Del Paso Manor Water District

June 16, 2022

Hon. Michael Bowman, Presiding Judge
Sacramento County Superior Court
720 9th Street
Sacramento, CA 95814

Re: Del Paso Manor Water District Grand Jury Report

Dear Judge Bowman:

On November 4, 2021, the Del Paso Manor Water District (hereinafter "the District" or "DPMWD") received the Grand Jury Report entitled "Del Paso Manor Water District Flooded with Public Safety Dangers." On or around February 4, 2022, the District provided its response to the Findings and Recommendations.

On April 13, 2022, we received a follow-up from the Grand Jury and status review. The president of the Board of Directors of DPMWD and the Board have been asked to respond.

Pursuant to Penal Code section 933, here is the District's response:

FINDINGS

F1. The DPMWD Board of Directors has responded to and agreed with each of the eight recommendations contained within the SCGJ report titled, "Del Paso Manor Water District Flooded with Public Safety Dangers." (Issued November 5, 2021.)

Response to F1.

We agree with this finding.

F2. The DPMWD Board of Directors is meeting the requirements of the Ralph M. Brown Act and Public Records Act with regard to providing public meeting agendas, minutes, and board packets in a timely manner. They have also conducted Brown Act training, as recommended by the Grand Jury.

Response to F2.

We agree with this finding.

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F3. The Sacramento Local Agency Formation Commission has agreed to conduct a new Municipal Service Review in coordination with the DPMWD, providing a timeline for completion in 2022.

Response to F3.

We agree with this finding.

During the course of 2022, the District's General Manager, Alan Gardner, has had a number of conversations with the Executive Director of the Sacramento Local Agency Formation Commission ("LAFCO"), Jose Henriquez. Two of the meetings included Board President Ryan Saunders, and one included Board Vice President Osmar Macias. We shared status updates of the District and planned Operations and Maintenance and Capital improvements projects. On May 12, 2022, the General Manager also provided an 11-page list of what had been accomplished since October 2021, a copy of which is attached (See Attachment 1.) During the May 16, 2022 Regular Board meeting, Executive Director Henriquez shared that he retained the consultant that will conduct the Municipal Service Review ("MSR"). The MSR is currently intended to conclude in approximately November, but could be extended to include the results of the District's Proposition 218 rate setting, currently planned for approximately December 2022.[1]

F4. The DPMWD Board of Directors has agreed to initiate a Proposition 218 process to address a rate increase for needed infrastructure improvements.

Response to F4.

We agree with this finding.

The District recognizes the need for a Proposition 218 study and rate setting to fund critical infrastructure improvements. On multiple occasions, during the "General Manager Report" section of the District's public meeting agenda, the General Manager has reported the progress of such process. The District Engineer has prepared a Gantt Chart planning out the anticipated steps to complete the Proposition 218 rate setting procedures. (See Attachments 2A-C.)

Notwithstanding the foregoing, and as demonstrated in the Grand Jury's Findings and Recommendations, part of the underpinning for the rate study and rate setting is HydroScience's completion of its Technical Memorandum. There were significant delays in the completion of the final document, which the District received in final form on Sunday, June 12, 2022. (See Attachment 3.) With the final Technical Memorandum, Forsgren Engineering can begin its preparation of its Capital Improvement Plan, which, in turn, will allow the rate study consultant to commence the Proposition 218 analysis. Still, notwithstanding the delay due to the late receipt of the final Technical Memorandum, the District has authorized staff to retain a public relations firm, rate study consultant, and private or public lender to assist with the capital improvements costs.

[1] While the District has planned for milestones to achieve certain tasks and hopes that the rate-setting hearing can occur in December 2022 or early 2023, the District is limited to the extent it waits on retained consultants to complete reports. When reports, such as the HydroScience Technical Memorandum are delayed, they necessarily result in a ripple effect by which other reports relying on that one cannot be timely completed.

F5. Although the DPMWD Board of Directors has publicly agreed with the recommendations of the Grand Jury's November 5, 2021 report, the District has only begun to publicly address the methodology it will undertake to determine the full extent of the costs to repair infrastructure and make necessary safety improvements.

Response to F5.

We disagree partially with this finding.

We agree that the District Board of Directors has publicly agreed with most of the recommendations in the November 5, 2021 Grand Jury report.[2]

We disagree that the District has "only begun" to publicly address the methodology it will undertake to determine the full extent of the costs to repair infrastructure and make necessary safety improvements. In fact, the District has discussed the necessary repairs and costs on a rolling basis, as that information has become available to it.

For example, in early January 2022, the District tasked HydroScience with an updated Technical Memorandum and retained Forsgren Engineering. Furthermore, the 11-page list of accomplishments referenced in response to Finding 3, above, are all actions that either actually repaired critical infrastructure or were necessary for effectuating the Proposition 218 study. HydroScience's final Technical Memorandum was submitted to Forsgren Engineering on June 12, 2022.

Furthermore, Cal. Const. art. XIII D, section 4, adopted as part of Proposition 218, imposes fundamental assessment methodology and procedural requirements on the levy of all assessments, including water rates. In particular, the District must commission an engineer's report to analyze the cost of improvements so that rates do not exceed the proportional benefit and cost of service. That report is in process and is required before the rate study is commissioned.

Prior to levying any rates, the District must mail a notice to the record owner of each parcel proposed to be assessed, showing the reason for the rate increase, the total amount charged, the basis for the amount, and the duration of the payments. The notice also requires other hearing and procedural requirements.

Only then, and after at least 45 days have passed, may the District hold a public hearing to review ballot protests, tabulate whether there has been a majority protest, and consider the adoption of a rate increase. Consequently, while the District acknowledges that funding is necessary to construct and repair necessary infrastructure, that funding is not immediately available and cannot be obtained instantaneously. As the Grand Jury surely appreciates, the District is committed to following the procedural and substantive legal requirements before such undertaking.

[2] The District agreed in part with Recommendation 6, and explained that board meeting agendas and minutes would be reviewed by legal counsel for the foreseeable future and until such time that staff is adequately prepared and trained; however, this would not continue indefinitely and is not legally required.

RECOMMENDATIONS

R1. The DPMWD should complete in earnest a full analysis of the 2009 Water District Master Plan, as was the original intent of the HydroScience Engineering contract to complete a Master Plan Update. This should incorporate all short, mid, and long-range repair and replacement needs with well-defined costs.

Response to R1.

This District respectfully disagrees. However, the District believes that the update to the Technical Memorandum by HydroScience accomplishes Recommendation No. 1.

At its January 2022 board meeting, the District authorized HydroScience to complete the Technical Memorandum with the assistance and input from the General Manager and Forsgren, the District's engineer. HydroScience committed to completing its updates in early May 2022. However, the District did not receive the final version of the Memorandum until Sunday, June 12, 2022. The delay in receiving this document necessarily had a domino effect on the District's ability to move forward with other aspects of the Proposition 218 process. It is only after having received the final Technical Memorandum on June 12, 2022 that Forsgren Engineering has been able to move forward from its preliminary work and begin to draft a Capital Improvement Plan for the District. Using those documents, a rate consultant can then begin to prepare the rate study. Once the District has an understanding of what the rates will be, it will develop an informational campaign to educate residents of the proposed rate increase, the need for improvements, the timeline for the adoption of rates, and the protest hearing. To this end, the Board of Directors authorized staff to seek a public relations firm at its May 16, 2022 meeting.

The District disagrees that a full Master Plan update is warranted. In fact, the District believes that such endeavor would be an unnecessary cost to ratepayers and delay the Prop. 218 process. The existing Master Plan was in need of updates, as it related to upgrading source of supply infrastructure. However, a full review was unnecessary given that the District is, and was, fully built out at the time the initial Master Plan was adopted, and there are no new facts or any change in circumstances other than the moving Well 8 to "standby" status, moving Well 3 to 15 day use, and having Well 6 re-drilled to reduce Manganese levels.

The updated Technical Memorandum will be used by the proposed rate consultant to develop short-term, medium-term, and long-term repair and replacement needs and their relative costs. Again, due to factors outside the control of the District and the delay in receiving the final Technical Memorandum, we believe the rate study will be completed sometime around fall 2022. It is important to note that there are extreme supply chain issues resulting from COVID and the war in Ukraine. As such, even if the District was positioned to proceed on improvements and had a budget, costs are volatile and subject to flux on a daily or even hourly basis. This has been true of existing projects where suppliers have committed to honoring prices for windows of "three hours."

R2. The DPMWD should continue to work with the Sacramento Local Agency Formation Commission to complete a new Municipal Service Review in 2022, in alliance with a timeline developed and provided to the Grand Jury.

Response to R2.

This recommendation will be implemented by LAFCO and the District.

Specifically, the District commits to the following timelines and actions: LAFCO advised on May 16, 2022 during public comment at the regularly scheduled Board meeting that it had selected the consultant that will perform the MSR. The review is anticipated to be performed over the summer and early fall, with a report issuing in November 2022. Depending on the District's Proposition 218 schedule and hearing date, LAFCO may delay issuing the report until the results of the rate-setting hearing are known.

R3. The DPMWD should develop and publicize its own Action Plans with timeframes for the Municipal Service Review and Proposition 218 process to secure voter approval of necessary rate increases.

Response to R3.

This recommendation was implemented on May 16, 2022. At that meeting, the General Manager and LAFCO Executive Director announced the progress of the MSR.

While the MSR is outside the scope of the District's responsibilities, the District has committed to working cooperatively with LAFCO, and had its initial meeting with the President on June 14, 2022. The MSR is expected to begin on or before August 2022, consistent with the District and LAFCO's earlier response to the Grand Jury Report. This information was identified and made public as part of the agenda packet that disclosed the District's response to recommendations and findings, and also when that document was published on the District's website. (See https://www.delpasomanorwd.org/files/aa1233585/2022-02-02--FINAL--DPMWD+Response+to+Grand+Jury.PDF.)

Furthermore, the General Manager provides periodic updates to the Board in his oral reports at Board meetings and provided updates on May 16, 2022 and June 6, 2022. As indicated throughout the responses herein, the District only received the completed update of the Technical Memorandum from HydroScience on June 12, 2022. With this milestone complete, Forsgren Engineering will develop the Capital Improvement Plan that will position the District to work on the rate study. To this end, the District, at the same Board meeting, authorized staff to retain a professional public relations firm to assist with public outreach and education.

R4. The DPMWD should develop a strategic communications planning effort to regularly interact with its ratepayers through a variety of direct outreach efforts to ensure constituencies are informed of actions and associated costs to ensure a safe water supply.

Response to R4.

This recommendation requires further analysis.

The District has authorized staff to issue a Request for Proposals for a public relations firm. The extent of any contract, while necessary, is contingent upon availability of funds.

Notwithstanding the foregoing, staff has and will continue to publish important timelines, documents, and other notices on the District's website, and as part of the agenda for each public meeting. The Board has also taken action to increase its regular meetings to twice a month, in order to limit special meetings. This process will enhance public awareness and transparency since regular meetings are known in advance and require greater noticing requirements.

The General Manager contacted the NextDoor platform on or around May 3, 2022 to create a public agency account for the purpose of disseminating District business to its residents, and also intends to submit public information releases to the local biweekly community paper. The General Manager will also orally update the Board and public regarding the Proposition 218 progress at board meetings, from time to time.

R5. In the absence of a meaningful response by local leaders and agencies, the DPMWD should look for opportunities at the state and federal levels for funding resources which might help to alleviate the financial hardships confronting its ratepayers.

Response to R5.

This recommendation has been implemented, but is also an ongoing endeavor.

Even prior to the Grand Jury's recommendation, District staff has been working to find alternative funding mechanisms. For example, the General Manager is seeking a hardship waiver from the County to offset the costs for repairs to Wells 2 and 7 because of the high fees to cycle the wells to either the storm drain or sewer systems.

Furthermore, staff has been made aware of the State's portal to research grant opportunities. (See Attachment 4, email from General Counsel to General Manager dated April 11, 2022.)

The District has applied for the California Low Income Household Water Assistance Program, which allows low-income households an opportunity for assistance in paying water rates.

The General Manager has also: reviewed funding opportunities under the new federal infrastructure bill; attempted to access one of the fifteen earmarks obtained by our Congressman; is reviewing State Revolving Fund principal forgiveness loans for hazard mitigation; and is reviewing FEMA hazard mitigation opportunities to restore to use Wells 3 and 8.

Finally, on May 16, 2022, the Board of Directors approved a contract with Renne Public Policy Group to assist the District in researching, analyzing, and applying for grants to alleviate financial hardships confronting its ratepayers. This is also beneficial in gaining ratepayer support because it demonstrates a commitment by the Board to seek alternative funding sources to mitigate significant water rate increases.

CONCLUSION

The District has spent significant time in reviewing, analyzing, and preparing responses to the Grand Jury's reports. We are hopeful that this final response resolves the Grand Jury's questions and the District can shift all of its focus on the Proposition 218 process and other pressing District business.

Sincerely,

Del Paso Manor Water District
Board of Directors

cc: Ms. Ginger Durham Jury Commissioner (via email)
Ms. Erendira Tapia-Bouthillier (via email)
Sacramento County Board of Supervisors (information copy, via U.S. Mail)

ATTACHMENT 1

Attachment 1

List of Accomplishments, Continuing and New Projects Improving Del Paso Manor Water District October 2021 to Date

FIELD

1. Determined with loss of Well 8 since October 2019, the District had inadequate fire flow in different areas, making increased fire flow a critical first need.
2. Determined stabilizing and securing supply was a companion need, especially to maintain District independence.
3. Determined to update existing Wells to increase supply and fire flow rather than build new Well at cost of $3.5-5 million per RWA/SGA. All updates will cost much less than new Well.
4. Replacing the pipes.
    a. Since we will be moving almost all the pipes being replaced from back yards to front streets, we will need to include replacing all the service lines at District cost as Suburban did under similar circumstances. The reasons include any home with galvanized pipes requiring use of the same backyard connection location to the home or the reverse flow from the front of the house can erode the pipes, e.g., like running your hand from a fish's tail to its head. This concern was reconfirmed by District Engineer Forsgren.
    b. Confirmed replacement of 2.9 miles of steel pipe required, but no current funding, and costs up from $1.1 million a mile in 2017 to about $3.5 million a mile as of March 2022 or $10.6 million in current dollars.
    c. Confirmed replacement of 11.8 miles of 4" and 6" AC pipe required at a current cost of about $3.5 million a mile or $41,300,000 in current dollars.
    d. Confirmed potential replacement of 3.3 miles of 10"-12" AC around and near Country Club Plaza. Since it will not restrict fire flow and seems to be in good condition it can be the last potential pipe project at a current cost of about $11,550,000.

e. Confirmed replacement of all AC pipe could cost a minimum of about $52,850,000 million in current dollars before continuing rapid inflation and materials shortages and the normal delays and time it takes for each phase of this effort. Explored a modified approach of improving fire flow through the District by replacing all 3" and 4" pipes first, but Forsgren advised it would be too disjointed in approach, especially with moving pipes from back to front street.
f. Confirmed total pipe replacement in 2022 dollars would be $63,450,000, with the clear caveat that materials, labor, and general inflation should significantly impact that total over time. (Note that the cost per mile was SSWD's cost in March 2022, and RWA, SGA and Forsgren opined that was a reasonable amount to use as a current average.)

5. Continued Field Manager's initiative to control the prior considerable number of leaks by running lower pressures in both halves of the District. This Does not eliminate the risk of significant blowouts of the old pipes, especially the steel ones, during fire emergencies' shutdown process. This blowout risk will continue unmoderated until all Wells have variable speed drives controlled by SCADA and/or there are automatic pressure-controlled interties with Sacramento Suburban Water District (SSWD) installed.
6. Wells 2, 7 and 4 updates in process, with Well 2's work proceeding, Well 7 planning in process with necessary site survey completed. Well 4 to follow 2, 7 and Well 9 generator.
7. Well 9 generator project has been restarted and is in process. Note that prior information and work were not accurate in cost, detail and time needed. When this is completed then Wells 6B and 9 will have permanent generators. The portable generator can no longer be permitted and should be replaced to ensure that in blackouts the District has full drinking water and sanitation. Without a generator on *all* active Wells, we will not have fire flow during a blackout, although once the automatic interties are active that will definitely help.
8. Resolved consistent break-ins to Well 8 site and building during winter by homeless for shelter by installing a new site security fence with razor wire top.

9. All deeds and titles missing and needed for site work. Located and obtained new copies of all missing deeds/titles to all Well sites at no cost instead of First American bid of $25,000 and 6-10 weeks. Victoria's personal contact performed the search in less than a week.
10. Well 6B's transfer switch and SCADA being updated to current standard and to allow remote, rather than manual operation.
11. Negotiated with SSWD GM in December and implementing SSWD/DPMWD automatic interties for emergency use. The current manual interties can take 1-3 hours to open and do not allow setting different pressure levels. The automatic interties will be controlled by pressure drops or increases and restore full fire flow to the northwest corner of the District, will improve fire flow to the high school, and generally reinforce the entire District, including potential low-pressure areas during a fire emergency and mitigate high pressure blowouts on shutdown from a fire.
12. SCADA software was not updated or maintained for over 10 years. It will be fully updated by end of April for about $8,000. With the update the District can now also use Google Chrome expanding ease of control.
13. Determined that a number of commercial meters did not have registers or were not recording usage, and a number of commercial spaces had no meter at all, causing revenue loss. Broken commercial meters are being replaced after being unable to track usage for, in some cases, over 5 years, e.g., four of the units in a strip mall. As additional examples, also not working for a shorter time are the large apartment next to Well 8 and a Veterinarian's office.
14. Now conducting a full audit of commercial spaces and customers to determine how many are unmetered, broken and need to be installed or replaced. Clearly this revenue loss has been going on for years. Will have determined what needs to be done and will include it in the 218 since some of the installations or replacements will be costly and we do not know whether nearby valves will work or cause a greater amount of work.
15. Well 3 123 TCP contamination limiting Well 3 to a maximum of 15 days a year per SWRCB DDW. Contacted specialized counsel in San Francisco. Determined no point source was required to file claim against manufacturer. Cleanup would be two activated carbon filters and site changes. Would allow fulltime use rather than 15 days per year current

State Board limitation. Prior Board relied on misinformation from then counsel and allowed statute of limitations to run without filing for compensation that could run from $500,000 up to the $3.5-5 million cost of new Well if the site was too small for necessary remediation equipment. Exploring potential funding for mitigation from other sources to regain full use, e.g., Hazard Mitigation Study and FEMA funding for up to 75% of costs.

16. Determined, with Field Manager, that Well 8 would not be used even in an emergency due to PCE contamination 12x the MCL and *no* public evidence that even short-term use would not harm residents, especially with a large apartment complex first in line to receive water directly from the Well. Note that the point source of the contamination is upgradient about a mile away and was measured at 3500 times the MCL. The movement of the plume is slow since the contamination occurred, we have been advised, over 30 years ago.
17. SSWD Safety report performed at the request of the old Board listed a sizable number of necessary outside plant corrections. Field Manager had been resolving the issues. Cleared any remaining obstacles and obtained necessary parts and equipment for Field Manager to cure 100% of issues found by SSWD in time for JPIA on site insurance review. JPIA report had no negative findings and only two minor suggestions.
18. Discussed fire flow to High School issue with County Asst Fire Marshall. Determined that when HS upgraded pipe from 4" to 6" about a decade ago, in exchange for waiving the $80,000 fee the HS waived the requirement to provided fire flow. Currently HS recently added covered walkways that changed the fire demand from 4400 to 6500 gpm because under the County Building Code it meant the separate buildings were now considered 1 unit. HS never asked Fire Marshall or DPMWD. Requested Fire Marshall inspect the site to see if it indeed did need 6500. Requested our Field Manager review the site. He thought the walkways were not flammable. If FM decides fire flow has to increase to 6500 gpm, she said her office would support the school district funding an additional well on site to meet the demand since there was no will serve letter or prior notice to DPMWD or FM.
19. Also discussed with Deputy Fire Marshall how we are working with SSWD to reinforce fire flow substantially and quickly, except where it is restrained by pipe size. The deficit, known by the last Board that took no

action from 2018 till they left in August 2021, resulted in the FM placing some businesses in the District on fire watch until the interties are upgraded to automatic and activated.

20. Field Manager managed the physical cleanup of all Well sites and the old office building and garage.
21. Planning for projects necessary O&M and capital for the coming 218 proceeding in process.
    a. Prepare 2022-2023 budget. Prepare subsidiary budget for use if 218 generates new revenue.
    b. Budget for full LAFCO review, summer 2022.
    c. Cleanup all issues with commercial meters to have 100% installed and correctly billed. Estimate for new budget O&M.
    d. Finish rehab of Wells 2,7,4,9 and potentially 3 and 5.
    e. Complete transition to automatic interties.
    f. Once interties fully active, rehab of the above Wells is completed and we have full fire flow and maximum day demand without considering Well 8 as a standby, consider decommissioning Well 8, especially if we can't get mitigation money to replace it.
    g. Begin replacement of steel pipe.
        i. Identify order of steel replacements.
        ii. Preliminary drawings by Forsgren.
        iii. Then current bid estimates.
        iv. Funding from new commercial loan/State Revolving Fund/FEMA.
            1. Hazard Mitigation part loan part grant, state and federal.
            2. State principal forgiveness loan, especially for Well 3.
            3. New $1B in hazard mitigation program funding found by Mona.
    h. Concurrent Hazard Mitigation Study as basis for FEMA potential 75% funding.
        i. Hire person or firm that regularly performs this work.
    i. Application to FEMA to cure hazards, with up to 75% subsidy per approved project.
        i. Determine if expert drafter required.

j. Further update to Master Plan confirming which pipe and timing thereof for replacing for the next 218 rate proceeding.
k. New utility truck for 3rd field staff, full set of tools and upgrades to equipment, and all office items, phone, computer, iPad etc. Use this truck for internal projects since determined both current trucks cannot be reasonably modified with utility beds to safely carry all tools and equipment.
l. Re-fence or fully security fence all Wells.
m. Staff salaries and benefits, annual COLA.
n. Create Administrative Services Manager position and fund it, moving VH into it and leaving OM position vacant for now.
o. Continue to satisfy LAFCO, including its required full review this summer, and maintain either their active support or forbearance while we proceed.
p. Develop or confirm support witnesses for 218 from LAFCO, Bd of Supervisors, RWA, SGA, SWRCB's Regional DDW, as well as staff witnesses, CPA, and residents.

AGENCIES

22. Communicated with elected officials—County, City of Sacramento, SWRCB, and DDW. Both meet and greets and discussions about the Grand Jury and District needs.
23. Communicated with ED of RWA and several staff, participated in Water Forum and had accepted proposed suggestions on process and procedure for the WF.
24. Discussions with RWA ED and staff and SGA staff about potential funding for District including Well 3 mitigation and return to full use. No current funding available through their assistance.
25. Discussions with State Board area Engineer on new Board and GM's plans and activities. He provided comments and assistance on several issues including clearing up an issue and inspector's mistake from the July 2021 State Board inspection.
26. Discussions with the Sacramento Air Quality Management District continuing re generator requirements and limitations. Determined we are not restricted to just Aqua Sierra's suggested generator brand at Well 9. As

of 4-22-22 we can use any natural gas or propane generator that meets emission standards. Please note that we will not use propane near or on school grounds, or in neighborhoods.

27. In process of exploring possibility of State Revolving Fund principal forgiveness loans.
28. Explored whether any other State programs could financially assist the District. Advised by SGA programs out of currently available funds or residents' average income is too high.
29. Explored whether the District could qualify for any of the 15 earmarks for federal funding our Congressman received. Informed only for shovel ready projects and organizations with a current relationship.
30. Believe the District could qualify for FEMA hazard grants for the pipes and maybe Wells 3 and 8, but it takes a year to go through the necessary process and prepare the application. It can take up to another year to get grants, if made, for up to 75% of a project.
31. LAFCO told me that's too long for them to support. If we can find other money through the 218 and expand our loan for working capital, that would satisfy LAFCO's timeline. Then backing that with a Hazard Study is a real potential avenue for significant funding that LAFCO could support.

GRAND JURY

32. The new Board and GM have restored normal special district governance and procedures, some of which are detailed in this section and the section on OFFICE. Please note that following correct procedure and governance, as opposed to having ad hoc committees make some of the decisions, extends the time for any action requiring Board authorization.
33. Managed from the outset the District's response to the GJ inquiry and implementation of GJ recommendations with team of Ryan, Bob, Debbie, Victoria, Mike, and Mona's office. Successfully retaining Debbie as a consultant resulted in a complete history of actions with citations to District Board minutes that will also be useful in the 218. Response completed and filed on time.
34. Resolved issues with HydroScience Tech Memo. They are updating their Tech Memo to be consistent with the new District team's recognition of District needs. Forsgren provided HydroScience with two sets of additional

materials and is managing the update. We expect receipt by about 5-15-22.

35. Note the GJ requested the HydroScience update be completed, the R 1 roadmap be completed and publicized to residents, and we understood both to serve as the basis for the 218. This has been the basis of all work with both companies and our staff. We will include a new line item in the new 218 for an additional planning project to further update these documents for the next 218, which will need to be about 3 years out.
36. Almost all GJ recommendations are completed. GJ Recommendation 1 was on time. However, the new April 14, 2022, GJ updated requests may require modifications to the R1 response and timing.
37. Communicated with LAFCO, established talking relationship, convinced them not to recommend consolidation and to delay their review of the District to allow new Board and GM to demonstrate the direction and changes they will make.
38. Achieved LAFCO Chair's agreement to attend our 218 and advise residents that the upgrades have to be done, the residents will be paying for them, and the issue will be which group will be in charge: this District's team; another special district which will hold DPMWD as a separate zone until improvements are made and there is rough parity with the acquiring District; or a private company which will view the opportunity as a guaranteed short-term investment, doing all the upgrades quickly and recovering their costs with a guaranteed return, causing the highest near term rates.
39. Communicated with several members of the County leadership and after discussing our responses and new direction achieved their comfort with our new direction and neutral response to GJ.
40. Over time achieved Supervisor Desmond's agreement to attend 218 hearing and tell residents "the facts" and need to pay for the necessary upgrades.
41. Communicated with Fire Marshal, established talking relationship with Deputy Fire Marshal as noted above and achieved comfort with our new direction and an essentially neutral response to the GJ simply noting some prior deficiencies.

42. Communicated with District Attorney's Office and discussed new Board, new GM, and District's response to GJ and current and future compliance with the Brown Act and applicable rules and regulations. Mona finished this discussion prior to filing the District's GJ response.
43. Already discussed with General Counsel potential response to the new GJ document due in 60 days. She has a draft outline to frame the response with which I concur. Note, the GJ did not even wait until the time limits the GJ had originally established had expired before issuing the new document. The document also ignored the timing needed when employing proper governance, the timing to underpin a 218 proceeding, and gave suggestions for funding we have already explored. The primary response team will be Ryan, Mona, and me.
44. LAFCO received their copy of the new GJ document on Monday April 18, 2022. Their ED stated he considered it excessive and unfair, especially since the GJ didn't even wait to actually see what we did with the time they set for a full response to their recommendations. He indicated he agreed with the plan we have previously discussed with him, the Chair and Supervisor Desmond to start a 218 as soon as possible by using the corrected HydroScience Memo, Forsgren's work and the response to R1. He stated at this point we knew what was necessary for the near term. He understood we could estimate total costs over time using current cost with the notation for future supply and inflation. He agreed that the positive result of the 218 could then be used as a bridge for a Hazard Mitigation Study and application for those funds, or State Principal Forgiveness Loans. He indicated he would not be in favor of a plan that extended the time before we could file a 218.

CONSULTANTS/OFFICE

45. Gained lessor's confidence after his concerns about the GJ report and achieved new Maryal Office 5 yr. Lease at favorable terms.
46. We understood there were some ventilation issues after the first lease but thought the addition of room air cleaners that could trap even viruses would be sufficient. They weren't. Three of four employees experienced C-19. OSHA and the Department of Public Health have newer guidelines stating that adequate ventilation is a key factor in preventing illness and

transmission, especially C-19. We put together a proposal for tasteful security screens that will allow flowthrough air passage. Before proceeding we had the verbal ok of the two resident owners and was told the third was not active in building management. After first agreeing our front door neighbor decided to call for an HOA meeting. We provided our landlord with the information and article on the need for improved ventilation justifying the security screens. Our proposed solution is by far the least cost response. Lessor advised on 4-18-22 he expects approval. On 4-19-22 Lessor approved the installation and screens were ordered.

47. Managed through three staff of four having Covid.
48. Conducted search, interviews (with Gwynne), and successfully recommended new general counsel.
49. Conducted RFP search, interviews and successfully recommended for hire new district engineer for 5-year contract.
50. Increased District's purchasing power and improved timing for securing materials or favorable bids by establishing accounts with vendors.
51. Proposed changing banks. Much better and reliable daily service available. Substantially lower deposit requirement to avoid regular charges. In process.
52. Reinstated COLA, absent since 2018, and updated salary bands.
53. Achieved update standby compensation and provision of annual boots and pants (consistent with other districts). Standby duty has been a key negative factor for potential hires and the reason given for our recent field staff resignation.
54. Finalized settlement of one lawsuit and assisted with a second.
55. Reinstated staff attending continuing education and outreach to other Districts for comparisons on procedures and processes.
56. Updated policy on banking sick and vacation time, recognizing difficulty of small staff taking time and the pandemic.
57. Opened safe in old office to determine if any key papers inside. Only items were the combination and $.11. Disabled door so it can't be closed again.
58. Hired RGS for zoom meetings and board clerk, with recordings added to District's website. Significant improvement in process and clerk function.

60. District cell for GM & office manager to further Brown Act access and preservation of materials.
61. As a result of one field staff's resignation, I activated the January 11, 2011, Mutual Aid Agreement with SSWD, with GM Dan York's active assistance and cooperation. He will send two T2 D2 staff for on call and overtime work so that our Field Manager will only have one week out of three until we have new field staff members.
62. I also found that the 2011 Agreement provided the framework for the automatic interties since it included the full process for the current manual ones. I am pursuing amending the Agreement with Dan York.
63. From 10/25 through February put in an average of 70 hours a week, 55-60 since then.

BOARD MEETINGS

64. Consistent Board packets & agendas compliant with Brown Act.
65. Reinstated staff to attend board meetings.
66. Reinstated field reports for regular meetings.
67. Increased discussion and transparency in staff and other reports.
68. Added budget to actuals review each month.
69. Modified presentation of warrants and payment of housekeeping bills to avoid penalties.
70. Updated emergency notification plan.
71. State Water Resources Control Board Report issues resolved or in process.
72. Brown Act compliance in place and regularly practiced.
73. Annual EAR (electronic annual report) filed.
74. Assisted with 20/21 audit, satisfactorily responded, or resolved auditor's questions. Board approved the audit.
75. Began CCR prep. and retained the same firm to process the report.
76. State reports filed timely.
77. Assisted Board members outside of meeting in learning or understanding various issues, rules, and regulations.
78. GM position authorization increased twice, better management, lower meeting costs.

ATTACHMENT 2

Attachment 2A

MEETING OF THE BOARD OF DIRECTORS
DEL PASO MANOR WATER DISTRICT

December 10, 2021 6:30 PM
1817 Maryal Drive, Suite 300, Sacramento 95864

MINUTES

1. CALL TO ORDER:

The meeting was called to order at 6:32 p.m. by President Saunders.

2. ROLL CALL:

Roll call was taken by Chair Saunders and the following Directors were present: Dolk, Macais, Matteoli, Pratt, and Chair Saunders. Also in attendance was General Manager Gardner, Bill Slenter, HydroScience, and Ligaya Kohagura, HydroScience.

3. ADOPTION OF AGENDA: Members may pull an item from the agenda.

There was a motion by Director Pratt to adopt the agenda. The motion was seconded by Director Matteoli.

Upon call for public comment, no member from the public wished to speak. The motion passed on a 5-0 roll call vote.

4. PUBLIC COMMENTS: The Board of Directors welcomes participation at these meetings. Matters under the jurisdiction of the Board that are not posted on the agenda may be addressed by the public, California law prohibits the Board from acting on any matter which is not on the posted agenda, unless the members determines that it is an emergency or other situation specified in Government Code Section 54954.2. Public comments are limited to five (5) minutes per individual. Please make your comments directly to the DPMWD Chair. Comments will be accepted via teleconference.

Upon call for public comment, no member from the public wished to speak.

5. CONSENT CALENDAR: All items under Consent Calendar will be considered together by one action of the Board, any Member or members of the public may request that an item be removed and considered separately.

5A. Approval of Warrants and Payroll
There was no Board discussion. Director Dolk made a motion to approve the warrant. Director Pratt seconded the motion.

Upon call for public comment, no member from the public wished to speak. The motion passed on a 5-0 roll call vote.

6. PUBLIC HEARING: None

7. NEW BUSINESS:

7A. Review of May 2021 HydroScience Strategic Water Solutions Technical Memorandum.

Pursuant to the November 5, 2021 Grand Jury Report, discussion of the findings and recommendations of the May 2021 HydroScience Strategic Water Solutions Technical Memorandum, originally authorized by the DPMWD as Proposed Update to its 2009 Water District Master Plan and request for public comment.

General Manager Gardner introduced this item to the Board providing background information. When this originally started the District was looking for a full update to its 2009 Master Plan. The price came in around $140,000 they withdrew the RFQ. They issued a modified RFQ. The winning bid was HydroScience. It was in their September 22nd submission. They met and talked about almost everything that we would be interested in. That was accepted and in November a contract was signed. Unfortunately the then leadership of the District chose to make oral modifications that were not confirmed in writing and HydroScience was told not to do anything that would result to talking about fluoride or a meter. That took all surface water off of the table and they had that in as something they would look at. Additionally, they were told no pipes and our pipes are from 1945 from our mains. The Board chose not to let HydroScience to comment on that. HydroScience did the best they could because they also did not receive some of the data or reports that was supposed to come to them. He asked them for two modifications. We need a discussion in the 218 on replacing mains that are in the backyards. We also need a discussion of surface water and what came up today is we need a discussion of some money to determine the size and the position of the plume that is under Well 8. Today I met with Mr. York and President Saunders and he agreed to try to work with us to determine the extent of the plume. If we could do that there is remediation money and we might get Well 8 back. I needed them to make three amendments without doing a lot of additional work. One was to add two exhibits, the surface water report from 2015 and the presentation of pipes that was made in May of 2017 which would be put in this document and add them on the page which would list the capital projects at the bottom listed as low priority and also list doing research on the plume. Also add a statement at the bottom the

order may change depending on needs or catastrophic changes in the district. This would be reviewed by the District Engineer when appointed. He believes that this report could be made into something that will satisfy our need for 218 and give us enough of a base to make the presentations necessary in the 218. We still need to work out money and things like that. He invited staff from HydroScience to answer any questions the Board may have. What he has suggested is a way to proceed and make use of the work that HydroScience did.

Director Matteoli spoke stating that he agrees that we can use the information they have and they should be able to move forward and prioritize the projects. General Manager Gardner gave an overview of the status of the Wells.

Director Dolk asked questions about if the requirements of Fireflow and AT&T be met. Director Pratt asked how the Dan York agreement will get memorialized and in what format will it be in. General Manager Gardner responded.

Director Dolk stated that we need to move on the fire hydrants, and asked if the District can quantify which pipes have the most leaks and General Manager Gardner responded. More discussion ensued regarding the pipes and the age of the pipes.

This item is not an action item. There is a consensus among the Board that the General Manager's recommendation is the way to move forward.

8. DIRECTORS COMMENTS: Verbal information, non-action comments.

9. GENERAL MANAGERS COMMENTS: Verbal report

None.

10. ADJOURNMENT: Next Regular Board of Directors meeting is scheduled for January 4th, 2022

Director Pratt made a motion to adjourn. Director Macias seconded the motion. The meeting was adjourned at 7:30 p.m. on consensus.

APPROVAL: ATTEST:

_____ _____

Ryan Saunders, President of the Board Yvonne Spence, Clerk of the Board

order may change depending on needs or catastrophic changes in the district. This would be reviewed by the District Engineer when appointed. He believes that this report could be made into something that will satisfy our need for 218 and give us enough of a base to make the presentations necessary in the 218. We still need to work out money and things like that. He invited staff from HydroScience to answer any questions the Board may have. What he has suggested is a way to proceed and make use of the work that HydroScience did.

Director Matteoli spoke stating that he agrees that we can use the information they have and they should be able to move forward and prioritize the projects. General Manager Gardner gave an overview of the status of the Wells.

Director Dolk asked questions about if the requirements of Fireflow and AT&T be met. Director Pratt asked how the Dan York agreement will get memorialized and in what format will it be in. General Manager Gardner responded.

