an ac patch over the casing tests station at foot station 8+31, and may have broken the test station in the process.

Recommendations:

If the Agency determines that the casing at 3+95 is critical, and that the Agency should maintain it for an indefinite period, the Agency can install cathodic protection in order to prevent corrosion activity on the casing.

The Agency should expose the casing at station 8+31 test station for testing. If the cables were damaged by excavation during roadwork, it may be necessary to expose the casing and pipeline in order to reattach the cables.

2.4 TREATMENT PLANTS AND RESERVOIRS

2.4.1 Del Valle Water Treatment Plant

Steel Clearwell

Findings:
The clearwell internal CP system did not meet NACE criterion of -850mV instant off. JDH has adjusted the rectifier during the survey to provide additional current output. The clearwell coating and cathodic protection systems will be renovated under a pending 2017 project. Following installation of the coating and cathodic protection system, the CP system will be offline for 2 years, during the coating warranty period.

The external ICCP system is not producing optimal levels of protection. JDH suspects that the system is failing, due to the aging anode bed.

Recommendations:
It is common for at grade steel water storage tanks to operate without cathodic protection on the exterior tank bottoms. The Agency should evaluate its risk tolerance, and repair/maintenance options, and determine whether repairing the CP is warranted.

DAF Pipeline

Findings:
Pipe-to-soil potentials on the DAF raw water piping have increased to varying extents since the prior survey at most test locations. Transient soil conditions, or other benign, temporary causes, may influence these changes. Increases in pipe-to-soil potentials may also be an indication of increased corrosion activity on the pipeline, and, as such, the inspection team should consider the data significant during analysis of the system's corrosion status.

Shorting of several structures across insulating joints has occurred as indicated below:

Insulating Joints:
OF Piping;
1+10 (DAF) - shorted
3+15 (North CIV) – shorted
RW Piping;
1+00 (2) (DAF) – both shorted

JDH conducted electrical continuity testing on several of the pipes in the area of the Booster Station on Del Valle B and the DAF pipelines, but findings were inconclusive. Some portions of the pipeline are shorted to electrical ground.

Recommendations:
The Agency should install an impressed current cathodic protection system for corrosion control of the buried pipeline.

Treatment Plant Yard Piping

Findings:
JDH did not evaluate or analyze corrosion risks for unprotected yard process structures during this survey. Pressurized ductile iron or steel fire and domestic water pipelines, for example, generally require cathodic protection in order to mitigate risk of corrosion related failure. Within the plant's process piping system there may be other critical structures that require protection as well.

Recommendations:
JDH recommends that the Agency commission a more exhaustive review of the record documents related to treatment facilities and plant piping, along with soil testing, in order to determine the possible need for additional corrosion control measures such as implementing cathodic protection systems.

2.4.2 Dougherty Reservoir Tank

Findings:
The interior of the tank is not cathodically protected as the internal rectifier is out of service.
The exterior of the tank did not meet the -850mV NACE criterion; however, the external rectifier has been adjusted, and the external cathodic protection system of the tank should be retested during the next bi-monthly survey.

The outfall pipeline is electrically isolated from the tank at the exterior tank vault.

Recommendations:
The Agency should undertake the following evaluation and repair projects:

1. Conduct an evaluation of the internal tank lining above the water line within the next three years.
2. Consider abandoning the external tank CP system at the end of its useful life
3. Retest external pipe-to-soil potentials during the next bi-monthly survey.

2.4.3 Patterson Pass Water Treatment Plant

Conventional Clarifier

Findings:
JDH inspected the Conventional Clarifier following Agency personnel reports that an impressed current wire anode had come loose due to failure of a tie-wrap restraint, and indications that the coatings, applied in 2013, were failing at several locations.

The Agency repaired the loose anode wire restraint prior to JDH's visit, and visual inspection of the cathodic protection system indicated that the hardware is in adequate condition.

The dimensionally stable, impressed current anode wires may provide corrosion protection to the fixed, submerged steel elements in the clarifier for 20 years or more; however, the magnesium anodes sacrifice a significant amount of material when discharging current to protect the rake arm assemblies. Since the magnesium anode sizes are constrained by loading limits on the rake arms, the magnesium anodes will provide protection for a significantly shorter period than the impressed current anodes.

Based on visual inspection, the estimated depletion of the magnesium anodes appears to be 25%-30%, and we expect the magnesium anodes will require replacement in 3-5 years.

Where JDH and Agency personnel identified coating damage, corrosion was generally not evident. Cathodic protection can damage some coating systems, if the CP systems generate a large voltage shift on the structure. JDH considered the location and nature of the coating damage, and determined that coating damage was most likely the result of improper coating preparation. For a more definitive explanation for the coating failure, the Agency should contact a coating inspection specialist to conduct a full installation document review, and coating inspection. Where water inundates the clarifier surfaces during operation, cathodic protection current appears to be providing corrosion control.

The exception to protection levels occurs at the launder structures where JDH is aware of at least one location, at an exterior launder waterline, where the coating is disbonded and corrosion is significantly active. At this location, JDH believes the water level varies such that the cathodic protection system cannot provide current to the cyclically wetted surface. A cycling effect in the clarifier, similar to the splash zone effect in a marine environment, will allow water laden with ferric chloride and other process salts to wet the steel surface without permanently submerging those locations. Since cathodic protection will not provide protection to tank structures, which are not submerged, quality coating is the only effective way to prevent corrosion at above the water line.

Recommendations:
JDH does not recommend that the Agency perform any urgent remedial work on the CP or coating systems; however, the Agency should consider a spot coating project to repair failed coatings as needed within three years. The Agency should also perform the following inspections as part of an annual inspection program:

1. During each annual shutdown, the Agency should perform a visual inspection of the anodes and coatings.
2. While the clarifier is in operation, the Agency should conduct CP system testing under the supervision of a NACE certified CP Specialist.

Wash water Tank

Findings:
The wash water tank, located near the reservoir north of the treatment plant, is an above grade steel tank with a galvanic cathodic protection system installed on the interior. The CP system includes three (3), 25 lb. magnesium anodes.

Recommendations:
No action is required at this time.

UF Clarifier

Findings:
The UF Clarifier is a concrete structure with internal steel mechanical structures and process piping. The bulk of the steel structures inside the clarifier are protected by a galvanic cathodic protection system. Soil to electrolyte potentials near the brackets and process piping are marginally low; however, some cathodic protection current is reaching these areas.

Recommendations:
While the protection levels don't warrant an urgent response, if visual inspection indicates significant corrosion at these locations, the Agency should consider adding additional anodes in these areas. The Agency should also perform the following inspections as part of an annual inspection program:

1. During each annual shutdown, the Agency should perform a visual inspection of the anodes and coatings.
2. While the clarifier is in operation, the Agency should conduct CP system testing under the supervision of a NACE certified CP Specialist.

Chlorine Contact Tank

Findings:
The Chlorine Contact Tank is receiving adequate cathodic protection.

Recommendations:
No action is required at this time.

Treatment Plant Yard Piping

Findings:
JDH did not evaluate or analyze corrosion risks for unprotected yard process structures during this survey. Pressurized ductile iron or steel fire and domestic water pipelines, for example, generally require cathodic protection in order to mitigate risk of corrosion related failure.

Recommendations:
JDH recommends that the Agency commission a more exhaustive review of the record documents related to treatment facilities and plant piping, along with soil testing, in order to determine the possible need for additional corrosion control measures.

SECTION III - DISCUSSION AND TEST METHODS

3.1 GENERAL

Previous survey reports have made recommendations for repairs or additional testing to the pipelines and the cathodic protection systems, however, our recommendations are based on the results of our most recent testing. We reviewed the recommendations provided in previous reports and evaluated the recommendations based on the current data collected during this investigation.

With assistance from Zone 7 staff, we conducted an extensive review of Zone 7 records to collect all available reports and data from previous corrosion investigations and annual surveys. These reports were reviewed to determine the historical operation of the cathodic protection systems and to determine if there is an increased corrosion activity on the cement mortar coated steel pipelines. We also utilized the baseline (native) potentials available in the previous reports to determine if the concrete pipelines were adequately protected.

The survey included annual surveys of the structures with cathodic protection, a detailed evaluation of each structure's cathodic protection system (e.g. electrical continuity tests), and adjustment of the cathodic protection systems. Issues requiring additional troubleshooting and repair have been identified in this report for future remediation.

Criteria for Cathodic Protection

The criteria used to determine whether a structure is adequately protected from corrosion is the National Association of Corrosion Engineers (NACE) Standard SP-0169, Rev. 2013, Section 6.2.2.1.2, states the following:

> *"A negative polarized (structure-to-soil) potential of at least 850 mV relative to a saturated copper, copper-sulfate reference electrode."*

OR

> *"A negative minimum of 100 mV of cathodic polarization between the structure surface and a stable reference electrode contacting the electrolyte. The formation or decay of polarization can be measured to satisfy the criterion."*

A polarized potential is measured when the cathodic protection current is momentarily interrupted, also called the "Instant Off" potential.

JDH conducted surveys of pipelines protected with impressed current cathodic protection (ICCP) by temporarily installing a current interrupter unit at each rectifier on the system. During the pipeline surveys, the current interrupter is temporarily installed in the output circuit of the rectifier to cycle the cathodic protection current "ON" and "OFF" and the polarized or "OFF" structure-to-soil potentials were measured at the accessible test stations. Based upon the results of the structure-to-soil potentials, the current output of the rectifier was adjusted as required until the potentials satisfied one of the aforementioned criteria. This was done especially when the structure-to-soil potentials were out of acceptable range and may result in possible corrosion losses to the pipe. JDH accomplished all required adjustments during the detailed evaluation survey.

3.2 CATHODIC PROTECTION SYSTEMS

Zone 7 has the following types of pipelines and storage tanks in the system. Each of these requires a unique approach in monitoring practices, protection criterion and maintenance requirements:

a) Dielectric coal tar coated buried pipelines.
b) Polyethylene encased ductile iron pipe
c) Concrete cylinder pipelines.
d) Mortar coated welded steel pipelines.
e) Concrete cylinder pipelines.
f) Wrapped concrete cylinder pipelines.
g) Reinforced concrete structure with steel rake arm clarifiers.
h) Dielectric (epoxy) coated steel storage tanks.
i) Bare steel storage tank bottoms.

Zone 7 uses both impressed current and sacrificial anode cathodic protection systems, as described below.

Impressed current cathodic protection (ICCP) systems use an external electrical power source to provide electric current to the pipeline or tank. ICCP uses a rectifier to convert AC to DC and discharge the DC current through an anode. Materials such as high silicon cast iron, graphite or mixed metal oxide coated platinum or titanium are used for impressed current anodes. These anode materials are chosen to discharge large amounts of current for long periods of time at low anode consumption rates. ICCP can be designed for many types of structures and can be designed for either very high current output or relatively low current output.

The impressed current cathodic protection systems are monitored by measuring the rectifier voltage and current output to ensure the rectifier is operating properly at the correct output. Pipe-to-soil potentials are measured at each test station annually and the rectifier output is adjusted as required to ensure the potentials meet NACE criteria for corrosion protection.

Sacrificial anode cathodic protection systems for pipelines or water storage tanks use an anode made from zinc or magnesium connected to the structure. The anode is more active than the steel structure and the cathodic protection current is provided by corrosion of the anode. These anodes have a lower current output than the ICCP systems and the anodes will be consumed sooner than the ICCP anodes and have a shorter life. Sacrificial anodes are usually used on small diameter or short length pipelines or well-coated water storage tanks. The pipe-to-soil potentials and anode current output of such systems are monitored once a year for optimal performance.