Director Dolk stated that we need to move on the fire hydrants, and asked if the District can quantify which pipes have the most leaks and General Manager Gardner responded. More discussion ensued regarding the pipes and the age of the pipes.

This item is not an action item. There is a consensus among the Board that the General Manager's recommendation is the way to move forward.

8. DIRECTORS COMMENTS: Verbal information, non-action comments.

9. GENERAL MANAGERS COMMENTS: Verbal report

None.

10. ADJOURNMENT: Next Regular Board of Directors meeting is scheduled for January 4th, 2022

Director Pratt made a motion to adjourn. Director Macias seconded the motion. The meeting was adjourned at 7:30 p.m. on consensus.

APPROVAL:

Ryan Saunders, President of the Board

ATTEST:

Yvonne Spence, Clerk of the Board

Attachment 2B

SPECIAL MEETING OF THE BOARD OF DIRECTORS
DEL PASO MANOR WATER DISTRICT

February 17, 2022 6:30 P.M.
1817 Maryal Drive, Suite 300, Sacramento 95864

MINUTES

1. CALL TO ORDER:

The meeting was called to order at 6:30 p.m. by Chair Saunders.

2. ROLL CALL:

Directors Present: Dolk, Macias, Matteoli, Pratt, and Saunders
Staff Present: General Manager Gardner
Legal Counsel Present: Mona Ebrahimi

3. ADOPTION OF AGENDA: Members may pull an item from the agenda.

There was a motion by Director Dolk to adopt the agenda. The motion was seconded by Director Pratt. The agenda was adopted on a 5-0 roll call vote.

4. PUBLIC COMMENTS: The Board of Directors welcomes participation at these meetings. Matters under the jurisdiction of the Board that are not posted on the agenda may be addressed by the public, California law prohibits the Board from acting on any matter which is not on the posted agenda, unless the members determines that it is an emergency or other situation specified in Government Code Section 54954.2. Public comments are limited to five (5) minutes per individual. Please make your comments directly to the DPMWD Chair. Comments will be accepted via teleconference.

Upon call for public comment, no one from the public addressed the Board.

5. CONSENT CALENDAR: All items under Consent Calendar will be considered together by one action of the Board, any Member or members of the public may request that an item be removed and considered separately.

Upon call, the following items were pulled from the consent calendar to be taken up separately:

Director Dolk pulled item 5K
Director Macias pulled item 5H
Director Matteoli pulled items 5M and 5N
Director Saunders pulled item 5A

Upon call for public comment, no one from the public addressed the Board.

Item 5B. Approval of the Minutes of the September 01, 2021 meeting

Item 5C. Approval of the Minutes of the September 02, 2021 meeting.

Item 5D. Approval of the Minutes of the September 07, 2021 meeting

Item 5E. Approval of the Minutes of the September 13, 2021 meeting

Item 5F. Approval of the Minutes of the September 21, 2021 meeting

Item 5G. Approval of the Minutes of the September 28, 2021 meeting

Item 5I. Approval of the Minutes of the October 01, 2021 meeting

Item 5J. Approval of the Minutes of the October 5, 2021 meeting

Item 5L. Approval of the Minutes of the November 30, 2021 meeting

Director Pratt made a motion to approve the remaining items on the consent calendar (items 5B, 5C, 5D, 5E, 5F, 5G, 5I, 5J, and 5L). The motion was seconded by Director Dolk. The motion passed on 5-0 roll call vote.

PULLED CONSENT ITEMS:

Item 5K. Approval of the Minutes of the November 10, 2021 meeting.
Director Dolk requested a correction to his name in the "Adjournment" paragraph. The minutes has it spelled as "DOLT" and the spelling should be "DOLK". Director Pratt made a motion to approve the minutes with the correction noted. The motion was seconded by Director Macias. Upon call for public comment, no one from the public addressed the Board. The motion passed on a 5-0 roll call vote.

Item 5H. Approval of the Minutes of the September 29, 2021 meeting.
Director Macias made a motion to approve the item. The motion was seconded by Director Dolk. Upon call for public comment, no one from the public addressed the Board. The motion passed on a 5-0 roll call vote.

Item 5M. Approval of the Minutes of the December 20, 2021 meeting.
Director Matteoli noted that the footer of the document was labeled as "Agenda" and it should state "Minutes". Also the cover page should list the meeting as a "Special" meeting. Upon call for public comment, no one from the public addressed the Board. Director Dolk made a motion to approve the minutes with the corrections noted. The motion was seconded by Director Pratt. The motion passed on a 5-0 roll call vote.

Item 5N. Approval of the Minutes of the January 04, 2021 meeting.
Director Matteoli stated that the cover page should state if the meeting was a regular or special meeting. He also pointed out a typo on page 1, item 4, Carol is with a "C", not a

"K". Director Pratt also identified a typo on page 4, item 8B, "LACO" should be "LAFCO". Upon call for public comment, no one from the public addressed the Board.

Director Pratt made a motion to approve the item with the changes noted. Director Macias seconded the motion. The motion passed on a 5-0 roll call vote.

Item 5A. Approval of the Minutes of the August 26, 2021 meeting.
Chair Saunders asked about the meeting of August 26, 2021 being continued to August 27, 2021. There are not any minutes for August 27, 2021. General Manager Gardner explained that the recordings were not provided. Legal Counsel suggested that an Ad Hoc committee (Saunders and Matteoli) work to identify all of the missing minutes. No action was taken on this item. Upon call for public comment, no one from the public addressed the Board.

6. PUBLIC HEARING: None

7. NEW BUSINESS:

Item 7A.
A Resolution approving a Consultant Services Agreement with Forsgren Associates, Inc. for the position of District Engineer and authorizing the President of the Board of Directors to execute the agreement on behalf of the Del Paso Manor Water District.

Director Pratt made a motion to approve Resolution 22-0217 as amended and summarized by Legal Counsel. Director Macias seconded the motion. Upon call for public comment, no one from the public addressed the Board. The motion passed on a 5-0 roll call vote.

8. GENERAL MANAGERS COMMENTS: Verbal report.

General Manager Gardner updated the board members on Well 7, JPIA, COLAs and inspections. Upon call for public comment, no one from the public addressed the Board.

9. DIRECTORS COMMENTS: Verbal information, non-action comments

There were no comments from any of the Directors.

10. ADJOURNMENT: Next Regular Board of Directors meeting is scheduled for March 1st, 2022

Director Dolk made a motion to adjourn. Director Matteoli seconded the motion. The meeting was adjourned at 7:46 p.m. on consensus.

APPROVAL: ATTEST:

_____ _____
Ryan Saunders, President of the Board Yvonne Spence, Clerk of the Board

"LAFCO". Upon call for public comment, no one from the public addressed the Board. Director Pratt made a motion to approve the item with the changes noted. Director Macias seconded the motion. The motion passed on a 5-0 roll call vote.

Item 5A. Approval of the Minutes of the August 26, 2021 meeting.
Chair Saunders asked about the meeting of August 26, 2021 being continued to August 27, 2021. There are not any minutes for August 27, 2021. General Manager Gardner explained that the recordings were not provided. Legal Counsel suggested that an Ad Hoc committee (Saunders and Matteoli) work to identify all of the missing minutes. No action was taken on this item. Upon call for public comment, no one from the public addressed the Board.

6. PUBLIC HEARING: None

7. NEW BUSINESS:

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A Resolution approving a Consultant Services Agreement with Forsgren Associates, Inc. for the position of District Engineer and authorizing the President of the Board of Directors to execute the agreement on behalf of the Del Paso Manor Water District.

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APPROVAL:

Ryan Saunders, President of the Board

ATTEST:

Yvonne Spence

Yvonne Spence, Clerk of the Board

"LAFCO". Upon call for public comment, no one from the public addressed the Board. Director Pratt made a motion to approve the item with the changes noted. Director Macias seconded the motion. The motion passed on a 5-0 roll call vote.

Item 5A. Approval of the Minutes of the August 26, 2021 meeting.
Chair Saunders asked about the meeting of August 26, 2021 being continued to August 27, 2021. There are not any minutes for August 27, 2021. General Manager Gardner explained that the recordings were not provided. Legal Counsel suggested that an Ad Hoc committee (Saunders and Matteoli) work to identify all of the missing minutes. No action was taken on this item. Upon call for public comment, no one from the public addressed the Board.

6. PUBLIC HEARING: None

7. NEW BUSINESS:

Item 7A.
A Resolution approving a Consultant Services Agreement with Forsgren Associates, Inc. for the position of District Engineer and authorizing the President of the Board of Directors to execute the agreement on behalf of the Del Paso Manor Water District.

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8. GENERAL MANAGERS COMMENTS: Verbal report.

General Manager Gardner updated the board members on Well 7, JPIA, COLAs and inspections. Upon call for public comment, no one from the public addressed the Board.

9. DIRECTORS COMMENTS: Verbal information, non-action comments

There were no comments from any of the Directors.

10. ADJOURNMENT: Next Regular Board of Directors meeting is scheduled for March 1st, 2022

Director Dolk made a motion to adjourn. Director Matteoli seconded the motion. The meeting was adjourned at 7:46 p.m. on consensus.

APPROVAL:

Ryan Saunders, President of the Board

ATTEST:

Yvonne Spence

Yvonne Spence, Clerk of the Board

Attachment 2C

Del Paso Manor Water District- Prop. 218 Process

Task	Type	May	June	July	August	September	October	November	December	January
HSE Memo Revision	C									
Develop Initial Road Map	C									
Public Outreach	DPMWD									
Prepare Rate Study RFP	DPMWD									
Board Meeting	BM									
Finalize Road Map	C									
RFP Questions	DPMWD									
Rate Study Proposal Preparation	C									
Board Meeting	BM									
Board Meeting	BM									
Review Rate Study Proposals	DPMWD									
Road Map Presentation	C									
Board Meeting	BM									
Negotiate Rate Study Contract	DPMWD									
Board Meeting	BM									
Develop Draft Rate Study	C									
Board Meeting	BM									
Board Meeting	BM									
Prop 218 Notice	DPMWD									
Board Meeting	BM									
Prepare Final Rate Study	C									
Board Meeting	BM									
Prepare for Public Hearing	DPMWD									
Board Meeting	BM									
Board Meeting	BM									
Mail/Post Prop 218 Notice	DPMWD									
Public Hearing Buffer Period	DPMWD									
Public Hearing Notice	DPMWD									
Public Hearing	BM									

Legend

Consultants	C
Del Paso Manor Water District	DPMWD
Board Meeting	BM

ATTACHMENT 3

Technical Memorandum

HydroScience
Strategic Water Solutions

Sacramento • Berkeley • San Jose

To: Del Paso Manor Water District, Mr. Alan Gardner, General Manager

From: Bill Slenter, PE, Project Manager

Subject: 2022 Amendment to the DPMWD 2009 Water Master Plan

Date: June 6, 2022

Section 1: Executive Summary

1.1 Purpose

This technical memorandum (TM) represents an amendment (2022 Amendment) to the District's 2009 Water Master Plan (2009 WMP) to document data, policies, projects, and strategies that have been completed or updated in the intervening 12 years and provides a roadmap for reaching new policy and vision goals. This 2022 Amendment updates specific aspects of the 2009 WMP as follows:

- Water demands and planning criteria.
- Water supply and wells.
- Hydraulic modeling utilizing updated system flow criteria to determine pipe and hydrant deficiencies.
- Identification of near term (0-5 years) prioritized projects to address the most significant deficiencies.
- Longer-term recommendations for additional studies and projects.

This 2022 Amendment does not commit the ratepayer to any specific discretionary action in order to implement policy goals. Updates to the 2009 WMP are presented in this TM, which is organized similarly to the 2009 WMP. The TM includes references to the 2009 WMP where appropriate, for convenience.

In addition to updating the data and facilities to represent current conditions, this 2022 Amendment presents a preliminary Capital Improvement Plan (CIP) for near-term system improvements to supplement the longer-range improvements in the 2009 WMP. There are significant liabilities facing the District in maintaining a high quality, reliable water supply and level of service. These liabilities are addressed by the recommended CIP.

1.2 Water Demands and Planning Criteria

The water use over the past two decades has reduced significantly due to ongoing drought conservation measures. It is expected that some conservation measures that were required during the extended drought periods have remained in use even when there is no drought. The updated evaluation of water demands resulted in the following findings:

- The calculated average for the District is 2.56 persons per household. Using the staff reported number of 1,798 residential connections, the estimated population for the District of roughly 4,600 persons.
- The District reports that there are currently 1,798 residential connections and 100 commercial connections, which indicates that 95% of the District's connections are residential.
- The District provided monthly well meter data from 2014 through mid-July 2020 and monthly commercial meter reading from April 2020 through November 2020. In comparing the only recent overlapping data from April 2020 through July 2020, it is estimated that the residential water use of 768,816 gpd represented approximately 49% of all water delivered while commercial/industrial/institutional represented 51%. The largest single water use account was the cooling towers at AT&T.
- Usage metering is limited to commercial and mutli-family residential connections. Commercial metering does not generally separate irrigation demands, making it difficult to quantify implementation of outdoor water use conservation policies.
- Based on historical well production data from January 2014 thru July 2020, the Average Day Demand (ADD) is estimated at 698 gpm. This represents a reduction from the historical water use of 1,680 gpm (1.5 MGD) reported in the 2009 WMP. ADD has remained low these past 6 years since the last significant drought year in 2015. This reduction is likely to be permanent due to conservation policies enacted during the multi-year drought of 2012-2016.
- The reduction in ADD water demand, despite a slight increase in population, can be attributed to continuing water conservation efforts and public awareness for drought potential. Based on the District's updated population of 4,600 persons, the estimated residential per capita water demand is 218 gpcd.
- Using the available well supply data (and previously noted 10% unaccounted for water losses), the estimated Maximum Day Demand (MDD) is 1,396 gpm for the years 2014-2019.
- For commercial customers, the largest user is the AT&T Telephone Service Center, which is located in the northwest of the service area. The hydraulic model considered a demand of 3,500 gpm for a 4-hour duration to represent the fire flow requirements at this location. Fire flow requirements should be confirmed by the District in consideration of building fire sprinklers prior to implementing any related CIP projects.
- A fire demand of 3,500 gpm for a 4-hour duration was considered for the WinCo Foods location at the southern end of the Country Club Plaza near the intersection of Watt Avenue and Butano Dr. The District should confirm this fire flow requirement as well.
- As the State of California continues to take a hard look at water use, sustainability, climate change, and requires a more active approach in determining local water use patterns, the District is likely to be statutorily exempt from some requirements due to its small size but can expect increasing pressure to increase water conservation. Water conservation should continue to be a key element of managing the District's water supply.

1.3 Water Supply and Wells

The water supply and well evaluation contained in the 2009 WMP was updated with new information provided by the District including the results of a State Water Resources Control Board (SWRCB) inspection conducted in 2019. During the period since 2009, two wells were

abandoned, two wells were developed and equipped as replacements, one well has been taken offline indefinitely due to contamination, another was placed on standby due to high contaminant levels, and one well is being monitored for rising contaminant levels.

Per California Waterworks Standards (Title 22, Chapter 16), community water systems using only groundwater shall be capable of meeting MDD with the highest-capacity source off-line. Currently, the District's well system firm capacity (with Well 9 on standby) is 3,075 gpm, which is greater than the updated MDD of 1,396 gpm. So, the District meets this waterworks standard. Additionally, a system without a storage tank should be capable of meeting MDD plus the maximum Fire Flow (FF) demand with the largest well out of service. For the AT&T facility and Winco, the FF demand is currently estimated at 3,500 gpm (subject to verification). Based on these conditions, the District's system does not currently meet this criteria. Note that Title 22 does not require a public water system to provide fire flow as a minimum condition of service. Fire protection requirements for building permit approvals is in the jurisdiction of SMFD and not the District.

In 2008, the District completed a Conjunctive Use Plan to evaluate alternatives for developing a surface water use program and participating in groundwater wheeling with neighboring districts to bring more surface water into the District and to offset groundwater pumping during wet years. Implementation of this plan has not progressed as of the date of this 2022 Amendment.

1.4 Facilities Replacement Planning and Implementation

Hydraulic modeling utilizing updated system flow criteria was performed to determine pipe and hydrant deficiencies and identify near-term capital improvement projects. The evaluation and identification of near-term CIP projects to address identified deficiencies as well as aging and undersized piping is summarized in Table 1-1, next page.

Table 1-1: Near Term CIP Summary

Project Priority	Description	Need Addressed	Estimated Planning-Level Implementation Cost[1]
1	Automate SSWD Interties	Improve available fire flow supply during an emergency. Eliminate response time delay for engaging the interties during an emergency.	To be determined
2	Rehabilitate Existing Wells 2 and 7	Improve available supply from existing wells	To be determined
3	Add Treatment to Well 3	Improve available supply from existing wells	To be determined
4	Install 260kW, 480VAC NG outdoor genset at Well 9 with sound enclosure; replace MTS with ATS (See Note 2)	Provide redundancy and reliability to the system	$450,000
5	Replace Undersized and Aging Backyard Mains with New Mains in Public ROW	Replace undersized pipe and pipe prone to failure, provide improved pipe access	See Attachment C
3	Install New Water Supply Well(s) Totaling 1,800 gpm Additional Flow (See Note 3) Engineering Evaluation of New Supply Options	MDD+FF deficiency, improve system pressures, improve supply reliability Select most cost-effective and feasible approach to augment supply.	$3,100,000 $50,000 – $75,000
NP[7]	Install 15 Additional Fire Hydrants and Upgrade AT&T Hydrant	Improve compliance with 500 ft max hydrant spacing, address deficient fire flows	$252,000
NP[7]	Pipe Replacement Projects 2-10 (see Note 4)	Hydrant flow deficiency	$580,000
NP[7]	Implement DPMWD-CWD Intertie (Conjunctive Use Project) (see Notes 5, 6)	Improve available supply through introduction of surface water	See Attachment E

Notes:
1. Rounded to two significant figures. Forsgren Associates is updating “to be determined” costs in a separate effort.
2. Genset cost excludes the cost of bringing natural gas onsite. If there is a natural gas pipeline in the street near the water main, the approximate added cost is $10,000 for the natural gas service extension). Installation of genset at this location will require coordination with adjacent school.
3. New well project is a placeholder for a well or other alternative to increase capacity and/or provide storage for fire flow. Alternatives include: alternate well locations, greater number of smaller new wells, rehabilitation/reboring of existing wells, and utilization of interties. Higher priority projects to rehabilitate existing wells may reduce the flow requirement for a new well. Project cost will change depending on the type of project chosen. Cost of land acquisition is not included. A budgetary amount for an engineering study to evaluate and select the preferred alternative is presented.
4. Pipe replacement projects can also be implemented individually or in smaller groups. Refer to prioritization in Attachment B, Cost Detail, for recommended order of implementation. Order is set based on level of existing fire flow deficiency addressed by the corresponding upgrade. Prior to implementing this project, update the hydraulic model to reflect any system upgrades including replacement of backyard main piping. Some or all of these pipe replacement projects may not be required after the other upgrades.
5. The District should first evaluate potential impacts to residential metering and fluoridation requirements and need to update the existing agreement, as stated herein, prior to implementing this project. Connection of interties will require a hydraulic model update to understand the impacts to the distribution system.
6. Refer to Attachment E.
7. NP=Not Prioritized.

Section 2: Introduction

2.1 Purpose of the 2022 Amendment to the 2009 Water Master Plan

The Del Paso Manor Water District (District) has long been committed to providing a safe and reliable water supply while, at the same time, maintaining low water rates. The 2009 Water System Master Plan (2009 WMP) was the first District Master Plan to address the District's planning strategies and to develop projects to address aging infrastructure and changing water supply concerns. This 2022 Amendment to the 2009 WMP (2022 Amendment) is not intended to be a full master planning effort but a documentation of data, policies, projects, and strategies that have been completed or updated in the intervening 12 years and a roadmap for reaching new policy and vision goals. This 2022 Amendment updates specific aspects of the 2009 WMP as follows:

- Water demands and planning criteria
- Water supply and wells
- Hydraulic modeling utilizing updated system flow criteria to determine pipe and hydrant deficiencies
- Identification of near term (0-5 years) prioritized projects to address the most significant deficiencies
- Longer-term recommendations for additional studies and projects

This 2022 Amendment does not commit the ratepayer to any specific discretionary action in order to implement policy goals. Updates to the 2009 WMP are presented in this TM organized similarly to the 2009 WMP, for convenience.

Limited updated data was available regarding well condition and customer demands. Where data was not provided or was limited, the team made inferences based on knowledge of other nearby water districts and recent experiences on similar water system planning.

2.2 Background

The District is located in the Arden area of unincorporated Sacramento County, northeast of the City of Sacramento, as shown in the vicinity and location maps provided in Figures 1 and 2. The District service area is approximately 1.3 square miles and the District provides drinking water to approximately 1,800 residential, commercial, and institutional customers. The District is bounded on all sides by Sacramento Suburban Water District (SSWD), a large water purveyor in the Sacramento region. Figure 3 provides a map of the region and the Districts location relative to neighboring water purveyors.

The District is fully built-out and is facing an increasing infrastructure liability as the aging pipelines and wells reach the end of their useful life. The District's water system is comprised of buried water mains, eight (8) groundwater wells, and individual service connections, and has generally been in continuous service for over 65 years. Figure 4 provides the location of each of the existing District wells and approximate locations and diameters of existing buried water distribution pipelines. The District's elected Board of Directors, recognizing that the aging system and water supply reliability impact water service, commissioned this update to the 2009 WMP. Over the next 5 to 30 years, the infrastructure needs will continue to rise as more older facilities fail. This update will provide an initial roadmap for distributing available funding.

FIGURE 1
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
VICINITY MAP

HydroScience

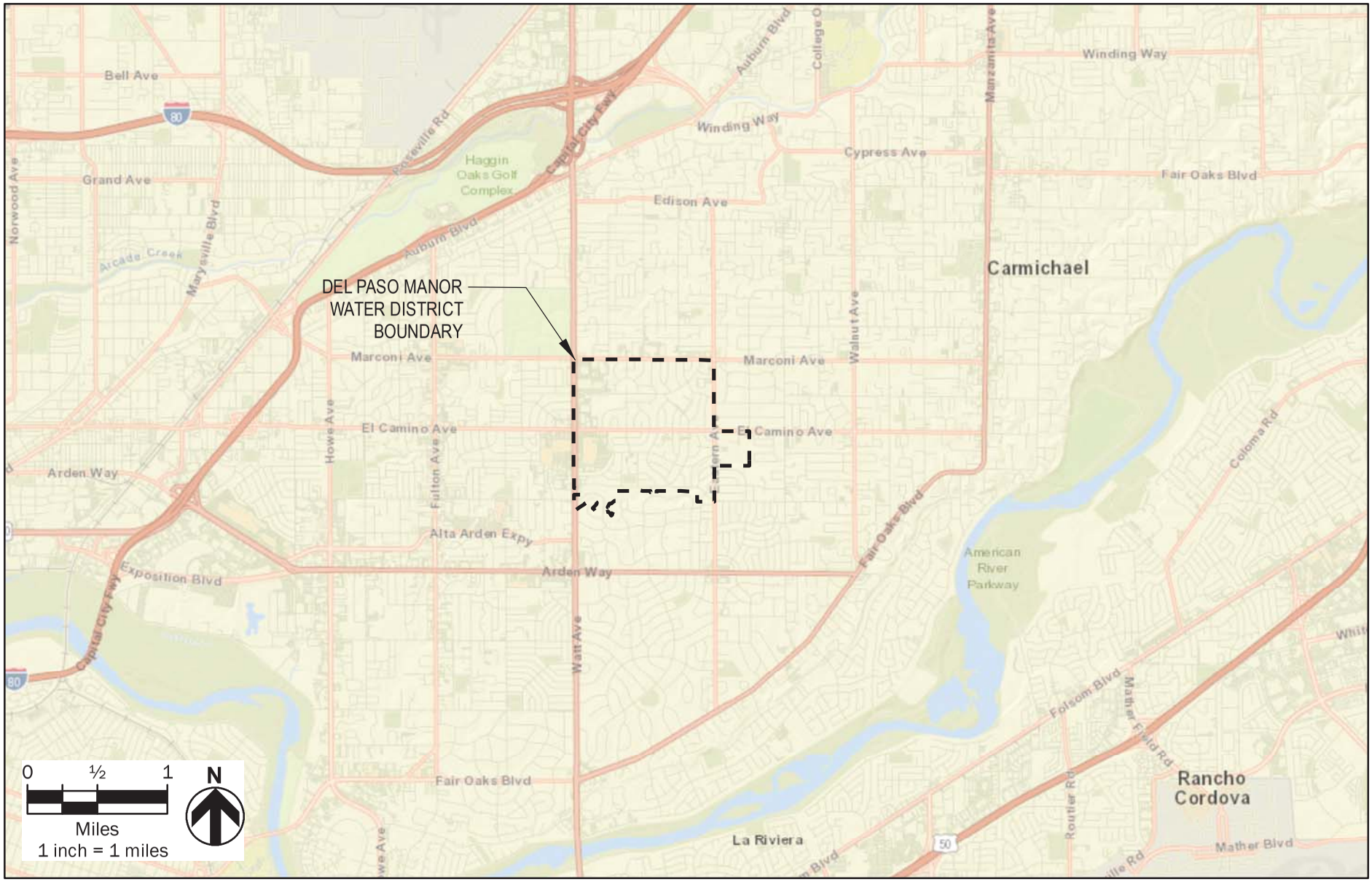


FIGURE 2
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
LOCATION MAP

HydroScience

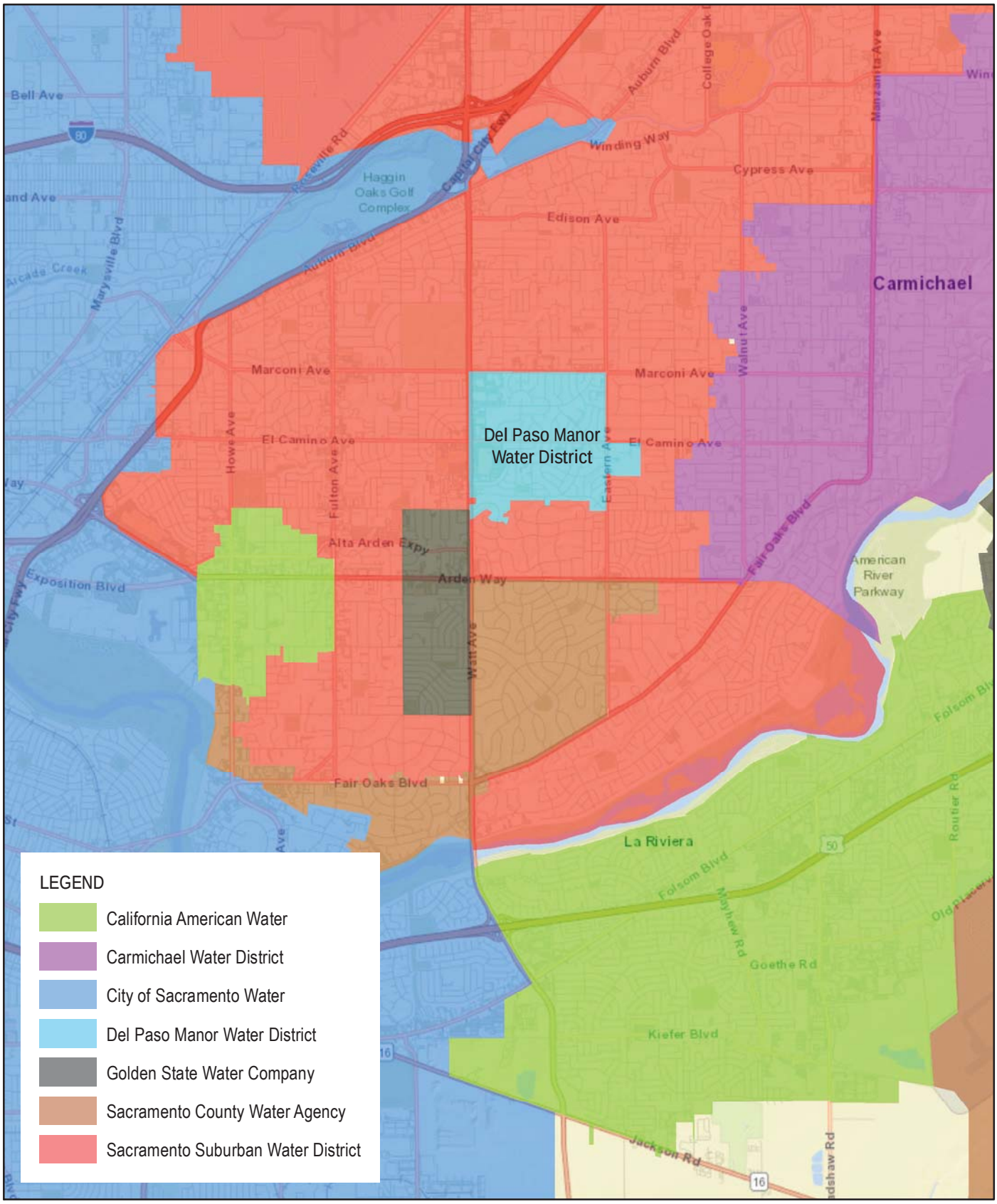


FIGURE 3
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
ADJACENT WATER DISTRICTS

HydroScience

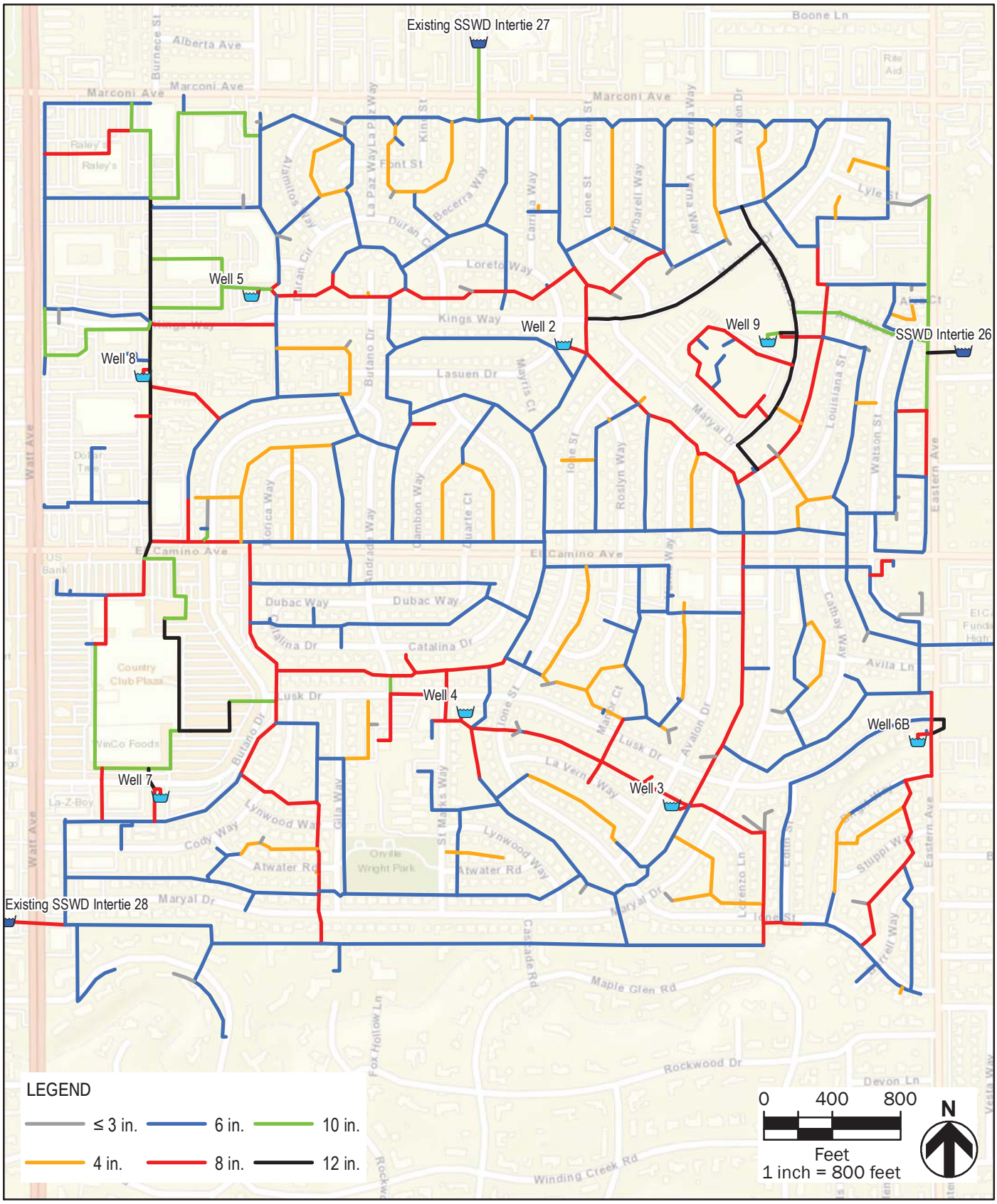


FIGURE 4
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
DISTRICT FACILITIES MAP

HydroScience

Section 3: Water Demands and Planning Criteria

This section provides updates to the water demands and planning criteria that were previously addressed by Section 3 of the 2009 WMP.

3.1 Introduction

The District is designated as a "Small Water District" and therefore does not meet the California threshold of an "Urban Water Supplier". Since it neither serves more than 3,000 urban connections nor provides more than 3,000 acre-feet of water annually, the District is not subject to State of California Assembly Bill AB-2572, which would require metering of all municipal (residential and commercial) connections by January 1, 2025.

The District reports that its number of connections has remained stable since the previous master plan due to the service area being built-out.

3.2 Population and Growth

The District is not expected to experience significant population growth or demographic changes. The District has one elementary school, one high school and a commercial district, however the majority of service connections are residential. The land use change most anticipated is redevelopment of commercial properties with potentially different water needs. This should be accommodated in the record-keeping process moving forward so these potential changes can be considered during the evaluation of demand in subsequent master planning efforts.

The District encompasses a small geographic area within an unincorporated portion of Sacramento County whose population is not measured and reported through the usual sources for determining population and growth. Because population in the District area is not measured directly, this report determines the District's population growth by investigating Census Designated Places (CDP) within the northern unincorporated areas of Sacramento that exhibit similar socio-economic and geographical characteristics. Table 3-1 (next page) shows the CDP areas used in the 2009 WMP and provides updated 2019 population and housing unit density for each CDP. The table below indicates that the Foothill Farms and the Gold River CDPs experienced significant growth indicating that the CDPs still had open tracts of land available for development. The District service area does not incorporate such tracks of developable land. therefore, Foothill Farms and Gold River CDPs were discounted in the estimate calculation of the population per household in the District's service area. As projected in the 2009 WMP, the increase in estimated population per household is minor and can be attributed to the area's demographics slowly changing from older single or two person residences to younger two to four person residences. This trend is expected to continue slowly. As shown in the table below, the calculated average for the District is 2.56 persons per household. Using the staff reported number of 1,798 residential connections, the estimated population for the District of roughly 4,600 persons.

Table 3-1: Population and Housing Unit Density

Geographic Area	Housing Units per square mile	Population per square mile	Population per Household	Change since 2000
Arden Arcade CDP	2,521.2	5,778.9	2.29	+0.15
Carmichael CDP	2,052.2	4,774.4	2.33	---
Citrus Heights City	2,486.0	6,153.0	2.48	+0.04
Fair Oaks CDP	1,222.4	2,873.3	2.35	-0.09
Foothill Farms CDP	3,036.9	8,543.1	2.81	+0.26
Florin CDP	1,823.3	5,466.1	3.00	+0.12
Gold River CDP	1,336.9	2,899.2	2.17	-0.28
La Riviera CDP	2,606.1	6,022.2	2.31	+0.02
Orangevale CDP	1,199.7	3,028.2	2.52	-0.12
Rio Linda CDP	518.1	1,652.4	3.19	+0.28
Del Paso Manor WD Estimated Population/Household Density			**2.56 4,600 persons**	**+0.06**

US Census 2019 American Community Survey 5-Year Estimates

3.3 Water Use

The District provided historical well production data from January 2014 thru July 2020 which was used to estimate system demands (Table 3-2). Based on typical water system data, we assumed that 10% of the water produced at the wells is unaccounted for water loss and the remaining 90% of water supply volume is the District demand.

Table 3-2: Annual Well Production and ADD Estimate

Year	Well Production	Well Production	Average Day Demand (ADD)
2014[1]	1,447 AFY	1.29 MGD	897 gpm
2015	941 AFY	0.84 MGD	585 gpm
2016	1,113 AFY	0.99 MGD	690 gpm
2017	1,111 AFY	0.99 MGD	689 gpm
2018	1,100 AFY	0.98 MGD	682 gpm
2019	1,037 AFY	0.93 MGD	643 gpm
2020[1]	1,125 AFY	1.00 MGD	698 gpm
AVERAGE	**1,125 AFY**	**1.00 MGD**	**698 gpm**

Notes:
1. Well production data for 2014 and 2020 available only for January through September and January through July, respectively. Usage totals were averaged over available months and projected for the total year.

The District reports that there are currently 1,798 residential connections and 100 commercial connections which indicates that 95% of the District's connections are residential. No additional breakdown of this information was available.

It is assumed that the customer service type breakdown (residential vs commercial) has not changed significantly since the 2009 WMP, since the water system has been considered built-out for a long period of time. Historical demand and water customer data for the period of 2009 to April 2020 was not available to confirm this.

In comparing the only recent overlapping data of well production and commercial meter reading from April 2020 through July 2020, it is estimated that the residential water use of 768,816 gpd represented approximately 49% of all water delivered while commercial/industrial/institutional represented 51%. The largest single water use account was the cooling towers at AT&T.

The District remains largely unmetered. Commercial and multi-family residential connections are metered while single-family residential services remain unmetered. The commercial metered connections do not generally have separate irrigation meters installed making it difficult to quantify implementation of outdoor water use conservation policies. Currently, there are no plans to implement a meter installation program within the District.

3.4 Water Demand Criteria

The following provides a discussion of the hydraulic model, updated with available recent data, used to determine water peaking factors and water supply need. Demand criteria is based on water use within the District and within similar water agencies in Sacramento County.

Hydraulic Modeling. The hydraulic model used for this update was previously created for the 2009 WMP and subsequently updated and calibrated for the 2014 Surface Water Report. This model was further updated with current demand criteria and used to evaluate the system for compliance with water system standards and design criteria. The overall model findings in the Normal Operations evaluation, shown in Figure A-3, were confirmed with the District as generally matching with real world observations made by District operations. A detailed explanation of the hydraulic modeling evaluations and results is provided in Attachment A.

Average Day Demand (ADD). The 2022 Amendment updated the Districts system demands based on available data. The District's Average Day Demand (ADD) estimates were provided in Table 3-2. The 2009 WMP, relying on historical groundwater production records from 1998 through 2007, reported an ADD of 1.50 MGD. The District's current ADD is estimated as the average of estimated water demands from 2014 through 2020. As shown in Table 3-2, the District's current ADD is estimated as 697 gpm (1.00 MGD). The reduction in ADD water demand, despite a slight increase in population, can be attributed to continuing water conservation efforts and public awareness for drought potential. As discussed in Section 3-2, the District's updated population is 4,600. Therefore, the estimated residential per capita water demand is 218 gpcd. This estimated water use per capita is primarily used to determine whether conservation measures are having an impact on water use practices.

Maximum Day Demand (MDD). MDD represents peak water use during summer months (June through August). Using the available well supply data (and previously noted 10% unaccounted for water losses), the estimated MDD is 1,396 gpm for the years 2014-2019.

Peak Hour Demand (PHD). PHD represents the peak hourly use hour during a maximum demand day. Hourly well production data was unavailable at the time of this analysis. The existing hydraulic model used for the 2009 WMP used a diurnal curve indicating a peak hour factor of 1.8

times MDD. No additional information on hourly well production was available. Therefore, using the 1.8 times the estimated MDD of 1,396, the estimated PHD is 2,513 gpm.

Peaking Factors. Water peaking factors are necessary to predict fluctuations in water demands throughout the year. This allows the District to identify possible deficiencies during high use events. Utilizing the estimated ADD of 698 gpm and MDD of 1,172 gpm, the calculated MDD peaking factor is 1.7. This calculated peaking factor is considered low compared to other similar systems that HydroScience has analyzed and is well below the 2.93 MDD peaking factor determined by the 2009 WMP. It is plausible that increased water conservation has reduced the peak from 2009, however the data set available to calculate the updated MDD is of limited duration and detail. Therefore, HydroScience has conservatively established an updated MDD peaking factor at 2 times ADD and used this value for the model evaluations. This is consistent with peaking factors utilized by Sacramento County Water Agency. Table 3-3 summarizes the recommended updated peaking factors for this analysis and the associated demands.

Table 3-3: Summary of Water Demands and Peaking Factors

Demand Type	Peaking Factor	Demands
Annual Average Day (ADD)	1.0	1,125 AFY (698 gpm)
Maximum Day Demand (MDD)	2.0 x ADD	2,250 AFY (1,396 gpm)
Peak Hour Demand (PHD)	1.8 x MDD	4,052 AFY (2,513 gpm)

Fire Flow Requirements. The District is within the Sacramento Metropolitan Fire Department (SFMD) service area. For residential customers, the hydraulic model considered a fire flow demand of 1,500 gpm for a 2-hour duration. The 2009 WMP indicated that a review of existing SFMD records identified a 3,500 gpm fire demand for the AT&T facility and a March 23, 2021 email from Angela Hampton of SMFD indicated that the fire demand for WinCo Foods, based off square footage and Type VB construction, would be between 3,250 to 4,000 gpm for a 4-hour duration. A mid-point value of 3,500 gpm at this site was used for the current analysis.

The AT&T Telephone Service Call Center and WinCo Foods are served by hydrants H-11P and H-1P, respectively. The locations of these hydrants are shown on Figure A7.

The District advised in May 2022 that both buildings are sprinklered. Further review with SFMD and a firm determination of the required fire flows at these locations in consideration of the presence of sprinklers is recommended prior to implementing any related CIP projects to increase fire flow. It must also be determined whether these fire flows must be provided at the hydrants (H-11P and H-1P) or at the fire sprinkler risers. For the purposes of this effort, the hydraulic model assumed fire flows of 3,500 gpm at both of these hydrants.

Note that Title 22 does not require a public water system to provide fire flow as a minimum condition of service. Fire protection requirements for building permit approvals is in the jurisdiction of SMFD and not the District.

Non-residential, commercial, industrial and park demands represented approximately 50% of all water use during the 4 months of 2020 for which records were available. This represents a very small data set. Based on the data available, the AT&T center's cooling tower is typically the largest single commercial water user. In addition to the small data set in the summer of 2020, the four months of overlapping supply and use data provided also coincided with the beginning months of

a historic pandemic period where stay-at-home orders were enforced in Sacramento County. Schools, restaurants, department stores, and other businesses deemed “non-essential” were shuttered and many residents of Sacramento County were sheltered at their residences. The lack of data prior to the pandemic impacts the usefulness of the data for an analysis to predict trends and forecast future needs.

3.5 Water Conservation

While the 2009 WMP was written just after a multi-year drought period, this 2022 Amendment is being prepared at the early stages of another drought period. California’s water reservoirs are expected to reach record lows by the end of the summer 2021. Significant conservation measures are likely to be placed on larger districts along with restrictions on the use of their surface water sources. These measures will result in increased pumping from the area’s groundwater aquifers including the one relied upon by the District. The increased groundwater pumping, although not quantified in this report, may have significant impact to groundwater levels and water quality available to the District.

As the State of California continues to take a hard look at water use, sustainability and climate change and requires a more active approach in determining local water use patterns, the District is likely to be statutorily exempt from some requirements due to its small size but can expect increasing pressure to increase water conservation. Water conservation should continue to be a key element of managing the District’s water supply.

3.6 Water System Standards and Design Criteria

The water system standards presented in this section are based on standard water distribution system operating criteria. Minimum pressure criteria were established in accordance with California Waterworks Standards Section 64602. System pressure in the distribution system must operate within the required minimum and maximum range. Maximum velocity criteria are required to minimize head loss in the distribution mains. Pressure, velocity, and additional water system design criteria is provided in Table 3-4.

Table 3-4: Water System Criteria

Pressure	Criteria
Average water system pressure	50 psi
Minimum water system pressure under PHD	40 psi
Minimum water system pressure under MDD	40 psi
Minimum residual pressure under MDD+FF with Largest Supply Out of Service	20 psi
Maximum water system pressure	80 psi
Velocity	**Criteria**
Maximum velocity under ADD	3 fps
Maximum velocity under MDD	5 fps
Maximum velocity under PHD	7 fps

Target velocity under MDD+FF	10 fps
Maximum velocity under MDD+FF	13 fps
Other Design Criteria	**Criteria**
Hazen-Williams Roughness Coefficient	100-150[1]
Maximum fire hydrant spacing	500 feet
Minimum pipe diameter for looped system	8 inch
Pipe diameter for dead-end runs	6 inch

Notes:
1. The Hazen-Williams coefficients for existing pipe segments were adopted from the 2014 hydraulic model provided to HydroScience. Coefficients varied by pipe material, age, and condition. See Appendix A for further detail.

Section 4: Water Supply and Wells

This section provides updates to the evaluation of existing water supply, water supply deficiencies, and approaches to address those deficiencies. These planning elements were previously addressed by Sections 4 and 5 of the 2009 WMP.

4.1 Groundwater Supply

The District remains an active member of regional groundwater planning organizations and initiatives, including the Sacramento Groundwater Authority (SGA) and the Regional Water Authority (RWA). There are several documents published by these organizations since the 2009 WMP which can be found at the web locations below.

- SGA Water Accounting Framework Phase III Effort Final, 2010 (https://www.sgah2o.org/wp-content/uploads/2016/06/WAF-PhaseIII-Final-9-28-10.pdf)
- SGA Groundwater Management Plan, Sacramento County, North Basin, 2014 (https://www.sgah2o.org/wp-content/uploads/2016/06/GMP_SGA_2014_Final.pdf)
- SGA Basin Management Report – 2016 Update (https://www.sgah2o.org/wp-content/uploads/2017/01/pub-bmreport-2015.pdf)
- RWA Regional Water Reliability Plan – May 2019 (https://rwah2o.org/wp-content/uploads/2019/05/RWRP_May2019b.pdf)

These documents indicate that the North Basin is in recovery and water levels, although still low, are rebounding. Continued pumping by the District will not impact the status of the groundwater basin. There is a potential for perchloroethylene (PCE) contamination in the northwest corner of the District stemming from the migration of the known contamination plume from the area formerly known as McClellan Air Base. More information regarding this plume and its migration can be found in the documents listed above.

The District currently maintains eight (8) wells to supply the District's water distribution system. Since the 2009 WMP was published, Well Nos. 1 and 6 were abandoned and Well Nos. 6B and 9 were developed and equipped as replacements, respectively. Currently, Well No. 8 has been taken offline indefinitely due to exceedances of the maximum contaminant level (MCL) for

tetrachloroethylene (PCE). Well No. 5, which is in the same general vicinity, is being monitored to ensure that it is not impacted by the PCE plume migration. Well 7 is operable, but the current District practice is to only operate this well during emergency conditions. Due to its configuration in a vault, it requires confined space access for maintenance and refilling of chemical supplies. However, it is available if needed to meet demands.

The State Water Resources Control Board (SWRCB) performed an inspection of the District system on December 4, 2019 and issued the following report: "*2019 Compliance Inspection of the Del Paso Manor County Water District Public Water System (PWS No. 3410007)*", State Water Resources Control Board, January 28, 2020 (2019 Inspection). According to this inspection report, the Well No. 3 status was changed from Active to Standby due to exceedances of the MCL for 1,2,3 Trichloropropane (TCP). Additional testing will be required in order to apply for a change in status back to Active.

Well production capacity as provided by the District and documented in the SWRCB 2019 Inspection are shown in the following Table 4-1. The locations of the District wells are shown in Figure 5. Additional details on recent well history and the SWRCB 2019 Inspection are provided in Section 5.

Per California Waterworks Standards (Title 22, Chapter 16), community water systems using only groundwater shall be capable of meeting MDD with the highest-capacity source off-line. Currently, the District's well system firm capacity (with Well 9 on standby) is 3,075 gpm, which is greater than the updated MDD of 1,396 gpm. Therefore, the District meets this waterworks standard.

Since the District does not have any storage tanks in their distribution system, the District's well system's firm capacity should also be capable of meeting MDD + FF demand or 4,896 gpm (based on estimated fire flow requirements of 3,500 gpm at the AT&T Telephone Service Center and Winco Foods in Country Club Plaza, subject to confirmation). Based on this best practice, the District has a well pumping deficit of 1,821 gpm. To meet this MDD+FF condition, new source(s) and/or improvement to existing sources may be needed. Note that Title 22 does not require a public water system to provide fire flow as a minimum condition of service. Fire protection requirements for building permit approvals is in the jurisdiction of SMFD and not the District.

The District currently has a Mutual Aid Agreement with SSWD that authorizes use of the interties for emergency use. The critical path for engaging these interties during an emergency the required is operator response time to travel to and unlock the valves and open them to permit flow. Automation and metering of the interties would eliminate this response time delay.

Table 4-1: Groundwater Supply and Active Pumping Capacity

Well No	Year Built	Age In Years	Active Pumping Capacity	Well Status / Comments
2	1948	72	375 gpm	Video inspection completed.
3	1949	71	--	Permitted Use is Standby, 1,2,3 TCP MCL Exceeded
4	1951	69	475 gpm	Video inspection scheduled for 2021
5	1955	67	450 gpm	
6B	2014	6	1,100 gpm	Primary well with standby generator, Used during low winter demands (down to 100 gpm)
7	1956	64	675 gpm[1]	District minimizes operation of this well. See Note 1.
8	1977	43	--	PCE detected. Well Offline. Expected complete loss
9	2011	9	1,500 gpm	Primary well, New Generator scheduled for 2021 installation
Total Capacity			**4,575 gpm**	PHD=2,513 gpm
Firm Capacity			**3,075 gpm**	MDD = 1,396 gpm, MDD+FF=4,896 gpm

Notes:
1. Well 7 is available and would be operated by the District during a MDD+FF condition with the largest well (Well 9) out of service. However, the configuration of Well 7 in a vault requires confined space entry for local maintenance and replenishment of chemical supplies. Therefore, the District keeps this well on standby under normal operating conditions.

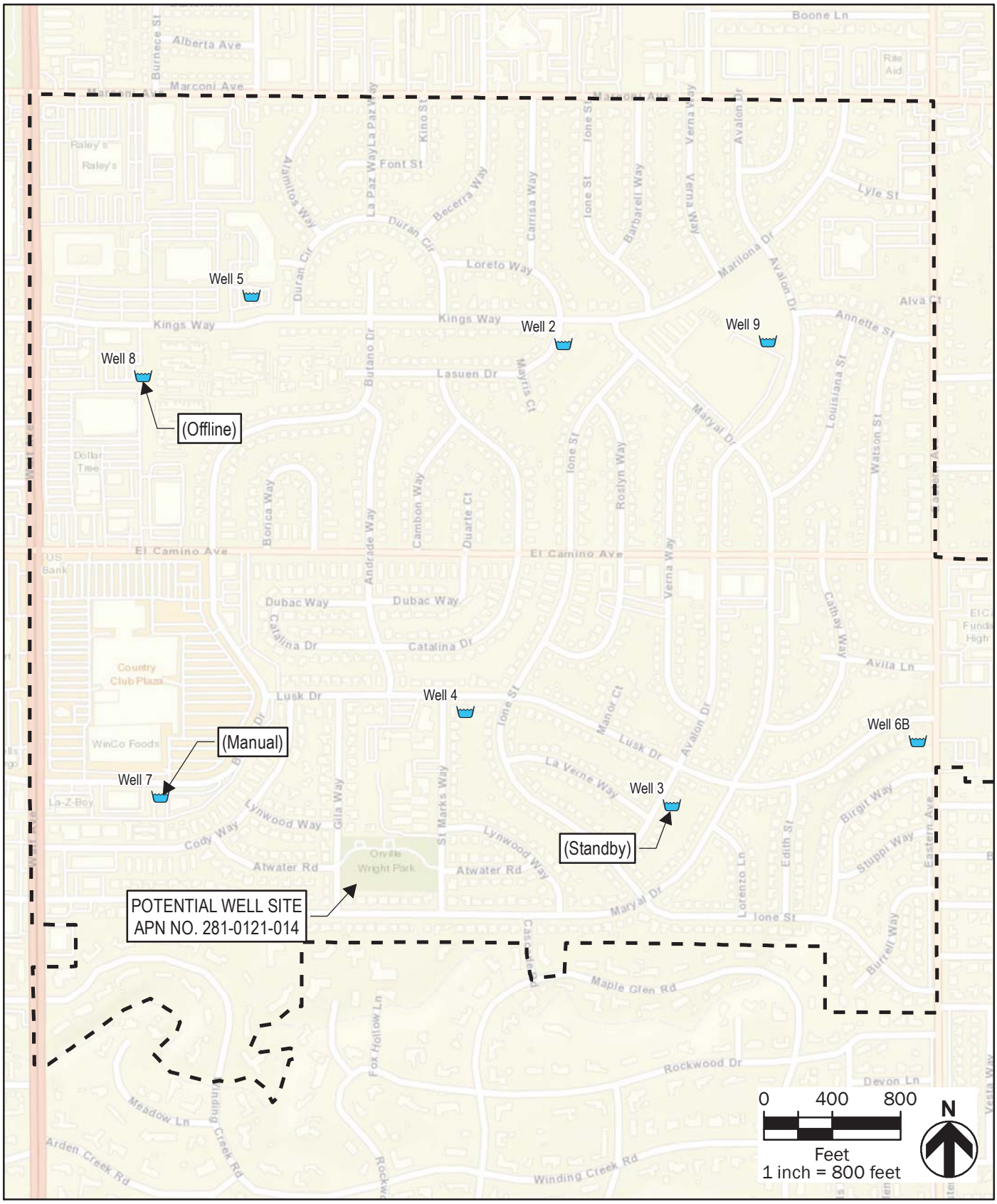


FIGURE 5
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
DISTRICT WELL LOCATIONS

HydroScience

4.2 Surface Water Supply

In 2008, the District completed a Conjunctive Use Plan to evaluate alternatives for developing a surface water use program and participating in groundwater wheeling with neighboring districts to bring more surface water into the District and to offset groundwater pumping during wet years.

The District continues to have a 1968 agreement with the City of Sacramento that establishes conditions for transfer of up to 6.8 cubic feet per second or 2,460 acre-feet annually to the District through the City's Area D water service area.

The District also has a current Mutual Aid and Assistance Agreement with SSWD (SSWD Mutual Aid Agreement), dated January 11, 2011, which remains in effect until terminated by one party after providing a written notice of termination. This agreement allows the transfer of water in the event of an emergency and assistance of support staff on a regular and ongoing basis. The District has three interties with SSWD for emergency water transfer. Each intertie is outfitted with manually operated valves. Outfitting the interties with automated valves or motor operated valves connected through SCADA would allow the interties to automatically open in emergency situations where pressure in the vicinity of the intertie drops below the setpoint of 30 psi.

Based on information provided for this update, no progress has been made in taking the next step.

Section 5: Facilities Replacement Planning and Implementation

This section provides selected updates to the assessment of existing facilities, planning for replacement and augmentation of facilities, a focused near term (0-5 years) prioritized CIP for the proposed projects, and recommendation for future studies, projects, and other actions. These planning elements were previously addressed by Sections 6 and 9 of the 2009 WMP.

5.1 Water Main and Hydrant Existing Condition and Capacities

The pipe network is a looped system of mostly small diameter (2-inch to 12-inch) transite, PVC, steel, and ductile iron pipe located mostly in backyards. As noted elsewhere in this TM, the District's system is more than 75 years old and, as indicated in the SWRCB 2019 Inspection Report, the distribution system is "suffering from age and wear and may be in need of increased maintenance". When compared to two other water systems in 2018 (located in close proximity to the District), the District was found to have experienced nine times the number of leaks and breaks as the other systems. An annual program of main replacement will be necessary for the District to maintain system reliability in the future.

The system includes approximately 3,000 linear feet of 3-inch or less pipe in the system at 39 locations, which do not meet the minimum water main diameter (4-inches) requirements specified in Title 22 of the California Code of Regulations (CCR). A significant portion of these non-compliant mains are small dead-end extensions located in cul-de-sacs and at the edge of the District's boundary.

The District utilizes a single pressure zone with the distribution system pressure maintained by hydropneumatic tanks at well sites throughout the system. Pressure is operationally maintained at 46 psi to 56 psi via well sources triggered by pressure switches at the pressure tanks.

The hydraulic model was used to evaluate the sufficiency of the water system to meet defined criteria (MDD, FF) under certain constraints (flow, pressure and velocity). The model shows that the system is capable of meeting MDD with the largest source removed, however low pressures are experienced (less than 40 psi) in the northeast quadrant of the District as indicated in Figure A4 of Attachment A. Additionally, evaluation of the model for MDD+FF with the largest source removed identified a number of fire hydrant flow deficiencies as indicated in Figure A6 of Attachment A.

The District maintains a network of fire hydrants connected to the system. California Fire Code Section C102 (Table C102.1) requires that fire hydrants be spaced an average of 500 feet apart in residential water distribution systems. Due to the District being mainly comprised of "backyard mains" rather than pipelines within street rights-of-way, this average spacing is not currently met. The system map was studied to determine locations where hydrant spacing maximums are not currently met and identify locations where:

- a fire hydrant can be served from a minimum 8-inch pipeline or at the intersection of three or more 6-inch pipelines, and
- is able to be placed within the public right-of-way.

Fifteen (15) locations were identified where the noted criteria is met for providing fire hydrant infill to the system. Deficiencies in hydrant spacing would be addressed in conjunction with pipeline replacement projects.

Descriptions of the projects associated with correcting the noted deficiencies are provided in Section 5.3 below. Total costs associated with these projects are provided Table 5-1 and breakdown cost estimates are provided in Attachment B.

5.2 Existing Well Ages and Condition

This subsection provides available updated information about existing condition and operating status of each of the wells since the 2009 WMP.

The SWRCB 2019 Inspection Report documented a series of planned projects that the District had indicated would be implemented as near-term projects:

- Well 2 - Pulling the pump and TV examination of well casing was to be scheduled for Jan 2020. Had positive coliform tests last 2 quarters of 2019.
- Well 3 - Chemical feed system was to be repaired in December 2019.
- Well 5 - Well was scheduled for video inspection in 2018/2019 but was postponed.
- Well 7 - Necessary corrections were identified during inspection and new SCADA and PLC were in design at the time of the report and expected to be completed in Spring of 2020.
- Well 8 - Install rebuilt right angle drive for service during power outages.
- 2018 rate increase included budgets for inspections of Well 4 and 9 in 2020/2021, site paving and tank inspections in 2021/2022, and inspection of Well 6B in 2022/2023.

Of the projects listed above, the Well 2 TV examination and the Well 3 chemical feed system repairs were completed. Well 3 was placed in standby permit status due to contamination issues (see below).

The inspection report also noted the recent removal and replacement of 205-feet of 4-inch Transite with 6-inch ductile iron pipe (DIP).

The District provided the following status of each of the existing wells:

- Well No. 1 – Well has been abandoned, all facilities pulled and backfilled.
- Well No. 2 – Video inspection completed. Results under evaluation.
- Well No. 3 – Currently offline and on standby due to test samples showing trichloropropane (1,2,3, TCP) contaminant.
- Well No. 4 – The planned video inspection is pending.
- Well No. 5 – No reported changes.
- Well No. 6 and 6B – Well No. 6 was replaced by Well No. 6B. The Well No. 6B generator transfer switch failed during power outage in 2020 and has since been repaired.

- Well No. 7 – The well is functional, but the facility is not currently configured for operational convenience. The wellhead and disinfection system are located in a below-grade concrete vault which requires confined space entry protocols and complicates the replenishment of disinfectant chemicals. Reconfiguration of the facility should be feasible and would permit the well to be regularly used.
- Well No. 8 – SWRCB 2019 Permit and Inspection Report indicated PCE was detected and had failed bacteriological testing. The well was switched to quarterly monitoring; however, due to continued presence of PCE this well has subsequently been removed from service indefinitely.
- Well No. 9 – This is a new well installed since the 2009 WMP. The SWRQCB 2019 Permit and Inspection Report set the design capacity at 1,500 gpm.

The resulting capacity and system redundancy based on these changes was previously summarized in Table 4-1.

5.3 Water Main, Hydrant, Well, and Water Supply Improvements

As a long-term goal, HydroScience recommends that the District plan to implement the distribution (water main) improvement system goals established in the 2009 WMP to extent feasible, which is to replace older failing backyard mains with upsized and well-looped 6-inch or greater diameter pipeline network. As part of upgrading water mains, hydrants should be added where required to decrease the maximum hydrant spacing to 500 ft or less in accordance with Table 3-4.

Coupled with the need to address distribution pipe network deficiencies is the need to provide sufficient well supply to meet MDD+FF with the largest well out of service. As documented in Section 4.1 and Table 4-1, there is currently a supply deficiency in meeting this condition, with the capacity shortfall estimated at 1,821 gpm based on the preliminary fire flow values determined for AT&T and Winco (to be confirmed in a future effort). The SSWD emergency interties currently provide a means to supplement fire flows, and automation of the intertie valves plus metering would mitigate existing response time issues with activating them.

The near-term recommended CIP projects to address this well pumping deficiency is to rehabilitate existing Wells 2 and 7, investigate and, if feasible, install a TCP removal treatment system at Well 3, and (if necessary, depending on the outcome of these existing well improvements) construct a new well to further augment existing supplies.

Attachment A details the modeling run that was performed to test addition of a new 1,821 gpm well source to the system. The selected well site location for this model run was at Orville Wright Park. This is considered a theoretical modeling scenario based on adding one new well providing the entire projected flow deficiency and is subject to change depending on the outputs of the existing wells after rehabilitation and refinement of the proposed location(s) for new well(s).

Alternatives to installation of a single new well source at Orville Wright Park that should be evaluated before implementation of a water supply improvement project include:

- Utilization of SSWD interties to provide supplemental flow addressing some or all of the shortfall. This would require updating the current agreement with SSWD to allow for regular

service of the connection in order to count it towards the firm capacity and addressing any needs to meter or fluoridate if applicable.

- Construction of two or more smaller wells to provide equal or greater additional flow. More than one well is preferred to avoid establishing a larger maximum sized well than the existing maximum sized well (currently Well 9 at 1,500 gpm) that would need to be assumed to be offline during a MDD+FF event for the purpose of redundancy analysis.
- Determine optimal site(s) for installation of new well(s) and address land acquisition costs in the final cost estimates.
- Construct one new well and perform rehabilitation/improvements to one or more existing wells to provide a total increase to source capacity of at least 1,821 gpm. This alternative should be based on condition assessment results that show the existing well is in suitable condition for rehabilitation. Available condition assessment information was not available to sufficiently evaluate this alternative. Reboring existing well(s) to increase capacity can also be evaluated.
- Construction of a storage tank and booster pump station sized to meet a maximum fire flow demand of 3,500 gpm for a 4-hour duration at the two locations (AT&T and WinCo Foods) where this higher fire flow is required. This alternative would be in lieu of sizing the well supply and upgrading pipelines to meet this fire flow requirement.

For simplicity, this 2022 Amendment establishes the construction of a single new 1,821 gpm well in the CIP as a placeholder for any of these improvement options. A future study should further evaluate these options in consideration of District goals and priorities and select a best-value option for implementation. An engineering budget cost range is included in the CIP to conduct this evaluation.

The SWRCB Inspection Report and District documentation indicated a number of condition issues that should be addressed either as ongoing maintenance projects or as part of a comprehensive well rehabilitation or replacement project. The more significant items include:

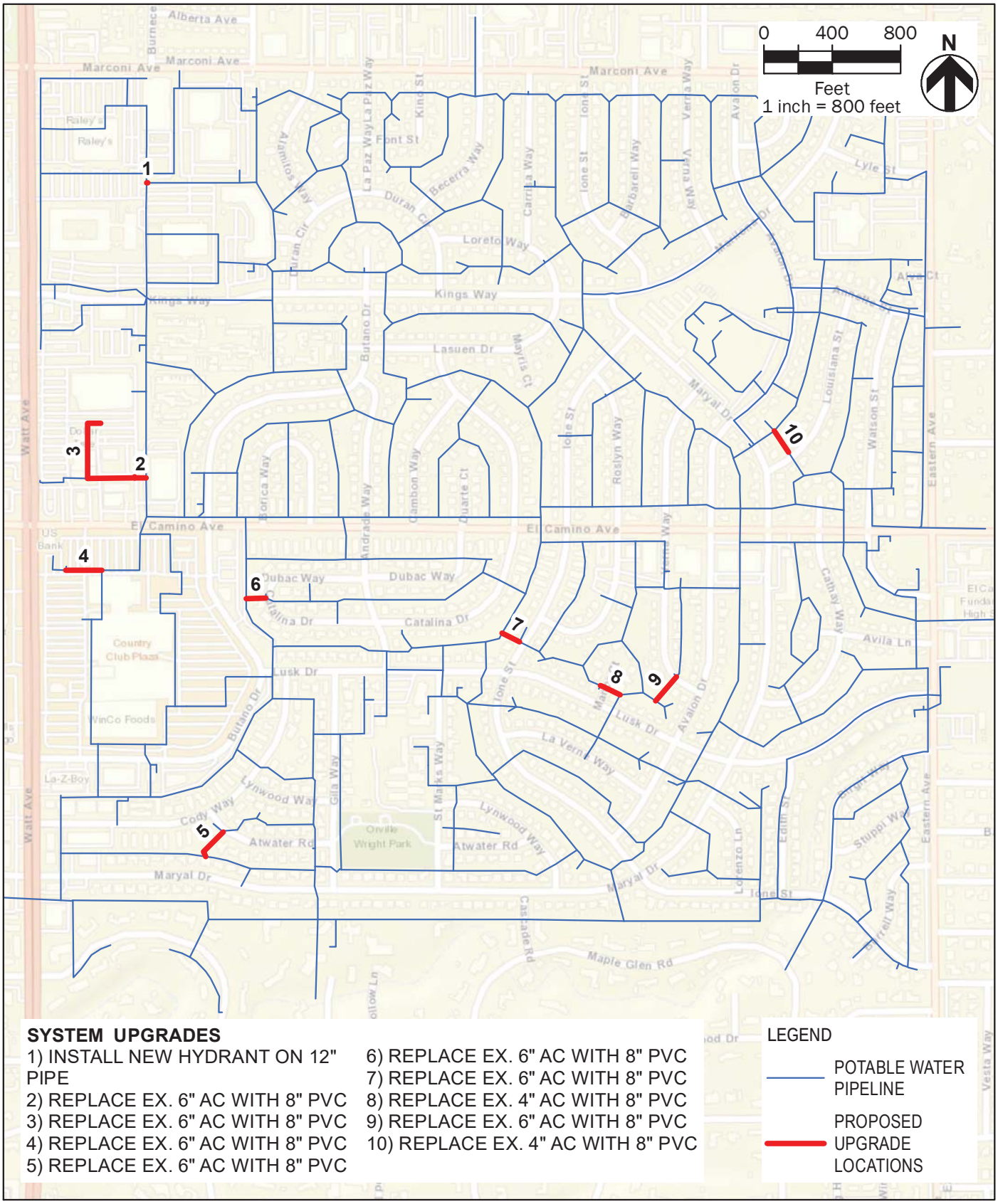
- Well 5 – Inspect and repair casing hole.
- Wells 3 and 5 – Increase pedestal height to at least 18-inches to reduce the risk of contamination.

Other near-term priority system improvements to address water system standards and design criteria (see Section 3.6) resulting from updated hydraulic model runs (see Attachment A), and address aging and undersized piping are summarized below:

- Generator at Well 9: Install a generator at the well site with automatic transfer switch to provide backup power during a utility outage. This project would need to be coordinated with the adjacent school.
- Replace Undersized and Aging Backyard Mains with New Mains in Public ROW: This would entail phased comprehensive replacement of existing water mains that are undersized (below 6”), constructed of inferior materials (steel and ACP), and are located in back yards. The new mains would be constructed within the public right of way (streets). The District presented an initial plan to ratepayers to implement this project in 2017 (see Attachment C).
- Install 15 Additional Fire Hydrants and Upgrade AT&T Hydrant: Install new fire hydrants to resolve the spacing issue previously discussed and install one new fire hydrant at AT&T,

serviced from the 12-inch main located near the existing fire hydrant H-11P which will increase the available fire flow from 1,229 gpm to 2,125 gpm. Prior to implementation of the AT&T hydrant upgrade, the District should verify the required fire flow at this location in consideration of the building being sprinklered, and should verify if the required fire flow must be provided at the hydrant or at a fire sprinkler lateral. Prior to implementation of the addition of 15 new hydrants, the District should seek to combine hydrant spacing improvements with the replacement of backyard mains. The District should re-run the hydraulic model accounting for all planned near-term system improvements and updates to fire flow requirements at AT&T and Winco before implementing this project.

- Pipe Replacement Projects: The District model was evaluated for Maximum Day Demand plus a 1,500 gpm Fire Flow for 2 hours. The results of that evaluation can be found in Attachment A, Figure A5. The hydrants found to be deficient are shown in red with the available fire flow in gallons per minute provided under the hydrant label. The System Upgrades Project, shown in Figure 6, contains the new hydrant described above at Location 1 and nine (9) other discreet locations where minor system improvements will result in all hydrants being capable of meeting the 1,500 gpm fire flow demand. For hydrants H-11P (AT&T) and H-1P (WinCo Foods), the upgrades will make those hydrants capable of 3,500 gpm. The District should re-run the hydraulic model accounting for all planned near-term system improvements and updates to fire flow requirements at AT&T and Winco before implementing this project. Other higher priority projects may reduce or eliminate the need for this project.
- Install PRV Stations: Installation of three automated PRV valves set to open the SSWD interconnections if the pressure in the District drops below the setpoint. The District should first evaluate potential impacts to residential metering and fluoridation requirements, as stated herein, prior to implementing this project. The District should also model the proposed interconnections to determine impacts on system flows and pressures.



SYSTEM UPGRADES

1) INSTALL NEW HYDRANT ON 12" PIPE
2) REPLACE EX. 6" AC WITH 8" PVC
3) REPLACE EX. 6" AC WITH 8" PVC
4) REPLACE EX. 6" AC WITH 8" PVC
5) REPLACE EX. 6" AC WITH 8" PVC
6) REPLACE EX. 6" AC WITH 8" PVC
7) REPLACE EX. 6" AC WITH 8" PVC
8) REPLACE EX. 4" AC WITH 8" PVC
9) REPLACE EX. 6" AC WITH 8" PVC
10) REPLACE EX. 4" AC WITH 8" PVC

LEGEND

POTABLE WATER PIPELINE

PROPOSED UPGRADE LOCATIONS

HydroScience

FIGURE 6
DEL PASO MANOR WATER DISTRICT
WATER MASTER PLAN UPDATE
SYSTEM UPGRADE LOCATIONS

5.4 Capital Improvement Recommendations

Near-term prioritized CIP projects to address immediate and critical deficiencies is addressed in this subsection. The recommendations presented herein, coupled with the recommendations in the 2009 WMP, are made in consideration of the District's established policy of performing capital improvement projects as funding allows with a focus on hydraulically critical regions first and condition/age second.

Descriptions of the planned capital improvement projects are given in Table 5-1 below, with priorities. A detailed cost estimate for each project is provided in Attachment B.