Pipe-to-soil potentials are the primary test method used to determine if a pipeline meets NACE criteria for corrosion protection. Pipe-to-soil potentials are measured at each test station for impressed current and sacrificial anode cathodic protection systems.

1.3 CORROSION MONITORING SYSTEMS

1.3.1 GENERAL

Pipelines with corrosion monitoring system are generally evaluated by measurement of pipe-to-soil potentials utilizing the corrosion monitoring systems as well as conducting soil corrosivity surveys comprising of soil resistivity surveys as well as chemical analysis of soil samples. Pipe-to-soil potentials as well as soil resistivity

surveys were conducted on the pipelines with corrosion monitoring during the Baseline Survey.

1.3.2 Corrosion Monitoring Systems

None of the mortar coated steel transmission pipelines are designed with sacrificial anodes or impressed current rectifiers for corrosion protection. Although the pipelines do not have a corrosion protection system, the pipelines are electrically continuous and there are test stations at regular intervals to monitor the electrical activity (corrosion) of the pipelines. Pipe-to-soil potentials are measured on the mortar coated steel pipelines' test stations once every year. The potentials from each survey are analyzed by comparing to it to previous year's survey to determine the electrical activity (corrosion) of the pipeline as well as per ASTM C876 as follows:

The cement mortar coating has a pH of 10 to 12 that passivates the steel cylinder to prevent corrosion of the steel. New cement mortar coated steel is expected to have a potential of 0 volts to -0.2 volts versus a copper, copper-sulfate reference electrode. Due to age or pipe movement, some cracks may develop in the mortar coating exposing the steel to the soil. As the steel corrodes, the potential of the pipeline will become more negative.

ASTM Test Method C876 describes a corrosion monitoring technique by measuring the corrosion potential of the reinforcing steel in reinforced concrete structures. As the reinforcing corrodes, the corrosion potential will shift in the negative direction, as summarized below:

Corrosion Potential (vs. Cu,Cu-SO4 Reference)	Significance
> -0.20 volts	Greater than 90% probability that no corrosion is occurring
≤ -0.20 volts and ≥ -0.35 volts	Uncertain over corrosion activity
< -0.35 volts	Greater than 90% probability that corrosion is occurring

Although ASTM C876 is used for reinforcing steel in concrete structures, the information in the test method should be considered when evaluating the condition of a mortar coated steel structure such as pipelines.

APPENDIX I: REMEDIATION PIORITIES & COST ESTIMATES

Zone 7 Water Agency

2016/2017 Engineering and Construction Cost Estimate
Cathodic Protection Upgrades & Field Studies

Cathodic Protection Engineering & Construction - Maintenance Improvements & Investigations

Task No.	System	Structures	Recommendation	Estimated Engineering Design & Construction Support
1.0 - FYI 2017/2018				
1.1	Patterson Pass WTP	Backwash Tank	Coating & Corrosion Inspection	$ 4,500
1.2	Hopyard Pipeline	18" CCP	Install 4 test stations, and conduct interrupted survey to determine corrosion risk.	$ 7,500
1.3	Vineyard Pipeline	36" CMCL	Install 2 test stations	$ 2,500
1.4	Dougherty Tank Internal Inspection	Steel Water Storage Tank	During annual shutdown, inspect interior coatings and cathodic protection equipment.	$ 7,000
1.5	Del Valle Water Treatment Plant	Various	Design Cathodic protection for various plant piping systems.	$ 20,000
1.6	Del Valle A & B Pipelines	CMCL Pipelines	Design Cathodic protection for the subject pipelines.	$ 8,000
Total				**$ 49,500**

APPENDIX II: PIPELINE PIPE-TO-SOIL DATA

ZONE 7 WATER AGENCY
ALTAMONT PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	Rectifier Off	Rectifier Off	Rectifier Off	Rectifier Off	Rectifier Off		
			2017	2014	2013	2012	2010		
331+69	ETS-White		1,010				1,001	End Altamont PL	N 37.709383 W 121.72568
	ETS-Red							4" Gas PG&E	
1+93 RCS	ETS-White		1,010	1,030	1,004	1,041		18" Altamont PL Rate Control outlet pipeline to Vasco 2 (CMCL)	N 37.709383 W 121.72568
	ETS-Red							Vasco 2 PL (dielectric coating)	
332+30	ETS-White	286	1,031	1,042	1,015	1,027	1,026	Altamont PL	N 37.709444 W 121.72581
	ETS-Blue	1,101	1,046			960	1,050	Vasco 2 PL?	
	ETS- Yellow					1,006		PG&E Crossing	
332+70	ETS-White	286		CNL	CNL	CNL	1,001	PG&E Crossing; CNL	
	ETS-Red	960					1,028		
332+90	Rectifier	286		1,012	491	1,024	980		N 37.70943 W 121.725569
341+00	ETS	340	1,045	1,056	1,026	1,043	1,025		N 37.707842 W 121.72788
350+00	ETS	333	1,055	1,061	1,030	1,018	1,021		N 37.7068 W 121.730586
357+50	ETS-White	379			1,089	1,064	1,074		N 37.706383 W 121.73292
	ETS- Black 1			1,168	1,280	1,300		FPTS Black/Yellow Wire is PG&E 24" Gas Pipe	
	ETS-Black 2			1,191	1,205	1,220		FPTS Black/Yellow Wire is PG&E 24" Gas Pipe	
357+80	ETS-White	370	1,148	1,105	1,096	1,059	1,048		N 37.706458 W 121.73304
	ETS- Black 2		1,147			1,092		FPTS Black/Yellow Wire is PG&E 24" Gas Pipe	
	ETS-Black 3		1,147			1,092		FPTS Black/Yellow Wire is PG&E 24" Gas Pipe	
365+70	ETS	319	1,038	1,041	998	980	984		N 37.707778 W 121.73525
374+80	ETS	320		1,025	984	972	982		N 37.706064 W 121.73887
385+00	ETS	309		CNL	CNL	CNL	CNL		
395+00	ETS	305	796	790	729	685	670		N 37.705217 W 121.74337
402+00	ETS	335	794	788	728	665	650		N 37.704681 W 121.74578
409+70	ETS-White	295	830	843	802	740	770		N 37.702953 W 121.74679
	ETS-Green	793	668	689		646	728	Casing	
413+43	ETS-White	346	812	887	847	793	828		N 37.702053 W 121.74733
	ETS- Green	793		724		703	728	Casing	
424+80	ETS	302	873	870	863	783	860		N 37.7015 W 121.750244
434+00	ETS	327			324	815	934		N 37.701947 W 121°45'12.20"
442+85	ETS	293	964	976	CNL	857	974	885	N 37.702028 W 121.75595
449+00	ETS	294	954	954	945	869	962		N 37.701342 W 121.75782
461+30	ETS	289	924	922	913	815	913		N 37.699642 W 121.76197
471+00	ETS	279	969	991	963	881	976		N 37.698936 W 121.76495
479+75	ETS	264		978	934	CNL	CNL		
483+00	Rectifier	231	858	828	748	638	871		N 37.698158 W 121.76914
485+40	ETS	268	836	745	700	597	684		N 37.698069 W 121.76991
496+62	ETS-White	262	810	790	781	681	836	Casing Isolated 2014	N 37.696111 W 121.77312
	ETS-Green	661				570	624		
498+35	ETS-White	291	750	794	783	682	875	Casing Isolated 2014	N 37.696244 W 121.77397
	ETS-Green	683				574	635		
508+00	ETS	216	736	655	597	531	560		N 37.695983 W 121.77673
517+50	ETS	242	810	712	656	583	742		N 37.695781 W 121.77963
524+00	ETS	250	821	718	664	620	740		N 37.695878 W 121.78008
532+00	ETS	250	807	734	689	565	694		N 37.697314 W 121.78228
540+32	ETS-White	265	765	750	730	602	765	Casing Isolated 2014	N 37.696133 W 121.78437
	ETS-Green	488				442	520		
541+70	ETS-White	240	760	756	737	624	724	Casing Isolated 2014	N 37.696164 W 121.78486
	ETS-Green	462				465	495		
551+00	ETS	283	783	716	709	562	755		N 37.697827 W 121.78723
561+00	ETS	233	797	724	712	552	836		N 37.699536 W 121.79015
576+40	ETS-White	248	796	726	712	564	771		N 37.700431 W 121.79513
	ETS-Blue	243				1,084	768		
	ETS-Black					574			
	PG&E							PG&E Crossing	
581+65	ETS	253	870	818	768	594	844		N 37.70035 W 121.796872
587+60	ETS-White		890	CNL	CNL	575	CNL	CNL 2013 Under New A/C	N 37.699103 W 121.79850
598+00	ETS	224	885	849	770	541	871		N 37.697206 W 121.80071
606+85	Pipe			898	862	485	CNL	8.5' East Of Airport Rate Station	N 37.696661 W 121.80376
607+00	Rectifier	281		942	844	568	979	Airport Rate Control Station	N 37.696747 W 121.80372
608+85	ETS-White	313		CNL	CNL	CNL	938	CNL-Buried By PG&E 2012	
	ETS-Red	444					874		

ZONE 7 WATER AGENCY
CHAIN OF LAKES PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)					Comments	GPS Location
		Native	2017	2014	2013	2012		
Well No. 1	ETS-Black	378	355	339	352	397	North 8" TW, 24" UGW, And West 8" TW Readings Were Taken Directly On Pipes Labeled On The Exterior Of The Building	N 37.686006 W 121.84638
	ETS- Red	293	264	282		281		
	North 8" TW	340	263	296		157		
		152	265	107				
	24" UGW	71	163	133		216		
		172	163	145				
	West 8" TW	312	408	395		155		
		154	272	120				
25+00	ETS-White	346	384	421	356	469	Determine the coating material for the UGW & TW PLs. If the coating for both parallel pipes is the same, no action is needed. If one of the pipelines is mortar coated, and the other is dielectric coated, attempt to isolated, and install CP.	N 37.686075 W 121.84357
	ETS- Red	346	384	421		469		
33+50	ETS-White	333	379	396	337	432	Determine the coating material for the UGW & TW PLs. If the coating for both parallel pipes is the same, no action is needed. If one of the pipelines is mortar coated, and the other is dielectric coated, attempt to isolated, and install CP.	N 37.68597 W 121.84081
	ETS- Red	333	379	393		432		
Well No. 2	ETS-White	461	195	180	164	279	Surge Tank And 14" UGW Readings Were Taken Directly On Surge Tank And Exterior Pipe Located At The North Of The Building	N 37.685769 W 121.83790
	ETS- Red	526	402	420		462		
	Surge Tank	462	166	190		247		
		281	170	117				
	14" UGW	485	217	185		108		
		261	178	186				
Well No. 5	ETS-Black	410	314	410			12" UGW	
Well No. 5	ETS-White	430	314	430			12" UGW	