Table 5-1: Near Term CIP Summary

Project Priority	Description	Need Addressed	Estimated Planning-Level Implementation Cost[1]
1	Automate SSWD Interties	Improve available fire flow supply during an emergency. Eliminate response time delay for engaging the interties during an emergency.	To be determined
2	Rehabilitate Existing Wells 2 and 7	Improve available supply from existing wells	To be determined
3	Add Treatment to Well 3	Improve available supply from existing wells	To be determined
4	Install 260kW, 480VAC NG outdoor genset at Well 9 with sound enclosure; replace MTS with ATS (See Note 2)	Provide redundancy and reliability to the system	$450,000
5	Replace Undersized and Aging Backyard Mains with New Mains in Public ROW	Replace undersized pipe and pipe prone to failure, provide improved pipe access	See Attachment C
3	Install New Water Supply Well(s) Totaling 1,800 gpm Additional Flow (See Note 3) Engineering Evaluation of New Supply Options	MDD+FF deficiency, improve system pressures, improve supply reliability Select most cost-effective and feasible approach to augment supply.	$3,100,000 $50,000 – $75,000
NP[7]	Install 15 Additional Fire Hydrants and Upgrade AT&T Hydrant	Improve compliance with 500 ft max hydrant spacing, address deficient fire flows	$252,000
NP[7]	Pipe Replacement Projects 2-10 (see Note 4)	Hydrant flow deficiency	$580,000
NP[7]	Implement DPMWD-CWD Intertie (Conjunctive Use Project) (see Notes 5, 6)	Improve available supply through introduction of surface water	See Attachment E

Notes:
1. Rounded to two significant figures. Forsgren Associates is updating “to be determined” costs in a separate effort.
2. Genset cost excludes the cost of bringing natural gas onsite. If there is a natural gas pipeline in the street near the water main, the approximate added cost is $10,000 for the natural gas service extension). Installation of genset at this location will require coordination with adjacent school.
3. New well project is a placeholder for a well or other alternative to increase capacity and/or provide storage for fire flow. Alternatives include: alternate well locations, greater number of smaller new wells, rehabilitation/reboring of existing wells, and utilization of interties. Higher priority projects to rehabilitate existing wells may reduce the flow requirement for a new well. Project cost will change depending on the type of project chosen. Cost of land acquisition is not included. A budgetary amount for an engineering study to evaluate and select the preferred alternative is presented.
4. Pipe replacement projects can also be implemented individually or in smaller groups. Refer to prioritization in Attachment B, Cost Detail, for recommended order of implementation. Order is set based on level of existing fire flow deficiency addressed by the corresponding upgrade. Prior to implementing this project, update the hydraulic model to reflect any system upgrades including replacement of backyard main piping. Some or all of these pipe replacement projects may not be required after the other upgrades.
5. The District should first evaluate potential impacts to residential metering and fluoridation requirements and need to update the existing agreement, as stated herein, prior to implementing this project. Connection of interties will require a hydraulic model update to understand the impacts to the distribution system.
6. Refer to Attachment E.
7. NP=Not Prioritized.

5.5 Other Recommendations

The following are some additional near-term recommendations to improve District's operations and business strategies, which would ensure continued sustainability.

- **Record Keeping**. Since the District residential areas are built-out, the commercial properties have greatest potential impacts to the District's water demands and operations. Commercial properties are also currently metered. Therefore, the District's new accounting system may be improved, if not currently available, to maintain electronic records of water consumption from existing meters. This electronic record-keeping process will provide improved water use information for future evaluations and subsequent master planning efforts.
- **Conjunctive Use Plan**. The 2009 WMP included a significant analysis of developing water for implementation of a Conjunctive Use Plan. Subsequent steps taken by the District include developing a "road map" document describing required steps to introduce surface water supplies into the system (see Attachment D), and then preparing a planning-level definition, maps, and cost estimates for installing approximately 1 mile of either 12" or 18" pipe between CWD and DPMWD's system (see Attachment E). Should DPWMD choose to move forward with this intertie, the following recommendations are made:
    - If surface water use is considered beyond emergency use, we recommended the District investigate whether this operational change may require the installation of residential water meters or the fluoridation of the water system.
    - The Intertie Project planning document should be updated to reflect current conditions and contain updated cost estimates reflecting current pricing.
    - Due to changes in regional surface water strategies, continue vetting opportunities to participate in conjunctive use arrangements.
- **Regional Planning**. Maintain active participation in SGA and RWA.

Attachments:

A. Hydraulic Model Update

B. CIP Cost Estimates

C. DPMWD May 2017 Proposition 218 Public Hearing Presentation (Pipe Replacements)

D. DPMWD Surface Water Utilization Road Map, January 2015

E. DPMWD-CWD Intertie Project for Conjunctive Use and Climate Adaptation

ATTACHMENT A
Hydraulic Model Update

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Attachment A: Hydraulic Modeling

The existing District potable water model was updated with changes since the 2009 Master Plan to determine system capacity under peak demand conditions and identify deficiencies. The service area was modeled as a single pressure zone and system.

Provided below is a discussion of the hydraulic model updates and analysis performed.

A.1 Model Development

The District potable water model was initially developed in 2014 using Bentley OpenFlows WaterGEMS software. Baseline water demands for existing conditions were estimated based on the water demand analysis presented in the previous section and updated in the model.

The Hazen-Williams coefficients were adopted from the 2014 hydraulic model. Table A-1 shows the pipe roughness coefficients for each pipe material. Certain pipe materials utilized different roughness coefficients. This is generally due to difference in age or pipe condition.

Table A-1: Hazen-Williams Roughness Coefficients

Pipe Material	Hazen-Williams Coefficient						
	100	110	115	120	130	140	150
Asbestos Cement	X	X	X	X	X		
Ductile Iron				X	X		
PVC						X	X
Steel	X						

Development and analysis of the hydraulic model was based on the data received and the resulting data allocation. Data used for the development of the existing condition hydraulic model were as follows:

- Well 9 Yard Pipe Calcs (.xls)
- Well 9 Flow Calculations (.xls)
- DPM Well 9 Record Set (.pdf)
- Del Paso Manor Water District Master Plan 2009 (.pdf)
- City of Sacramento – Fire Sprinkler Systems Requirements (.pdf)
- Meter Read Consumption (.pdf)
- Western States Fire Protection Co. Fire Flow Test Results (.pdf)
- Hydraulic Modeling Workshop_v51 FINAL (.pdf)
- Distribution System As-Builts (.pdf)
- Fire Flow Analysis Summary – DISTRICT MP KJ (.pdf)

- DISTRICT Surface Water Utilization Road Map (.pdf)
- LEAK LOG – MASTER (.xlsx)
- Response to District Water Model and Fire Flow Analysis – DISTRICT MP KJ (.pdf)
- State Water Resources Control Board – DISTRICT 2019 Inspection Report (.pdf)
- Well Production (2019-2020) (.xlsx)
- Well Production 2014 to current (.xlsx)
- Well pumping capacity 2019 (.docx)

A.2 Modeling Scenarios

The District service area was analyzed for existing conditions using the data provided. The scenarios analyzed are discussed below:

- **Maximum Day Demand (MDD) – Normal Operations:** This analysis identifies deficiencies in the system simulating maximum day demands under normal system supply operations.
- **Maximum Day Demand (MDD) – Largest Source Removed:** This analysis identifies deficiencies in the system simulating maximum day demands with the largest supply source (Well 9) removed.
- **Maximum Day Demand + Fire Flow (MDD+FF) – Normal Operations:** This analysis identifies deficiencies within the system when simulating maximum day demands under normal operations and a related fire flow event concurrently. Fire flow is simulated at existing hydrants in the system and fire flow rates are determined by the most conservative land use type at the respective hydrant.
- **Maximum Day Demand + Fire Flow (MDD+FF) – Largest Source Removed:** This analysis identifies deficiencies within the system simulating maximum day demands and a concurrent fire flow event with the largest supply source (Well 9) removed.
- **Maximum Day Demand + Fire Flow (MDD+FF) – Largest Source Removed – With System Upgrades and New Well #10:** This analysis tests whether fire flow at hydrants is met simulating maximum day demands and a related fire flow event occurring concurrently with the largest supply source (Well 9) removed and after the addition of new Well #10 and implementation of recommended pipe improvements.

A.3 Hydraulic Modeling Results

The entire District service area was modeled and evaluated based on the flow, velocity and pressure performance criteria limits presented in Table 3-4. The results are discussed below.

System-wide Conditions with Normal Operations

MDD: The system was modeled with normal operations under a maximum day demand scenario and analyzed as a 24-hour extended period simulation. This type of simulation allows for the analysis of the peak hour demand while also observing system operations throughout a simulated maximum day. The system was able to stay below the maximum velocity criteria. During the peak

hour (05:00 AM) some pressures in the system fall below the minimum pressure threshold of 40 psi. Pressure ranges for this deficiency is approximately 38 – 51 psi (see **Figure A3).**

MDD+FF: The system was modeled with normal operations under a maximum day demand plus fire flow scenario. This type of simulation is a 2-hour period providing an iterative analysis at each hydrant while systematically increasing the fire flows. Fire hydrant flows are reported as the maximum flow recorded prior to any of the constraints of pressure (>20 psi) or velocity (<13 fps) being exceeded. During MDD+FF conditions, the system exhibited fire hydrant flow deficiencies. Eleven of thirty-three hydrants did not meet required fire flow demand (3,500 gpm at H-11P and 1,500 gpm all others) while staying within the established criteria (see **Figure A5)**. Nine of the eleven violations are due to velocity restrictions in the adjacent pipelines.

System-wide Conditions with Largest Source Removed

MDD: The system was modeled with the largest supply source (Well/Pump 9) removed. The system was able to meet the maximum velocity criteria. During the peak hour (05:00 AM), some pressures in the system fall below the minimum pressure threshold of 40 psi. Pressures throughout the system were approximately 4 psi lower than with MDD under normal operations simulation. Pressure ranges for this deficiency is approximately 34 – 48 psi (see **Figure A4)**.

MDD+FF: The system was modeled with the largest supply source (Well/Pump 9) removed under a maximum day demand plus fire flow scenario. This type of simulation is a 2-hour period providing an iterative analysis at each hydrant while systematically increasing the fire flows. Fire hydrant flows are reported as the maximum flow recorded prior to any of the constraints of pressure (>20 psi) or velocity (<13 fps) being exceeded. During MDD+FF conditions, the system exhibited fire hydrant flow deficiencies results similar to those with normal operations. Ten of thirty-three hydrants did not meet fire flow demand (3,500 gpm at H-11P and 1,500 gpm all others) while staying within the established criteria (see **Figure A6)**. There is one hydrant, J453, that did not satisfy fire flow demand with normal operations but improved with Pump 9 off. Hydrant J453 experienced velocity violations with normal operations that were not violated when Pump 9 was removed.

MDD+FF – With System Upgrades and New Well #10: The system was modeled during MDD+FF conditions with the largest supply source removed and following system upgrades and the addition of a new Well #10 (rated for 1,800 gpm). The results indicate that all hydrants including the new hydrant at AT&T satisfy all fire flow conditions (see **Figure A7)**.

A.4 Summary of Results

Table A-2 provides a summary of the results of the hydraulic analyses. Results shown are based on the results as they relate to the performance criteria limits provided in Table 3-4.

Table A-2: Hydraulic Analysis Results

Performance Criteria		**Meets Criteria?**	
Pressure		**Current Conditions**	**After CIP Implementation**
Minimum water system pressure under PHD	40 psi	No	No[1]
Minimum water system pressure under MDD	40 psi	No	No[1]
Minimum residual pressure under MDD+FF with Largest Supply Out of Service	20 psi	**No**	**Yes**
Maximum water system pressure	80 psi	Yes	Yes
Velocity		**Current Conditions**	**After CIP Implementation**
Maximum velocity under MDD	5 fps	Yes	Yes
Maximum velocity under PHD	7 fps	Yes	Yes
Maximum velocity under MDD+FF	13 fps	**No**	**Yes**
Other Design Criteria		**Current Conditions**	**After CIP Implementation**
Hazen-Williams Roughness Coefficient	100-150[4]	N/A	N/A
Maximum fire hydrant spacing	500 feet	No	No[2]
Minimum pipe diameter for looped system	8 inch	No	No[3]
Pipe diameter for dead-end runs	6 inch	**No**	**Yes**

Notes:
1. The system continues to experience low pressure in the northwest corner of the service area. Proposed new well improves the number of services experiencing low pressure but does not completely eliminate them.
2. The proposed CIP, which includes addition of 15 new fire hydrants, will not create a complete system of hydrants at maximum 500-foot spacing, but it will improve conformance to this requirement and reduce the areas currently not serviced by a hydrant.
3. The proposed CIP includes piping improvements that will meet the requirement for dead-end runs of pipe to be 6-inches or greater. However, it does not address the requirement for looped pipes to be 8-inches or greater.
4. The Hazen-Williams coefficients for existing pipe segments were adopted from the 2014 hydraulic model provided to HydroScience. Coefficients varied by pipe material, age, and condition. See Table A-1 for further detail.

A.5 Detailed Modeling Results

Figures depicting model results output and model output tables follow.

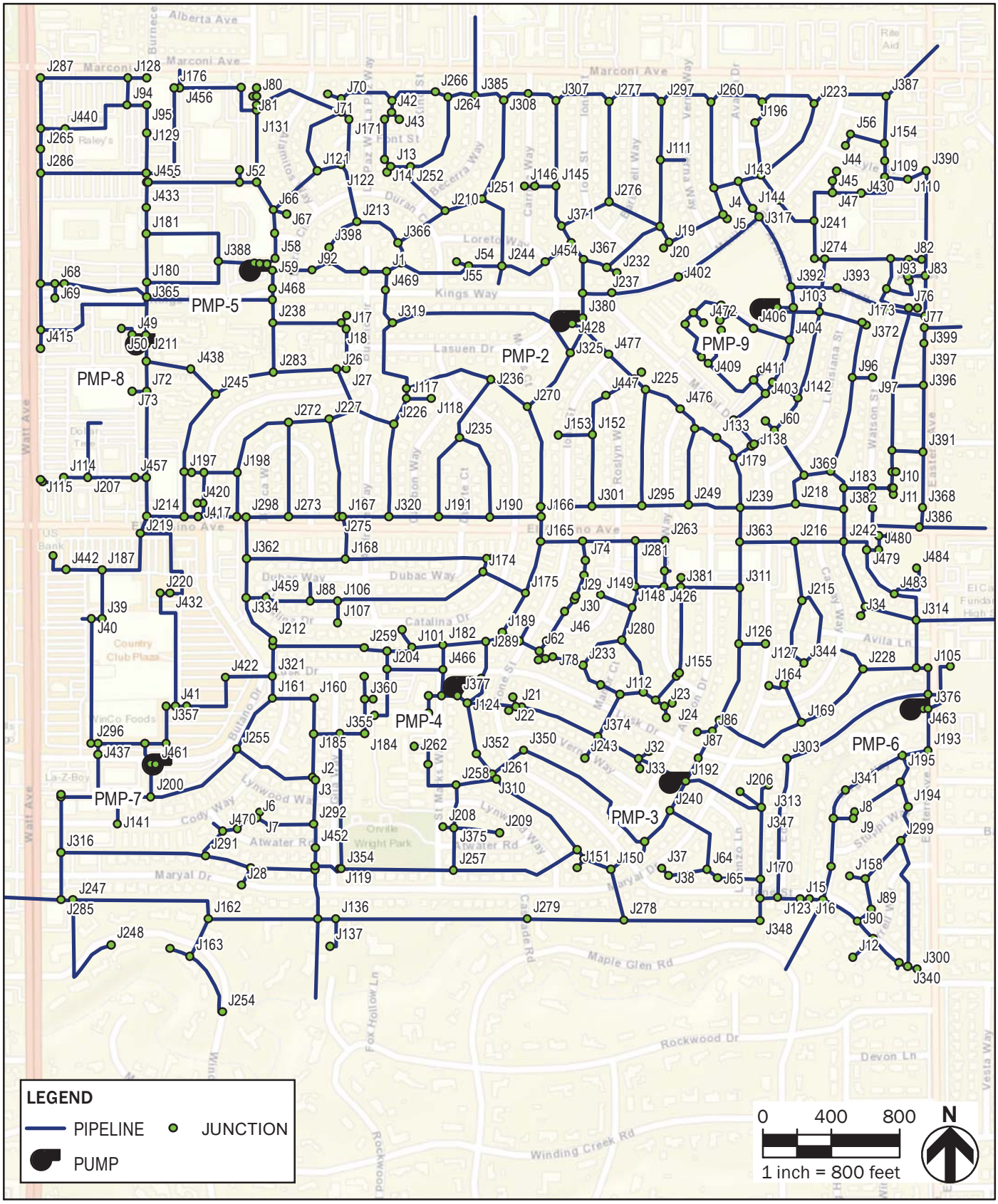


FIGURE A1
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
JUNCTION LABELS

HydroScience

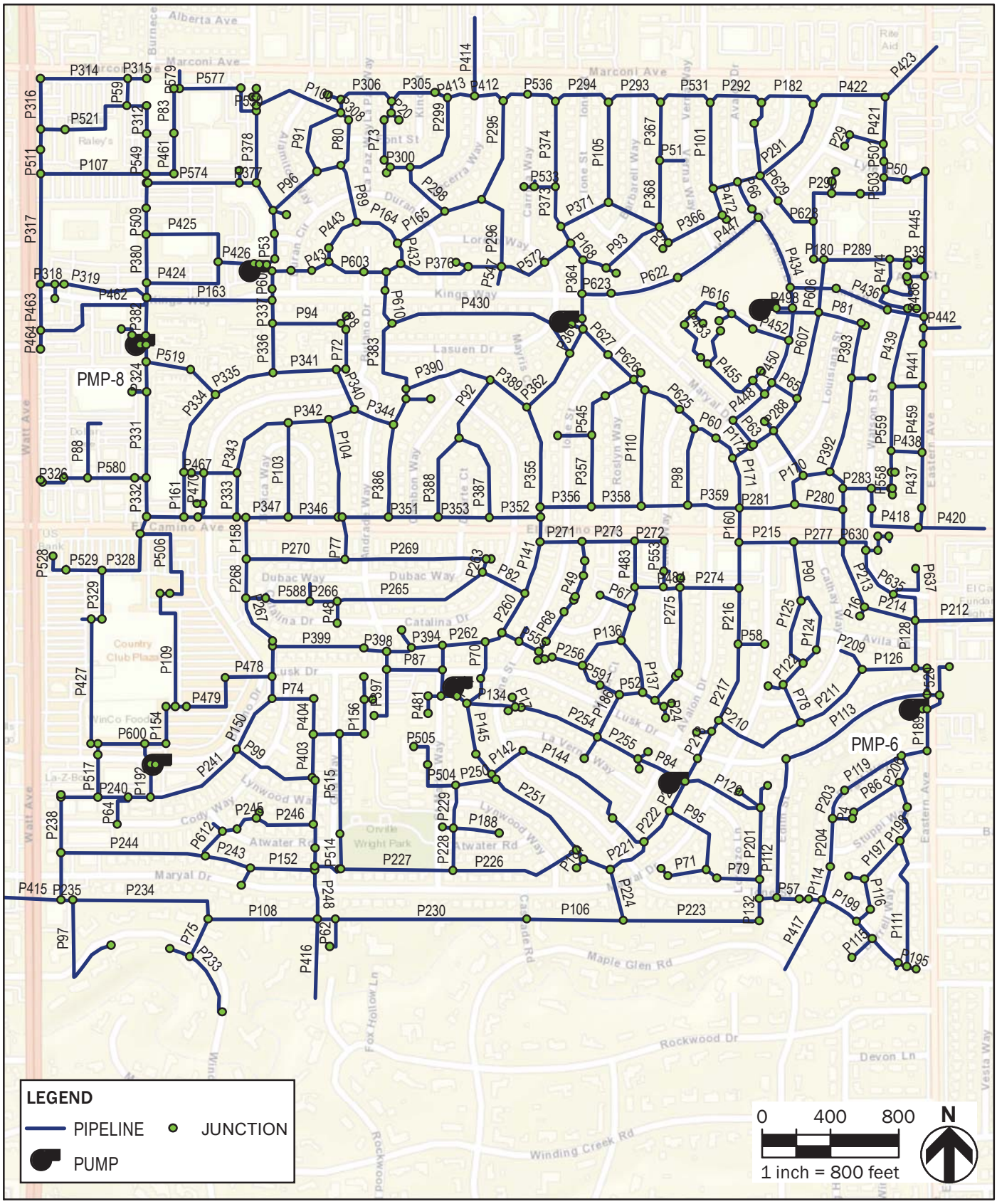
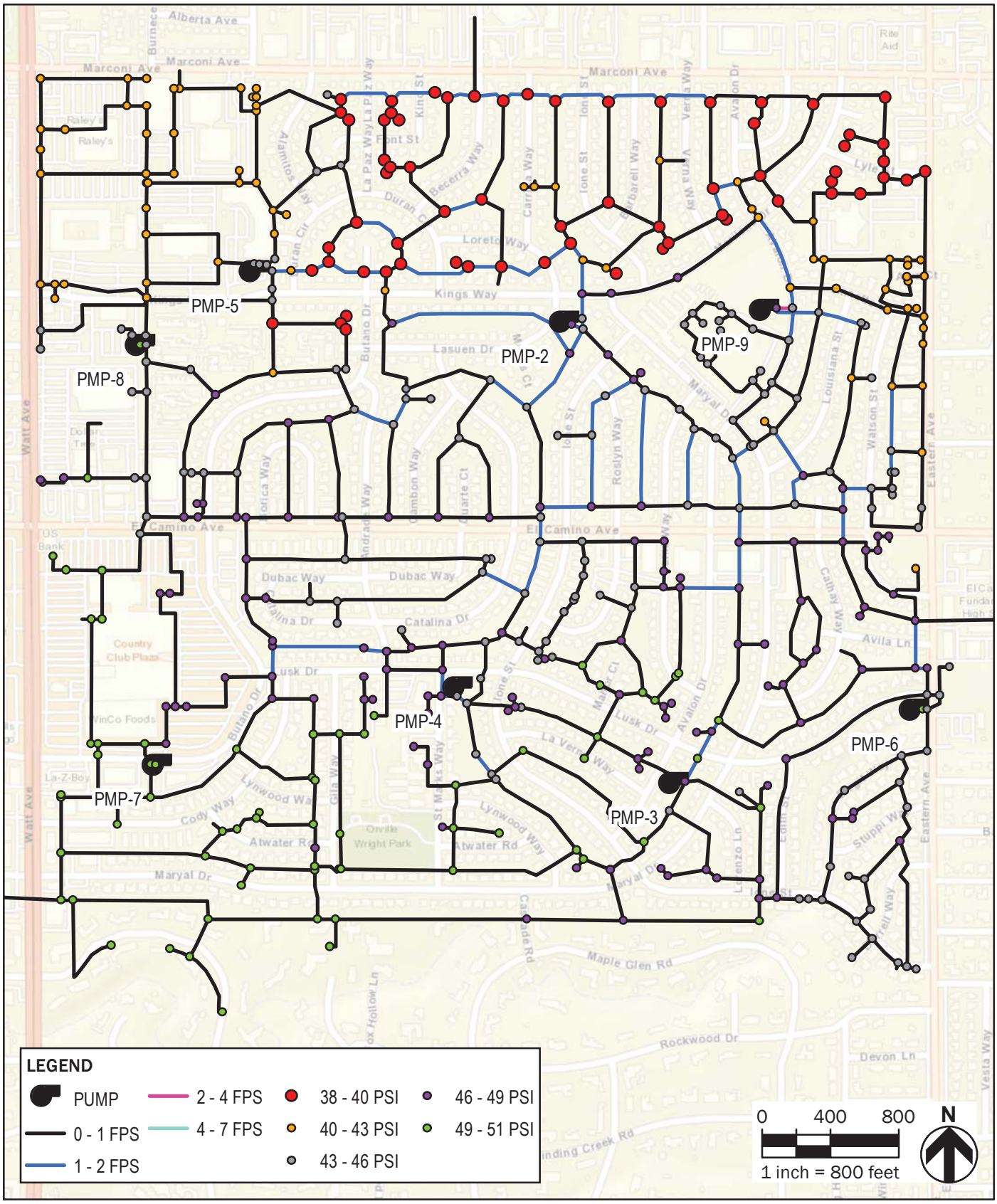


FIGURE A2
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
PIPE LABELS

HydroScience



HydroScience

FIGURE A3
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
MDD MIN. PRES. AND MAX. VEL. - NORMAL OPERATIONS

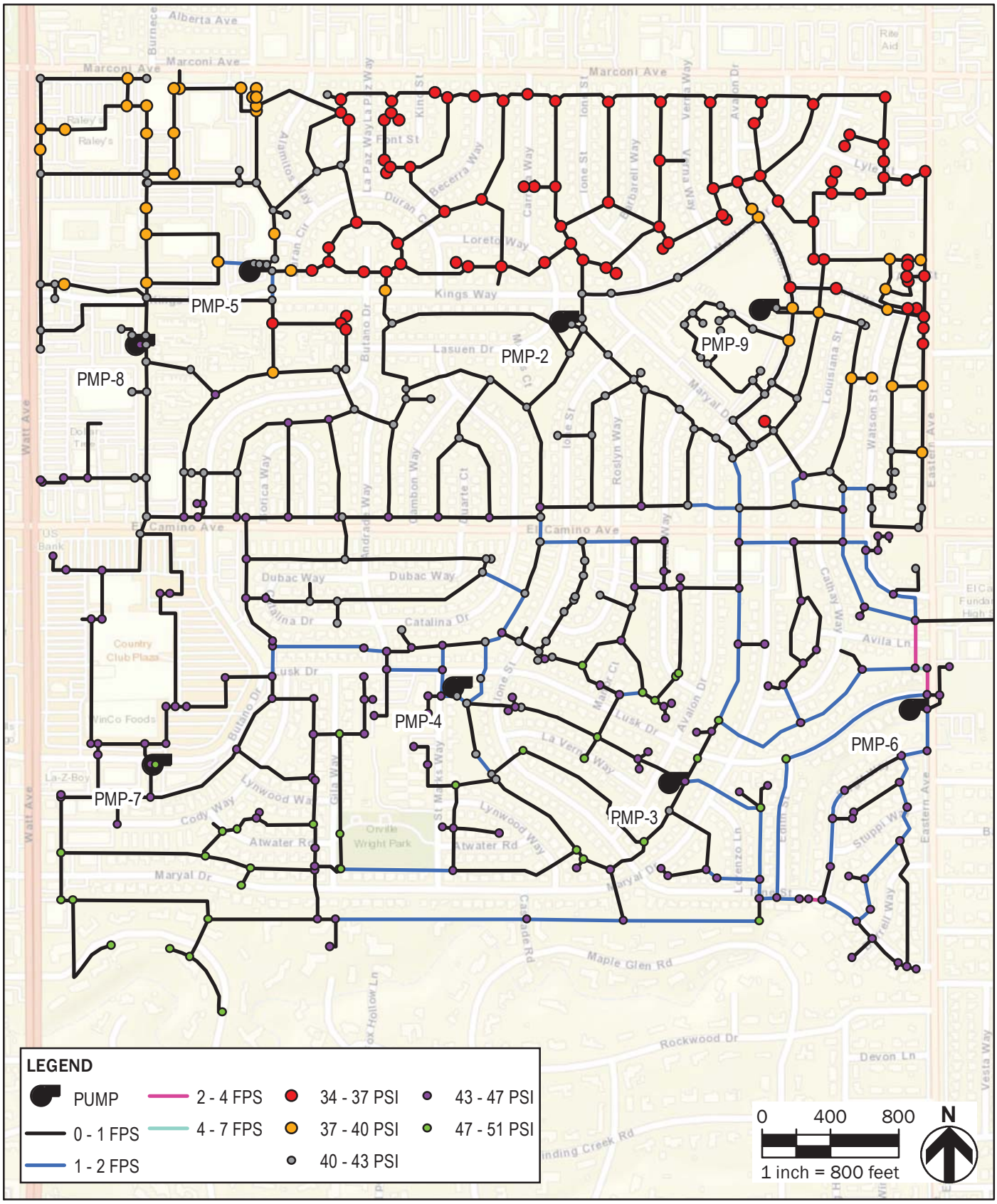
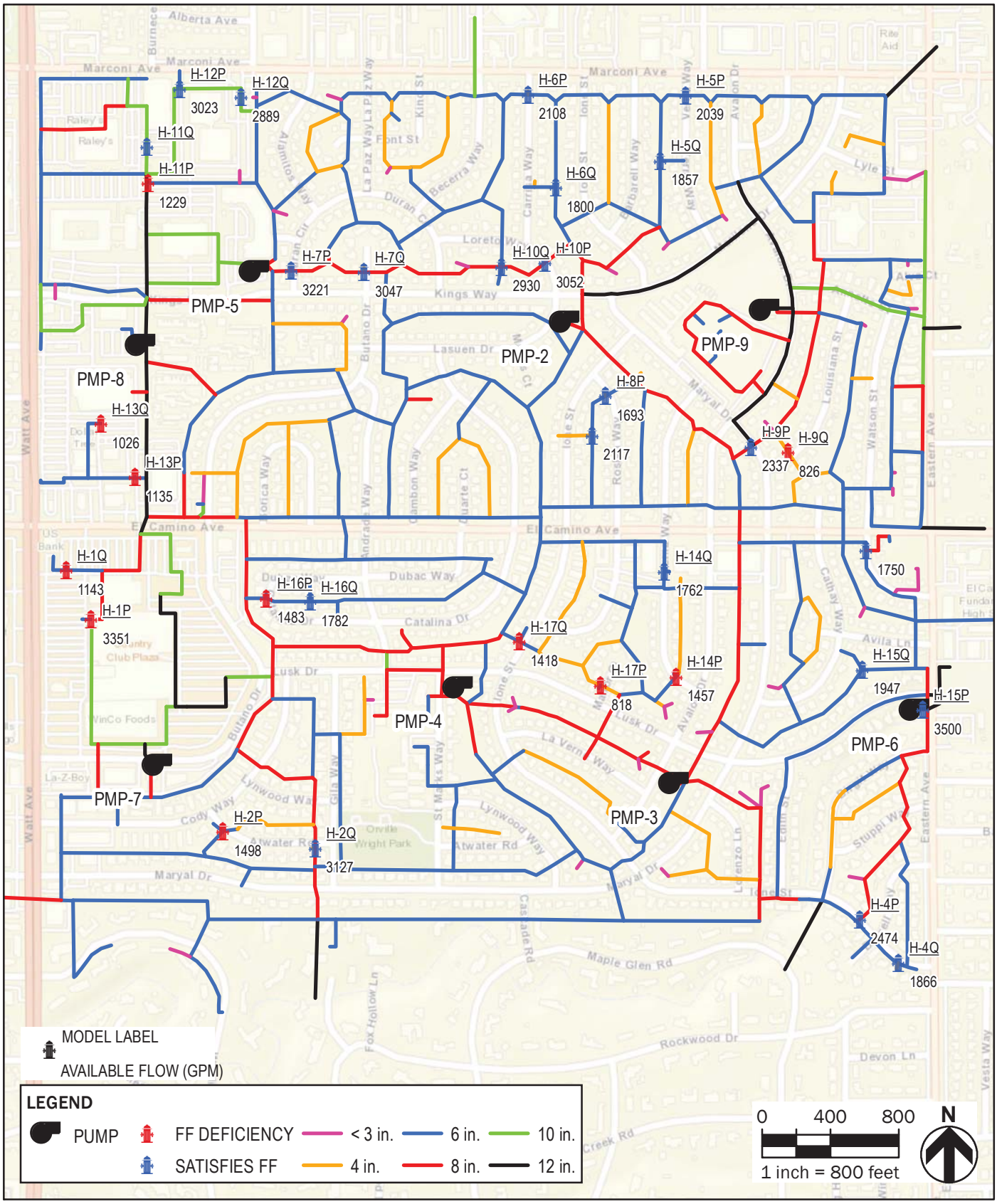


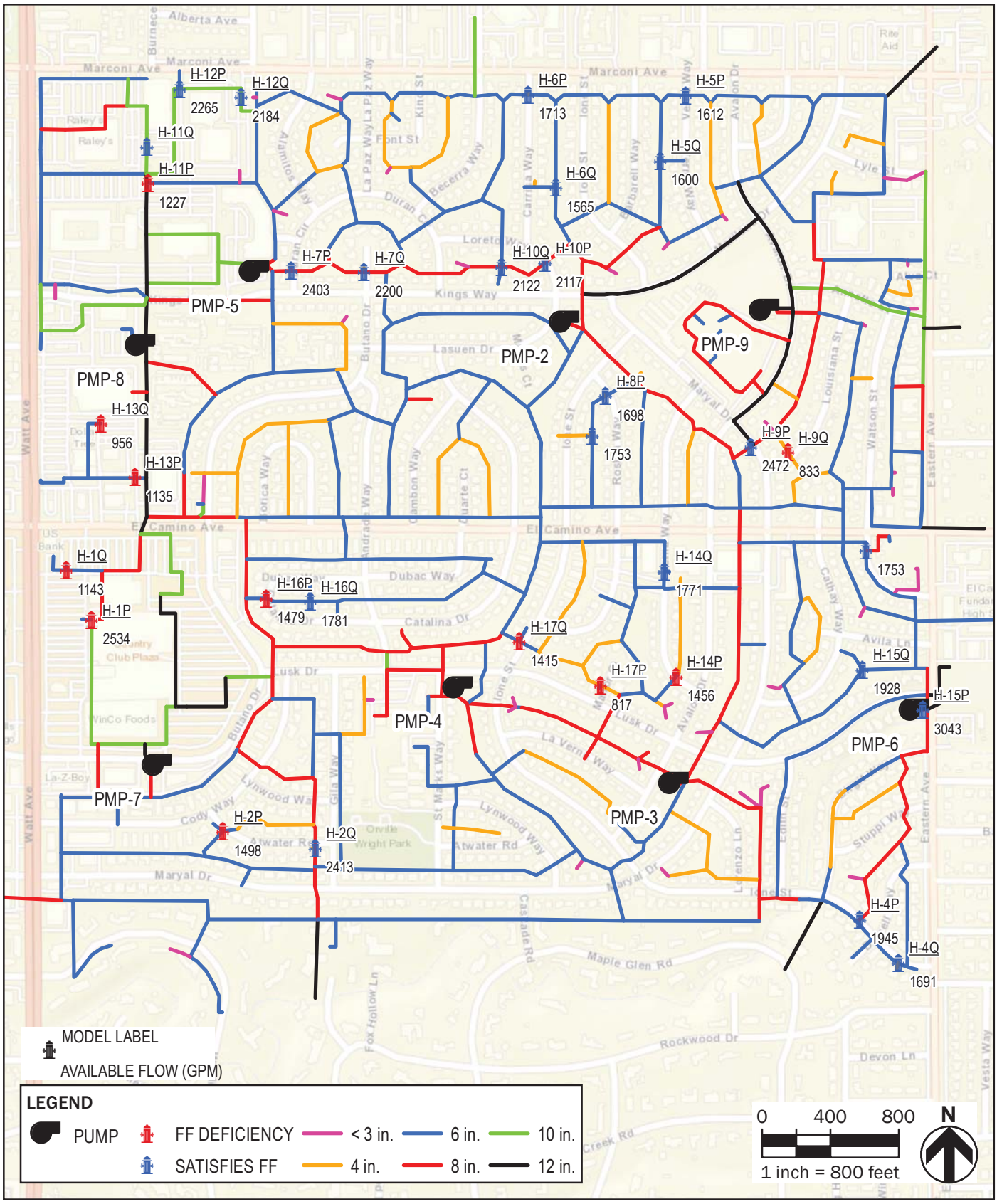
FIGURE A4
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
MDD MIN. PRES. AND MAX. VEL. - PUMP 9 OFF

HydroScience



HydroScience

FIGURE A5
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
MDD+FF AVAILABLE FIRE FLOW - NORMAL OPERATIONS



HydroScience

FIGURE A6
DEL PASO MANOR WATER DISTRIBUTION SYSTEM
MDD+FF AVAILABLE FIRE FLOW - PUMP 9 OFF

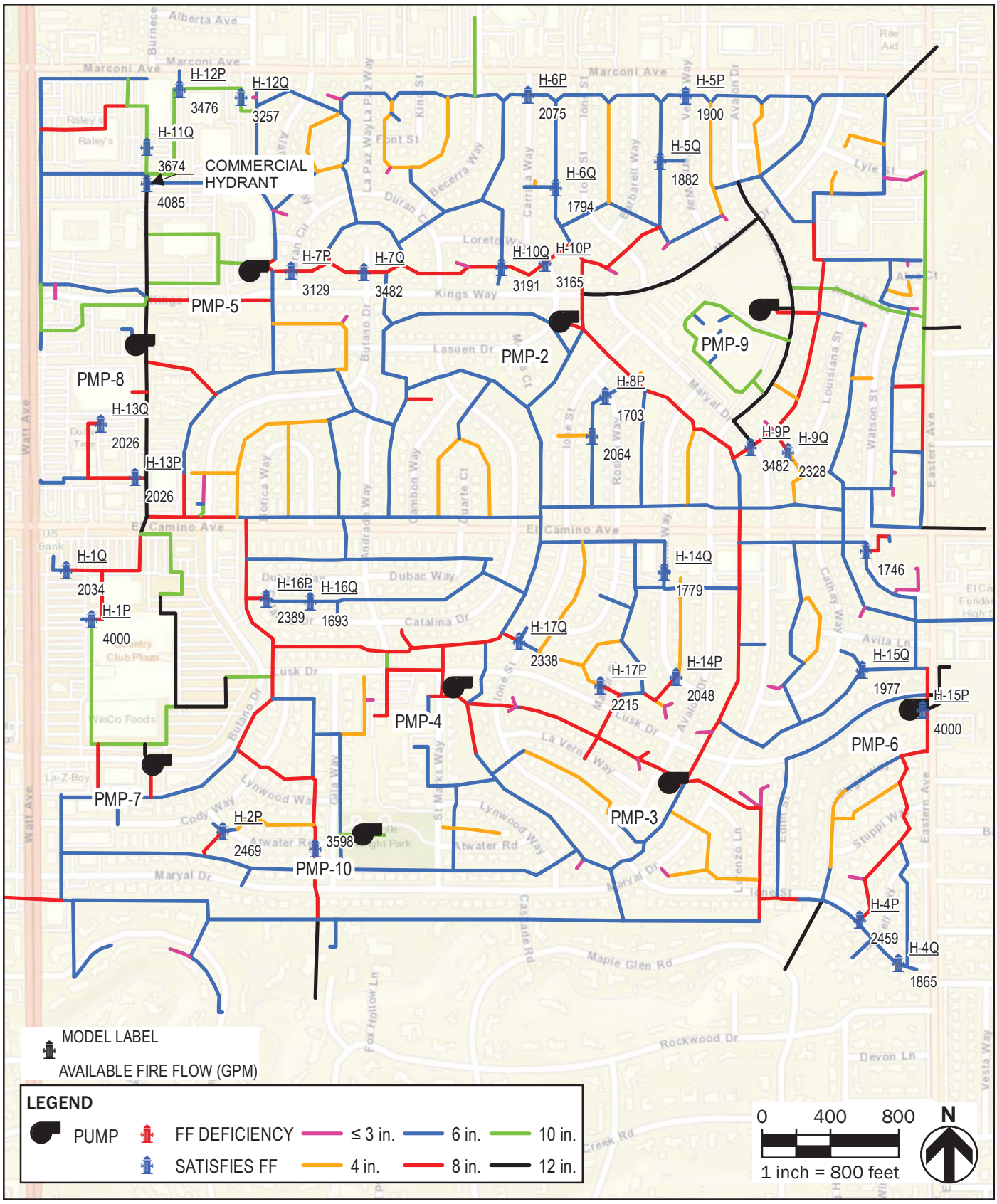


FIGURE A7
DEL PASO WATER DISTRIBUTION SYSTEM
MDD+FF AVAILABLE FIRE FLOW - PUMP 9 OFF - WITH SYSTEM UPGRADES

HydroScience

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J1	86	3	187	44	176	39
J2	62	3	187	54	176	49
J3	62	3	187	54	176	49
J4	90	3	187	42	179	38
J5	88	3	187	43	179	39
J6	62	3	187	54	175	49
J7	62	3	187	54	175	49
J8	68	3	187	51	176	47
J9	68	3	187	51	176	47
J10	74	3	187	49	179	45
J11	73	4	187	49	179	46
J12	71	3	187	50	176	46
J13	86	3	187	44	176	39
J14	86	3	187	44	176	39
J15	71	3	187	50	176	46
J16	71	3	187	50	176	46
J17	87	3	187	43	176	38
J18	87	3	187	43	175	38
J19	87	3	187	43	179	40
J20	87	3	187	43	179	40
J21	70	3	187	51	177	46
J22	70	3	187	51	177	46
J23	70	3	187	51	177	46
J24	70	3	187	51	177	46
J25	87	3	187	43	175	38
J26	70	3	187	51	176	46
J27	70	3	187	51	176	46
J28	60	3	187	55	175	50
J29	76	3	187	48	177	44
J30	76	3	187	48	177	44
J31	60	3	187	55	175	50
J32	70	3	187	51	177	46
J33	70	3	187	51	177	46
J34	70	3	187	51	177	46
J35	70	3	187	51	177	46
J36	70	3	187	51	177	46
J37	68	3	187	51	176	47
J38	68	3	187	51	176	47
J39	62	3	187	54	175	49
J40	62	3	187	54	175	49
J41	64	3	187	53	175	48
J42	87	3	187	43	176	39
J43	86	3	187	44	176	39
J44	90	3	187	42	179	39
J45	90	3	187	42	179	39
J46	76	3	187	48	177	44
J47	90	3	187	42	179	39
J48	68	3	187	52	177	47
J49	74	3	187	49	175	44
J50	74	3	187	49	175	44
J51	68	3	187	52	177	47
J52	76	3	187	48	175	43
J53	76	3	187	48	175	43
J54	86	3	187	44	177	39
J55	86	3	187	44	177	39
J56	90	3	187	42	179	39
J57	90	3	187	42	179	39
J58	76	3	187	48	176	43
J59	76	3	187	48	176	43
J60	76	3	187	48	180	45

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J61	85	3	187	44	180	41
J62	72	3	187	50	177	45
J63	74	3	187	49	177	44
J64	68	3	187	52	176	47
J65	68	3	187	51	176	47
J66	76	3	187	48	175	43
J67	76	3	187	48	175	43
J68	76	3	187	48	175	43
J69	76	3	187	48	175	43
J70	86	3	187	44	176	39
J71	76	3	187	48	176	43
J72	74	3	187	49	175	44
J73	74	3	187	49	175	44
J74	74	3	187	49	177	44
J75	74	3	187	49	177	44
J76	85	3	187	44	179	41
J77	85	3	187	44	179	41
J78	74	3	187	49	177	44
J79	74	3	187	49	177	44
J80	78	3	187	47	175	42
J81	78	3	187	47	175	42
J82	85	3	187	44	179	41
J83	82	3	187	45	179	42
J84	78	3	187	47	175	42
J85	78	3	187	47	175	42
J86	64	3	187	53	177	49
J87	64	3	187	53	177	49
J88	72	3	187	50	176	45
J89	74	3	187	49	176	44
J90	74	3	187	49	176	44
J91	72	3	187	50	177	45
J92	85	3	187	44	176	39
J93	82	3	187	45	179	42
J94	80	3	187	46	175	41
J95	80	3	187	46	175	41
J96	82	3	187	45	179	42
J97	78	3	187	47	179	44
J98	85	3	187	44	176	39
J99	85	3	187	44	176	39
J100	68	3	187	51	176	47
J101	70	3	187	51	177	46
J102	72	3	187	50	177	45
J103	78	3	187	47	180	44
J104	71	3	187	50	180	47
J105	70	3	187	51	176	46
J106	72	3	187	50	176	45
J107	72	3	187	50	176	45
J108	80	3	187	46	175	41
J109	90	3	187	42	179	39
J110	90	3	187	42	179	39
J111	85	3	187	44	179	40
J112	64	3	187	53	177	49
J113	62	3	187	54	177	50
J114	68	3	187	51	175	46
J115	68	3	187	51	175	46
J116	80	3	187	46	176	41
J117	72	3	187	50	176	45
J118	73	3	187	49	176	45
J119	60	3	187	55	176	50
J120	62	3	187	54	176	49

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J121	76	3	187	48	176	43
J122	76	3	187	48	176	43
J123	66	3	187	52	176	48
J124	72	3	187	50	177	45
J125	65	3	188	53	177	48
J126	70	3	187	51	177	46
J127	70	3	187	51	177	46
J128	78	3	187	47	175	42
J129	78	3	187	47	175	42
J130	80	3	187	46	175	41
J131	80	3	187	46	175	41
J132	80	3	187	46	175	41
J133	76	3	187	48	179	45
J134	76	3	187	48	179	45
J135	72	3	187	50	177	45
J136	62	3	187	54	176	49
J137	61	3	187	54	176	50
J138	76	3	187	48	180	45
J139	75	3	187	49	180	45
J140	62	3	187	54	175	49
J141	62	3	187	54	175	49
J142	76	3	187	48	180	45
J143	84	3	187	45	179	41
J144	82	3	187	45	179	42
J145	85	3	187	44	178	40
J146	85	3	187	44	178	40
J147	74	3	187	49	176	44
J148	72	3	187	50	177	45
J149	72	3	187	50	177	45
J150	64	3	187	53	176	49
J151	64	3	187	53	176	49
J152	75	3	187	49	178	45
J153	75	3	187	49	178	45
J154	90	3	187	42	179	39
J155	62	3	187	54	177	50
J156	74	3	187	49	175	44
J157	62	3	187	54	176	49
J158	74	3	187	49	176	44
J159	85	3	187	44	176	40
J160	65	3	187	53	176	48
J161	64	3	187	53	176	48
J162	60	3	187	55	175	50
J163	60	3	187	55	175	50
J164	70	3	187	51	177	46
J165	72	3	187	50	177	45
J166	72	3	187	50	177	45
J167	70	3	187	51	176	46
J168	70	3	187	51	176	46
J169	66	3	187	52	177	48
J170	64	3	187	53	176	49
J171	86	3	187	44	176	39
J172	70	13	187	51	177	46
J173	76	3	187	48	179	45
J174	72	3	187	50	176	45
J175	72	3	187	50	176	45
J176	78	3	187	47	175	42
J177	90	3	187	42	179	39
J178	90	3	187	42	179	39
J179	75	3	187	49	179	45
J180	78	3	187	47	175	42

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J181	78	3	187	47	175	42
J182	70	3	187	51	177	46
J183	72	3	187	50	179	46
J184	62	3	187	54	175	49
J185	62	3	187	54	176	49
J186	62	3	187	54	175	49
J187	62	3	187	54	175	49
J188	70	3	187	51	177	46
J189	70	3	187	51	177	46
J190	68	3	187	52	177	47
J191	68	3	187	51	176	47
J192	70	3	187	51	177	46
J193	70	3	187	51	176	46
J194	72	3	187	50	176	45
J195	72	3	187	50	176	45
J196	90	3	187	42	179	39
J197	70	3	187	51	175	46
J198	70	3	187	51	176	46
J199	62	3	187	54	175	49
J200	62	3	187	54	175	49
J201	62	3	187	54	175	49
J202	64	3	187	53	175	48
J203	72	3	187	50	176	45
J204	68	3	187	52	176	47
J205	72	3	187	50	177	45
J206	72	3	187	50	176	45
J207	62	3	187	54	175	49
J208	64	3	187	53	176	49
J209	62	3	187	54	176	49
J210	86	3	187	44	176	39
J211	74	3	187	49	175	44
J212	64	3	187	53	176	48
J213	86	3	187	44	176	39
J214	74	3	187	49	175	44
J215	68	3	187	52	177	47
J216	68	3	187	52	177	47
J217	74	3	187	49	179	45
J218	72	3	187	50	178	46
J219	72	3	187	50	175	45
J220	64	3	187	53	175	48
J221	74	3	187	49	179	45
J222	74	3	187	49	179	46
J223	90	3	187	42	179	39
J224	86	3	187	44	176	39
J225	73	3	187	49	179	46
J226	73	3	187	49	176	45
J227	68	3	187	51	176	47
J228	68	3	187	51	177	47
J229	66	3	187	52	176	48
J230	62	3	187	54	176	50
J231	73	3	187	49	179	46
J232	86	3	187	44	178	40
J233	62	3	187	54	177	50
J234	86	3	187	44	179	40
J235	72	3	187	50	177	45
J236	74	3	187	49	177	44
J237	86	3	187	44	179	40
J238	86	3	187	44	175	39
J239	73	3	187	49	178	45
J240	73	3	187	49	176	45

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J241	86	3	187	44	179	40
J242	68	3	187	52	177	47
J243	62	3	187	54	177	50
J244	86	3	187	44	177	39
J245	68	3	187	51	175	46
J246	72	3	187	50	175	45
J247	60	3	187	55	175	50
J248	60	3	187	55	175	50
J249	73	3	187	49	178	46
J250	74	3	187	49	175	44
J251	86	3	187	44	177	39
J252	86	3	187	44	176	39
J253	60	3	187	55	175	50
J254	60	3	187	55	175	50
J255	62	3	187	54	176	49
J256	74	3	187	49	176	44
J257	62	3	187	54	176	49
J258	62	3	187	54	176	49
J259	64	3	187	53	176	49
J260	90	3	187	42	179	39
J261	72	3	187	50	176	45
J262	64	3	187	53	176	49
J263	70	3	187	51	177	46
J264	86	3	187	44	176	39
J265	78	3	187	47	175	42
J266	86	3	187	44	176	39
J267	68	3	187	52	177	47
J268	72	3	187	50	179	46
J269	72	3	187	50	179	46
J270	72	3	187	50	177	45
J271	72	3	187	50	176	45
J272	68	3	187	51	176	47
J273	68	3	187	51	176	47
J274	84	3	187	45	179	41
J275	68	3	187	51	176	47
J276	86	3	187	44	178	40
J277	86	3	187	44	178	40
J278	63	3	187	54	176	49
J279	64	3	187	53	176	48
J280	68	3	187	52	177	47
J281	68	3	187	52	177	47
J282	86	3	187	44	176	39
J283	78	3	187	47	175	42
J284	62	3	187	54	175	49
J285	60	3	187	55	175	50
J286	76	3	187	48	175	43
J287	76	3	187	48	175	43
J288	76	3	187	48	175	43
J289	72	3	187	50	177	45
J290	62	3	187	54	176	49
J291	60	3	187	55	175	50
J292	60	3	187	55	176	50
J293	76	3	187	48	175	43
J294	76	3	187	48	175	43
J295	70	3	187	51	178	47
J296	62	3	187	54	175	49
J297	90	3	187	42	179	38
J298	64	3	187	53	176	48
J299	68	3	187	51	176	47
J300	74	3	187	49	176	44

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J301	70	3	187	51	178	47
J302	64	3	187	53	176	48
J303	64	3	187	53	176	49
J304	62	3	187	54	177	50
J305	62	3	187	54	177	50
J306	72	3	187	50	176	45
J307	86	3	187	44	178	40
J308	86	3	187	44	177	39
J309	60	3	187	55	176	50
J310	72	3	187	50	176	45
J311	68	3	187	52	177	47
J312	84	3	187	45	180	41
J313	68	3	187	51	176	47
J314	68	3	187	51	177	47
J315	74	3	187	49	176	44
J316	60	3	187	55	175	50
J317	82	3	187	45	179	42
J318	70	3	187	51	179	47
J319	70	3	187	51	176	46
J320	68	3	187	51	176	47
J321	66	3	187	52	176	47
J322	60	3	187	55	176	50
J323	70	3	187	51	176	46
J324	64	3	187	53	175	48
J325	70	3	187	51	178	47
J326	76	3	187	48	175	43
J327	74	3	187	49	179	45
J328	85	3	187	44	179	41
J329	66	3	187	52	176	47
J330	76	3	187	48	175	43
J331	62	3	187	54	175	49
J332	60	3	187	55	176	50
J333	72	3	187	50	176	45
J334	64	3	187	53	176	48
J335	72	3	187	50	176	45
J336	74	3	187	49	179	45
J337	70	3	187	51	177	46
J338	90	3	187	42	179	39
J339	72	3	187	50	176	45
J340	74	3	187	49	176	44
J341	72	3	187	50	176	45
J342	66	3	187	52	176	48
J343	68	3	187	52	177	47
J344	68	3	187	52	177	47
J345	68	3	187	52	177	47
J346	68	3	187	51	177	47
J347	62	3	187	54	176	50
J348	62	3	187	54	176	49
J349	62	3	187	54	177	50
J350	62	3	187	54	176	50
J351	62	3	187	54	176	50
J352	72	3	187	50	177	45
J353	64	3	188	53	177	49
J354	60	3	187	55	176	50
J355	60	3	187	55	176	50
J356	60	3	187	55	175	50
J357	64	3	187	53	175	48
J358	64	3	187	53	175	48
J359	64	3	187	53	175	48
J360	64	3	187	53	175	48

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J361	64	3	187	53	175	48
J362	64	3	187	53	176	48
J363	68	3	187	52	177	47
J364	76	3	187	48	175	43
J365	76	3	187	48	175	43
J366	86	3	187	44	176	39
J367	86	3	187	44	179	40
J368	74	3	187	49	179	46
J369	70	3	187	51	179	47
J370	86	3	187	44	178	40
J371	86	3	187	44	178	40
J372	76	3	187	48	179	45
J373	85	3	187	44	179	41
J374	62	3	187	54	177	50
J375	62	3	187	54	176	49
J376	72	3	187	50	176	45
J377	72	3	188	50	177	45
J378	62	3	187	54	175	49
J379	72	3	187	50	175	45
J380	73	3	187	49	179	46
J381	68	3	187	52	177	47
J382	70	3	187	51	178	47
J383	76	3	187	48	180	45
J384	74	3	187	49	176	44
J385	86	3	187	44	177	39
J386	74	3	187	49	179	45
J387	90	3	187	42	179	39
J388	78	3	187	47	175	42
J389	72	3	187	50	176	45
J390	91	3	187	42	179	38
J391	80	3	187	46	179	43
J392	84	3	187	45	180	41
J393	85	3	187	44	180	41
J394	83	3	187	45	180	42
J395	80.2	3	187	46	179	43
J396	83	3	187	45	179	42
J397	86	3	187	44	179	40
J398	86.7	3	187	43	176	39
J399	86.6	3	187	44	179	40
J400	85	3	187	44	179	41
J401	86	3	187	44	179	40
J402	70	3	187	51	179	47
J403	75.8	3	187	48	180	45
J404	77.2	3	187	48	180	44
J405	76	3	187	48	180	45
J406	76	3	187	48	180	45
J407	76	3	187	48	180	45
J408	76	3	187	48	180	45
J409	76	21	187	48	180	45
J410	76	3	187	48	180	45
J411	76	3	187	48	180	45
J412	76	3	187	48	180	45
J413	78	3	187	47	175	42
J414	75	3	187	48	175	43
J415	75	3	187	48	175	43
J416	70	3	187	51	176	46
J417	64	3	187	53	175	48
J418	70	3	187	51	176	46
J419	66	3	187	52	175	47
J420	66	3	187	52	175	47

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J421	83.3	3	187	45	179	42
J422	65.2	3	187	53	175	48
J423	64	3	187	53	175	48
J424	64	3	188	53	177	49
J425	70.7	3	187	50	177	46
J426	68.6	3	187	51	177	47
J427	86.9	3	187	43	179	40
J428	72	3	188	50	179	47
J429	90	2	187	42	179	39
J430	90	3	187	42	179	39
J431	63.2	9	187	54	176	49
J432	64	7	187	53	175	48
J433	77	156	187	48	175	43
J434	77.1	8	187	47	175	43
J435	74	13	187	49	175	44
J436	60	10	187	55	176	50
J437	62	19	187	54	175	49
J438	69.7	45	187	51	175	46
J439	72	43	187	50	176	45
J440	78.4	0	187	47	175	42
J441	74	0	187	49	176	44
J442	62	0	187	54	175	49
J443	85	0	187	44	178	40
J444	86	0	187	44	177	40
J445	86	0	187	44	176	39
J446	80.3	0	187	46	176	41
J447	73.2	0	187	49	179	46
J448	69.1	0	187	51	177	47
J449	72.9	0	187	50	177	45
J450	75	5	187	49	179	45
J451	75	0	187	49	179	45
J452	62.8	0	187	54	176	49
J453	75.9	0	187	48	180	45
J454	86	0	187	44	178	40
J455	76	0	187	48	175	43
J456	78.2	0	187	47	175	42
J457	71.7	0	187	50	175	45
J458	62	0	187	54	177	50
J459	66.5	0	187	52	176	47
J460	63.1	0	187	54	177	49
J461	60	0	187	55	175	50
J462	61	0	187	54	175	50
J463	60	0	187	55	176	50
J464	62	0	187	54	175	49
J465	86	0	187	44	176	39
J466	68	0	187	52	177	47
J467	78	0	187	47	180	44
J468	76	0	187	48	175	43
J469	80.5	0	187	46	176	41
J470	60	0	187	55	175	50
J471	76	0	187	48	180	45
J472	76	0	187	48	180	45
J473	76	0	187	48	180	45
J474	76	0	187	48	180	45
J475	70	0	187	51	179	47
J476	75	0	187	49	179	45
J477	72.5	0	187	50	179	46
J478	88.4	0	187	43	179	39
J479	68	0	187	52	177	47
J480	68	0	187	52	177	47

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J481	68	0	187	52	177	47
J482	68	0	187	52	177	47
J483	68	0	187	52	177	47
J484	79	0	187	47	177	42

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P1	8	12	0.08	0.005	ACP
P2	2	4	0.46	0.692	ACP
P3	2	4	0.46	0.693	ACP
P4	4	4	0.09	0.016	ACP
P5	2	6	0.64	1.3	ACP
P6	2	4	0.46	0.693	ACP
P7	6	33	0.37	0.152	DI
P8	4	15	0.39	0.236	ACP
P9	2	4	0.46	0.693	ACP
P10	2	4	0.46	0.693	ACP
P11	2	4	0.46	0.693	ACP
P12	2	4	0.46	0.692	ACP
P13	4	24	0.62	0.549	ACP
P14	4	24	0.6	0.516	ACP
P15	2	4	0.46	0.692	ACP
P16	2	4	0.46	0.692	ACP
P17	2	4	0.46	0.693	ACP
P18	2	4	0.46	0.693	ACP
P19	8	24	0.15	0.016	PVC
P20	6	4	0.05	0.003	ACP
P21	4	4	0.11	0.024	ACP
P22	4	20	0.52	0.398	ACP
P23	4	9	0.23	0.085	ACP
P24	2	4	0.46	0.692	ACP
P25	6	4	0.05	0.003	ACP
P26	8	4	0.03	0.001	ACP
P27	2	4	0.46	0.692	ACP
P28	2	4	0.46	0.693	ACP
P29	4	4	0.11	0.024	ACP
P30	2	4	0.46	0.693	ACP
P31	4	20	0.51	0.384	ACP
P32	4	8	0.2	0.068	ACP
P33	2	4	0.46	0.693	ACP
P34	2	4	0.46	0.693	ACP
P35	2	4	0.46	0.693	ACP
P36	8	4	0.03	0.001	ACP
P37	4	30	0.76	0.795	ACP
P38	2	4	0.46	0.693	ACP
P39	6	4	0.05	0.003	ACP
P40	2	4	0.46	0.692	ACP
P41	6	0	0	0	ACP
P42	4	33	0.84	0.954	ACP
P43	8	223	1.42	1.544	ACP
P44	10	19	0.08	0.004	ACP
P45	4	4	0.11	0.024	ACP
P46	4	4	0.11	0.021	ACP
P47	8	4	0.03	0.001	ACP
P48	6	4	0.05	0.003	ACP
P49	4	27	0.68	0.648	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P50	2	2	0.25	0.27	DI
P51	6	0	0	0	ACP
P52	6	42	0.47	0.205	ACP
P53	6	46	0.52	0.288	DI
P54	8	4	0.03	0.001	ACP
P55	6	43	0.48	0.249	DI
P56	4	35	0.89	1.077	ACP
P57	8	37	0.24	0.041	ACP
P58	6	4	0.05	0.003	ACP
P59	10	11	0.05	0.002	ACP
P60	8	149	0.95	0.535	ACP
P61	6	77	0.88	0.648	ACP
P62	6	4	0.05	0.003	PVC
P63	12	309	0.88	0.333	DI
P64	6	4	0.05	0.003	ACP
P65	4	27	0.7	0.681	ACP
P66	12	157	0.44	0.095	DI
P67	6	4	0.05	0.003	ACP
P68	4	18	0.46	0.32	ACP
P69	4	9	0.23	0.085	ACP
P70	6	73	0.83	0.58	ACP
P71	4	9	0.23	0.085	ACP
P72	4	20	0.51	0.378	ACP
P73	4	22	0.56	0.452	ACP
P74	6	16	0.18	0.036	ACP
P75	6	13	0.15	0.025	ACP
P76	6	129	1.47	1.676	ACP
P77	6	37	0.42	0.169	ACP
P78	6	72	0.82	0.574	ACP
P79	4	11	0.28	0.125	ACP
P80	6	28	0.32	0.098	ACP
P81	6	96	1.08	0.96	ACP
P82	6	114	1.3	1.334	ACP
P83	10	45	0.18	0.019	ACP
P84	8	74	0.48	0.149	ACP
P85	4	27	0.7	0.679	ACP
P86	4	7	0.17	0.05	ACP
P87	8	133	0.85	0.436	ACP
P88	6	0	0	0	ACP
P89	6	67	0.76	0.498	ACP
P90	6	88	1	0.821	ACP
P91	4	17	0.44	0.289	ACP
P92	6	37	0.43	0.169	ACP
P93	8	27	0.17	0.031	ACP
P94	4	7	0.17	0.048	ACP
P95	4	14	0.35	0.186	ACP
P96	6	49	0.56	0.28	ACP
P97	6	4	0.05	0.003	ACP
P98	4	49	1.25	2.006	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P99	8	16	0.1	0.009	ACP
P100	6	87	0.98	0.799	ACP
P101	4	24	0.62	0.745	ACP
P102	4	4	0.11	0.024	ACP
P103	4	4	0.1	0.019	ACP
P104	6	16	0.18	0.04	DI
P105	4	9	0.24	0.096	ACP
P106	6	63	0.71	0.438	ACP
P107	6	3	0.03	0.001	ACP
P108	6	28	0.32	0.102	ACP
P109	12	65	0.19	0.014	PVC
P110	6	105	1.19	1.147	ACP
P111	6	10	0.11	0.014	ACP
P112	6	21	0.24	0.059	ACP
P113	6	24	0.28	0.076	ACP
P114	6	7	0.08	0.008	ACP
P115	6	4	0.05	0.003	ACP
P116	8	21	0.13	0.014	ACP
P117	2	4	0.46	0.692	ACP
P118	8	69	0.44	0.129	ACP
P119	6	13	0.15	0.025	ACP
P120	8	41	0.26	0.05	ACP
P121	2	4	0.46	0.693	ACP
P122	6	79	0.89	0.668	ACP
P123	4	18	0.45	0.305	ACP
P124	4	21	0.53	0.411	ACP
P125	6	64	0.73	0.456	ACP
P126	6	38	0.43	0.172	ACP
P127	6	152	1.73	2.271	ACP
P128	6	127	1.44	1.627	ACP
P129	8	100	0.64	0.258	ACP
P130	2	4	0.46	0.693	ACP
P131	2	4	0.46	0.693	ACP
P132	8	44	0.28	0.057	ACP
P133	8	176	1.12	0.731	ACP
P134	8	132	0.84	0.43	ACP
P135	6	126	1.43	1.61	ACP
P136	4	16	0.42	0.265	ACP
P137	6	35	0.39	0.147	ACP
P138	4	12	0.3	0.146	ACP
P139	6	17	0.19	0.04	ACP
P140	4	13	0.34	0.181	ACP
P141	6	100	1.14	1.049	ACP
P142	6	17	0.19	0.038	ACP
P143	6	14	0.16	0.031	DI
P144	4	15	0.38	0.222	ACP
P145	8	141	0.9	0.488	ACP
P146	8	9	0.06	0.003	ACP
P147	6	47	0.53	0.259	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P148	4	18	0.46	0.358	DI
P149	6	11	0.12	0.017	ACP
P150	8	34	0.22	0.034	ACP
P151	6	4	0.05	0.003	ACP
P152	6	29	0.33	0.105	ACP
P153	10	67	0.27	0.036	PVC
P154	10	62	0.25	0.031	PVC
P155	12	137	0.39	0.063	ACP
P156	4	13	0.34	0.181	ACP
P157	2	4	0.46	0.693	ACP
P158	8	85	0.55	0.192	ACP
P159	8	274	1.75	1.66	ACP
P160	8	321	2.05	2.581	DI
P161	8	30	0.19	0.028	ACP
P162	8	78	0.5	0.163	ACP
P163	8	69	0.44	0.129	ACP
P164	6	105	1.2	1.15	ACP
P165	6	71	0.8	0.551	ACP
P166	8	36	0.23	0.039	ACP
P167	2	4	0.46	0.693	ACP
P168	8	290	1.85	2.995	Steel
P169	4	4	0.1	0.028	ACP
P170	4	49	1.24	3.215	ACP
P171	6	189	2.14	4.611	ACP
P172	8	152	0.97	0.555	ACP
P173	8	90	0.58	0.212	ACP
P174	6	8	0.09	0.017	Steel
P175	2	4	0.46	0.693	ACP
P176	2	4	0.46	0.692	ACP
P177	2	4	0.46	0.693	ACP
P178	6	13	0.15	0.025	ACP
P179	8	84	0.54	0.187	ACP
P180	8	89	0.57	0.206	ACP
P181	4	23	0.58	0.489	ACP
P182	6	57	0.64	0.364	ACP
P183	6	41	0.47	0.204	ACP
P184	2	4	0.46	0.692	ACP
P185	8	4	0.03	0.001	ACP
P186	8	41	0.26	0.048	ACP
P187	4	4	0.11	0.024	ACP
P188	4	4	0.11	0.024	ACP
P189	8	72	0.46	0.14	ACP
P190	8	327	2.09	2.31	ACP
P191	8	266	1.7	1.577	ACP
P192	8	9	0.06	0.003	PVC
P193	12	4	0.01	0	PVC
P194	8	184	1.17	1.082	ACP
P195	6	4	0.05	0.003	ACP
P196	6	12	0.13	0.019	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P197	8	27	0.17	0.023	ACP
P198	8	40	0.25	0.047	ACP
P199	6	17	0.19	0.037	ACP
P200	6	28	0.32	0.1	ACP
P201	8	87	0.55	0.198	ACP
P202	8	78	0.5	0.163	ACP
P203	4	10	0.26	0.109	ACP
P204	4	8	0.19	0.063	ACP
P205	8	43	0.27	0.054	ACP
P206	8	53	0.34	0.078	ACP
P207	8	75	0.48	0.151	ACP
P208	8	149	0.95	0.539	ACP
P209	6	0	0	0	ACP
P210	6	38	0.43	0.175	ACP
P211	6	42	0.48	0.212	ACP
P212	6	19	0.21	0.046	ACP
P213	6	78	0.88	0.651	ACP
P214	6	71	0.81	0.558	ACP
P215	6	51	0.58	0.299	ACP
P216	8	156	1	0.588	ACP
P217	8	150	0.96	0.546	ACP
P218	8	179	1.14	0.755	ACP
P219	8	185	1.18	0.804	ACP
P220	6	77	0.87	0.637	ACP
P221	6	57	0.65	0.371	ACP
P222	6	59	0.66	0.387	ACP
P223	6	41	0.47	0.204	ACP
P224	6	33	0.38	0.134	ACP
P225	6	35	0.4	0.151	ACP
P226	6	46	0.52	0.249	ACP
P227	6	84	0.96	0.759	ACP
P228	6	43	0.48	0.215	ACP
P229	6	56	0.64	0.356	ACP
P230	6	58	0.66	0.382	ACP
P231	6	49	0.56	0.281	ACP
P232	3	4	0.2	0.096	ACP
P233	6	4	0.05	0.003	ACP
P234	6	11	0.12	0.016	ACP
P235	6	5	0.05	0.004	ACP
P236	6	8	0.09	0.01	ACP
P237	6	4	0.05	0.004	ACP
P238	6	10	0.11	0.013	ACP
P239	6	16	0.18	0.038	DI
P240	6	7	0.08	0.01	DI
P241	6	28	0.32	0.115	DI
P242	6	15	0.17	0.035	DI
P243	6	20	0.23	0.053	ACP
P244	6	14	0.16	0.027	ACP
P245	4	3	0.07	0.01	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P246	4	12	0.3	0.143	ACP
P247	8	9	0.06	0.003	ACP
P248	8	16	0.1	0.009	ACP
P249	8	17	0.11	0.01	ACP
P250	6	78	0.89	0.662	ACP
P251	6	41	0.47	0.203	ACP
P252	6	121	1.37	1.474	ACP
P253	6	137	1.55	1.869	ACP
P254	8	125	0.79	0.386	ACP
P255	8	80	0.51	0.17	ACP
P256	4	13	0.32	0.164	ACP
P257	2	10	0.98	2.867	ACP
P258	2	4	0.46	0.692	ACP
P259	6	54	0.62	0.389	DI
P260	6	79	0.9	0.68	ACP
P261	8	115	0.74	0.334	ACP
P262	8	53	0.34	0.08	ACP
P263	6	57	0.65	0.371	ACP
P264	6	4	0.05	0.003	ACP
P265	6	53	0.6	0.317	ACP
P266	6	44	0.49	0.224	ACP
P267	8	36	0.23	0.044	DI
P268	8	47	0.3	0.074	DI
P269	6	48	0.55	0.271	ACP
P270	6	47	0.54	0.261	ACP
P271	6	26	0.29	0.085	ACP
P272	6	26	0.29	0.085	ACP
P273	6	27	0.31	0.095	ACP
P274	6	114	1.3	1.338	ACP
P275	4	25	0.65	0.595	ACP
P276	4	4	0.11	0.024	ACP
P277	6	47	0.53	0.258	ACP
P278	6	70	0.8	0.472	PVC
P279	6	199	2.26	3.746	ACP
P280	6	12	0.14	0.034	Steel
P281	6	56	0.63	0.572	Steel
P282	6	11	0.12	0.018	ACP
P283	6	140	1.59	1.948	ACP
P284	6	73	0.83	0.583	ACP
P285	6	213	2.41	4.217	ACP
P286	6	76	0.86	0.846	ACP
P287	8	23	0.15	0.023	ACP
P288	8	76	0.48	0.21	ACP
P289	6	48	0.54	0.265	ACP
P290	6	53	0.6	0.317	ACP
P291	6	49	0.56	0.282	ACP
P292	6	75	0.85	0.612	ACP
P293	6	91	1.03	0.869	ACP
P294	6	96	1.09	1.309	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P295	6	31	0.36	0.167	ACP
P296	6	79	0.89	0.67	ACP
P297	6	105	1.19	1.137	ACP
P298	6	35	0.4	0.15	ACP
P299	4	6	0.16	0.043	ACP
P300	4	35	0.9	1.092	ACP
P301	4	26	0.67	0.637	ACP
P302	4	18	0.47	0.321	ACP
P303	4	12	0.31	0.149	ACP
P304	6	93	1.06	0.915	ACP
P305	6	89	1.01	0.836	ACP
P306	6	94	1.07	0.931	ACP
P307	6	88	1	0.821	ACP
P308	6	23	0.27	0.071	ACP
P309	6	74	0.84	0.598	ACP
P310	6	13	0.15	0.029	DI
P311	6	4	0.05	0.004	DI
P312	10	24	0.1	0.006	ACP
P313	12	13	0.04	0.001	ACP
P314	6	2	0.02	0.001	ACP
P315	6	4	0.05	0.003	ACP
P316	6	2	0.03	0.001	ACP
P317	6	22	0.24	0.061	ACP
P318	6	2	0.02	0.001	ACP
P319	6	13	0.14	0.023	ACP
P320	6	8	0.09	0.01	ACP
P321	6	9	0.1	0.012	ACP
P322	12	88	0.25	0.028	ACP
P323	12	85	0.24	0.026	ACP
P324	12	95	0.27	0.033	ACP
P325	6	13	0.15	0.025	ACP
P326	6	9	0.1	0.012	ACP
P327	6	4	0.05	0.003	ACP
P328	8	22	0.14	0.018	ACP
P329	8	22	0.14	0.018	ACP
P330	12	61	0.17	0.014	ACP
P331	12	104	0.3	0.038	ACP
P332	12	126	0.36	0.055	ACP
P333	4	2	0.06	0.009	DI
P334	6	26	0.29	0.085	ACP
P335	6	41	0.47	0.204	ACP
P336	6	13	0.15	0.024	ACP
P337	6	15	0.17	0.031	ACP
P338	8	43	0.27	0.054	ACP
P339	8	155	0.99	0.578	ACP
P340	6	87	0.99	0.804	ACP
P341	6	58	0.66	0.382	ACP
P342	4	19	0.48	0.396	DI
P343	4	17	0.44	0.334	DI