ZONE 7 WATER AGENCY
CROSS VALLEY PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
-2+70	ETS			672	643	736	506	Under Old Gate At Mocho 1	N 37.686400 W 121.8770
6+32	ETS		569	503	506	648	613	On/Off Measured In 2012	N 37.68884 W 121.87781
6+91	ETS-Red		398	265	404	510	435	In Vault Shorted To Santa Rita-Dougherty Pipeline Take Off Reads	N 37.68891 W 121.87767
	ETS- Black		418	544	419	527	451		
11+52	ETS		538	337	409	503	429		N 37.68930 W 121.87617
23+52	ETS	28	41	13	10	17	32	Recommended new test station location.	N 37.69050 W 121.87231
31+64	ETS		367	160	170	187	202		N 37.69145 W 121.87012
39+27	ETS-Left		384	304	297	365	245	Stoneridge Well #1	N 37.69244 W 121.86716
	ETS- Right		350		329	434			
47+47	ETS	41	317	224	230	215	215		N 37.693459 W 121.86498
54+25	ETS-Left				250	185		Right-Pleasanton #3 Turnout, Vault-Leads Need To Be Extended	N 37.695319 W 121.86526
	ETS- Right					191			
61+77	ETS-White	42	346	255	260	253	261	IJ-Red Wire-North Side Of Pipe, White Wire-South Side Of Pipe	N 37.69740 W 121.865132
	ETS- Red		363			258	267		
62+48	ETS		354	275	362	347	299	In BO Box	N 37.69762 W 121.865152
73+55	ETS	54	405	289	306	289	299		N 37.70066 W 121.86507
92+10	ETS		417	240	284	281	297	In BO Box	N 37.700958 W 121.85819
104+04	ETS	58	367	235	222	191	164		N 37.70088 W 121.85453
116+03	ETS	50	297	203	186	165	164		N 37.70017 W 121.85059
124+88	AV		40	89	91	205			N 37.698621 W 121.84860
125+32	ETS-West	40	278	200	203	153	139	(IJ)	N 37.69864 W 121.84849
	ETS- East					157	146		
126+54	ETS	26				184	167	In BO Box	N 37.69856 W 121.84827
138+12	ETS	30	806	405	419	331	157		N 37.70072 W 121.84550
146+15	ETS-White		353		269	166	192	Red Wire-DSRSD Turnout And White-Cross Valley/Both Red And White Wires Can Be Found North East Of Turnout Station	N 37.700769 W 121.84372
	ETS- Red					343	467		
	ETS- NW					386			
	ETS- SW					325			
	ETS- NE					199			
	ETS- SE					202			
146+93	ETS	30				183		Needs G-5/Wires In Riser Pipe	N 37.70081 W 121.84241
160+92	ETS	30	291	208	210	175	169		N 37.70073 W 121.83772
172+11	ETS	90	308	216	214	176	191	(2017) Lid marked "storm" in sidewalk	N 37.70071 W 121.83395
182+10	ETS	60	289	202	222	110	225		N 37.70066 W 121.83031
183+10	ETS	40	338	236	234	210	236		N 37.70063 W 121.82999
189+12	AV		340	233	223	209			N 37.700640 W 121.82787
196+75	ETS		346	260	256	217	237	In BO Box	N 37.70062 W 121.82531
199+90	ETS	50	352	231	244	214	240	In AV Box	N 37.70067 W 121.82418
215+09	ETS	50	360	294	213	321	165		N 37.69958 W 121.8192
217+05	ETS		413	304	234	336		In BO Box	N 37.69951 W 121.818317
226+01	ETS	30	331	251	260	308	258		N 37.69985 W 121.81679
235+03	ETS		318	249	298	290	257		N 37.70052 W 121.81413
245+20	ETS	30	344	280	278	301	276		N 37.70046 W 121.81060
251+39	ETS-Left	34	365	284	319	340	301	ETS-Left-Pipe (Casing)	N 37.70033 W 121.80857
	ETS- Right					557	546		
255+99	ETS		332	305	327	372			N 37.69997 W 121.80700
256+94	ETS		357	295	19	198			N 37.69986 W 121.806723
259+83	ETS		376	351	372	362	314		N 37.69928 W 121.806039
270+55	ETS-North	26						CNL IJTS - Likely destroyed during new overpass construction on Isabel.	N 37.69642 W 121.80552
	ETS- South								

ZONE 7 WATER AGENCY
CROSS VALLEY PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
272+54	CVPL	26						Livermore #5 Turnout was relocated. Documentation pending review.	37°41'44.70"N 121°48'20.56"W
	10" LIV PL								
281+00	ETS							Recommended new test station location.	37°41'36.80"N 121°48'19.87"W
291+00	ETS							Recommended new test station location.	37°41'20.35"N 121°48'14.91"W
301+00	ETS							Recommended new test station location.	37°41'26.48"N 121°48'20.62"W
311+00	ETS							Recommended new test station location.	37°41'20.18"N 121°48'2.50"W
321+43	ETS	24	282	300	241	248	228		N 37.68891 W 121.79728
339+17	ETS	56	279	270	220	219	238		N 37.68633 W 121.79448
350+30	ETS		235	184	178	176	171		N 37.68602 W 121.79108
361+04	AV	248	238	260	226	198			N 37.683089 W 121.79115
361+06	ETS	60	236	264	230	212	206		N 37.683092 W 121.79115
371+00	ETS		361	256	251	222	233		N 37.680414 W 121.79055
376+23	ETS		248	236	226	200			N 37.679536 W 121.78919
378+90	ETS-Left	66	110	152	102	101	113	ETS-Left-Pipe (Casing)	N 37.678978 W 121.788683
	ETS- Right					295	295		
381+85	ETS-Left	52	232	248	195	179	185	ETS-Left-Pipe (Casing)	N 37.678396 W 121.788019
	ETS- Right					513	501		
404+47	ETS- East		290			296	297	East-Livermore #2 West-Cross Valley (IJ)	N 37.679130 W 121.780731
	ETS-West		290	311	289	290	277		

ZONE 7 WATER AGENCY

DEL VALLE DAFT TO FLOC-SED BASINS OVERFLOW PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)					Comments	GPS Location
		2017	2014	2013	2012	2010		
1+10	ETS-White 1	160	68	202	289	304	East Of Disolved Air Flotation Basins On Access Road To Building	N 37.631653 W 121.78448
	ETS-White 2				289			
	ETS-Red 1	160			286	304		
	ETS-Red 2				286			
3+40	ETS-White 1	190	138	102	312		North Of Inlet Screen/Overflow (Both Leads For Overflow 48") (Red 1-Top, White 2-Bottom)	N 37.631343 W 121.78419
	ETS-White 2				311			
	ETS-Red 1	190			311			
	ETS-Red 2				311			

ZONE 7 WATER AGENCY
DEL VALLE DAF TO FLOC-SED BASINS PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)					Comments	GPS Location
		2017	2014	2013	2012	2010		
1+00	ETS-White 1	178	196	205	274	208	East Of Disolved Air Flotation Basins (Both Leads 24")	N 37.631553 W 121.78438
	ETS-White 2				274			
	ETS-Red 1				274	208		
	ETS-Red 2				274			
1+05	ETS-White 1	155	193	202	228	193	East Of Disolved Air Flotation Basins (Both Leads 24")	N 37.631453 W 121.78438
	ETS-White 2				229			
	ETS-Red 1	157			229			
	ETS-Red 2				229	193		
2+10	ETS-White 1	189	227	242	376	205	Next To Eyewash North Of Overflow (Both Leads For Raw Water 48") (Red 1-Top, White 2-Bottom)	N 37.631353 W 121.78428
	ETS-White 2				377			
	ETS-Red 1	238			558	266		
	ETS-Red 2				558			
2+50	ETS-White 1	169	51	129	118		South Of Inlet Screen/Overflow (Both Leads For Raw Water 48") (Red 1-Top, White 2-Bottom)	N 37.631243 W 121.78423
	ETS-White 2				118			
	ETS-Red 1	282			414	293		
	ETS-Red 2	32						
4+62	Pipe-U.S.	392			440		30" Meter Near BPS (D.S.-Down Stream, U.S.-Up Stream)	N 37.630556 W 121.78423
	Pipe-D.S.	259	376	251	475	512		

ZONE 7 WATER AGENCY
DEL VALLE LINE A

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
142+38	ETS-Left		371	312	362	320	301		N 37.643011 W 121.78381
	ETS- Right								
153+30	ETS-1		440	410	441	455	426	ETS-1-8", ETS-2-48"	N 37.64054 W 121.78589
	ETS-2	235	211			303	255		
	ETS-3		440						
162+50	ETS	130	429	375	372	460	418		N 37.63825 W 121.78633
176+50	ETS	230	525	438	470	527			N 37.63437 W 121.78628
181+45	ETS-Red 1		519	556	555	600	638	Vault North Of Clearwell Near Raw Water Pumps; IJ Checked 2013	N 37.633025 W 121.78633
	ETS-Red 2		519			595			
	ETS- Black 1		427			433			
	ETS- Black 2		427			433	463		

ZONE 7 WATER AGENCY
DEL VALLE LINE B (48" PCCP(?) PL, 1975)

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
4+50	ETS		268	276	346	335	305	Old DWR Meter Vault	N 37.631111 W 121.784939
4+60	ETS	280		341			228	CNL-Water G-5 Valve Box	
6+14	ETS-White		350	370	326	418	573	Anode Read Measured In mA (IJ Readings Taken On Pipe Above Ground South East Of Test Station) (Test Station Number Written On Big Fink)	N 37.630571 W 121.784492
	ETS- Black		364			414	503		
	ETS- Red		346			418	573		
	ETS- Yellow		973			1007			
	Anode		1479			2	2		
	IJ- Soil		354			400	559		
	IJ- BPS		354			447	503		
6+75	ETS-White		311	348	458	550	475	Marked Test Staion #2, Anode Read Measured In mA	N 37.630451 W 121.784452
	ETS- Black		273			386	272		
	ETS- Red		311			551	475		
	ETS- Yellow		1091			1,193			
	Anode		1534			376	43		
6+95	ETS-White		314	387	473	424	488	Marked Test Station # 3, Anode Read Measured In mA	N 37.630381 W 121.78439
	ETS- Black		275			268	278		
	ETS- Red		314			424	488		
	ETS- Yellow		1056			1,038			
	Anode		314			134	154		
7+26	IJ-BPS		422	323	439	482	431	Read Taken On Pipe Above Ground South Of Pump Building	N 37.630348 W 121.78435
	IJ- Soil		371			376	295		
7+70	ETS-White		27	25		8	707	Cut Wire 2012 After Construction Of New DWR Metering Vault	N 37.630149 W 121.78427
	ETS- Black		52			138	318		
	ETS- Red						707		
	ETS- Yellow								
	Anode						7		
	IJ- Soil					403	605		
	IJ- BPS					580	504		
8+15	ETS-White		492	454	401	334		Marked Test Station #5; 18" Tapping Saddle, Tapping Valve, And FCA	N 37.630119 W 121.78429
	ETS- Black		492			334			
	ETS- Yellow		1,039			1,038			
8+20	ETS-Left	530	90	32		72	428	Cut Wire 2013	N 37.63008 W 121.78429
	ETS- Right								
12+60	BO	720	512	126	433	15	7		N 37.62908 W 121.78365
13+64	ETS-DWR	black	1,309			1,623	1,335		
	ETS-Zone 7	red	1,313	1,361	1,414	1,621	1,335	On South Wall Of DWR Vault 19.34 (IJ) (Test leads are not continuous with ETS @ 8+15. Further investigation required to determine where break exists.)	N 37.62880 W 121.78357