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P344	6	100	1.13	1.033	ACP
P345	6	30	0.34	0.111	ACP
P346	6	53	0.6	0.377	DI
P347	6	46	0.52	0.288	DI
P348	6	127	1.44	1.884	DI
P349	6	73	0.83	0.674	DI
P350	6	82	0.93	0.835	DI
P351	6	88	1	0.954	DI
P352	6	70	0.79	0.619	DI
P353	6	71	0.81	0.647	DI
P354	6	176	2	4.845	Steel
P355	6	24	0.27	0.116	Steel
P356	6	156	1.77	3.855	Steel
P357	6	90	1.03	1.085	ACP
P358	6	69	0.78	0.842	Steel
P359	6	80	0.9	1.11	Steel
P360	6	34	0.38	0.226	Steel
P361	6	231	2.62	7.988	Steel
P362	6	124	1.4	2.513	Steel
P363	8	182	1.16	1.062	ACP
P364	8	330	2.11	3.197	ACP
P365	6	52	0.59	0.308	ACP
P366	6	61	0.69	0.411	ACP
P367	6	12	0.14	0.029	ACP
P368	6	9	0.1	0.017	ACP
P369	6	54	0.61	0.332	ACP
P370	6	98	1.11	1.008	ACP
P371	6	56	0.63	0.351	ACP
P372	6	69	0.79	0.724	ACP
P373	6	59	0.67	0.647	Steel
P374	6	51	0.57	0.479	Steel
P375	8	194	1.24	1.191	ACP
P376	8	185	1.18	1.091	ACP
P377	6	11	0.12	0.018	ACP
P378	6	20	0.23	0.054	ACP
P379	6	9	0.1	0.012	ACP
P380	12	154	0.44	0.079	ACP
P381	12	86	0.25	0.027	ACP
P382	12	75	0.21	0.021	ACP
P383	6	60	0.68	0.407	ACP
P384	6	114	1.29	1.319	ACP
P385	6	107	1.22	1.189	ACP
P386	6	13	0.14	0.023	ACP
P387	4	13	0.34	0.18	ACP
P388	4	21	0.54	0.422	ACP
P389	6	108	1.23	1.203	ACP
P390	6	72	0.82	0.565	ACP
P391	12	161	0.46	0.1	DI
P392	6	79	0.9	0.924	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P393	6	87	0.98	0.801	ACP
P394	8	114	0.73	0.33	ACP
P395	8	106	0.67	0.284	ACP
P396	10	124	0.51	0.129	ACP
P397	8	4	0.03	0.001	ACP
P398	8	225	1.44	1.155	ACP
P399	8	221	1.41	1.113	ACP
P400	8	34	0.22	0.041	DI
P401	8	54	0.35	0.095	DI
P402	8	204	1.3	1.116	DI
P403	6	4	0.05	0.003	ACP
P404	6	13	0.15	0.024	ACP
P405	8	0	0	0	DI
P406	99	0	0	0	DI
P407	99	598	0.02	0	DI
P408	8	0	0	0	DI
P409	8	0	0	0	DI
P410	8	439	2.8	3.976	DI
P411	8	0	0	0	DI
P412	6	107	1.21	1.177	ACP
P413	6	102	1.16	1.088	ACP
P414	10	(N/A)	(N/A)	(N/A)	DI
P415	8	(N/A)	(N/A)	(N/A)	DI
P416	12	(N/A)	(N/A)	(N/A)	DI
P417	12	(N/A)	(N/A)	(N/A)	DI
P418	6	73	0.83	0.511	PVC
P419	6	76	0.87	0.552	PVC
P420	12	(N/A)	(N/A)	(N/A)	DI
P421	6	18	0.21	0.045	ACP
P422	6	15	0.17	0.032	ACP
P423	12	(N/A)	(N/A)	(N/A)	DI
P424	10	81	0.33	0.095	Steel
P425	10	88	0.36	0.11	Steel
P426	10	165	0.68	0.358	Steel
P427	10	27	0.11	0.007	PVC
P428	12	0	0	0	DI
P429	12	67	0.19	0.017	DI
P430	6	109	1.24	1.233	ACP
P431	8	146	0.93	0.708	ACP
P432	6	45	0.51	0.235	ACP
P433	12	667	1.89	1.388	DI
P434	12	445	1.26	0.656	DI
P435	10	217	0.89	0.365	DI
P436	10	213	0.87	0.351	DI
P437	6	80	0.91	0.608	PVC
P438	6	4	0.05	0.003	PVC
P439	6	16	0.18	0.036	ACP
P440	8	81	0.52	0.176	DI
P441	10	175	0.72	0.245	DI

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P442	12	(N/A)	(N/A)	(N/A)	DI
P443	6	38	0.44	0.177	ACP
P444	10	180	0.73	0.257	DI
P445	10	11	0.04	0.001	DI
P446	6	4	0.05	0.003	DI
P447	12	305	0.87	0.327	DI
P448	12	313	0.89	0.342	DI
P449	12	301	0.85	0.319	DI
P450	12	333	0.95	0.384	DI
P451	12	415	1.18	0.578	DI
P452	8	78	0.5	0.141	PVC
P453	8	64	0.41	0.099	PVC
P454	8	60	0.38	0.087	PVC
P455	8	33	0.21	0.029	PVC
P456	8	27	0.17	0.019	PVC
P457	8	4	0.03	0.001	PVC
P458	6	4	0.05	0.003	PVC
P459	8	89	0.57	0.209	DI
P460	10	38	0.16	0.015	DI
P461	10	41	0.17	0.017	DI
P462	10	36	0.15	0.013	DI
P463	10	27	0.11	0.008	DI
P464	6	4	0.05	0.003	DI
P465	8	123	0.79	0.379	ACP
P466	8	113	0.72	0.322	ACP
P467	4	4	0.11	0.024	ACP
P468	4	12	0.3	0.145	ACP
P469	10	6	0.02	0.001	DI
P470	2	4	0.37	0.323	DI
P471	6	4	0.05	0.003	DI
P472	4	69	1.77	3.823	DI
P473	2	6	0.66	1.384	DI
P474	6	30	0.34	0.112	ACP
P475	6	22	0.25	0.065	ACP
P476	4	4	0.11	0.024	DI
P477	8	288	1.84	2.109	DI
P478	10	145	0.59	0.173	ACP
P479	12	141	0.4	0.067	ACP
P480	4	4	0.11	0.024	ACP
P481	6	4	0.05	0.003	DI
P482	6	60	0.69	0.475	DI
P483	6	15	0.17	0.037	DI
P484	6	83	0.94	0.736	ACP
P485	6	51	0.58	0.297	DI
P486	10	20	0.08	0.004	DI
P487	10	184	0.75	0.269	DI
P488	10	209	0.85	0.338	DI
P489	8	439	2.8	3.976	DI
P490	8	435	2.77	3.901	DI

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P491	8	439	2.8	3.976	DI
P492	8	0	0	0	DI
P493	8	0	0	0	DI
P494	8	598	3.82	7.055	DI
P495	8	598	3.82	7.055	DI
P496	8	0	0	0	DI
P497	8	0	0	0	DI
P498	12	1087	3.08	2.957	ACP
P499	10	1379	5.63	11.171	DI
P500	6	32	0.37	0.13	ACP
P501	6	30	0.34	0.109	ACP
P502	6	39	0.45	0.184	ACP
P503	6	35	0.4	0.148	ACP
P504	6	18	0.2	0.043	ACP
P505	6	4	0.05	0.003	ACP
P506	10	50	0.21	0.024	ACP
P507	10	61	0.25	0.035	ACP
P508	12	16	0.04	0.001	ACP
P509	12	237	0.67	0.176	ACP
P510	6	3	0.03	0.001	ACP
P511	6	15	0.17	0.03	ACP
P512	10	188	0.77	0.279	ACP
P513	10	169	0.69	0.228	ACP
P514	6	33	0.37	0.115	PVC
P515	6	18	0.21	0.039	PVC
P516	8	45	0.28	0.05	PVC
P517	8	25	0.16	0.017	PVC
P518	8	63	0.4	0.109	ACP
P519	8	5	0.03	0.001	ACP
P520	12	63	0.18	0.015	DI
P521	8	4	0.03	0.001	PVC
P522	8	4	0.03	0.001	PVC
P523	6	3	0.04	0.002	ACP
P524	6	3	0.04	0.002	ACP
P525	4	0	0	0	DI
P526	8	18	0.11	0.012	DI
P527	8	18	0.11	0.013	DI
P528	6	4	0.05	0.004	DI
P529	6	4	0.05	0.004	DI
P530	6	0	0	0	DI
P531	6	95	1.08	1.288	ACP
P532	6	95	1.08	1.288	ACP
P533	6	4	0.05	0.005	ACP
P534	6	4	0.05	0.003	ACP
P535	4	0	0	0	ACP
P536	6	142	1.61	2.71	ACP
P537	6	142	1.61	2.711	ACP
P538	8	193	1.23	1.187	ACP
P539	4	0	0	0	DI

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P540	8	218	1.39	1.091	ACP
P541	8	218	1.39	1.091	ACP
P542	4	4	0.11	0.027	ACP
P543	4	4	0.11	0.032	ACP
P544	6	97	1.1	1.227	ACP
P545	6	97	1.1	1.227	ACP
P546	4	52	1.31	3.575	ACP
P547	6	0	0	0	DI
P548	10	28	0.12	0.009	ACP
P549	10	28	0.12	0.008	ACP
P550	10	51	0.21	0.029	DI
P551	10	51	0.21	0.029	DI
P552	6	29	0.33	0.105	ACP
P553	6	29	0.33	0.105	ACP
P554	6	0	0	0	DI
P555	6	34	0.38	0.163	DI
P556	6	34	0.38	0.163	DI
P557	6	0	0	0	DI
P558	6	84	0.95	0.748	ACP
P559	6	89	1.01	0.842	ACP
P560	2	7	0.72	1.6	ACP
P561	8	21	0.13	0.014	ACP
P562	8	21	0.13	0.014	ACP
P563	4	0	0	0	ACP
P564	6	0	0	0	DI
P565	4	0	0	0	DI
P566	8	0	0	0	DI
P567	4	0	0	0	DI
P568	8	320	2.04	2.566	ACP
P569	8	320	2.04	2.566	ACP
P570	6	0	0	0	DI
P571	8	277	1.77	2.308	ACP
P572	8	277	1.77	2.308	ACP
P573	6	0	0	0	DI
P574	6	5	0.05	0.004	ACP
P575	6	5	0.05	0.004	ACP
P576	6	0	0	0	DI
P577	10	48	0.19	0.022	ACP
P578	10	48	0.19	0.022	ACP
P579	6	0	0	0	DI
P580	6	18	0.2	0.043	ACP
P581	6	18	0.2	0.043	ACP
P582	6	0	0	0	DI
P583	6	22	0.25	0.065	ACP
P584	6	22	0.25	0.065	ACP
P585	6	0	0	0	DI
P586	8	0	0	0	DI
P587	6	0	0	0	DI
P588	6	39	0.44	0.184	ACP

TABLE 1

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P589	6	39	0.44	0.184	ACP
P590	6	0	0	0	DI
P591	4	6	0.16	0.044	ACP
P592	4	6	0.16	0.044	ACP
P593	6	0	0	0	DI
P594	8	0	0	0	DI
P595	8	0	0	0	DI
P596	8	0	0	0	DI
P597	8	0	0	0	DI
P598	10	1379	5.63	11.171	DI
P599	8	0	0	0	DI
P600	10	58	0.24	0.027	PVC
P601	10	30	0.12	0.008	PVC
P602	8	35	0.23	0.037	ACP
P603	8	193	1.23	0.871	ACP
P604	8	120	0.77	0.36	ACP
P605	8	253	1.62	1.433	ACP
P606	8	141	0.9	0.485	ACP
P607	8	53	0.34	0.092	ACP
P608	6	69	0.79	0.531	ACP
P609	6	69	0.79	0.531	ACP
P610	6	62	0.71	0.433	ACP
P611	6	62	0.71	0.433	ACP
P612	6	3	0.04	0.002	ACP
P613	6	3	0.04	0.002	ACP
P614	6	0	0	0	DI
P615	4	52	1.31	2.199	DI
P616	8	69	0.44	0.112	PVC
P617	8	69	0.44	0.112	PVC
P618	6	0	0	0	DI
P619	8	73	0.47	0.126	PVC
P620	8	73	0.47	0.126	PVC
P621	6	0	0	0	DI
P622	12	302	0.86	0.321	DI
P623	12	302	0.86	0.321	DI
P624	8	117	0.75	0.401	DI
P625	8	117	0.75	0.401	DI
P626	8	138	0.88	0.469	ACP
P627	8	138	0.88	0.468	ACP
P628	6	36	0.41	0.156	ACP
P629	6	36	0.41	0.156	ACP
P630	6	72	0.81	0.564	ACP
P631	8	0	0	0	DI
P632	8	0	0	0	DI
P633	8	0	0	0	DI
P634	6	0	0	0	DI
P635	6	72	0.81	0.564	ACP
P636	6	72	0.81	0.564	ACP
P637	1	0	0	0	PVC

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J1	86	3	178	40	169	36
J2	62	3	178	50	169	46
J3	62	3	178	50	169	46
J4	90	3	178	38	169	34
J5	88	3	178	39	169	35
J6	62	3	178	50	169	46
J7	62	3	178	50	169	46
J8	68	3	178	48	176	47
J9	68	3	178	48	176	47
J10	74	3	178	45	169	41
J11	73	4	178	45	169	42
J12	71	3	178	46	175	45
J13	86	3	178	40	169	36
J14	86	3	178	40	169	36
J15	71	3	178	46	173	44
J16	71	3	178	46	174	44
J17	87	3	178	39	169	35
J18	87	3	178	39	169	35
J19	87	3	178	39	169	36
J20	87	3	178	39	169	36
J21	70	3	178	47	171	44
J22	70	3	178	47	171	44
J23	70	3	178	47	171	44
J24	70	3	178	47	171	44
J25	87	3	178	39	169	35
J26	70	3	178	47	169	43
J27	70	3	178	47	169	43
J28	60	3	178	51	169	47
J29	76	3	178	44	170	41
J30	76	3	178	44	170	41
J31	60	3	178	51	169	47
J32	70	3	178	47	171	44
J33	70	3	178	47	171	44
J34	70	3	178	47	172	44
J35	70	3	178	47	172	44
J36	70	3	178	47	171	44
J37	68	3	178	48	172	45
J38	68	3	178	48	172	45
J39	62	3	178	50	169	46
J40	62	3	178	50	169	46
J41	64	3	178	49	169	46
J42	87	3	178	39	169	35
J43	86	3	178	40	169	36
J44	90	3	178	38	169	34
J45	90	3	178	38	169	34
J46	76	3	178	44	170	41
J47	90	3	178	38	169	34
J48	68	3	178	48	171	44
J49	74	3	178	45	169	41
J50	74	3	178	45	169	41
J51	68	3	178	48	171	45
J52	76	3	178	44	169	40
J53	76	3	178	44	169	40
J54	86	3	178	40	169	36
J55	86	3	178	40	169	36

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J56	90	3	178	38	169	34
J57	90	3	178	38	169	34
J58	76	3	178	44	169	40
J59	76	3	178	44	169	40
J60	76	3	178	44	169	40
J61	85	3	178	40	169	36
J62	72	3	178	46	170	43
J63	74	3	178	45	170	42
J64	68	3	178	48	172	45
J65	68	3	178	48	172	45
J66	76	3	178	44	169	40
J67	76	3	178	44	169	40
J68	76	3	178	44	169	40
J69	76	3	178	44	169	40
J70	86	3	178	40	169	36
J71	76	3	178	44	169	40
J72	74	3	178	45	169	41
J73	74	3	178	45	169	41
J74	74	3	178	45	170	42
J75	74	3	178	45	170	42
J76	85	3	178	40	169	36
J77	85	3	178	40	169	36
J78	74	3	178	45	171	42
J79	74	3	178	45	170	42
J80	78	3	178	43	169	39
J81	78	3	178	43	169	39
J82	85	3	178	40	169	36
J83	82	3	178	41	169	38
J84	78	3	178	43	169	39
J85	78	3	178	43	169	39
J86	64	3	178	49	171	46
J87	64	3	178	49	171	46
J88	72	3	178	46	169	42
J89	74	3	178	45	175	44
J90	74	3	178	45	175	44
J91	72	3	178	46	170	42
J92	85	3	178	40	169	36
J93	82	3	178	41	169	38
J94	80	3	178	42	169	38
J95	80	3	178	42	169	38
J96	82	3	178	41	169	38
J97	78	3	178	43	169	40
J98	85	3	178	40	169	36
J99	85	3	178	40	169	36
J100	68	3	178	48	176	47
J101	70	3	178	47	170	43
J102	72	3	178	46	170	43
J103	78	3	178	43	169	39
J104	71	3	178	46	169	43
J105	70	3	178	47	176	46
J106	72	3	178	46	169	42
J107	72	3	178	46	169	42
J108	80	3	178	42	169	38
J109	90	3	178	38	169	34
J110	90	3	178	38	169	34

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J111	85	3	178	40	169	36
J112	64	3	178	49	171	46
J113	62	3	178	50	171	47
J114	68	3	178	47	169	44
J115	68	3	178	47	169	44
J116	80	3	178	42	169	38
J117	72	3	178	46	169	42
J118	73	3	178	45	169	42
J119	60	3	178	51	169	47
J120	62	3	178	50	169	46
J121	76	3	178	44	169	40
J122	76	3	178	44	169	40
J123	66	3	178	48	173	46
J124	72	3	179	46	171	43
J125	65	3	179	49	171	46
J126	70	3	178	47	171	44
J127	70	3	178	47	171	44
J128	78	3	178	43	169	39
J129	78	3	178	43	169	39
J130	80	3	178	42	169	38
J131	80	3	178	42	169	38
J132	80	3	178	42	169	38
J133	76	3	178	44	169	40
J134	76	3	178	44	169	40
J135	72	3	178	46	171	43
J136	62	3	178	50	169	47
J137	61	3	178	51	169	47
J138	76	3	178	44	169	40
J139	75	3	178	44	169	41
J140	62	3	178	50	169	46
J141	62	3	178	50	169	46
J142	76	3	178	44	169	40
J143	84	3	178	41	169	37
J144	82	3	178	41	169	38
J145	85	3	178	40	169	36
J146	85	3	178	40	169	36
J147	74	3	178	45	175	44
J148	72	3	178	46	171	43
J149	72	3	178	46	171	43
J150	64	3	178	49	171	46
J151	64	3	178	49	171	46
J152	75	3	178	44	169	41
J153	75	3	178	44	169	41
J154	90	3	178	38	169	34
J155	62	3	178	50	171	47
J156	74	3	178	45	169	41
J157	62	3	178	50	169	46
J158	74	3	178	45	175	44
J159	85	3	178	40	169	36
J160	65	3	178	49	169	45
J161	64	3	178	49	169	46
J162	60	3	178	51	169	47
J163	60	3	178	51	169	47
J164	70	3	178	47	171	44
J165	72	3	178	46	170	42

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J166	72	3	178	46	170	42
J167	70	3	178	47	169	43
J168	70	3	178	47	169	43
J169	66	3	178	48	172	46
J170	64	3	178	49	172	47
J171	86	3	178	40	169	36
J172	70	13	178	47	172	44
J173	76	3	178	44	169	40
J174	72	3	178	46	170	42
J175	72	3	178	46	170	42
J176	78	3	178	43	169	39
J177	90	3	178	38	169	34
J178	90	3	178	38	169	34
J179	75	3	178	44	169	41
J180	78	3	178	43	169	39
J181	78	3	178	43	169	39
J182	70	3	178	47	171	44
J183	72	3	178	46	170	42
J184	62	3	178	50	169	46
J185	62	3	178	50	169	46
J186	62	3	178	50	169	46
J187	62	3	178	50	169	46
J188	70	3	178	47	170	43
J189	70	3	178	47	170	43
J190	68	3	178	47	169	44
J191	68	3	178	47	169	44
J192	70	3	178	47	171	44
J193	70	3	178	47	177	46
J194	72	3	178	46	176	45
J195	72	3	178	46	176	45
J196	90	3	178	38	169	34
J197	70	3	178	47	169	43
J198	70	3	178	47	169	43
J199	62	3	178	50	169	46
J200	62	3	178	50	169	46
J201	62	3	178	50	169	46
J202	64	3	178	49	169	45
J203	72	3	178	46	176	45
J204	68	3	178	48	170	44
J205	72	3	178	46	171	43
J206	72	3	178	46	172	43
J207	62	3	178	50	169	46
J208	64	3	178	49	171	46
J209	62	3	178	50	171	47
J210	86	3	178	40	169	36
J211	74	3	178	45	169	41
J212	64	3	178	49	169	46
J213	86	3	178	40	169	36
J214	74	3	178	45	169	41
J215	68	3	178	48	171	45
J216	68	3	178	48	171	45
J217	74	3	178	45	170	41
J218	72	3	178	46	170	42
J219	72	3	178	46	169	42
J220	64	3	178	49	169	45

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J221	74	3	178	45	169	41
J222	74	3	178	45	169	41
J223	90	3	178	38	169	34
J224	86	3	178	40	169	36
J225	73	3	178	45	169	42
J226	73	3	178	45	169	42
J227	68	3	178	47	169	44
J228	68	3	178	48	173	46
J229	66	3	178	49	170	45
J230	62	3	178	50	170	47
J231	73	3	178	45	169	42
J232	86	3	178	40	169	36
J233	62	3	178	50	171	47
J234	86	3	178	40	169	36
J235	72	3	178	46	169	42
J236	74	3	178	45	169	41
J237	86	3	178	40	169	36
J238	86	3	178	40	169	36
J239	73	3	178	45	170	42
J240	73	3	178	45	171	43
J241	86	3	178	40	169	36
J242	68	3	178	48	171	45
J243	62	3	178	50	171	47
J244	86	3	178	40	169	36
J245	68	3	178	47	169	44
J246	72	3	178	46	169	42
J247	60	3	178	51	169	47
J248	60	3	178	51	169	47
J249	73	3	178	45	170	42
J250	74	3	178	45	169	41
J251	86	3	178	40	169	36
J252	86	3	178	40	169	36
J253	60	3	178	51	169	47
J254	60	3	178	51	169	47
J255	62	3	178	50	169	46
J256	74	3	178	45	175	44
J257	62	3	178	50	171	47
J258	62	3	178	50	171	47
J259	64	3	178	49	170	46
J260	90	3	178	38	169	34
J261	72	3	178	46	171	43
J262	64	3	178	49	171	46
J263	70	3	178	47	170	43
J264	86	3	178	40	169	36
J265	78	3	178	43	169	39
J266	86	3	178	40	169	36
J267	68	3	178	48	171	44
J268	72	3	178	46	169	42
J269	72	3	178	46	169	42
J270	72	3	178	46	169	42
J271	72	3	178	46	169	42
J272	68	3	178	47	169	44
J273	68	3	178	47	169	44
J274	84	3	178	41	169	37
J275	68	3	178	47	169	44

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J276	86	3	178	40	169	36
J277	86	3	178	40	169	36
J278	63	3	178	50	171	47
J279	64	3	178	49	171	46
J280	68	3	178	48	171	44
J281	68	3	178	48	170	44
J282	86	3	178	40	169	36
J283	78	3	178	43	169	39
J284	62	3	178	50	169	46
J285	60	3	178	51	169	47
J286	76	3	178	44	169	40
J287	76	3	178	44	169	40
J288	76	3	178	44	169	40
J289	72	3	178	46	171	43
J290	62	3	178	50	169	46
J291	60	3	178	51	169	47
J292	60	3	178	51	169	47
J293	76	3	178	44	169	40
J294	76	3	178	44	169	40
J295	70	3	178	47	169	43
J296	62	3	178	50	169	46
J297	90	3	178	38	169	34
J298	64	3	178	49	169	46
J299	68	3	178	48	176	47
J300	74	3	178	45	175	44
J301	70	3	178	47	169	43
J302	64	3	178	49	169	45
J303	64	3	178	49	175	48
J304	62	3	178	50	171	47
J305	62	3	178	50	171	47
J306	72	3	178	46	177	45
J307	86	3	178	40	169	36
J308	86	3	178	40	169	36
J309	60	3	178	51	171	48
J310	72	3	178	46	171	43
J311	68	3	178	48	171	44
J312	84	3	178	41	169	37
J313	68	3	178	48	172	45
J314	68	3	178	48	172	45
J315	74	3	178	45	174	43
J316	60	3	178	51	169	47
J317	82	3	178	41	169	38
J318	70	3	178	47	169	43
J319	70	3	178	47	169	43
J320	68	3	178	47	169	44
J321	66	3	178	48	169	45
J322	60	3	178	51	171	48
J323	70	3	178	47	169	43
J324	64	3	178	49	169	45
J325	70	3	178	47	169	43
J326	76	3	178	44	169	40
J327	74	3	178	45	169	41
J328	85	3	178	40	169	36
J329	66	3	178	48	169	45
J330	76	3	178	44	169	40

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J331	62	3	178	50	169	46
J332	60	3	178	51	171	48
J333	72	3	178	46	170	42
J334	64	3	178	49	169	46
J335	72	3	178	46	170	42
J336	74	3	178	45	169	41
J337	70	3	178	47	169	43
J338	90	3	178	38	169	34
J339	72	3	178	46	174	44
J340	74	3	178	45	175	44
J341	72	3	178	46	176	45
J342	66	3	178	48	173	46
J343	68	3	178	48	171	45
J344	68	3	178	48	171	45
J345	68	3	178	48	171	45
J346	68	3	178	48	175	46
J347	62	3	178	50	172	48
J348	62	3	178	50	172	48
J349	62	3	178	50	171	47
J350	62	3	178	50	171	47
J351	62	3	178	50	171	47
J352	72	3	178	46	171	43
J353	64	3	179	50	171	46
J354	60	3	178	51	169	47
J355	60	3	178	51	169	47
J356	60	3	178	51	169	47
J357	64	3	178	49	169	46
J358	64	3	178	49	169	46
J359	64	3	178	49	169	46
J360	64	3	178	49	169	46
J361	64	3	178	49	169	46
J362	64	3	178	49	169	46
J363	68	3	178	48	170	44
J364	76	3	178	44	169	40
J365	76	3	178	44	169	40
J366	86	3	178	40	169	36
J367	86	3	178	40	169	36
J368	74	3	178	45	169	41
J369	70	3	178	47	170	43
J370	86	3	178	40	169	36
J371	86	3	178	40	169	36
J372	76	3	178	44	169	40
J373	85	3	178	40	169	36
J374	62	3	178	50	171	47
J375	62	3	178	50	171	47
J376	72	3	178	46	177	46
J377	72	3	179	46	171	43
J378	62	3	178	50	169	46
J379	72	3	178	46	169	42
J380	73	3	178	45	169	42
J381	68	3	178	48	171	44
J382	70	3	178	47	170	43
J383	76	3	178	44	169	40
J384	74	3	178	45	169	41
J385	86	3	178	40	169	36

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J386	74	3	178	45	169	41
J387	90	3	178	38	169	34
J388	78	3	178	43	169	39
J389	72	3	178	46	177	45
J390	91	3	178	37	169	34
J391	80	3	178	42	169	39
J392	84	3	178	41	169	37
J393	85	3	178	40	169	36
J394	83	3	178	41	169	37
J395	80	3	178	42	169	39
J396	83	3	178	41	169	37
J397	86	3	178	40	169	36
J398	87	3	178	39	169	36
J399	87	3	178	39	169	36
J400	85	3	178	40	169	36
J401	86	3	178	40	169	36
J402	70	3	178	47	169	43
J403	76	3	178	44	169	40
J404	77	3	178	43	169	40
J405	76	3	178	44	169	40
J406	76	3	178	44	169	40
J407	76	3	178	44	169	40
J408	76	3	178	44	169	40
J409	76	21	178	44	169	40
J410	76	3	178	44	169	40
J411	76	3	178	44	169	40
J412	76	3	178	44	169	40
J413	78	3	178	43	169	39
J414	75	3	178	44	169	41
J415	75	3	178	44	169	41
J416	70	3	178	47	169	43
J417	64	3	178	49	169	45
J418	70	3	178	47	169	43
J419	66	3	178	48	169	45
J420	66	3	178	48	169	45
J421	83	3	178	41	169	37
J422	65	3	178	49	169	45
J423	64	3	178	49	169	46
J424	64	3	179	50	171	46
J425	71	3	178	46	171	43
J426	69	3	178	47	171	44
J427	87	3	178	39	169	36
J428	72	3	178	46	169	42
J429	90	2	178	38	169	34
J430	90	3	178	38	169	34
J431	63	9	178	50	171	47
J432	64	7	178	49	169	45
J433	77	156	178	44	169	40
J434	77	8	178	44	169	40
J435	74	13	178	45	169	41
J436	60	10	178	51	169	47
J437	62	19	178	50	169	46
J438	70	45	178	47	169	43
J439	72	43	178	46	177	45
J440	78	0	178	43	169	39

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (Maximum) (ft)	Pressure (Maximum) (psi)	Hydraulic Grade (Minimum) (ft)	Pressure (Minimum) (psi)
J441	74	0	178	45	175	44
J442	62	0	178	50	169	46
J443	85	0	178	40	169	36
J444	86	0	178	40	169	36
J445	86	0	178	40	169	36
J446	80	0	178	42	169	38
J447	73	0	178	45	169	42
J448	69	0	178	47	170	44
J449	73	0	178	46	170	42
J450	75	5	178	44	169	41
J451	75	0	178	44	169	41
J452	63	0	178	50	169	46
J453	76	0	178	44	169	40
J454	86	0	178	40	169	36
J455	76	0	178	44	169	40
J456	78	0	178	43	169	39
J457	72	0	178	46	169	42
J458	62	0	178	50	171	47
J459	67	0	178	48	169	45
J460	63	0	178	50	171	47
J461	60	0	178	51	169	47
J462	61	0	178	50	169	47
J463	60	0	178	51	178	51
J464	62	0	178	50	169	46
J465	86	0	178	40	169	36
J466	68	0	178	48	171	44
J467	78	0	178	43	169	39
J468	76	0	178	44	169	40
J469	81	0	178	42	169	38
J470	60	0	178	51	169	47
J471	76	0	178	44	169	40
J472	76	0	178	44	169	40
J473	76	0	178	44	169	40
J474	76	0	178	44	169	40
J475	70	0	178	47	169	43
J476	75	0	178	44	169	41
J477	73	0	178	46	169	42
J478	88	0	178	39	169	35
J479	68	0	178	48	171	45
J480	68	0	178	48	171	45
J481	68	0	178	48	171	45
J482	68	0	178	48	171	45
J483	68	0	178	48	172	45
J484	79	0	178	43	172	40

TABLE 2

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P1	8	59	0.38	0.097	ACP
P2	2	4	0.46	0.693	ACP
P3	2	4	0.46	0.692	ACP
P4	4	29	0.75	0.773	ACP
P5	2	6	0.64	1.3	ACP
P6	2	4	0.46	0.693	ACP
P7	6	286	3.25	8.47	DI
P8	4	13	0.33	0.166	ACP
P9	2	4	0.46	0.692	ACP
P10	2	4	0.46	0.692	ACP
P11	2	4	0.46	0.693	ACP
P12	2	4	0.46	0.692	ACP
P13	4	19	0.48	0.344	ACP
P14	4	21	0.53	0.408	ACP
P15	2	4	0.46	0.693	ACP
P16	2	4	0.46	0.693	ACP
P17	2	4	0.46	0.692	ACP
P18	2	4	0.46	0.693	ACP
P19	8	68	0.44	0.11	PVC
P20	6	4	0.05	0.003	ACP
P21	4	4	0.11	0.024	ACP
P22	4	24	0.61	0.528	ACP
P23	4	9	0.23	0.085	ACP
P24	2	4	0.46	0.693	ACP
P25	6	4	0.05	0.003	ACP
P26	8	4	0.03	0.001	ACP
P27	2	4	0.46	0.693	ACP
P28	2	4	0.46	0.693	ACP
P29	4	4	0.11	0.024	ACP
P30	2	4	0.46	0.693	ACP
P31	4	31	0.8	0.884	ACP
P32	4	45	1.14	1.679	ACP
P33	2	4	0.46	0.692	ACP
P34	2	4	0.46	0.693	ACP
P35	2	4	0.46	0.693	ACP
P36	8	4	0.03	0.001	ACP
P37	4	18	0.45	0.299	ACP
P38	2	4	0.46	0.692	ACP
P39	6	4	0.05	0.003	ACP
P40	2	4	0.46	0.692	ACP
P41	6	0	0	0	ACP
P42	4	16	0.41	0.257	ACP
P43	8	148	0.95	0.725	ACP
P44	10	18	0.08	0.004	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P45	4	4	0.11	0.024	ACP
P46	4	26	0.66	0.621	ACP
P47	8	4	0.03	0.001	ACP
P48	6	4	0.05	0.003	ACP
P49	4	19	0.48	0.344	ACP
P50	2	1	0.1	0.053	DI
P51	6	0	0	0	ACP
P52	6	101	1.14	1.059	ACP
P53	6	62	0.7	0.493	DI
P54	8	4	0.03	0.001	ACP
P55	6	68	0.77	0.591	DI
P56	4	31	0.8	0.879	ACP
P57	8	283	1.81	1.763	ACP
P58	6	4	0.05	0.003	ACP
P59	10	11	0.04	0.001	ACP
P60	8	28	0.18	0.024	ACP
P61	6	125	1.42	1.575	ACP
P62	6	4	0.05	0.003	PVC
P63	12	118	0.34	0.056	DI
P64	6	4	0.05	0.003	ACP
P65	4	7	0.18	0.056	ACP
P66	12	59	0.17	0.016	DI
P67	6	4	0.05	0.003	ACP
P68	4	27	0.69	0.667	ACP
P69	4	9	0.23	0.085	ACP
P70	6	122	1.38	1.504	ACP
P71	4	9	0.23	0.085	ACP
P72	4	16	0.4	0.248	ACP
P73	4	5	0.14	0.033	ACP
P74	6	24	0.28	0.076	ACP
P75	6	13	0.15	0.025	ACP
P76	6	143	1.62	2.011	ACP
P77	6	49	0.55	0.275	ACP
P78	6	93	1.06	0.913	ACP
P79	4	48	1.23	1.949	ACP
P80	6	43	0.49	0.222	ACP
P81	6	46	0.52	0.248	ACP
P82	6	104	1.18	1.119	ACP
P83	10	25	0.1	0.007	ACP
P84	8	104	0.66	0.276	ACP
P85	4	11	0.27	0.119	ACP
P86	4	34	0.86	1.005	ACP
P87	8	161	1.03	0.619	ACP
P88	6	0	0	0	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P89	6	26	0.3	0.089	ACP
P90	6	78	0.88	0.652	ACP
P91	4	21	0.54	0.429	ACP
P92	6	19	0.21	0.047	ACP
P93	8	25	0.16	0.026	ACP
P94	4	11	0.29	0.131	ACP
P95	4	35	0.9	1.089	ACP
P96	6	57	0.65	0.37	ACP
P97	6	4	0.05	0.003	ACP
P98	4	29	0.73	0.746	ACP
P99	8	51	0.33	0.074	ACP
P100	6	25	0.28	0.08	ACP
P101	4	8	0.22	0.105	ACP
P102	4	4	0.11	0.024	ACP
P103	4	11	0.29	0.134	ACP
P104	6	32	0.37	0.148	DI
P105	4	4	0.09	0.017	ACP
P106	6	97	1.1	0.988	ACP
P107	6	5	0.06	0.004	ACP
P108	6	36	0.41	0.158	ACP
P109	12	136	0.39	0.055	PVC
P110	6	43	0.49	0.222	ACP
P111	6	62	0.7	0.43	ACP
P112	6	147	1.67	2.13	ACP
P113	6	150	1.7	2.213	ACP
P114	6	78	0.89	0.664	ACP
P115	6	4	0.05	0.003	ACP
P116	8	173	1.1	0.706	ACP
P117	2	4	0.46	0.692	ACP
P118	8	360	2.3	2.748	ACP
P119	6	65	0.73	0.464	ACP
P120	8	427	2.72	3.776	ACP
P121	2	4	0.46	0.693	ACP
P122	6	87	0.99	0.804	ACP
P123	4	22	0.56	0.45	ACP
P124	4	19	0.48	0.34	ACP
P125	6	62	0.7	0.429	ACP
P126	6	196	2.22	3.628	ACP
P127	6	493	5.6	20.025	ACP
P128	6	294	3.34	7.683	ACP
P129	8	228	1.46	1.184	ACP
P130	2	4	0.46	0.693	ACP
P131	2	4	0.46	0.693	ACP
P132	8	136	0.87	0.451	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P133	8	92	0.58	0.218	ACP
P134	8	145	0.92	0.51	ACP
P135	6	141	1.6	1.964	ACP
P136	4	15	0.37	0.212	ACP
P137	6	59	0.67	0.395	ACP
P138	4	14	0.36	0.197	ACP
P139	6	42	0.48	0.209	ACP
P140	4	13	0.34	0.181	ACP
P141	6	47	0.53	0.256	ACP
P142	6	18	0.2	0.043	ACP
P143	6	17	0.19	0.043	DI
P144	4	16	0.42	0.266	ACP
P145	8	117	0.75	0.345	ACP
P146	8	9	0.06	0.003	ACP
P147	6	71	0.81	0.553	ACP
P148	4	18	0.46	0.358	DI
P149	6	26	0.29	0.083	ACP
P150	8	21	0.13	0.014	ACP
P151	6	4	0.05	0.003	ACP
P152	6	34	0.39	0.145	ACP
P153	10	57	0.23	0.027	PVC
P154	10	52	0.21	0.023	PVC
P155	12	189	0.54	0.116	ACP
P156	4	13	0.34	0.181	ACP
P157	2	4	0.46	0.693	ACP
P158	8	116	0.74	0.339	ACP
P159	8	135	0.86	0.446	ACP
P160	8	254	1.62	1.674	DI
P161	8	46	0.29	0.061	ACP
P162	8	45	0.29	0.058	ACP
P163	8	68	0.43	0.125	ACP
P164	6	39	0.44	0.183	ACP
P165	6	41	0.46	0.196	ACP
P166	8	34	0.22	0.034	ACP
P167	2	4	0.46	0.693	ACP
P168	8	86	0.55	0.314	Steel
P169	4	3	0.07	0.015	ACP
P170	4	40	1.01	2.19	ACP
P171	6	143	1.62	2.742	ACP
P172	8	25	0.16	0.02	ACP
P173	8	70	0.45	0.132	ACP
P174	6	23	0.26	0.11	Steel
P175	2	4	0.46	0.693	ACP
P176	2	4	0.46	0.692	ACP