ZONE 7 WATER AGENCY
DEL VALLE - LIVERMORE PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
4+50	ETS	118		263	260	265	278		N 37.67767 W 121.78349
20+64	BO			CNL	CNL	CNL	263	CNL-Buried In Landscape 2012 & 2013	N 37.67443 W 121.78283
29+16	ETS	144	492	283	272	294	286		N 37.67332 W 121.78057
46+31	ETS	120	353	330	316	333	360		N 37.66848 W 121.78049
53+12	LV-North			282	258	282	261	North And South Of Vault For Zone 7 To Cal Water #6	N 37.66656 W 121.78043
	LV-South					348	263		
57+89	ETS	120	411	354	355	366	280		N 37.66523 W 121.78039
62+25	ETS- Left		407	367	361	370	381	In BO Box	N 37.66433 W 121.78042
	ETS- Right								
64+85	ETS-Left	180	415	368	333	372	381	In ARV Box (Casing)	N 37.66338 W 121.78043
	ETS- Right					558	560		
73+75	ETS	280	360	335	345	346	363		N 37.661047 W 121.78013
77+74	ETS	150	383	374	351	375	389		N 37.65991 W 121.78069
110+92	ETS	130	390	382	424	426	380		N 37.651564 W 121.78283
120+83	ETS			328	340	358	362		N 37.648806 W 121.78292
127+50	ETS	110	362	355	363	351	362		N 37.646992 W 121.78308
130+30	ETS	110	377	341	345	350	367		N 37.64624 W 121.78309
142+22	ETS-Left			354	393	387	362	Connection To Vineyard Pipeline (IJ)	N 37.642978 W 121.78367
	ETS-Right								

ZONE 7 WATER AGENCY
DOUGHERTY RESERVOIR PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
				Rectifier OFF	Rectifier OFF	Rectifier OFF	Rectifier OFF		
		Native	2017	2014	2013	2012	2010		
150+05	ETS-White	525	565	614	597	566	583	The ETS-Single Did Not Have A Steady Off Reading During Use Of Interrupter	N 37.71002 W 121.91058
	ETS- Black		565	614	597	566	583	570/565 ('17)	
	ETS- Green		1,018	614	598	562	581	1024/1018 ('17)	
	ETS- Yellow		565	614	597	564	583	570/565 ('17)	
	ETS- Single		604	746	732		720	604 ('17)	
155+50	BO	503	370	1,480	891	955	1,071	2014 off data is elevated - confirm during following survey. (2017) Not on this pipeline	N 37.71165 W 121.91072
161+70	ETS		368	1,379	942	1,000	994	Labeled 3+29 Hop. 2014 off data is elevated - confirm during following survey. (2017) Not on this pipeline	N 37.71276 W 121.91209
169+90	ETS	454	750	693	709	1,008	958	In BO Box (Casing). (2017) 873 on /750 off	N 37.71469 W 121.91379
177+80	ETS	418	CNL	695	647	1,000	946	Lead Needs To Be Replaced	N 37.71643 W 121.91530
183+34	ETS		CNL	CNL	CNL	CNL	955	CNL-Lead Needs To Be Replaced	N 37.7176 W 121.91499
189+85	ETS	392	688	670	911	958	901		N 37.71939 W 121.91505
192+20	BO	449	671	652	688	960	940		N 37.71990 W 121.91514
199+40	ETS-Red			824		412		Vault At Dougherty Reservoir, Red 2-Tank, Black 2-Pipe At Tank Reservoir Tank) (IJ)	N 37.721919 W 121.91519
	ETS- Black		790	823	591	413		812 on/790 off ('17)	
	ETS- Red 2					370			
	ETS-Black 2		790	823	591	413		812 on/790 off ('17)	

ZONE 7 WATER AGENCY

DSRSD #4 TURNOUT PIPELINE (Previously Santa Rita Turnout)

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
103+93	ETS-Top 1	375			853	550	911	In ARV Box At BART Station	N 37.702081 W 121.89708
0+07	ETS			1225 (on)	232	377		Pipe project equation: ex sta 8+27 = new sta 0+00	N 37.70214 W 121.89323
1+04	Red Wire			1207 (on)				16" Ductile Iron Pipe	
	White Wire	350		350				30" CMCL Pipe	
7+07*	Red Wire			369				16" Ductile Iron Pipe	
	White Wire	369		321				30" CMCL Pipe	
8+09	ETS	605		327	232	377		Leads In Vault	N 37.70214 W 121.89323
109+89	ETS	418		Abandoned	352	763			N 37.70201 W 121.89503
115+90	ETS	605			232	377		Leads In Vault	N 37.70214 W 121.89323
131+34	BO					681		Isolated In 2012. Could Not Access In 2013.	N 37.703414 W 121.89308

* Pipe potentials indicate potential electrical continuity between ductile iron and mortar coated pipe; however, continuity testing indicates electrical isolation at the insulating flange.

ZONE 7 WATER AGENCY
EL CHARRO PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
100+00	White		289	225	199	228	286	North TS -IJTS on 14" UGW, marker post gone	N 37.686032 W 121.84883
	Red		369	386			349		
100+00	Black		260	238			209	South TS - IJTS on 36" TW, marker post gone	
	Red		191	157			72		
107+00	ETS-Black	221		203	210	210		Black-36", White-14"	N 37.687813 W 121.84847
	ETS- White	482		270		192			
114+00	ETS-Black	213		219	191	224		Black-36", White-14"	N 37.689753 W 121.84852
	ETS- White	548		284		203			
120+00	ETS-Black	253	280	280	265	267		Black-36", White-14", in driveway to well house	N 37.691342 W 121.84867
	ETS- White	558	308	343		252			
128+10	ETS-Black	169	223	127	166	154		Black-36", Needs New Post Marker (Casing), Casing Shorted	N 37.693582 W 121.84860
	ETS- Black 2	595	590	127		535			
131+50	ETS-Black	199	207	203	227	204		Black-36" (Casing), Casing Shorted, Casing 570, test station settled - conduit stops lid from closing	N 37.694372 W 121.84836
	ETS- Black 2	627		203					
137+00	ETS-Black	224		240	227	239		Black-36"	N 37.696040 W 121.84836
146+64	ETS- White			CNL	CNL	219		CNL 2013, Paved Over	N 37.698579 W 121.84833
	ETS-Red			CNL	CNL	192			

ZONE 7 WATER AGENCY
HOPYARD PIPELINE (20" & 18" CCP, cir 1985)

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
0+19	BO	492	516	519	488	470			N 37.678389 W 121.90052
1+24	BO				488	459		Traffic control needed	N 37.678269 W 121.90101
1+82	TO		514		377	365		Pleasanton #2 TO (Test On Pipe)	N 37.678319 W 121.90116
11+32	AV			485	462	476		South Bank Of Canal	N 37.67999 W 121.903792
13+17	AV		551	473	466	481		North Bank Of Canal	N 37.680409 W 121.90392
52+25	ETS-Left		395	331		273		Leads Wires Need To Be Extended. Can Not Access In 2013 Faulty Lock, Direct contact	N 37.691228 W 121.90391
	ETS- Right					273			
77+67	ETS		628	621	616	603	598	ETS In Manhole At Shell Gas Station Entrance	N 37.69815 W 121.90363
81+11	BO	580	613	614	605	590	586		N 37.69897 W 121.90367
86+20	ETS		641	653	628	617	637		N 37.700308 W 121.90358
88+95	ETS		725	725	703	696		Water Lid S. Of Large MH	N 37.70120 W 121.90356
89+00	ETS	611	724	708	684	693	692	Water Lid N. Of Large MH	N 37.70121 W 121.90362
89+32	ETS-Left	598	555	654	659	569	556	Right Fink Pipe. Left Fink Casing. Resistively Shorted.	N 37.70126 W 121.90346
	ETS- Right		653			646	643		
93+32	ETS-Left		697	636	711	725	743	L. Fink Pipe. Wires In Box Casing. Resistively Shorted.	N 37.70207 W 121.90346
	ETS- Right		555			647	627		
103+50	ETS- Green		749	580	595	560	979	White 4X4 Post At Motorcycle Shop Garage Door, water valve	N 37.705311 W 121.90357
	ETS- White								
103+86	ETS	606					1,050	CNL-Buried Against Fence	
115+83	ETS-White	648			441	489	562	Camp Parks Turnout-Army Base (At Gate Ask To Speak With Joe Tavers)	N 37.70816 W 121.90330
	ETS- Green					489	558		
	ETS_ Black					436	461		
	ETS- Yellow					436	465		

ZONE 7 WATER AGENCY
LIVERMORE #1 PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)								Comments	GPS Location
		Native	Rectiifier On	Recitifer Off	Rectiifier On	Recitifer Off	Rectifier Off	Rectifier Off	Rectifier Off		
			2017		2014	2014	2013	2012	2010		
7+53	ETS-Right	351	1,400	1,166	1,217	984	911	826	1,153	Left-Clearwell, Right-Pipe (IJ), Isolated 2013	N 37.69447 W 121.68412
	ETS- Left	399	413	552				552	570		
11+21	BO	424	1,403	1,136	1,155	943	973	437	1,076		N 37.69430 W 121.68523
17+99	ETS		1,566	1,091	1,298	980	791	771	1,106		N 37.69434 W 121.68745
26+00	ETS	364	1,651	1,164	1,218	887	936	747	1,180		N 37.69430 W 121.69042
35+05	ETS				1,182	854	875	695	1,076	CNL, construction recently	N 37.69434 W 121.69352
44+40	ETS	300	1,550	1,037	1,105	762	790	616	1,017		N 37.69420 W 121.69660
45+17	BO	289								In Lawarence Livermore Lab Contact Safety And Security At Zone 7: dmoy@zone7water.com Need To Schedule At Least 24 Hours In Advance	
49+00	ETS										
55+40	ETS										
68+55	ETS										
80+11	ETS										
88+11	ETS										
94+80	ETS										
104+40	ETS		1,792	1,120	1,268	852	844	680	1,098		N 37.69446 W 121.71735
108+31	ETS	391	1,760	1,080	1,258	838	846	704	1,122	Loops Lid In Sidewalk	N 37.69436 W 121.71877
111+00	ETS	364	1,772	1,085	1,276	860	867	601	1,112		N 37.69496 W 121.71865
117+10	ETS	363	1,818	1,164	1,326	889	901	628	1,130		N 37.69672 W 121.71886
125+30	ETS	405	1,893	1,261	1,304	885	907	622	1,124		N 37.69631 W 121.72176
133+00	ETS	401	1,788	1,153	1,287	898	918	621	1,167		N 37.69598 W 121.72461
143+50	ETS	389	595	591	1,280	905	905	627	1,136		N 37.69540 W 121.72825
150+74	ETS	410	1,729	1,122	1,250	889	876	617	1,115		N 37.69493 W 121.73048
157+00	ETS	372	1,614	1,110	1,181	864	889	600	1,089		N 37.69462 W 121.73219
160+40	ETS	353	1,634	1,170	1,182	876		602	1,105		N 37.69487 W 121.73345
162+80	ETS-Left	367	1,628	1,124	1,187	894	896	604	1,101	One Wire Cut 2012	N 37.695002 W 121.73389
	ETS- Right							101	311		
166+34	ETS	532			1,178	858	CNL	CNL	CNL	CNL-Precast Boxes Destroyed	
166+86	ETS		1,677	1,130	1,204	884	915	600	CNL		N 37.694975 W 121.73515
172+04	BO	366	1,681	1,122	1,122	848	782	578	1,110		N 37.694301 W 121.73699
183+05	ETS		1,693	1,188	1,190	876	857	592	1,111		N 37.692898 W 121.74041
196+00	Vault	502							1,002	Cal Water Service-No Access 2012, 2013, 2014	
207+00	ETS	434	1,739	1,151	1,170	886	872	618	CNL		N 37.689969 W 121.74764
218+98	ETS	354	1,653	1,110	1,157	894	826	624	949	Vent Isolated 2012	N 37.68838 W 121.75140
219+62	ETS	392	1,621	1,096	1,063	819	819	571	822	Vent Isolated 2012	N 37.68825 W 121.75131
220+00	ETS- Red	247	806	851	1,022	806	845	634	278	Silver Oaks Pump Station In Vault Adjacent Driveway	N 37.68811 W 121.75137
	ETS-Black	389	1649	1113				314	1,051		

ZONE 7 WATER AGENCY
LIVERMORE #2 PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2,017	2014	2013	2012	2010		
220+00	ETS-Red	247	919	406*	389	835/634	278	Silver Oaks Pump Station. Wires In Vault. IJ. Confirm Data. Probable short from Livermore #1 to Livermore #2 at this location.	N 37.68811 W 121.75137
	ETS-Black	389	1,825			286/314	1,043		
229+47	ETS		987	782	395	219	359	in landscaping	N 37.68726 W 121.75435
236+40	ETS		1,007	691	398	282	346	in parking lot	N 37.68652 W 121.75662
243+00	ETS-Left	268	927	679	375	236	351	IJ. (over fence)	N 37.68588 W 121.75883
	ETS-Right		927			236	355		
248+75	AV			533	314	202	210		N 37.6853 W 121.76047
248+96	ETS-Left	307	958		455	301	391	IJ.	N 37.68531 W 121.76065
	ETS-Right		962			297	378		
255+80	ETS-Red					529	477	Field STA 8+22. Resistive Short To Livermore #2. (in turn lane)	N 37.68504 W 121.76162
	ETS-White			890	689	599	488	DI Pipe replacement from 255+80 to 263+17 (confirm span of DI PL). HP Mag anodes installed on DI replacement section of pipeline.	
	ETS-Black					1,707	1,707	Missing 2017 data.)	
	Current					40 mA			
263+17	ETS-Red		293			309	280	Field STA 0+85. IJ Checked & Funcitional In 2012.	N 37.684342 W 121.76400
	ETS-White		942	905	588	470	478		
	ETS-Black		942			1,633	1,681		
	Current		30 mA			40 mA			
266+00	AV		928	237	251	278		Read Taken Off AV. (Confirm potential outlier data. Elevated relative surrounding Livermore pipeline, and probably not CP on ARV.)	N 37.68378 W 121.766033
266+51	ETS	287	356	306	297	416	320	In Vent At STA 266+55 (possible fire damage?)	N 37.68367 W 121.76630
267+40	ETS	304	289	265	294	278	315		N 37.683886 W 121.76658
	AV					270			
285+60	BO		294	90	263	254		In Median	N 37.68252 W 121.772153
313+50	ETS	404	231	242	254	225	282		N 37.67972 W 121.78073
313+53	Vent	238	232			266	232		N 37.67972 W 121.78073
314+22	ETS	198	246	254	251	251	262	In Median	N 37.67947 W 121.78048

ZONE 7 WATER AGENCY
MOCHO PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	2017	2014	2013	2012	2010		
5+00	East-Left		352	350		312	389	Well #6 Outlet	N 37.67871 W 121.90020
	East-Right		364	362		310			
	West-Left		201	194		309	363		
	West-Right		353	350		75			
5+48	ETS-Left		311	301		341		Left Measured On Bottom, Right Measure On Top	N 37.67882 W 121.89989
	ETS-Right		455	468	452	449	449		
8+80	ETS-Left		301	293		295			N 37.67914 W 121.89896
	ETS-Right	389	354	351	335	304	372		
17+18	ETS-Black		288	294	331	296	348	Water Lid	N 37.68055 W 121.89659
	ETS-Red		534	527		537	529		
27+16	LV		301	206	326	282	338		N 37.6823 W 121.89587
37+00	ETS	363	310	277	312	282	341		N 37.68383 W 121.89233
48+00	ETS	373	310	277	302	279	346		N 37.68495 W 121.88970
58+00	ETS	368	CNL					CNL-Paved Over 2010	N 37.68637 W 121.88629
58+90	ETS		286	272	294	270			N 37.68648 W 121.88592
67+00	ETS	358	272	268	301	266	325		N 37.68713 W 121.88372
75+90	LV		190	173		50	326	Not Steady (Install test lead on structure)	N 37.68799 W 121.88066
79+20	ETS	343	271	260	288	265	334	Isolated From Cross Valley Pipeline 2012	N 37.68842 W 121.87955
85+00	ETS		252	246	281	261	292	Isolated From Cross Valley Pipeline 2012	N 37.68890 W 121.87769

ZONE 7 WATER AGENCY
SANTA RITA - DOUGHERTY PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)						Comments	GPS Location
		Native	Rectifier Off	Rectifier Off	Rectifier Off	Rectifier Off	Rectifier Off		
			2017	2014	2013	2012	2010		
23+19	ETS	305	725	603	649	789	769	934 on/725 off ('17)	N 37.68718 W 121.87784
29+25	ETS	452						CNL-Mocho Well (Buried)	
39+03	BO	373	656	797	641	820	802	Near Stall 4771 In Pavement. 715/656 ('17)	N 37.6901 W 121.88180
47+59	ETS		737	681	693	839		Across From Stall #138. 1062/787 ('17)	N 37.69175 W 121.88401
54+10	ETS-Red		780	679	709	836	824	In Manhole Between Last Parking Spots (By Canal). 1020/780 ('17)	N 37.69288 W 121.88579
	ETS-Black					832			
62+49	ETS		819	705	731	837	811	1102/819 ('17)	N 37.69445 W 121.88781
74+00	ATS-Left	421				1,083	864	Left Read Was Steady. 1118/839 ('17)	N 37.69661 W 121.89098
	ATS-Right		839	723	764	860			
86+00	ATS	390					849	CNL-Paved Over 2012	N 37.69884 W 121.89386
87+00	ATS	389	830	705	765	857	847	1203/830 ('17)	N 37.69909 W 121.89423
93+00	ETS		846	723	762	860	844	Owens Rd/BART Parking Lot. 1227/846 ('17)	N 37.70008 W 121.89594
98+68	BO	364	822	758	762	885	870		N 37.70113 W 121.89710
102+05	ETS	418					855	CNL 2012. Probably destroyed during BART expansion.	
102+20	BO	350					876	CNL 2012. Probably destroyed during BART expansion.	
106+80	ETS-Left		827	777	804	886	807	Casing Lead Missing (Casing)	N 37.70213 W 121.89868
	ETS-Right						605		
107+33	ETS-Left	406	828	772	809	887	905	Casing Lead Missing (Casing). 1220/828 ('17)	N 37.70222 W 121.89899
	ETS-Right						605		
107+80	ETS-Left	417						CNL 2012-Landscaping At BART (Casing)	N 37.70221 W 121.89910
	ETS-Right								
108+92	AV					127			N 37.70240 W 121.899461
113+00	ATS-Left					1,273		No Shift/Not Connect To Pipe 2012	N 37.70355 W 121.901017
	ATS-Right			792		914			
114+54	BO		849	826	901	814	955	1239/849 ('17)	N 37.7038 W 121.901431
117+00	ATS	118				1,385		No Shift/Not Connect To Pipe	N 37.70431 W 121.90199
118+00	ATS	64				1,355		No Shift/Not Connect To Pipe	N 37.70447 W 121.90225
120+00	ATS	243				1,343		No Shift/Not Connect To Pipe	N 37.70487 W 121.90275
122+00	ETS-White	690						In Curb At Motorcycle Shop. 1041/986 ('17)	N 37.705100 W 121.90339
	ETS-Green	451	986	838	812	978	988		
139+00	ETS		870	752	805	924	911	1407/876 ('17)	N 37.706703 W 121.90535
143+00	ATS	578	928	790	876	957	938	1456/928 ('17)	N 37.707072 W 121.90586
147+96	ETS	513				1,118	1,140	Lead In Rectifier (IJ)	N 37.70985 W 121.91019
147+98	AV					42		North Of Rectifier	N 37.70988 W 121.91014
148+00	Rectifier		1,141	1,082	1,126	1,126	1,140	1914/1141 ('17)	N 37.70985 W 121.91019
148+04	LV	480	441	1,088	1,167	1,174	1,140	Lead In Rectifier. 1914/1141 ('17)	N 37.70985 W 121.91019

ZONE 7 WATER AGENCY
SYCAMORE PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)					Comments	GPS Location
		Native	2017	2014	2013	2012		
+	BO			452	419	322		N 37.645289 W 121.78320
123+10	Meter			330	450	371		N 37.625213 W 121.75687
123+29	AV					29		N 37.624397 W 121.75691
123+30	BO					20		N 37.624397 W 121.75691

ZONE 7 WATER AGENCY
VASCO #1 PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)								Comments
		Native	Rectifier On	Rectifier Off	Rectifier Off	Rectifier Off	Rectifier On	Rectifier Off	Rectifier Off	
			2017		2014	2013	2012	2012	2010	
+40	ETS	371	1,893	1,147	871	914	936	619	903	
+80	Casing	637	448	458	348	462	443	449	930	
+85	ETS	378	1,873	1,137	819	922	911	603	872	
1+42	Rectifier	362	2,250	1,130	995	909	971	931	906	ACE Commuter Station
3+25	ETS		2,102	1,156	826	926	914	604	934	
6+05	ETS		1,770	1,101	889	932	914	690	942	Needs Lid For G-5
9+57	ETS				894	918	916	696	972	Broken wire
17+60	ETS	401	1,410	1,028	1,046	1,036	1,086	1,049	490	Casing Insulated In 2012.
22+11	ETS	466							901	Could Not Locate Paved Over 2012
27+26	ETS	449							886	Could Not Locate Paved Over 2012
27+80	ETS	464	1,370	1,016	1,055	1,047	1,072	1,039	875	

ZONE 7 WATER AGENCY
VASCO #2 PIPELINE

Station	Location	Pipe-To-Soil Potential (-millivolts)								Comments	GPS Location
		Native	2017 On	2017 Off	2014 Off	2013 Off	2012 Off	2010 Off	2008 Off		
+22	AV		1,340	1,028	1,077	1,038	1,026			In Sidewalk	N 37.703933 W 121.72136
11+59	ETS	424	1,416	1,041	1,167	1,091	1,078	1,022	977	Livermore #8 Turnout	N 37.70598 W 121.72344
19+91	ETS	497	1,460	1,055	1,198	1,139	1,127	1,049	980	No Definite Read On Vent 2012	N 37.70805 W 121.72481
	Vent	621						560	514		
23+15	ETS	492	1,553	1,073	1,269	1,212	1,199	1,082	960	No Definite Read On Vent 2012	N 37.70878 W 121.72530
	Vent	621						594	592		
24+20	ETS	497	1,553	1,064	1,297	1,240	1,226	1,106	985	No Definite Read On Vent 2012	N 37.70904 W 121.72551
	Vent	522	590	564				544	548		
25+65	ETS_Red									Vasco 2 PL (red wire)	N 37°42'33.78" W 121°43'32.45"
	ETS-White									Altamont 18" CMCL (white) (TS is associated with VRCS and documented on Alt des dwgs at sta 1+93)	
37+45	ETS	479	751	641	743	803	765	736	972		N 37.71212 W 121.72457
37+74	ETS-Red				239	280	134		93	Livermore #6 Turnout. Black cable may not be attached to buried Vasco #2 PL.	N 37.71218 W 121.72457
	ETS-Black							93	266		