TABLE 2

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P177	2	4	0.46	0.693	ACP
P178	6	13	0.15	0.025	ACP
P179	8	43	0.27	0.053	ACP
P180	8	46	0.29	0.061	ACP
P181	4	8	0.19	0.063	ACP
P182	6	17	0.19	0.037	ACP
P183	6	71	0.81	0.555	ACP
P184	2	4	0.46	0.693	ACP
P185	8	4	0.03	0.001	ACP
P186	8	134	0.86	0.444	ACP
P187	4	4	0.11	0.023	ACP
P188	4	4	0.11	0.024	ACP
P189	8	364	2.32	2.812	ACP
P190	8	339	2.17	2.469	ACP
P191	8	349	2.23	2.601	ACP
P192	8	9	0.06	0.003	PVC
P193	12	4	0.01	0	PVC
P194	8	79	0.51	0.229	ACP
P195	6	4	0.05	0.003	ACP
P196	6	48	0.54	0.267	ACP
P197	8	181	1.16	0.775	ACP
P198	8	248	1.58	1.38	ACP
P199	6	214	2.43	4.261	ACP
P200	6	289	3.28	7.45	ACP
P201	8	238	1.52	1.275	ACP
P202	8	288	1.84	1.824	ACP
P203	4	60	1.54	2.93	ACP
P204	4	81	2.08	5.143	ACP
P205	8	252	1.61	1.426	ACP
P206	8	291	1.85	1.852	ACP
P207	8	712	4.54	9.725	ACP
P208	8	496	3.17	4.989	ACP
P209	6	0	0	0	ACP
P210	6	97	1.1	0.982	ACP
P211	6	193	2.19	3.523	ACP
P212	6	19	0.21	0.046	ACP
P213	6	138	1.56	1.881	ACP
P214	6	144	1.63	2.041	ACP
P215	6	122	1.39	1.513	ACP
P216	8	170	1.08	0.685	ACP
P217	8	176	1.12	0.732	ACP
P218	8	89	0.57	0.205	ACP
P219	8	83	0.53	0.184	ACP
P220	6	30	0.34	0.112	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P221	6	42	0.48	0.209	ACP
P222	6	62	0.7	0.426	ACP
P223	6	132	1.5	1.756	ACP
P224	6	35	0.39	0.146	ACP
P225	6	65	0.74	0.469	ACP
P226	6	69	0.78	0.525	ACP
P227	6	125	1.42	1.58	ACP
P228	6	59	0.67	0.395	ACP
P229	6	69	0.78	0.518	ACP
P230	6	94	1.07	0.931	ACP
P231	6	88	1	0.821	ACP
P232	3	4	0.2	0.096	ACP
P233	6	4	0.05	0.003	ACP
P234	6	24	0.27	0.073	ACP
P235	6	18	0.2	0.042	ACP
P236	6	15	0.16	0.029	ACP
P237	6	4	0.05	0.004	ACP
P238	6	38	0.43	0.173	ACP
P239	6	32	0.36	0.145	DI
P240	6	21	0.24	0.068	DI
P241	6	37	0.42	0.188	DI
P242	6	27	0.31	0.11	DI
P243	6	28	0.32	0.101	ACP
P244	6	27	0.3	0.089	ACP
P245	4	4	0.11	0.023	ACP
P246	4	11	0.29	0.134	ACP
P247	8	62	0.4	0.107	ACP
P248	8	49	0.31	0.068	ACP
P249	8	11	0.07	0.004	ACP
P250	6	84	0.95	0.754	ACP
P251	6	45	0.51	0.234	ACP
P252	6	97	1.1	0.979	ACP
P253	6	116	1.31	1.37	ACP
P254	8	139	0.89	0.475	ACP
P255	8	95	0.61	0.233	ACP
P256	4	17	0.42	0.271	ACP
P257	2	14	1.38	5.411	ACP
P258	2	4	0.46	0.692	ACP
P259	6	67	0.76	0.574	DI
P260	6	147	1.67	2.13	ACP
P261	8	176	1.12	0.731	ACP
P262	8	70	0.45	0.133	ACP
P263	6	61	0.7	0.423	ACP
P264	6	4	0.05	0.004	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P265	6	39	0.45	0.185	ACP
P266	6	33	0.38	0.135	ACP
P267	8	89	0.57	0.239	DI
P268	8	116	0.74	0.391	DI
P269	6	55	0.63	0.348	ACP
P270	6	7	0.08	0.008	ACP
P271	6	106	1.2	1.153	ACP
P272	6	44	0.5	0.232	ACP
P273	6	97	1.1	0.989	ACP
P274	6	36	0.41	0.16	ACP
P275	4	23	0.59	0.496	ACP
P276	4	4	0.11	0.024	ACP
P277	6	50	0.56	0.284	ACP
P278	6	55	0.63	0.302	PVC
P279	6	221	2.51	4.529	ACP
P280	6	30	0.34	0.179	Steel
P281	6	20	0.22	0.082	Steel
P282	6	11	0.12	0.017	ACP
P283	6	126	1.43	1.597	ACP
P284	6	68	0.77	0.506	ACP
P285	6	188	2.14	3.365	ACP
P286	6	59	0.67	0.54	ACP
P287	8	15	0.1	0.011	ACP
P288	8	39	0.25	0.062	ACP
P289	6	14	0.16	0.028	ACP
P290	6	27	0.31	0.094	ACP
P291	6	21	0.24	0.06	ACP
P292	6	21	0.24	0.058	ACP
P293	6	26	0.3	0.088	ACP
P294	6	27	0.3	0.125	ACP
P295	6	16	0.19	0.05	ACP
P296	6	25	0.28	0.08	ACP
P297	6	24	0.28	0.076	ACP
P298	6	22	0.25	0.065	ACP
P299	4	4	0.11	0.023	ACP
P300	4	15	0.37	0.212	ACP
P301	4	8	0.21	0.077	ACP
P302	4	6	0.16	0.043	ACP
P303	4	13	0.34	0.181	ACP
P304	6	29	0.33	0.104	ACP
P305	6	26	0.29	0.084	ACP
P306	6	38	0.43	0.175	ACP
P307	6	44	0.5	0.23	ACP
P308	6	39	0.44	0.182	ACP

TABLE 2

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P309	6	13	0.14	0.023	ACP
P310	6	13	0.15	0.029	DI
P311	6	4	0.05	0.004	DI
P312	10	23	0.09	0.006	ACP
P313	12	58	0.17	0.013	ACP
P314	6	2	0.02	0.001	ACP
P315	6	4	0.05	0.003	ACP
P316	6	3	0.03	0.001	ACP
P317	6	24	0.28	0.076	ACP
P318	6	1	0.01	0	ACP
P319	6	13	0.15	0.025	ACP
P320	6	9	0.1	0.012	ACP
P321	6	9	0.1	0.012	ACP
P322	12	200	0.57	0.128	ACP
P323	12	197	0.56	0.125	ACP
P324	12	202	0.57	0.131	ACP
P325	6	13	0.15	0.025	ACP
P326	6	9	0.1	0.012	ACP
P327	6	4	0.05	0.003	ACP
P328	8	59	0.38	0.112	ACP
P329	8	65	0.42	0.135	ACP
P330	12	182	0.52	0.108	ACP
P331	12	208	0.59	0.138	ACP
P332	12	223	0.63	0.158	ACP
P333	4	7	0.18	0.064	DI
P334	6	43	0.49	0.219	ACP
P335	6	25	0.29	0.082	ACP
P336	6	33	0.38	0.137	ACP
P337	6	48	0.54	0.264	ACP
P338	8	66	0.42	0.119	ACP
P339	8	275	1.75	1.667	ACP
P340	6	62	0.7	0.429	ACP
P341	6	40	0.45	0.19	ACP
P342	4	4	0.11	0.027	DI
P343	4	5	0.13	0.036	DI
P344	6	32	0.37	0.129	ACP
P345	6	33	0.37	0.131	ACP
P346	6	12	0.14	0.025	DI
P347	6	15	0.17	0.037	DI
P348	6	111	1.26	1.464	DI
P349	6	48	0.54	0.305	DI
P350	6	18	0.21	0.051	DI
P351	6	40	0.46	0.223	DI
P352	6	68	0.77	0.594	DI

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P353	6	50	0.57	0.334	DI
P354	6	71	0.81	0.907	Steel
P355	6	47	0.53	0.414	Steel
P356	6	37	0.41	0.263	Steel
P357	6	36	0.4	0.193	ACP
P358	6	17	0.19	0.064	Steel
P359	6	95	1.08	1.551	Steel
P360	6	63	0.72	0.731	Steel
P361	6	46	0.52	0.399	Steel
P362	6	26	0.29	0.139	Steel
P363	8	75	0.48	0.205	ACP
P364	8	114	0.73	0.449	ACP
P365	6	18	0.2	0.042	ACP
P366	6	16	0.18	0.035	ACP
P367	6	6	0.06	0.007	ACP
P368	6	10	0.11	0.02	ACP
P369	6	32	0.36	0.124	ACP
P370	6	34	0.38	0.139	ACP
P371	6	14	0.15	0.026	ACP
P372	6	20	0.23	0.072	ACP
P373	6	20	0.23	0.09	Steel
P374	6	14	0.16	0.046	Steel
P375	8	57	0.36	0.123	ACP
P376	8	63	0.4	0.148	ACP
P377	6	5	0.06	0.004	ACP
P378	6	10	0.11	0.013	ACP
P379	6	9	0.1	0.012	ACP
P380	12	150	0.42	0.075	ACP
P381	12	163	0.46	0.088	ACP
P382	12	187	0.53	0.114	ACP
P383	6	31	0.35	0.118	ACP
P384	6	17	0.19	0.038	ACP
P385	6	23	0.26	0.068	ACP
P386	6	35	0.4	0.15	ACP
P387	4	15	0.39	0.227	ACP
P388	4	7	0.17	0.05	ACP
P389	6	25	0.28	0.079	ACP
P390	6	40	0.46	0.195	ACP
P391	12	62	0.18	0.017	DI
P392	6	58	0.66	0.524	ACP
P393	6	52	0.59	0.313	ACP
P394	8	119	0.76	0.353	ACP
P395	8	113	0.72	0.32	ACP
P396	10	155	0.63	0.194	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P397	8	4	0.03	0.001	ACP
P398	8	264	1.69	1.552	ACP
P399	8	261	1.67	1.519	ACP
P400	8	92	0.59	0.255	DI
P401	8	34	0.22	0.041	DI
P402	8	166	1.06	0.762	DI
P403	6	5	0.06	0.005	ACP
P404	6	27	0.31	0.094	ACP
P405	8	0	0	0	DI
P406	99	0	0	0	DI
P407	99	628	0.03	0	DI
P408	8	0	0	0	DI
P409	8	709	4.53	9.664	DI
P410	8	0	0	0	DI
P411	8	1080	6.89	21.066	DI
P412	6	32	0.37	0.13	ACP
P413	6	29	0.33	0.108	ACP
P414	10	(N/A)	(N/A)	(N/A)	DI
P415	8	(N/A)	(N/A)	(N/A)	DI
P416	12	(N/A)	(N/A)	(N/A)	DI
P417	12	(N/A)	(N/A)	(N/A)	DI
P418	6	52	0.59	0.271	PVC
P419	6	49	0.56	0.242	PVC
P420	12	(N/A)	(N/A)	(N/A)	DI
P421	6	12	0.13	0.02	ACP
P422	6	16	0.18	0.036	ACP
P423	12	(N/A)	(N/A)	(N/A)	DI
P424	10	167	0.68	0.363	Steel
P425	10	169	0.69	0.371	Steel
P426	10	340	1.39	1.358	Steel
P427	10	71	0.29	0.04	PVC
P428	12	0	0	0	DI
P429	12	67	0.19	0.017	DI
P430	6	33	0.37	0.132	ACP
P431	8	76	0.49	0.212	ACP
P432	6	30	0.34	0.11	ACP
P433	12	88	0.25	0.033	DI
P434	12	119	0.34	0.057	DI
P435	10	34	0.14	0.012	DI
P436	10	37	0.15	0.014	DI
P437	6	46	0.52	0.215	PVC
P438	6	4	0.05	0.003	PVC
P439	6	23	0.26	0.066	ACP
P440	8	27	0.17	0.022	DI

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P441	10	63	0.26	0.037	DI
P442	12	(N/A)	(N/A)	(N/A)	DI
P443	6	52	0.59	0.307	ACP
P444	10	60	0.25	0.034	DI
P445	10	8	0.03	0.001	DI
P446	6	4	0.05	0.003	DI
P447	12	62	0.18	0.017	DI
P448	12	115	0.33	0.054	DI
P449	12	78	0.22	0.026	DI
P450	12	82	0.23	0.029	DI
P451	12	70	0.2	0.021	DI
P452	8	22	0.14	0.014	PVC
P453	8	9	0.06	0.003	PVC
P454	8	5	0.03	0.001	PVC
P455	8	30	0.19	0.025	PVC
P456	8	39	0.25	0.039	PVC
P457	8	4	0.03	0.001	PVC
P458	6	4	0.05	0.003	PVC
P459	8	40	0.25	0.046	DI
P460	10	31	0.13	0.01	DI
P461	10	28	0.12	0.008	DI
P462	10	38	0.15	0.014	DI
P463	10	29	0.12	0.009	DI
P464	6	4	0.05	0.003	DI
P465	8	101	0.65	0.263	ACP
P466	8	94	0.6	0.229	ACP
P467	4	4	0.11	0.024	ACP
P468	4	8	0.21	0.074	ACP
P469	10	10	0.04	0.001	DI
P470	2	2	0.21	0.17	DI
P471	6	4	0.05	0.003	DI
P472	4	22	0.57	0.462	DI
P473	2	4	0.42	0.597	DI
P474	6	10	0.12	0.015	ACP
P475	6	16	0.19	0.037	ACP
P476	4	4	0.11	0.024	DI
P477	8	24	0.15	0.021	DI
P478	10	196	0.8	0.3	ACP
P479	12	192	0.55	0.12	ACP
P480	4	4	0.11	0.024	ACP
P481	6	4	0.05	0.003	DI
P482	6	61	0.69	0.48	DI
P483	6	56	0.63	0.412	DI
P484	6	49	0.55	0.277	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P485	6	21	0.24	0.059	DI
P486	10	17	0.07	0.003	DI
P487	10	57	0.23	0.031	DI
P488	10	41	0.17	0.016	DI
P489	8	0	0	0	DI
P490	8	4	0.03	0.001	DI
P491	8	0	0	0	DI
P492	8	0	0	0	DI
P493	8	0	0	0	DI
P494	8	628	4.01	7.724	DI
P495	8	628	4.01	7.724	DI
P496	8	709	4.53	9.663	DI
P497	8	709	4.53	9.664	DI
P498	12	21	0.06	0.002	ACP
P499	10	0	0	0	DI
P500	6	13	0.14	0.023	ACP
P501	6	11	0.12	0.016	ACP
P502	6	18	0.2	0.042	ACP
P503	6	15	0.17	0.03	ACP
P504	6	18	0.2	0.043	ACP
P505	6	4	0.05	0.003	ACP
P506	10	126	0.51	0.132	ACP
P507	10	133	0.54	0.147	ACP
P508	12	76	0.21	0.021	ACP
P509	12	302	0.86	0.276	ACP
P510	6	5	0.05	0.004	ACP
P511	6	16	0.18	0.034	ACP
P512	10	345	1.41	0.859	ACP
P513	10	365	1.49	0.951	ACP
P514	6	51	0.58	0.262	PVC
P515	6	41	0.47	0.174	PVC
P516	8	35	0.22	0.032	PVC
P517	8	50	0.32	0.062	PVC
P518	8	46	0.3	0.062	ACP
P519	8	34	0.22	0.035	ACP
P520	12	63	0.18	0.015	DI
P521	8	3	0.02	0	PVC
P522	8	3	0.02	0	PVC
P523	6	54	0.61	0.335	ACP
P524	6	54	0.61	0.335	ACP
P525	4	0	0	0	DI
P526	8	169	1.08	0.787	DI
P527	8	169	1.08	0.787	DI
P528	6	4	0.05	0.004	DI

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P529	6	4	0.05	0.004	DI
P530	6	0	0	0	DI
P531	6	26	0.3	0.12	ACP
P532	6	26	0.3	0.121	ACP
P533	6	4	0.05	0.005	ACP
P534	6	4	0.05	0.003	ACP
P535	4	0	0	0	ACP
P536	6	38	0.43	0.237	ACP
P537	6	38	0.43	0.237	ACP
P538	8	97	0.62	0.331	ACP
P539	4	0	0	0	DI
P540	8	153	0.97	0.562	ACP
P541	8	153	0.97	0.562	ACP
P542	4	4	0.11	0.027	ACP
P543	4	4	0.11	0.032	ACP
P544	6	29	0.33	0.135	ACP
P545	6	29	0.33	0.135	ACP
P546	4	34	0.88	1.683	ACP
P547	6	0	0	0	DI
P548	10	27	0.11	0.008	ACP
P549	10	27	0.11	0.008	ACP
P550	10	19	0.08	0.005	DI
P551	10	19	0.08	0.005	DI
P552	6	47	0.54	0.262	ACP
P553	6	47	0.54	0.263	ACP
P554	6	0	0	0	DI
P555	6	44	0.5	0.265	DI
P556	6	44	0.5	0.265	DI
P557	6	0	0	0	DI
P558	6	57	0.65	0.37	ACP
P559	6	52	0.59	0.313	ACP
P560	2	7	0.72	1.599	ACP
P561	8	76	0.48	0.154	ACP
P562	8	76	0.48	0.154	ACP
P563	4	0	0	0	ACP
P564	6	0	0	0	DI
P565	4	0	0	0	DI
P566	8	0	0	0	DI
P567	4	0	0	0	DI
P568	8	132	0.84	0.501	ACP
P569	8	132	0.84	0.501	ACP
P570	6	0	0	0	DI
P571	8	72	0.46	0.193	ACP
P572	8	72	0.46	0.193	ACP

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P573	6	0	0	0	DI
P574	6	13	0.14	0.023	ACP
P575	6	13	0.14	0.024	ACP
P576	6	0	0	0	DI
P577	10	22	0.09	0.005	ACP
P578	10	22	0.09	0.006	ACP
P579	6	0	0	0	DI
P580	6	18	0.2	0.043	ACP
P581	6	18	0.2	0.043	ACP
P582	6	0	0	0	DI
P583	6	26	0.3	0.087	ACP
P584	6	26	0.3	0.087	ACP
P585	6	0	0	0	DI
P586	8	1080	6.89	21.066	DI
P587	6	0	0	0	DI
P588	6	30	0.34	0.113	ACP
P589	6	30	0.34	0.113	ACP
P590	6	0	0	0	DI
P591	4	30	0.78	0.831	ACP
P592	4	30	0.78	0.831	ACP
P593	6	0	0	0	DI
P594	8	0	0	0	DI
P595	8	0	0	0	DI
P596	8	0	0	0	DI
P597	8	0	0	0	DI
P598	10	0	0	0	DI
P599	8	1080	6.89	21.066	DI
P600	10	48	0.2	0.019	PVC
P601	10	74	0.3	0.044	PVC
P602	8	56	0.36	0.088	ACP
P603	8	97	0.62	0.243	ACP
P604	8	179	1.14	0.755	ACP
P605	8	340	2.17	2.475	ACP
P606	8	51	0.33	0.074	ACP
P607	8	29	0.19	0.03	ACP
P608	6	118	1.33	1.406	ACP
P609	6	118	1.33	1.406	ACP
P610	6	60	0.69	0.411	ACP
P611	6	60	0.69	0.411	ACP
P612	6	2	0.03	0.001	ACP
P613	6	2	0.03	0.001	ACP
P614	6	0	0	0	DI
P615	4	34	0.88	1.035	DI
P616	8	13	0.09	0.005	PVC

TABLE 2

Label	Diam. (in)	Flow (Max.) (gpm)	Vel. (Max.) (fps)	Headloss Gradient (ft/1000ft)	Material
P617	8	13	0.09	0.005	PVC
P618	6	0	0	0	DI
P619	8	18	0.11	0.009	PVC
P620	8	18	0.11	0.009	PVC
P621	6	0	0	0	DI
P622	12	65	0.19	0.019	DI
P623	12	65	0.19	0.019	DI
P624	8	30	0.19	0.031	DI
P625	8	30	0.19	0.031	DI
P626	8	93	0.59	0.225	ACP
P627	8	93	0.59	0.225	ACP
P628	6	13	0.14	0.023	ACP
P629	6	13	0.14	0.023	ACP
P630	6	134	1.52	1.801	ACP
P631	8	0	0	0	DI
P632	8	0	0	0	DI
P633	8	0	0	0	DI
P634	6	0	0	0	DI
P635	6	134	1.52	1.801	ACP
P636	6	134	1.52	1.801	ACP
P637	1	0	0	0	PVC

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Resid. @ Total Flow Needed) (psi)	Vel. of Max. Pipe (fps)	Satisfies Fire Flow Constraints?
H-11P	1500	1229	38	13	FALSE
H-13P	1500	1135	44	13	FALSE
H-13Q	1500	1026	-3	12	FALSE
H-14P	1500	1457	33	13	FALSE
H-16P	1500	1483	46	13	FALSE
H-17P	1500	818	19	13	FALSE
H-17Q	1500	1418	35	13	FALSE
H-1Q	1500	1143	34	13	FALSE
H-2P	1500	1498	35	13	FALSE
H-9Q	1500	826	17	13	FALSE
DUTCH BRO HYDRANT	1500	1750	44	13	TRUE
H-10P	1500	3052	36	11	TRUE
H-10Q	1500	2930	36	8	TRUE
H-11Q	1500	3248	38	12	TRUE
H-12P	1500	3023	36	8	TRUE
H-12Q	1500	2889	35	8	TRUE
H-14Q	1500	1762	39	13	TRUE
H-15P	1500	3500	51	11	TRUE
H-15Q	1500	1947	44	13	TRUE
H-16Q	1500	1782	38	13	TRUE
H-1P	1500	3351	43	8	TRUE
H-2Q	1500	3127	42	11	TRUE
H-4P	1500	2474	38	13	TRUE
H-4Q	1500	1866	29	13	TRUE
H-5P	1500	2039	27	12	TRUE
H-5Q	1500	1857	27	11	TRUE
H-6P	1500	2108	29	12	TRUE
H-6Q	1500	1800	26	12	TRUE
H-7P	1500	3221	37	13	TRUE
H-7Q	1500	3047	35	10	TRUE
H-8P	1500	1693	36	13	TRUE
H-8Q	1500	2117	32	12	TRUE
H-9P	1500	2337	43	13	TRUE

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Resid. @ Total Flow Needed) (psi)	Vel. of Max. Pipe (fps)	Satisfies Fire Flow Constraints?
H-11P	1500	1227	38	13	FALSE
H-13P	1500	1135	44	13	FALSE
H-13Q	1500	1026	-3	12	FALSE
H-14P	1500	1456	30	13	FALSE
H-16P	1500	1479	37	13	FALSE
H-17P	1500	817	17	13	FALSE
H-17Q	1500	1415	34	13	FALSE
H-1Q	1500	1143	26	13	FALSE
H-2P	1500	1498	26	13	FALSE
H-9Q	1500	826	17	13	FALSE
DUTCH BRO HYDRANT	1500	1753	36	13	TRUE
H-10P	1500	2117	32	8	TRUE
H-10Q	1500	2122	32	8	TRUE
H-11Q	1500	3248	38	12	TRUE
H-12P	1500	2265	35	9	TRUE
H-12Q	1500	2889	35	8	TRUE
H-14Q	1500	1771	36	13	TRUE
H-15P	1500	3043	49	12	TRUE
H-15Q	1500	1928	36	13	TRUE
H-16Q	1500	1781	29	13	TRUE
H-1P	1500	2534	42	9	TRUE
H-2Q	1500	2413	41	9	TRUE
H-4P	1500	2474	38	13	TRUE
H-4Q	1500	1691	27	12	TRUE
H-5P	1500	2039	27	12	TRUE
H-5Q	1500	1600	23	9	TRUE
H-6P	1500	1713	25	10	TRUE
H-6Q	1500	1565	22	11	TRUE
H-7P	1500	2403	36	10	TRUE
H-7Q	1500	2200	33	8	TRUE
H-8P	1500	1698	32	13	TRUE
H-8Q	1500	1753	28	10	TRUE
H-9P	1500	2472	38	9	TRUE

Notes	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Resid. @ Total Flow Needed) (psi)	Vel. of Max Pipe (fps)	Satisfies Fire Flow Constraints?
DUTCH BRO HYDRANT	1500	1746	39.3	12.99	TRUE
H-10P	1500	3165	38.1	11.38	TRUE
H-10Q	1500	3191	38.3	8.41	TRUE
H-11P	3500	4085	29.2	9.52	TRUE
H-11Q	1500	3674	45.5	13	TRUE
H-12P	1500	3476	49.4	9.67	TRUE
H-12Q	1500	3257	48	8.63	TRUE
H-13P	1500	2026	48.4	13	TRUE
H-13Q	1500	2026	35.3	13	TRUE
H-14P	1500	2048	42.4	13	TRUE
H-14Q	1500	1779	40.8	12.99	TRUE
H-15P	1500	4000	51.1	6.04	TRUE
H-15Q	1500	1977	38.9	13.01	TRUE
H-16P	1500	2389	49.4	12.99	TRUE
H-16Q	1500	1693	39.4	13	TRUE
H-17P	1500	2215	45.9	13.01	TRUE
H-17Q	1500	2338	44.1	13	TRUE
H-1P	1500	4000	52.4	10.49	TRUE
H-1Q	1500	2034	47.7	13	TRUE
H-2P	1500	2469	42.4	12.68	TRUE
H-2Q	1500	3598	52.6	13	TRUE
H-4P	1500	2459	38	13.01	TRUE
H-4Q	1500	1865	29.5	13	TRUE
H-5P	1500	1900	28.3	11.66	TRUE
H-5Q	1500	1882	28.4	11.05	TRUE
H-6P	1500	2075	31.4	12.27	TRUE
H-6Q	1500	1794	27.6	12.2	TRUE
H-7P	1500	3129	44.9	13	TRUE
H-7Q	1500	3482	39.5	11.14	TRUE
H-8P	1500	1703	37.2	13	TRUE
H-8Q	1500	2064	33.1	12.01	TRUE
H-9P	1500	3482	43.6	13	TRUE
H-9Q	1500	2328	42	13	TRUE

Attachment B: CIP Cost Estimates

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS					HydroScience Engineers	
Del Paso Manor Water District Water Master Plan Update 475-001		Pipe Replacement Projects 2-10		BY: ARP LCK	SHEET: DATE: 5/18/2021	
ITEM DESCRIPTION: (INCLUDE SPECIFICATION REFERENCE IF POSSIBLE)			QUANTITY NUMBER	 UNIT	MATERIAL AND LABOR UNIT COST	 TOTAL
General						
	Mobilization/Demobilization		1	LS	$20,000	$20,000
	Bonds and Insurance		1	LS	$10,000	$10,000
	Start up and Testing		1	LS	$7,000	$7,000
System Upgrades by Location						
2	Replace ex 6" dia AC pipe w/ 8" PVC		74	LF	$130	$9,620
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		180		$9	$1,620
3	Replace ex 6" dia AC pipe w/ 8" PVC		739	LF	$130	$96,070
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		1,770	SF	$9	$15,930
4	Replace ex 6" dia DI pipe w/ 8" PVC		209	LF	$130	$27,170
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		500	SF	$9	$4,500
5	Replace ex 6" dia AC pipe w/ 8" PVC		194	LF	$130	$25,220
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		470	SF	$9	$4,230
6	Replace ex 6" dia AC pipe w/ 8" PVC		117	LF	$130	$15,210
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		280	SF	$9	$2,520
7	Replace ex 6" dia DI pipe w/ 8" PVC		114	LF	$130	$14,820
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		270	SF	$9	$2,430
8	Replace ex 4" dia AC pipe w/ 8" PVC		126	LF	$130	$16,380
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		300	SF	$9	$2,700
9	Replace ex 6" dia AC pipe w/ 8" PVC		186	LF	$130	$24,180
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		450	SF	$9	$4,050
10	Replace ex 4" dia DI pipe w/ 8" PVC		149	LF	$130	$19,370
	Tie-in		1	LS	$5,000	$5,000
	Pavement replacement		360	SF	$9	$3,240
SUBTOTAL						**$371,000**
Engineering			10%			$40,000
Environmental, Permits			5%			$20,000
Contractor Overhead and Profit			15%			$60,000
Estimating Contingency			25%			$90,000
TOTAL PROBABLE CONSTRUCTION COST						**$581,000**

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS			HydroScience Engineers
Del Paso Manor Water District Water Master Plan Update 475-001	**Install 15 Additional Fire Hydrants and AT&T Hydrant Upgrade**	BY: ARP LCK	SHEET: DATE: 5/18/2021

	ITEM DESCRIPTION: (INCLUDE SPECIFICATION REFERENCE IF POSSIBLE)	QUANTITY NUMBER	QUANTITY UNIT	MATERIAL AND LABOR UNIT COST	MATERIAL AND LABOR TOTAL
Fire Hydrant Installations - Resolve 500' Spacing Deficiency					
1	Install new Fire Hydrant with lateral and valves	16	EA	$5,000	$80,000
	Tie-in	16	LS	$5,000	$80,000
	Pavement replacement	320	SF	$9	$2,880
SUBTOTAL					**$162,900**
Engineering		10%			$16,300
Contractor Overhead and Profit		15%			$24,000
Environmental, Permits		5%			$8,100
Estimating Contingency		25%			$40,700
TOTAL PROBABLE CONSTRUCTION COST					**$252,000**

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS			HydroScience Engineers
Del Paso Manor Water District Water Master Plan Update 475-001	**Install NG Outdoor Genset at Well 9**	BY: ARP LCK	SHEET: DATE: 5/18/2021

	ITEM DESCRIPTION: (INCLUDE SPECIFICATION REFERENCE IF POSSIBLE)	QUANTITY NUMBER	QUANTITY UNIT	MATERIAL AND LABOR UNIT COST	MATERIAL AND LABOR TOTAL
Install NG Outdoor Genset at Well 9					
1	Genset, Installed	1	EA	$225,000	$225,000
	Concrete Pad	1	EA	$16,000	$16,000
	Electrical	1	EA	$50,000	$50,000
SUBTOTAL					**$291,000**
Engineering		10%			$29,100
Contractor Overhead and Profit		15%			$44,000
Environmental, Permits		5%			$14,600
Estimating Contingency		25%			$72,800
TOTAL PROBABLE CONSTRUCTION COST					**$451,500**

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS			HydroScience Engineers
Del Paso Manor Water District Water Master Plan Update 475-001	**New Well Development and Equipping Construction**	BY: ARP LCK	SHEET: DATE: 5/18/2021

ITEM DESCRIPTION: (INCLUDE SPECIFICATION REFERENCE IF POSSIBLE)		QUANTITY NUMBER	QUANTITY UNIT	MATERIAL AND LABOR UNIT COST	MATERIAL AND LABOR TOTAL
General					
	Mobilization/Demobilization	1	LS	$90,000	$90,000
	Bonds and Insurance	1	LS	$70,000	$70,000
	Start up and Testing	1	LS	$37,000	$37,000
				Subtotal	**$197,000**
Well Development					
	Drill pilot hole and borehole	1	LS	$100,000	$100,000
	Furnish casing, screen and seal	1	LS	$80,000	$80,000
	Gravel pack, testing and misc	1	LS	$90,000	$90,000
				Subtotal	**$270,000**
Well Site, Housing, and Equipping					
	Site Demolition, Clearing, Grubbing and Grading	1	LS	$90,000	$90,000
	Site Fill	1	LS	$70,000	$70,000
	Fencing	1	LS	$40,000	$40,000
	Pump and Above-ground Piping *(capacity ~ 1100gpm)*	1	LS	$140,000	$140,000
	Below-ground piping and Tie-ins	1	LS	$85,000	$85,000
	Well house slab and structural	1	LS	$250,000	$250,000
	Paint, sealing, HVAC, Plumbing	1	LS	$140,000	$140,000
	Standby Generator	1	LS	$225,000	$225,000
	Electrical wiring, lighting, panels	1	LS	$250,000	$250,000
	MCC, Control panels and PLC	1	LS	$200,000	$200,000
	Instrumentation and Programming	1	LS	$70,000	$70,000
				Subtotal	**$1,560,000**
SUBTOTAL					**$2,027,000**
Engineering		10%			$200,000
Environmental, Permits		5%			$100,000
Contractor Overhead and Profit		15%			$300,000
Estimating Contingency		25%			$510,000

TOTAL PROBABLE CONSTRUCTION COST	**$3,137,000**

ATTACHMENT C

DPMWD May 2017 Proposition 218 Public Hearing Presentation
(Pipe Replacements)

Del Paso Manor Water District

Proposition 218 Public Hearing

Summary Presentation

May 5, 2017

1

Objectives

- Expand on information presented earlier
- Increase awareness and understanding
- Respond to questions raised in earlier sessions
- Outline the Road Map to the Future

2

Topics Summary

- A Brief History of Time
- Current Activities and Proposal (What Do We Need to Do?)
- Why Is This Necessary / Prudent? (The Sky is Falling)
- How Will We Accomplish it? (The Approach)
- When Will It Occur? (2011…….)
- What is the Impact - $$$
- Are there other Options? (Can we avoid this altogether?)

3

A Brief History of Time

Pre-District

Well #1	1946	71 years
Well #2	1948	69 years
Well #3	1949	68 years
Well #4	1951	66 years
Well #5	1953	64 years
Well #6	1956	61 years
Well #7	1956	61 years

4

A Brief History of Time

District Established 1956

Well #8 1977 40 years

34 years

2011

Note:

In 1977, Well #1 was already 31 years old

5

A Brief History of Time

The Shift to Action

2006: 50th Anniversary of DPMWD Administration Change

Cultural Shift:…….

Time to Focus Squarely on the Future

6

A Brief History of Time

Prepare Master Plan 2009

- Evaluate District Assets
  - Wells and appurtenances
  - Transmission / Distribution System
  - Surface water supply agreements
- Define District Objective
  - A safe reliable water supply for District customers
- Define District Priorities
  - Replace aging infrastructure
  - Complete conjunctive use initiative
  - Transition to metered system
- Prepare a phased implementation plan

7

A Brief History of Time

Phase I Implementation

- Funding 2009-2010
- Rate Increase 2010
- Revised Phase Elements
  - Reflected Current Priorities

8

A Brief History of Time (Cont.)