APPENDIX III: RECTIFIER DATA

Zone 7

ALTAMONT PIPELINE

Rectifier No 1. - Manufacturer: Corrpro, Model: RTS CAYSE 40V-34A AVOZ 241, 1014, 2018, 2019, Serial No.: C-090005

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)									GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	Total		
Location-Northfront Road West Of North Vasco Road (Station 332+90)	8/25/2009	KAP	D	4	35.00	34.00												N 37.70943 W 121.725569	4/25/2017
	8/26/2009	KAP	B	1	11.10	10.10													7.75 V
	8/27/2009	KAP	B	1	9.50	36.00													21.76 A
	8/27/2009	KAP	A	3	4.00	15.00													A1) 0.32
	2/17/2010	KAP	A	5	6.02	16.50													A2) 0.24
	2/15/2012	BH/PW	A	5	8.00	18.90													A3) 0.21
	7/11/2012	WH/BH	A	5	7.90	19.30			3.03	3.09	2.31	2.35	2.49	2.72	2.91	4.65	23.55		A4) 0.2
	9/14/2012	BH	A	5	7.70	18.20			2.93	1.15	1.65	1.16	2.19	2.08	2.70	4.20	18.06		A5) 0.24
	11/13/2012	PW	A	5	7.72	22.73			3.01	3.05	2.25	2.29	2.30	2.50	2.68	4.46	22.54		A6) 0.25
	1/28/2013	PW	A	5	7.66	17.80													A7) 0.27
	3/12/2013	PW	A	5	7.66	22.10	1,385												A8) 0.42
	5/6/2013	PW	A	5	7.58	21.84	1,382												
	7/15/2013	PW	A	5	7.54	21.62	1,396												
	9/26/2013	JW/PW	A	5	7.47	19.30													
	12/18/2013	BH	A	5	7.72	23.76	1,402		3.10	3.00	2.30	2.30	2.40	2.50	2.80	4.40	22.80		
	11/5/2014	DK	A	5	7.5	21.36	1,381	1081	3.00	2.70	2.10	2.20	2.20	2.40	2.50	4.10	21.20		
	5/1/2015	BH	A	5	7.54	26.70	1,587		3.10	2.80	2.20	2.20	2.30	2.50	2.70	4.10	21.90		
	8/21/2015	DK	A	5	7.57	22.08	1,445	980	3.10	2.80	2.10	2.20	2.30	2.40	2.70	4.10	21.70		
	6/15/2016	DK	A	5	7.49	21.12	1,359	1039	3.10	2.50	2.00	2.20	2.30	2.40	2.50	4.10	21.10		
	10/13/2016	DK	A	5	7.6	21.44	1,206	923	3.10	2.40	2.00	2.20	2.40	2.50	2.70	4.20	21.50		

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)									GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	Total		
Location-W. Los Positas & Hilliker Place (Station 483+00)	8/25/2009	KAP	B	4	17.80	34.00												N 37.698158 W 121.76914	4/12/2017
	8/26/2009	KAP	A	3	5.90	10.10													16.34 V
	8/27/2009	KAP	A	5	9.90	36.00													26.0 A
	2/16/2010	KAP	B	3	16.41	15.00													2.3
	2/29/2012	BH/PW	B	5	20.48	35.20													3.4
	2/29/2012	BH/PW	B	3	16.24	27.70													3.4
	7/11/2012	WH/BH	B	3	16.70	27.40			2.24	3.43	3.15	3.26	3.88	0.22	3.66	6.88	26.72		3.2
	9/14/2012	BH	B	3	16.70	26.10			2.40	3.50	3.20	3.30	3.70	0.10	3.50	6.70	26.40		3.7
	11/13/2012	PW	B	3	16.28	26.20			2.33	3.50	3.19	3.29	3.58	0.04	3.33	6.55	25.81		3.8
	1/28/2013	PW	B	3	16.21	25.40													
	3/12/2013	PW	B	3	16.36	26.29	1,258												
	5/6/2013	PW	B	3	16.17	25.76	1,208												
	7/15/2013	PW	B	3	16.34	26.07	1,130												
	9/26/2013	JW/PW	B	3	16.07	25.89													
	12/18/2013	BH	B	3	16.58	22.60	1,212		2.50	3.70	3.50	3.40	3.70	0.00	3.50	6.70	27.00		
	11/5/2014	DK	B	3	16.4	26.14	1,204	838	2.20	3.50	3.50	3.20	3.70	0.00	3.40	6.60	26.10		
	5/1/2015	BH	B	3	16.34	26.48	1,258		2.40	3.60	3.70	3.40	3.70	0.10	3.60	6.70	27.20		
	8/21/2015	DK	B	3	16.51	26.08	1,201	850	2.10	3.10	3.40	3.10	3.50	0.10	3.40	6.50	25.20		
	6/15/2016	DK	B	3	16.55	26.56	1,282	937	2.30	3.50	3.50	3.20	3.80	0.10	0.38	6.80	23.58		
	10/13/2016	DK	B	3	16.48	27.20	1,275	869	2.30	3.60	3.60	3.30	3.60	0.00	3.60	6.60	26.60		

Rectifier No 3. - Manufacturer: Corrpro, Model: RTS CAYSE 40V-34A AVOZ 241, 1014, 2018, 2019, Serial No.: C-090006

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)									GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	Total		
	8/25/2009	KAP	A	4	25.00	34.00													On 2/29/2012 Airport Rate Control Station Was Found Off And PG&E Meter Was
	8/26/2009	KAP	A	4	6.00	7.00													

Location-Airway Blvd. & Isabel (Station 607+00)	8/27/2009	KAP	B	3	14.00	15.00												N 37.696747 W 121.80372	Removed From Panel Thus The Rectifier Had No Power And No Testing Was Completed 4/25/17 15.18V 23.2x0.8 = 18.56 A A1) 1.8 A2) 3.3 A3) 0.1 A4) 4.0 A5) 3.6 A6) 0 A7) 3.1 A8) 3.4
	2/17/2010	KAP	B	4	15.20	29.30													
	2/29/2012	BH/PW	B	4															
	7/11/2012	WH/BH	B	4	15.60	21.60			1.99	2.06	3.26	3.77	3.60	1.52	4.38	5.50	26.08		
	9/14/2012	BH	B	4	15.60	25.50			1.73	2.10	3.41	3.54	3.27	1.44	4.41	5.23	25.13		
	11/13/2012	PW	B	4	15.52	25.60			1.51	1.92	3.26	3.72	3.40	1.48	4.62	5.35	25.26		
	1/28/2013	PW	B	4	15.32	24.40													
	3/12/2013	PW	B	4	15.60	24.48	1,662												
	5/6/2013	PW	B	4	15.37	24.53	1,577												
	7/15/2013	PW	B	4	15.50	24.86	1,623												
	9/26/2013	JW/PW	B	4	15.21	23.91													
	12/18/2013	BH	B	4	15.67	24.40	1,607		1.50	1.90	3.20	3.70	3.60	1.70	4.70	3.80	24.10		
	11/5/2014	DK	B	4	15.66	21.36	1,544	894	1.50	2.00	2.20	4.40	3.50	1.50	3.20	4.40	22.70		
	5/1/2015	BH	B	4	15.55	21.87	1,696		1.60	2.20	2.20	3.90	3.10	1.50	3.40	4.00	21.90		
	8/21/2015	DK	B	4	15.64	20.64	1,537	882	1.70	2.40	2.20	4.00	3.20	1.50	3.40	4.10	22.50		
	6/16/2016	DK	B	4	15.81	20.08	1,520	922	1.90	3.40	0.10	4.20	3.90	0.10	3.50	3.60	20.70		
	10/13/2016	DK	B	4	15.72	20.08	1,337	908	1.80	3.30	0.00	4.00	4.00	0.00	3.60	3.80	20.50		

Zone 7

DEL VALLE WATER TREATMENT PLANT

Rectifier No 2. -Clearwell (External) - Manufacturer: , Model: CPAYSA 30-12 FNPSTZ, Serial No.: 89C1626

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)														GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	Total			
Del Valle WTP Plant S. Of Guard Shack And Main Gate Anodes Are In Junction Boxes Around The Face Of The Tank 4 Total Pull Boxes	4/6/2006		A	5	7.25	7.01																N 37.633094 W 121.78596	Anode Juntion Box #1 Contains Anodes 1, 2, & 10 Anode Junction Box #2 Contains Anodes 7, 8, & 9 Anode Junction Box #3 Contains Anodes 3, 5, & 6 Anode Junction Box #4 Contains Anodes 4, 11, & 12
	12/1/2006		A	5	7.16	6.89																	
	4/19/2007	KAP	A	5	7.19	6.79																	
	6/6/2007	KAP	A	5	7.13	6.86			0.18	0.2	0.16	0.93	1.53	1.33	0.16	0.53	0.22	0.16	0.46	0.94	6.80		
	6/12/2008	KAP	A	5	7.02	6.72																	
	6/16/2010	KAP	A	5	7.06	7																	
	4/24/2012	BH/PW	A	5	7.31	7.26																	
	4/25/2012	MA/PW	A	3	5.20	4.8																	
	7/11/2012	WH/BH	A	5	5.36	4.74			0.14	0.15	0.12	0.54	1.03	0.9	0.1	0.37	0.16	0.12	0.32	0.64	4.59		
	9/14/2012	BH	A	4	5.50	5.01			0.14	0.17	0.11	0.47	1.05	0.71	0.1	0.4	0.18	0.13	0.34	0.71	4.51		
	11/13/2012	PW	A	4	5.43	4.78			0.08	0.13	0.13	0.56	1.12	0.94	0.04	0.35	0.13	0.10	0.35	0.67	4.60		
	1/28/2013	PW	A	4	5.38	4.59	1,565																
	3/12/2013	PW	A	4	5.37	4.46	1,565																
	5/6/2013	PW	A	4	5.38	4.69	1,642																
	7/15/2013	PW	A	4	5.27	4.8	1,634																
	9/30/2013	JW/PW	A	4	5.28	4.56																	
	12/18/2013	BH	A	4	5.19	4.29	1,535		0.1	0.13	0.13	0.51	0.95	0.82	0.08	0.32	0.14	0.10	0.30	0.60	4.18		
	11/5/2014	DK	A	4	5.41	4.77	1,655	801															
	5/1/2015	BH	A	4	5.3	4.68	1,623		0.1	0.14	0.11	0.64	0.98	0.86	0.09	0.33	0.15	0.10	0.37	0.61	4.48		
	8/21/2015	DK	A	4	5.27	4.77	1,655	862	0.1	0.13	0.12	0.51	0.98	0.82	0.09	0.32	0.14	0.11	0.29	0.60	4.21		
	6/16/2016	DK	A	4	5.31	4.8	1,668	852	0.13	0.15	0.12	0.70	1.01	0.88	0.11	0.39	0.15	0.12	0.32	0.63	4.71		
	10/13/2016	DK	A	4	5.17	4.65	1,644	870	0.12	0.15	0.12	0.60	1	0.88	0.09	0.35	0.15	0.12	0.32	0.62	4.52		
	4/25/2017				5.37	4.56																	

Zone 7

DEL VALLE WATER TREATMENT PLANT

Rectifier No 1. -Clearwell (Internal) - Manufacturer: , Model: CPAYSA 24-16 FNPSTZ, Serial No.: 89C1625

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Reference Potential (-mV)	Set Potential (-V)	Meter Voltage (Volts)	Meter Current (Amps)	GPS (Lat/Lon)	Comments
Del Valle Water Treatment Plant South Of Guard Shack And Main Gate Access Driveway Through Dirt Road Around Tank	8/5/2005		A	3	111/100	N/A	2.15	0.19	N 37.633094 W 121.78596	
	10/31/2005		A	3	113/51	N/A	2.15	0.11		
	1/6/2006	KAP	A	3	112/43	N/A	2.30	0.10		
	4/6/2006	KAP	A	3	N/A	0.600	2.16	0.09		
	4/6/2006	KAP	A	3	N/A	0.300	2.21	0.11		
	12/1/2006	KAP	A	3	306/160	N/A	2.46	0.20		
	4/19/2007	KAP	A	3	474/560	0.426	3.05	0.48		
	6/21/2007	KAP	A	3	463/144	0.385	3.05	0.74		
	6/21/2007	KAP	A	3	450/125	350.000	2.95	0.40		
	6/12/2008	KAP	A	3	102/50	0.100	3.40	0.21		
	6/16/2010	KAP	A	3	N/A	0.100	2.78	0.60		
	4/24/2012	BH/PW	A	3	250	0.100	2.78	0.76		
	7/11/2012	WH/BH	A	3	250	0.100	2.80	0.68		
	9/14/2012	BH	A	3	250	0.100	2.70	0.72		
	11/13/2012	PW	A	3	232	0.100	2.62	0.45		
	1/28/2013	PW	A	3	220	0.100	2.59	0.52		
	3/12/2013	PW	A	3	186	0.100	2.60	0.43		
	5/6/2013	PW	A	3	183	0.100	2.72	0.51		
	7/15/2013	PW	A	3	299	0.100	2.53	0.54		
	10/3/2013	JW/PW	A	3	167	0.010	2.37	0.42		
	12/18/2013	BH	A	3	287	0.100	2.48	0.36		
	11/5/2014	DK	A	3	132	0.100	2.27	0.44		
	5/1/2015	BH	A	3	289	0.100	2.35	0.52		
	8/21/2015	DK	A	3	189	0.100	2.00	0.20		
	6/16/2016	DK	A	3	98	0.100	2.00	0.20		
	10/13/2016	DK	A	3	99	0.100	2.00	0.20		

jdh corrosion consultants, inc.

Zone 7

DOUGHERTY RESERVOIR

Rectifier No 2. - Reservoir (External) - Manufacturer: , Model: CSAYSA 40-34, Serial No.: 83C2525

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)									GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	Total		
Off Stagecoach Road And Topaz Circle Enter Through Gate To The North	4/6/2006	KAP	B	5	22.83	17.48												N 37.721919 W 121.91519	Anodes Are Located Around The Outside Of The Tank And Junction Boxes Are Attached To ATS Posts. 10/13/16: Rectifier output increased to settings as shown.
	4/7/2006	KAP	C	3	29.62	24.29													
	12/1/2006	KAP	C	3	30.15	15.52													
	4/19/2007	KAP	C	3	30.56	13.83													
	6/6/2007	KAP	C	3	30.26	12.81													
	6/6/2007	KAP	C	3	35.56	14.13													
	6/12/2008	KAP	C	4															
	3/25/2012	BH/PW	A	3	1.37	0.08													
	5/3/2012	PW	C	3	29.91	13.92													
	7/11/2012	WH/BH	C	3	30.90	9.76			0.02	0.32	1.57	0.03	1.27	0.01	1.42	N/A			
	9/14/2012	BH	C	3	31.00	9.52			0.09	1.13	0.09	0.00	1.17	1.21	0.20	N/A			
	11/13/2012	PW	C	3	30.98	5.83			0.15	1.33	0.08	0.80	1.42	1.29	0.28	0.27	5.62		
	1/28/2013	PW	C	3	29.33	10.56													
	3/12/2013	PW	C	3	29.98	8.46	1,833												
	5/6/2013	PW	C	3	30.03	8.36	1,568												
	7/15/2013	PW	C	3	30.51	6.39	1,247												
	9/25/2013	JW/PW	C	3	30.29	5.76	1,177												
	10/2/2013	JW/PW	C	3	30.60	5.73													
	10/2/2013	JW/PW	D	1	37.29	7.28	1,520												
	12/18/2013	BH	D	1	38.30	9.30	1,719		0.20	2.00	0.20	0.90	2.00	1.80	0.30	0.12	7.52		
	11/5/2014	DK	D	1	37.29	6.14	1,288	535											
	5/1/2015	BH	D	1	35.94	9.80			0.20	2.10	0.20	0.90	2.00	1.70	0.30	0.10	7.50		
	8/21/2015	DK	D	1	36.93	6.47	1,350	580	0.13	1.40	0.13	0.40	1.40	1.20	0.20	0.07	4.93		
	4/15/2016	DK	D	1	33.60	16.20			0.63	1.90	1.09	2.45	2.02	1.28	3.05	3.45	15.87		
	10/13/2016	DK	D	1	34.78	6.51			0.16	1.00	1.76	1.28	0.89	0.51	0.46	0.63	6.69		
	10/13/2016	DK	D	2	37.71	7.11													

Zone 7

DOUGHERTY RESERVOIR

Rectifier No 1. - Reservoir (Internal) - Manufacturer: , Model: CPAYSA 18-22 FNSZ, Serial No.: 83C2526

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Set Potential (-mV)	Meter Voltage (Volts)	Meter Current (Amps)	GPS (Lat/Lon)	Comments
Off Stagecoach Road And Topaz Circle Enter Through Gate To The North	Unknown		A	5	213	2.03	0.01	N 37.721919 W 121.91519	Gauges Do Not Work! Survey On 11/13/12 At Top Of Water -563 mV, 2' Below Top Of Water -442 mV; Have Determined Issue With Rectifier. On 3/12/13 Rectifier Was Turned Off Due To Internal Failure To Adjustment Of Set Potential. New Rectifier and Reference Electrode being Installed on 6/20/2016. New Rectifier and electrode operating properly. No defects noted on 10/13/2016. 4/25/17 - V=1.8, t=0.01, Pon = -956, OK
	Unknown		A	5	246	2.07	0.01		
	12/1/2006	KAP	A	5		2.06	0.01		
	4/19/2007	KAP	A	5	139	2.06	0.01		
	6/21/2007	KAP	A	5		2.05	0.01		
	6/12/2008	KAP	A	5	100	2.06	0.02		
	6/12/2008	KAP	A	5	(+) 50	2.05	0.01		
	6/16/2010	KAP	A	5	(+) 50	2.01	0.04		
	6/16/2010	KAP	A	5	100	2.42	0.06		
	3/25/2012	BH/PW	A	5	218	1.47	0.01		
	7/11/2012	WH/BH	A	5	218	1.49	0.00		
	9/14/2012	BH	A	5	200	2.00	0.00		
	11/13/2012	PW	D	5	426	0.86	0.02		
	1/28/2013	PW	D	5	295	0.92	0.00		
	3/12/2013	PW	D	5	370	0.89	0.00		
	3/12/2013	PW	D	5	OFF	OFF	OFF		
	5/6/2013	PW	D	5	OFF	OFF	OFF		
	7/15/2013	PW	D	5	OFF	OFF	OFF		
	9/25/2013	JW/PW	D	5	OFF	OFF	OFF		
	12/18/2013	BH	D	5	OFF	OFF	OFF		
	11/5/2014	DK	D	5	OFF	OFF	OFF		
	5/1/2015	BH	D	5	OFF	OFF	OFF		
	8/21/2015	DK	D	5	OFF	OFF	OFF		
	6/16/2016	DK	D	5	OFF	OFF	OFF		
	10/13/2016	DK	AUTO	AUTO	950	1.80	0.02		

Zone 7

PATTERSON PASS WATER TREATMENT PLANT

Rectifier No 3. - Chlorine Contact (External) - Manufacturer: Corrpro , Model: avaysa 40-5, Serial No.: C-990929

Location	Date	Inspected By	Dial Setting	Meter Voltage (Volts)	Meter Current (Amps)	Tank-To-Water (-mV)		GPS (Lat/Lon)	Comments
						ON	OFF		
At Patterson Pass Water Treatment Plant Between Floc Sediment Clarifier And UF Clarifier	8/5/2005		20%	4.45	4.68			N 37.695906 W 121.682728	12/1/06-Cut Anode Wire Lead To No Reads. 6/21/07-Blown Fuse Lead To No Reads. 6/21/07-New Fuse Was Replaced. 9/14/2012 Fuse Blown- Replaced And Reads Taken. 8/21/15-Blown Fuse. 8/25/15-JDH replaced this fuse and re-tested. 6/16/16: Rectifier found OFF. Tuend ON and CP System is Polarizing.
	3/23/2006		25%	5.30	5.46				
	12/1/2006		50%	0.95	0.00				
	4/19/2007	KAP	20%	1.00	0.00				
	6/21/2007	KAP	20%	0.00	0.00				
	6/21/2007	KAP	15%	2.99	3.23				
	5/29/2008	KAP	20%	4.32	3.84				
	6/16/2010	KAP	20%	4.70	4.20				
	6/16/2010	KAP	25%	5.60	5.01				
	3/16/2012	BH/PW	26%	5.66	5.10				
	7/11/2012	BH/PW	26%	5.20	4.80				
	9/14/2012	BH	22%	4.30	4.70				
	11/13/2012	PW	22%	4.90	4.40				
	1/28/2013	PW	22%	5.02	4.19				
	3/12/2013	PW	22%	4.98	4.23	1,986			
	5/6/2013	PW	22%	4.81	4.24	1,974			
	7/15/2013	PW	22%	4.58	4.15	1,859			
	9/26/2013	JW/PW	22%	4.67	4.18				
	12/18/2013	BH	22%	4.88	4.04	1,938			
	10/28/2014	DK	29%	6.14	5.85				
	5/1/2015	BH	30%	4.85	4.18	1,875			
	8/21/2015	DK	30%	0FF	OFF	OFF			
	8/25/2015	DK	22%	4.78	5	2,090	680 Off/500 Long off (OK)		
	6/15/2016	DK	22%	4.88	4.65	2,999	560		
	10/13/2016	DK	22%	5.18	5.02	2,117	791		

Zone 7

PATTERSON PASS WATER TREATMENT PLANT

Rectifier No 2. - Chlorine Contact (Internal) - Manufacturer: Corrpro , Model: TASCA 20-5, Serial No.: C-011332

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Set Potential (-mV)	GPS (Lat/Lon)	Comments
At Patterson Pass Water Treatment Plant Between Floc Sediment Clarifier And UF Clarifier	Unknown		A	3	2.13	0.14	952	N 37.695906 W 121.682728	3/16/2012-No Current Was Measured At Rectifier, However Survey Proved That Current Was Applied Inside The Tank. 10/28/2014 Water Low/Rectifier off. 6/16/16: Rectfier found OFF. 10/13/16: Rectifier found OFF. 4/25/17 OFF
	12/1/2006		A	3	2.20	0.06	954		
	4/19/2007	KAP	A	3	2.72	0.12	952		
	6/21/2007	KAP	A	3	2.75	0.08	953		
	6/12/2008	KAP	A	3	2.77	0.07	952		
	6/16/2010	KAP	A	3	2.58	0.06	950		
	3/16/2012	BH/PW	A	3	1.98	0.00	954		
	7/11/2012	BH/PW	A	3	1.50	0.00	954		
	9/14/2012	BH	A	3	2.00	0.01	954		
	11/13/2012	PW	A	3	2.21	0.00	954		
	1/28/2013	PW	A	3	2.64	0.01	958		
	3/12/2013	PW	A	3	2.31	0.01	954		
	5/6/2013	PW	A	3	2.78	0.01	953		
	7/15/2013	PW	A	3	5.72	0.02	953		
	9/26/2013	JW/PW	A	3	2.61	0.04	953		
	1218/2013	BH	A	3	2.54	0.04	953		
	10/28/2014	DK	A	3	OFF	OFF	OFF		
	5/1/2015	BH	A	3	2.61	0.04	953		
	8/21/2015	DK	A	3	2.48	0.05	954		
	6/16/2016	DK	A	3	OFF	OFF	OFF		
	10/13/2016	DK	A	3	OFF	OFF	OFF		

Zone 7

PATTERSON PASS WATER TREATMENT PLANT

Rectifier No 1. - Floc Sediment Clarifier - Manufacturer: Farwest, Model: ASAI, Serial No.: 121596

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	GPS (Lat/Lon)	Comments
At Patterson Pass Water Treatment Plant Adjacent Main Office Building	8/5/2005		2	2	9.38	9.74	N 37.695415 W 121.68318	Reads Could Not Be Completed On 3/16/12 Due To Construction Of New Cathodic Protection System. The clarifier was empty and the rectifier was turned off on 11/13/12 during the bi-monthly November rectifier survey . JDH will complete the survey when the clarifier is filled. On 3/12/13 Rectifier Found Off And Clarifier Empty. 10/13/16: Rectifier operating.
	10/31/2005		2	2	9.54	9.99		
	1/6/2006		2	2	9.72	5.01		
	3/4/2006		2	2	9.54	3.59		
	3/4/2006		2	4	11.70	10.26		
	12/1/2006		2	4	11.79	12.56		
	12/20/2006		2	3	10.57	12.30		
	4/19/2007	KAP	2	3	10.14	10.14		
	6/22/2007	KAP	2	3	9.08	12.06		
	6/22/2007	KAP	2	2	9.80	10.17		
	5/29/2008	KAP	2	3	10.04	12.36		
	6/23/2008	KAP	2	1	8.74	12.30		
	6/16/2010	KAP	2	3				
	3/16/2012	BH/PW						
	7/11/2012	BH/PW	3	1	8.50	4.82		
	9/14/2012	BH	3	1	8.30	7.50		
	11/13/2012	PW	3	1	13.23	0.00		
	1/28/2013	PW	3	1	8.49	5.40		
	3/12/2013	PW	3	1	OFF	OFF		
	5/6/2013	PW	3	1	8.54	4.91		
	7/15/2013	PW	3	1	8.46	4.66		
	9/30/2013	JW/PW	3	1	8.35	7.37		
	10/3/2013	JW/PW	3	1	8.31	7.08		
	12/18/2013	BH	3	1	8.38	6.10		
	10/28/2014	DK	3	1	8.42	8.10		
	5/1/2015	BH	3	1	8.68	5.10		
	8/21/2015	DK	3	1	8.39	8.10		
	6/16/2016	DK	3	1	8.83	3.70		
	10/13/2016	DK	3	1	8.44	7.20		

Zone 7

SANTA RITA - DOUGHERTY PIPELINE

Rectifier No 1. - Manufacturer: Goodall, Model: CSAYSA 20-16 DEFNPSZ, Serial No.: 92C2358

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)											GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Total		
6309 Dougherty Road (Station 148+00)	8/5/2005		B	2	7.88	14.10														N 37.70985 W 121.91019	Shorted To: Dougherty Reservoir Pipeline & Portion Of Cross Valley And Vineyard Pipelines
	10/31/3105		B	2	7.90	14.10															
	1/6/2006		B	2	7.81	14.10															
	3/4/2006		B	2	7.82	14.10															
	12/1/2006		B	2	7.89	13.90															
	4/19/2007	KAP	B	2	7.90	13.90															
	6/7/2007	KAP	B	2	7.62	14.50															
	6/7/2007	KAP	B	3	8.71	16.20															
	6/18/2008	KAP	B	3	8.71	15.40															
	3/4/2010	KAP	B	3	8.71	15.50															
	3/16/2010	KAP	B	3	8.66	15.20			2.06	1.68	1.51	1.08	0.96	0.91	1.37	1.40	1.58	2.64	15.19		
	3/7/2012	BH/PW	B	3	8.49	16.10															
	7/11/2012	BH/WH	B	3	8.80	16.30			2.13	1.73	1.56	1.11	0.99	0.94	1.42	1.44	1.64	2.74	15.70		
	9/14/2012	BH	B	3	9.10	14.20			1.70	1.77	1.59	1.14	1.02	0.97	1.14	1.42	1.68	2.79	15.22		
	11/13/2012	PW	B	3	8.57	15.00			2.02	1.63	1.44	0.99	0.88	0.82	1.26	1.30	1.45	2.46	14.25		
	1/28/2013	PW	B	3	8.86	16.00															
	3/12/2013	PW	B	3	8.78	15.78	1,620														
	5/6/2013	PW	B	3	8.70	15.42	1,592														
	7/15/2013	PW	B	3	8.76	15.45	1,615														
	9/25/2013	JW/PW	B	3	8.82	15.70	1,610														
	10/2/2013	JW/PW	B	3	8.83	15.59		1,126													
	12/18/2013	BH	B	3	8.69	15.20	1,800		2.06	1.68	1.50	1.06	0.96	0.93	1.42	1.41	1.60	2.64	15.26		
	11/5/2014	DAK	B	3	9.02	15.84	1,705	1,166	2.16	1.15	1.55	1.20	1.07	0.97	1.47	1.48	1.60	2.62	15.27		
	5/1/2015	BH	B	3	9.03	16.52	1,652		2.30	1.84	1.28	1.25	1.12	1.01	1.49	1.49	1.66	2.61	16.05		
	5/1/2015	BH	B	3	9.12	16.28	1,640	1,156	2.27	1.84	1.62	1.28	1.07	0.98	1.45	1.45	1.62	2.57	16.15		
	6/16/2016	DK	B	3	8.43	14.72	1,574	1,101	2.12	1.67	1.49	1.16	0.97	0.90	1.26	1.28	1.41	2.28	14.54		
	10/13/2016	DK	B	3	8.75	15.20	1,612	1,068	2.17	1.75	1.52	1.18	0.98	0.90	1.29	1.29	1.43	2.36	14.87		

Zone 7

VASCO PIPELINE

Rectifier No 1. - Manufacturer: Goodall, Model: CSAYSA 24-16 DEFNPSZ, Serial No.: 92C2357

Location	Date	Inspected By	Tap Coarse Setting	Tap Fine Setting	Meter Voltage (Volts)	Meter Current (Amps)	Pipe-To-Soil (-mV)		Anode Current (Amps)											GPS (Lat/Lon)	Comments
							ON	OFF	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Total		
ACE Commuter Station On South Vasco Road (Station 1+42)	8/5/2005		B	1	6.52	10.60														N 37.69708 W 121.71877	Bonded To: Vasco 2 & Livermore #1 3/12/13 - Vasco rectifier was found to have a blown surge protector. 3/18/13 - Surge protector replaced and rectifier re-energized. 3/19/13 - Spot survey to ensure proper cathodic protection Is achieved. 4/25/17 - Increased output in order to provide C.P. to section of pipe at noth of Vasco Rd at vault. B.O. at vault. -935mV on at Vasco Rd./Northfront Rd.
	10/31/3105		B	1	6.31	4.80															
	1/6/2006		B	1	6.41	13.00															
	12/1/2006		B	1	6.06	9.10															
	4/19/2007	KAP	B	1	6.05	8.90															
	6/6/2007	KAP	B	1	6.12	9.20															
	6/6/2007	KAP	A	5	5.81	8.80															
	6/11/2008	KAP	A	5	5.78	8.20															
	6/11/2008	KAP	A	4	4.43	5.60															
	3/4/2010	KAP	A	4	4.43	8.00															
	4/15/2010	KAP	A	3	3.11	2.50															
	2/15/2012	BH/PW	A	3	2.50	3.20			0.46	0.40	0.33	0.30	0.28	0.24	0.23	0.25	0.29	0.36	3.14		
	5/3/2012	PW	A	4	4.18	5.30															
	7/11/2012	WH/BH	A	4	4.20	5.60			0.78	0.69	0.55	0.50	0.48	0.40	0.39	0.42	0.48	0.61	5.30		
	9/14/2012	BH	A	4	4.20	5.50			0.78	0.70	0.55	0.50	0.48	0.40	0.39	0.43	0.50	0.63	5.36		
	11/13/2012	PW	A	4	4.41	5.40			0.78	0.69	0.53	0.49	0.46	0.39	0.38	0.42	0.48	0.63	5.25		
	1/28/2013	PW	A	4	4.44	5.40															
	3/12/2013	PW	A	4				585													
	3/18/2013	BO/PW	A	4	4.02	6.40	1,199														
	3/19/2013	BO/PW	A	4	4.23	5.60															
	5/6/2013	PW	A	4	4.38	5.35	1,443														
	7/15/2013	PW	A	4	4.39	5.29	1,478														
	9/26/2013	JW/PW	A	4	4.38	5.21		909													
	9/30/2013	JW/PW	A	4	4.40	5.26															
	12/18/2013	BH	A	4	4.43	5.52	1,498		0.78	0.69	0.54	0.50	0.47	0.40	0.38	0.42	0.50	0.64	5.32		
	11/5/2014	DK	A	4	4.41	5.20	1,560	903	0.78	0.68	0.52	0.48	0.46	0.39	0.37	0.42	0.49	0.62	5.21		
	5/1/2015	BH	A	4	4.37	5.40	1,520	921	0.77	0.68	0.53	0.48	0.46	0.40	0.38	0.42	0.50	0.63	5.25		
	8/21/2015	DK	A	4	4.39	5.36	1,508	920	0.79	0.70	0.54	0.50	0.47	0.41	0.38	0.44	0.51	0.63	5.37		
	6/16/2016	DK	A	4	4.39	5.04	1,649	1,060	0.73	0.65	0.51	0.47	0.44	0.38	0.36	0.40	0.47	0.59	5.00		
	10/13/2016	DK	A	4	4.39	5.03	1,651	1,048	0.73	0.65	0.50	0.46	0.43	0.37	0.36	0.40	0.47	0.58	4.95		
	4/14/2017	BH	A	4	4.39	5.20	1,560	1,021	0.77	0.65	0.53	0.48	0.44	0.39	0.34	0.41	0.48	0.61	5.10		