Phase I Accomplished

- Well 9 and appurtenances constructed to replace Well 1 - 2011
- Well 6B and appurtenances constructed to replace Well 6 - 2013
- Upgraded 4 additional well electrical systems
- Added SCADA to 7 well systems
- Piping – 6,384 feet

Pipeline

- Replaced 6,384 feet
- 24 hydrants
- 60 services
- Re-established SSWD inter-tie (for emergency use)

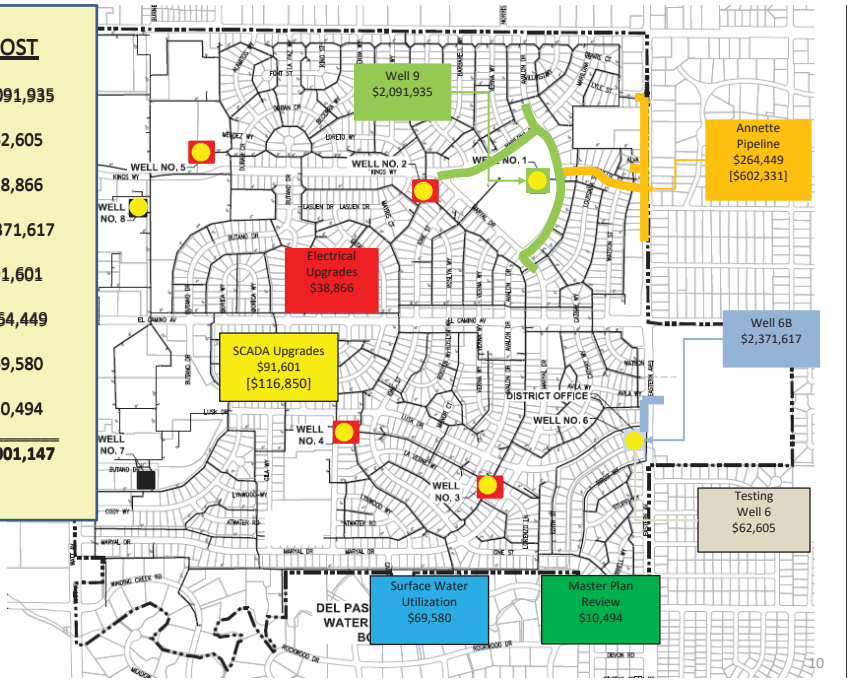
Conjunctive Use

- Ripened existing agreements
- Discussion with CWD for inter-tie

Phase 1 Completed: June 2015

9

COST
~~$2,091,935~~
$62,605
$38,866
$2,371,617
~~$91,601~~
~~$264,449~~
$69,580
$10,494
$5,001,147



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10

A Brief History of Time (Cont.)

Current Action

- Planning for Phases 2 / 3
- Workshop April 10, 2017
- Follow-up to Questions/ Requests
- This Hearing

11

Why?

Planned System Maintenance

- Operational Issues
  - The Here & Now
- Strategic Planning for Resiliency
  - The Crystal Ball

12

Why?

Operational Issues:

- Age: Expected lifespans exceeded
- Corrosion/ Brittleness: Common problems
- Deposition / Scale: Diminished Capacity
- Repair Histories: Type & Location
- Risk of Imminent Failure: Wells
- Major Repairs and Upgrades

13

Why?

Corrosion / Brittleness

14

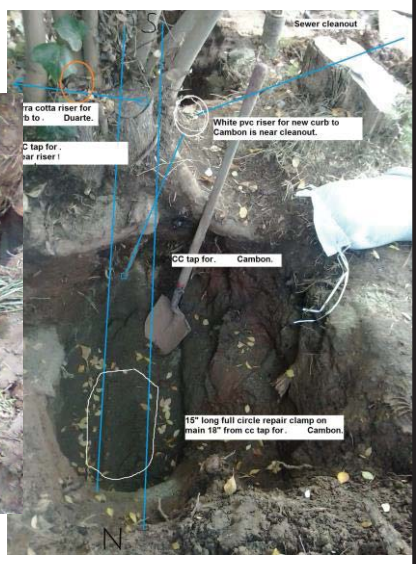
Why?

Deposition / Scale – Diminished Capacity

15

Why?

Repair History



16

Why?

Strategic Planning for Resiliency

- Redundancy
  - Conjunctive use
  - Collaborative operations
  - Maintain Agreements already in place
- Regulatory Oversight
  - Evolving requirements
- Transition to Metering compliance

The Final "WHY":

Quality, Reliability, Safety

17

How Will We Do It?

- Replace sequentially, groups of connections
- Oldest to most recent (installed)
- Subject to current priorities (unforeseen events)
- Move mains from back lot lines to front utility easements
  - Why?

18

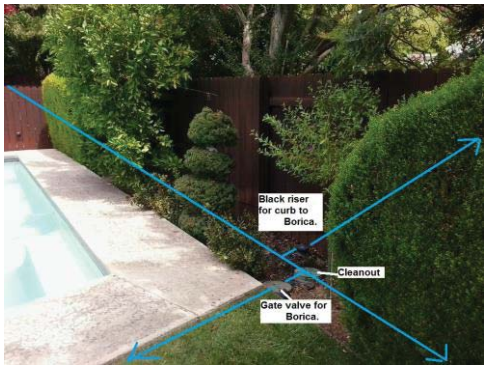
How Will We Do It??

Back to Front – Why?

- 10’ utility easement (5’ either side of property line)
- Massive amount of encroachment
- Demolition of permanent amenities / structures
  - Expensive
  - “Unpopular”
- Selective replacement following construction
- Conflict with other utilities
- Temporary service lines through yards / neighborhoods
- Very difficult access
- Very small equipment required
- Hand digging (expensive)
- Sewerline proximity (less than 10’)
- Asbestos Cement pipe removal / disposal requirements

19

How Will We Do It?



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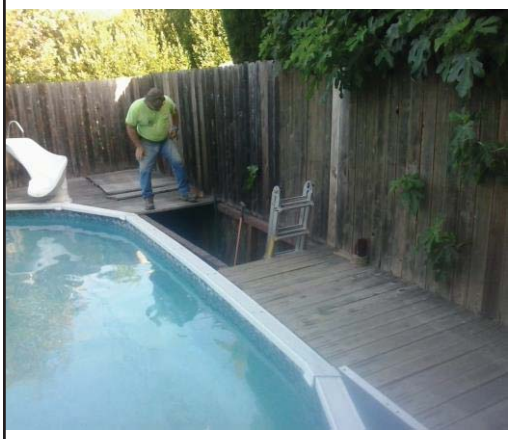
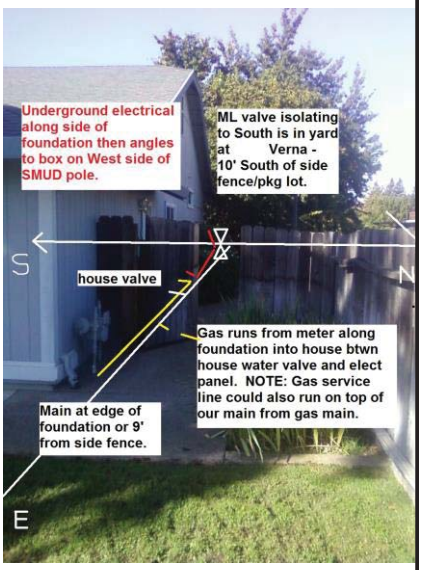
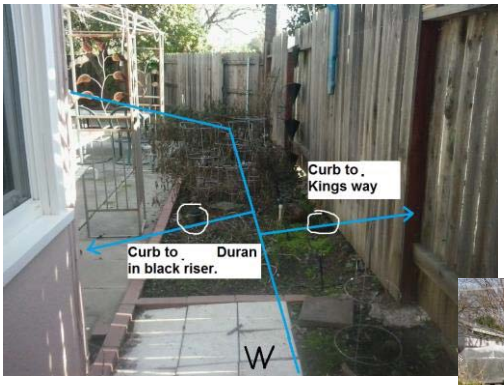
How Will We Do It?

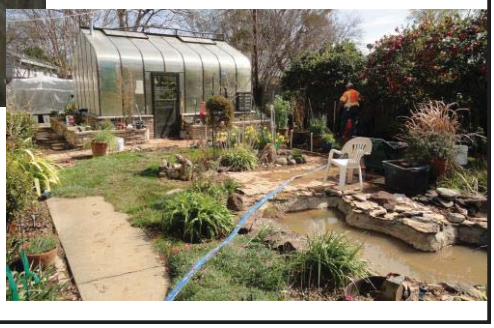




21

How Will We Do It?





22

How Will We Do It?

23

How Will We Do It?

24

How Will We Do It?

25

How Will We Do It?

26

How Will We Do It?

One last point

- Cost Comparison Exercise
- Random sample of 10 segments
- Cost estimates for two of the ten segments
  - Back lot line versus moving to front

27

How Will We Do It?

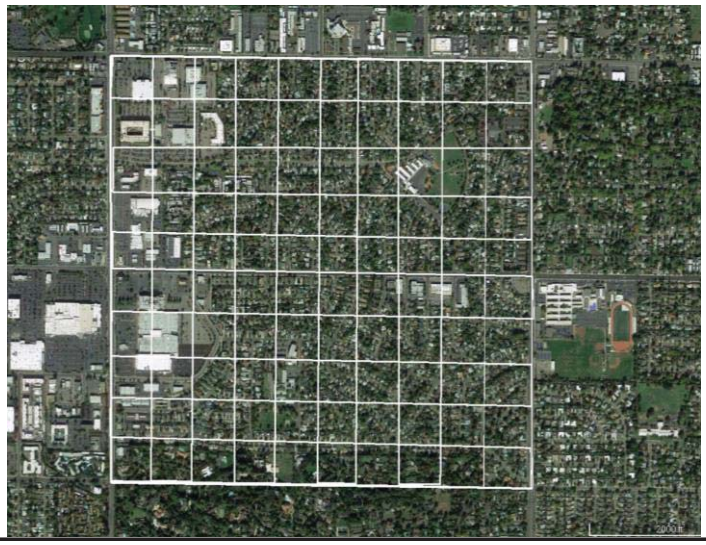
DPMWD

* Waterlines displayed are based on Del Paso Manor Water District waterlines from 2012.

28

How Will We Do It?

Grid Overlay



29

How Will We do It?

Randomly Selected Segments

30

30

3

415 Feet

31

How Will We Do It?

Villa Vista Way

32

32

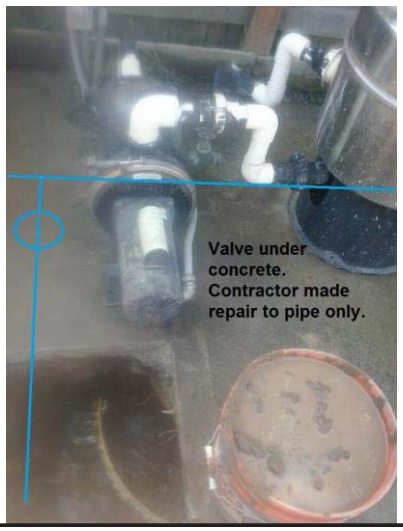
7

585 Feet

33

How Will We Do It?

Dubac Way



34

Segment 3

IN EXISTING LOCATION

Item Description	Quantity	Unit	Unit Cost	Cost Opinion ($)
Piping	**1**	**LS**	**$ 83,462.50**	**$ 83,462.50**
8-inch Ductile Iron Piping	415	LF	$ 71.50	$ 29,672.50
AC Pipe Removal	415	LF	$ 90.00	$ 37,350.00
Valves, Hydrants, Blow-offs and Fittings	415	LF	$ 36.00	$ 14,940.00
Disinfection	1	LS	$ 1,500.00	$ 1,500.00
Surface and Existing Facility Repair	**1**	**LS**	**$ 160,275.00**	**$ 160,275.00**
Amenities: Selective Replacement	1	LS	$ 15,000.00	$ 15,000.00
Controlled Removal and Disposal	415	LF	$ 110.00	$ 45,650.00
Fence Replacement	415	LF	$ 100.00	$ 41,500.00
Sod repair	12450	SF	$ 2.50	$ 31,125.00
Tree Replacement	10	EA	$ 2,000.00	$ 20,000.00
Irrigation Line Replacement	200	LF	$ 5.00	$ 1,000.00
Landscape Paver and Misc. Repair	300	LF	$ 20.00	$ 6,000.00
Services	**1**	**LS**	**$ -**	**$ -**
Service Retrofit to Front Yard	0	EA	$ 2,000.00	$ -
MOBILIZATION	***7 %***		***$ 243,737.50***	***$ 17,061.63***
			Subtotal	**$ 260,799.13**
			Engineering, Legal and Administration (15%)	$ 39,000.00
			Environmental Categorical Exemption (1%)	$ 2,607.99
			Total Project Cost	**$ 302,000.00**
			Cost Per LF of Pipe	**$ 727.71**

35

Segment 3

IN STREET ROW

Item Description	Quantity	Unit	Unit Cost	Cost Opinion ($)
Piping	**1**	**LS**	**$ 46,412.50**	**$ 46,412.50**
8-inch Ductile Iron Piping	415	LF	$ 71.50	$ 29,672.50
Valves, Hydrants, Blow-offs and Fittings	415	LF	$ 36.00	$ 14,940.00
Disinfection	1	LS	$ 1,800.00	$ 1,800.00
Surface and Existing Facility Repair	**1**	**LS**	**$ 21,360.00**	**$ 21,360.00**
Amenities: Selective Replacement	0	LS	$ 15,000.00	$ -
Fence Replacement	0	LF	$ 15,000.00	$ -
Sod repair	2000	SF	$ 2.50	$ 5,000.00
Pavement Repair	1660	SF	$ 8.50	$ 14,110.00
Tree Replacement	0	EA	$ 2,000.00	$ -
Irrigation Line Replacement	50	LF	$ 5.00	$ 250.00
Landscape Paver and Misc. Repair	100	LF	$ 20.00	$ 2,000.00
Services	**1**	**LS**	**$ 16,000.00**	**$ 16,000.00**
Service Retrofit to Front Yard	8	EA	$ 2,000.00	$ 16,000.00
MOBILIZATION	***7 %***		***$ 83,772.50***	***$ 5,864.08***
			Subtotal	**$ 89,636.58**
			Engineering, Legal and Administration (15%)	$ 13,000.00
			Environmental Categorical Exemption (1%)	$ 896.37
			Total Project Cost	**$ 104,000.00**
			Cost Per LF of Pipe	**$ 250.60**

36

Segment 7

IN EXISTING LOCATION

Item Description	Quantity Unit	Unit Cost	Cost Opinion ($)
Piping	**1 LS**	**$ 117,037.50**	**$ 117,037.50**
8-inch Ductile Iron Piping	585 LF	$ 71.50	$ 41,827.50
AC Pipe Removal	585 LF	$ 90.00	$ 52,650.00
Valves, Hydrants, Blow-offs and Fittings	585 LF	$ 36.00	$ 21,060.00
Disinfection	1 LS	$ 1,500.00	$ 1,500.00
Surface and Existing Facility Repair	**1 LS**	**$ 148,375.00**	**$ 148,375.00**
Amenities: Selective Replacement	1 LS	$ 15,000.00	$ 15,000.00
Fence Replacement	585 LF	$ 100.00	$ 58,500.00
Sod Repair	17550 SF	$ 2.50	$ 43,875.00
Tree Replacement	12 EA	$ 2,000.00	$ 24,000.00
Irrigation Line Replacement	200 LF	$ 5.00	$ 1,000.00
Landscape Paver and Misc. Repair	300 LF	$ 20.00	$ 6,000.00
Services	**1 LS**	**$ -**	**$ -**
Service Retrofit to Front Yard	0 EA	$ 2,000.00	$ -
MOBILIZATION	***7 %***	***$ 265,412.50***	***$ 18,578.88***
		Subtotal	**$ 283,991.38**
	Engineering, Legal and Administration (15%)		$ 43,000.00
	Environmental Categorical Exemption (1%)		$ 2,839.91
		Total Project Cost	**$ 330,000.00**
		Cost Per LF of Pipe	**$ 564.10**

37

Segment 7

IN STREET ROW

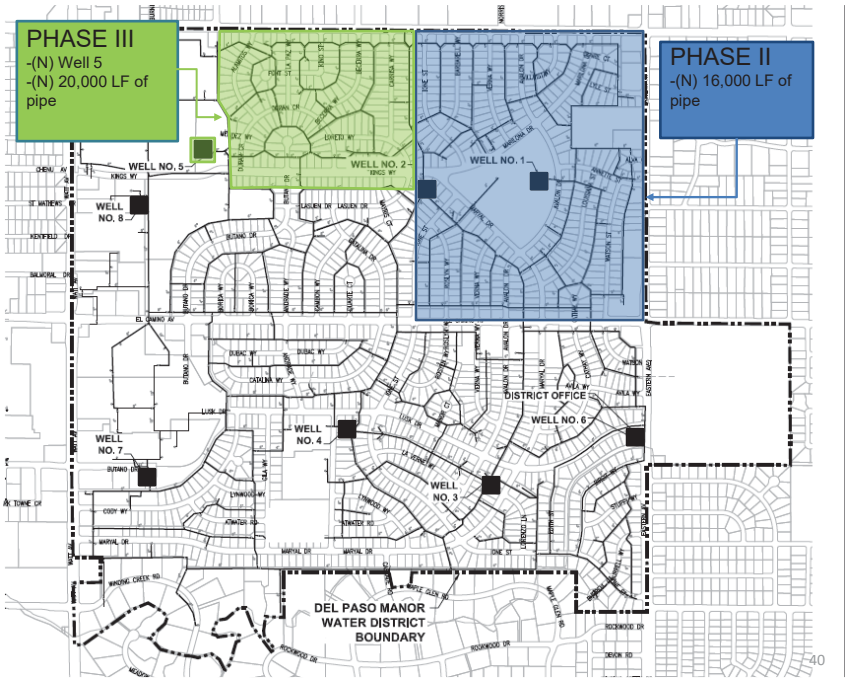
Item Description	Quantity Unit	Unit Cost	Cost Opinion ($)
Piping	**1 LS**	**$ 64,687.50**	**$ 64,687.50**
8-inch Ductile Iron Piping	585 LF	$ 71.50	$ 41,827.50
Valves, Hydrants, Blow-offs and Fittings	585 LF	$ 36.00	$ 21,060.00
Disinfection	1 LS	$ 1,800.00	$ 1,800.00
Surface and Existing Facility Repair	**1 LS**	**$ 35,640.00**	**$ 35,640.00**
Amenities: Selective Replacement	0 LS	$ 20,000.00	$ -
Fence Replacement	0 LF	$ 15.00	$ -
Sod repair	3000 SF	$ 2.50	$ 7,500.00
Pavement Repair	2340 SF	$ 8.50	$ 19,890.00
Tree Replacement	3 EA	$ 2,000.00	$ 6,000.00
Irrigation Line Replacement	50 LF	$ 5.00	$ 250.00
Landscape Paver and Misc. Repair	100 LF	$ 20.00	$ 2,000.00
Services	**1 LS**	**$ 14,400.00**	**$ 14,400.00**
Service Retrofit to Front Yard	8 EA	$ 1,800.00	$ 14,400.00
MOBILIZATION	***7 %***	***$ 114,727.50***	***$ 8,030.93***
		Subtotal	**$ 122,758.43**
	Engineering, Legal and Administration (15%)		$ 18,000.00
	Environmental Categorical Exemption (1%)		$ 1,227.58
		Total Project Cost	**$ 142,000.00**
		Cost Per LF of Pipe	**$ 242.74**

38

When Will It Occur?

- Planning Began - 2007
- Master Plan Completed - 2009
- Phase I
  - Funding Obtained - 2009-2010
  - Construction Began - 2011
  - Construction Completed - 2015
- Phase II
  - Funding - 2017
  - Construction Begin - 2018
  - Construction Complete - 2020
- Phase III
  - Construction Begin - 2020
  - Construction Complete - 2022

39



40

Phase II Estimate

Item Description	Quantity	Unit	Unit Cost	Cost Opinion ($)
Piping	**1**	**LS**	**$2,399,436.62**	**$ 2,399,436.62**
12-inch Ductile Iron Piping*		LF	$ 114.00	$ -
8-inch Ductile Iron Piping	16,000	LF	$ 71.50	$ 1,144,000.00
6-inch Ductile Iron Piping	0	LF	$ 51.50	$ -
Valves, Hydrants, Blow-offs and Fittings	16000	LF	$ 41.00	$ 656,000.00
Disinfection	16000	LF	$ 18.31	$ 292,957.75
Surface Repair	16000	LF	$ 19.15	$ 306,478.87
Services	**1**	**LS**	**$ 1,013,540.00**	**$ 1,013,540.00**
Service Retrofit to Front Yard	542	EA	$ 1,870.00	$ 1,013,540.00
MOBILIZATION	*7*	*%*	***$3,412,976.62***	***$ 238,908.36***
			Subtotal	**$ 3,651,884.98**
			Contingency (25%)	**$ 912,971.25**
			Subtotal	**$ 4,564,856.23**
			Engineering, Legal and Administration (15%)	$ 684,728.43
			Environmental Categorical Exemption (1%)	$ 45,648.56
			Total Project Cost	**$ 5,295,000.00**

Updated from 2009 Master Plan

41

Phase III Estimate

Item Description	Quantity	Unit	Unit Cost	Cost Opinion ($)
BASELINE EFFORT	*1*	*LS*	***$1,780,085.77***	***$ 1,780,085.77***
Wells	**1**	**LS**	**$ 1,197,016.00**	**$ 1,197,016.00**
Construct Well 5	400	LF	$ 800.00	$ 320,000.00
Building, Generator and Pump Appurtenances	1	LS	$ 500,000.00	$ 500,000.00
(N) Block Wall	140	LF	$ 114.40	$ 16,016.00
Landscape and Site Work	1	LS	$ 11,000.00	$ 11,000.00
Pump and Motor	1	EA	$ 200,000.00	$ 200,000.00
SCADA, Electrical and Controls	1	LS	$ 150,000.00	$ 150,000.00
Pipelines	**1**	**LS**	**$ 425,989.77**	**$ 425,989.77**
12-inch Ductile Iron Piping		LF	$ 114.00	$ -
8-inch Ductile Iron Piping	4900	LF	$ 71.50	$ 350,350.00
6-inch Ductile Iron Piping	0	LF	$ 51.50	$ -
Valves, Hydrants, Blow-offs and Fittings	1	LS	$ 75,639.77	$ 75,639.77
Services	**1**	**LS**	**$ 157,080.00**	**$ 157,080.00**
Service Retrofit to Front Yard	84	EA	$ 1,870.00	$ 157,080.00
Services Existing in Front Yard	0	EA	$ 1,320.00	$ -
Meters	0	EA	$ 880.00	$ -
METER INSTALLATION	*1*	*LS*	***$1,844,882.73***	***$ 1,844,882.73***
Pipelines	**1**	**LS**	**$ 1,354,942.73**	**$ 1,354,942.73**
12-inch Ductile Iron Piping	0	LF	$ 114.00	$ -
8-inch Ductile Iron Piping	14040	LF	$ 71.50	$ 1,003,860.00
6-inch Ductile Iron Piping	1350	LF	$ 51.50	$ 69,525.00
Valves, Hydrants, Blow-offs and Fittings	1	LS	$ 138,200.23	$ 138,200.23
AC Pipe Removal	1300	LF	$ 37.40	$ 48,620.00
Trenchless Excavation	1300	LF	$ 72.88	$ 94,737.50
Services	**1**	**LS**	**$ 489,940.00**	**$ 489,940.00**
Service Retrofit to Front Yard	262	EA	$ 1,870.00	$ 489,940.00
Services Existing Front Yard	0	EA	$ 1,320.00	$ -
Meters	0	EA	$ 880.00	$ -
MOBILIZATION	*7*	*%*	***$3,624,968.50***	***$ 253,747.80***
			Subtotal	**$ 3,879,000.00**
			Contingency (25%)	$ 970,000.00
			Subtotal	$ 4,849,000.00
			Engineering, Legal and Administration (15%)	$ 727,000.00
			Environmental Categorical Exemption (1%)	$ 48,490.00
			Total Project Cost	**$ 5,624,000.00**

42

How do we pay for it?

Funding Alternatives

- Types:
  - Grants
  - Loans
  - Bonds
- Sources:
  - Federal
  - State SRLF
  - Potential Proposition Funding
  - Utility – Preferred lending institutions

Note: Applied for 2 ARRA Grants in 2009 for Phase 1

- CWD Inter-tie $2.65M
- Resilience Work - $252,000
- Unsuccessful – Ranked very low

43

What is the Impact-$?

User Rates

Flat Service Charge – Single Family & Duplex

Single Family

Property Size (units in feet² (sf))	Current (units in $)	2017 (units in $)	2018 (units in $)	2019 (units in $)	2020 (units in $)	2021 (units in $)
0 - 5,000	38.80	50.40	54.95	59.90	65.30	71.15
5,001 - 8,000	43.65	56.70	61.80	67.30	73.40	80.00
8,001 - 11,000	47.25	61.40	66.90	72.90	79.50	86.60
11,001 - 14,000	50.90	66.10	72.05	78.50	85.60	93.25
14,001 - 17,000	54.50	70.85	77.20	84.05	91.65	99.90
17,001 - 20,000	58.15	75.55	82.30	89.65	97.75	106.50
Over 20,000	58.15 + 1.21/sf	75.55 + 1.57/sf	82.30 + 1.71/sf	89.65 + 1.86/sf	97.75 + 2.03/sf	106.50 + 2.21/sf

Duplex

Property Size (units in feet² (sf))	Current (units in $)	2017 (units in $)	2018 (units in $)	2019 (units in $)	2020 (units in $)	2021 (units in $)
Duplex A – 5001 - 8000	79.40	103.20	112.45	122.55	133.60	145.60
Duplex B – 8001 - 11000	83.00	107.90	117.60	128.15	139.70	152.25
Duplex C – 11001 - 14000	86.65	112.60	122.7	133.70	145.8	158.85

(Will continue to be billed bi-monthly)

44

44

Are There Other Options?

Risk vs Reward

- Do nothing
  - Wait for failures
- Cost-cutting Measures
  - Always looking for ways to reduce expenses
- More Phases over an extended period of time?
  - Risk element
  - It will never get less expensive
  - Financing costs as low as they'll ever be

45

Questions?

46

ATTACHMENT D

DPMWD Surface Water Utilization Road Map, January 2015

DPMWD Surface Water Utilization Road Map
January 13, 2015

1 Background

In 1968, the public agency now known as Del Paso Manor Water District (DPMWD, or District) entered into a contract with the City of Sacramento for the option to divert surface water from the Lower American River at the City of Sacramento's Fairbairn Water Treatment Plant. Since that time, DPMWD has not exercised that contract at any point, but has paid approximately $4,000 annually to preserve the option. Through 2014, this investment totals approximately $184,000 (without accounting for inflation); a not-insignificant investment by DPMWD over the past 46 years.

Conditions have changed somewhat in the Sacramento Region since this agreement was put into place. Population is greater, with increasing demands on a limited supply. In addition, conjunctive use[1] has become the norm when the possibility exists for districts throughout California. The Sacramento Groundwater Authority actively implemented conjunctive use in the Sacramento Region beginning in the early 2000s. An important point for groundwater users throughout the region is the contamination plumes coming from the Aerojet facility (south of the American River, but travelling northwest) and the McClellan base. Either contamination plume has the potential to affect DPMWD's water supply.

This document, the DPMWD Surface Water Utilization Road Map, was identified by the DPMWD Board and management as an important way to track their actions and decisions throughout this process. The District contracted with Forsgren Associates, Inc. in early 2014 to lead this effort, compiling relevant information and recording decisions for this Road Map. Board decisions throughout this process culminated in the "Priority Pathway" referenced in the final section of this document. Some relevant reference and backup materials are included as appendices to this document; all are available through DPMWD staff.

2 Process Description

The DPMWD Board of Directors decided, in 2013, to explore the use of their surface water options. This decision was fueled by the desire of District leadership to participate in a regional approach to more sustainably manage regional resources as well as a strong value placed on the best use of District assets in the good faith of ratepayers' trust. The process was guided by these two major goals, detailed by the three objectives below:

1. Act in the best interest of ratepayers, including:
    a. Providing for water supply redundancy for Del Paso Manor Water District with the goal of increasing supply reliability in times of regulatory or hydrologic constraint, and
    b. Ensuring the security and sustainability of the region's long term water supply, including groundwater resources.
2. Utilize Del Pas Manor Water District assets, including the current surface water contract with the City of Sacramento.
3. Participate in conjunctive use as a member of the Water Forum, Regional Water Authority, and Sacramento Groundwater Authority.

Knowing that there are strong feelings from various interests in the Sacramento water community regarding any changes in the current status of resource use, the first step identified for this process was that of secondary research. Data assessment through collecting information, reports, and studies that are already available is a good way to evaluate a situation and forestall the inevitable political conversations. These political elements will come later in the process (see

[1] Conjunctive use is the coordinated management of surface and groundwater supplies to maximize the yield of the overall suite of resources.

section 5), but it is important to understand the situation – and, preferably, identify a desired path – before engaging these elements.

Secondary research began with an initial collection of information from DPMWD, including the original contract, District master planning documents, and Sacramento Water Forum materials. The scope then widened to include associated entities' materials, such as the City of Sacramento Urban Water Management Plan, Carmichael Water District (CWD) planning documents, and information regarding water rights, transfers, and changes from the State Water Resources Control Board. This information, available in the bibliography and associated digital library, fed the development of a decision-tree, or flow chart, as displayed in section 3.

This process involved the DPMWD General Manager Debra Sedwick, other District staff, and legal counsel. The project kickoff meeting consisted of a brainstorm session (mid-January 2014) that included not only the direction of the project and the necessary associated materials, but also how to best structure the research so that it would inform the design and development of the decision flow chart, as well as how best to go about obtaining information in the hands of others.

The research component of the process began immediately following that first meeting, and two weeks later another meeting with DPMWD was convened (at the end of January) to review the research status and findings, to work through the draft flow chart, and to begin the discussion regarding practical next steps. While it was clear that input from the Board of Directors was necessary to identify the path forward, it was also clear that there were practical steps that could be taken to maintain the momentum of the project while not overstepping concerns of privacy, budget, or general project direction. These next steps, as well as those determined by the Board of Directors in their Board meetings, are outlined in section 5 of this Road Map.

3 Flow Chart

A flow chart was developed for the purposes of aiding the DPMWD Board of Directors in making informed decisions about the integration of surface water into their water supply system. The flow chart was designed to be a "living" document that changed dynamically as DPMWD discovered new options and exhausted others.

Early in the process, a decision was made to use Microsoft Excel to build and maintain the flow chart. Excel has the capabilities of creating and editing flow chart diagrams with ease, which was ideal for this study, since the flow chart continuously changed with new information and decisions.

A coloring scheme was developed to code the elements of the chart, and process element lists were created to keep the flow chart organized as it grew and became more complicated. Numbers were utilized to reference the process elements, which were then used throughout the chart to reference these same processes. This made it easy to edit the process through a simple change in the process elements, and without needing to change the entire flow chart.

At each junction in the flow chart a question was used to determine the path to follow. The questions were designed to specifically guide each decision made to the most applicable conclusion. An answer of "Yes" usually meant that the process was to continue along its current path. Answers of "No" usually lead to an unexplored idea, or back to a previously explored path. The Flow Chart is available in Appendix C.

4 Flow Chart Discussion

On March 3, 2014, the DPMWD Board met and reviewed the surface water utilization presentation by Forsgren Associates. Forsgren utilized the flow chart discussed above, and other relevant research documents (included in the bibliography identified in Appendix A) to depict DPMWD's foreseen available options for utilizing surface water in the District's system.

Some Board members objected to injecting fluoride into DPMWD's system as well as interconnecting with other systems that serve fluoridated water. At this point, only CWD serves water without the addition of fluoride. A de-fluoridation station was mentioned as an option if DPMWD was to connect to another system with only fluoridated water available. Other members mentioned that a de-fluoridation station may be very expensive to build and maintain.

Some Board members also expressed interest in researching the plausibility of constructing an injection well. This would allow DPMWD, as well as other agencies in the basin, to inject water into the groundwater basin for stored water credits that could be sold or banked. While labeled a "cloud" idea in the flow chart, indicating a more conceptual and "inventive" concept, there was some interest from the Board in this option. The board opted to hold off on further investigation until the more immediate and currently feasible options were exhausted.

5 Following the Flow Chart

5.1 March 2014 Report to the Board

As described in section 2, there were two components of the "next steps" discussion that were approached differently during the secondary research phase: making use of the City of Sacramento-DPMWD contract, and pursuing a new contract for surface water. In defining the path forward, decisions by the Board were essential for determining investment of resources and political nuance. However, through the research accomplished in the process of developing the flow chart, it became clear that there would be several interim steps that would be necessary no matter the final path determination.

The Board pointed out that, at the very least, almost all identified options involve a conversation with the City of Sacramento, and with CWD. The Board also recognized that a conversation with the Regional Water Authority would be necessary following conversations with the City of Sacramento and CWD. They agreed that it was not yet time to talk to Sacramento Suburban Water District, since key processes making this a logical pathway had yet to take place (i.e.: the merger with San Juan Water District).

The Board authorized Forsgren to meet with the City of Sacramento and CWD to begin exploring the foreseen and unforeseen possibilities with each entity. Forsgren was also tasked with updating the flow chart and doing necessary research with new options as they arose, as well as removing old options as they were exhausted.

5.2 April 2014 Report to the Board

Updated objectives were brought to the DPMWD Board of Directors at their April meeting. These are reflected in Section 2 of this document, on page 1.

5.3 May 2014 Report to the Board

The May report to the DPMWD Board of Directors was a simple update of the progress to date; meetings had been held with CWD and the City of Sacramento, but had not yet been held with the Regional Water Authority and DPMWD's legal counsel, Adam Brown. It was deemed that these were necessary to provide a full status report.

5.4 June 2014 Report to the Board

June held several updated pieces of information for the Board:

- Updated flow chart,
- Report of activities-to-date, and
- Discussion and confirmation of a priority pathway.

This information was summarized in an evaluation document delivered to the Board on that date (included as Appendix B to this document). An excerpt follows:

> Based on our preliminary analysis and initial discussions with potential project partners, the pathway that appears to best meet the project objectives involve constructing an intertie with the Carmichael Water District (CWD). Though this method would require a change in point of diversion with the State Water Resources Control Board, this is seen as preferred because of DPMWD's good working relationship with the CWD Board and staff, because of the fair pricing and wheeling rates of CWD, and because of the lack of fluoride in the water CWD produces and delivers. While still being evaluated, this alternative is viewed as favorable.
>
> Our first conversation with CWD suggested that changing the point of diversion from the City of Sacramento's Fairbairn Water Treatment Plant (WTP) to CWD's WTP would be a theoretically practical effort, but might yield little benefit to the District. This is for two main reasons:
>
> 1. The contract between DPMWD and the City of Sacramento is subject to Hodge, which dictates when water may be taken from the river. Historically, it looks as though DPMWD would only be able to exercise the contract three out of ten years; and
> 2. The CWD WTP is maxed out during much of the summer due to CWD customer demands as well as a commitment by CWD to provide water to Golden State Water Company (GSWC).
>
> Based on these reasons, it can be seen that infrastructure to accommodate surface water getting into DPMWD may not be cost-effective due to the limited time in which it could be used.
>
> However, upon conversation with CWD and subsequent conversations with GSWC, an alternate surface water supply was identified that could add flexibility to the DPMWD through additional redundancy, thus meeting the objectives of the Surface Water Utilization project. This alternate source is the Groundwater Extraction and Treatment (GET) water from the Aerojet activity south of the river.
>
> *Preferred Option:*
> Aerojet is currently pumping contaminated groundwater out of the basin south of the Lower American River (LAR) and treating that to a tertiary level, and discharging that treated groundwater into the LAR. These actions make that groundwater become surface water upon entering the river. Aerojet plans to continue this work for the next 200 years in order to remediate the contaminated basin. GSWC has contracted with Aerojet for this water, using CWD as a treatment facility, and there is the potential that DPMWD might also make use of this resource.
>
> The proposed approach is three-fold (not necessarily in the following order):
>
> i. Change the point of diversion for DPMWD's 1968 contract with the City of Sacramento to CWD (in part or in whole);
> ii. Contract with Aerojet for additional surface water from their GET facility (amount and duration to be determined), via CWD's WTP; and
> iii. Build an intertie between CWD and DPMWD along El Camino, tying the CWD and DPMWD systems together.
>
> There are some obvious benefits and costs to this approach, as well as some that may not be so obvious. A summary list is available in the table below for Board review and discussion.

In addition to this evaluation document the Board discussed an updated cost estimate for the DPMWD-CWD intertie. They also reviewed a legal opinion from Adam Brown on the topic of the Aerojet water and the CWD intertie. The

DPMWD Board approved an amendment to the Task Order that requested an additional meeting with CWD for a more in-depth look at the option, and an initial meeting with Aerojet to see if there continues to be GET water available.

5.5 August 2014 Report to the Board

Significant refinements to the flow chart were made in time for presentation to the Board at their August meeting. While these refinements did not necessarily change the path, they helped to show the reasoning behind actions that the Board has taken. With these refinements, it was clear to all that the important next step was to meet with Aerojet. This was authorized by the Board and pursued by Forsgren and DPMWD management.

5.6 Aerojet Meeting Outcome and Next Steps

The meeting with Aerojet was held September 3, 2014. Held via an introduction provided by Paul Schubert and at the GSWC offices in Rancho Cordova, the meeting showed some promise. Points in favor of the contract, as noted by the Aerojet official attending, included:

- Flexible schedule for taking water: DPMWD would not be dependent upon this as a sole resource, and so could pull water only when Aerojet was able to have the pumps on, as well as during the shoulder and winter seasons.
- The small amount needed by DPMWD could represent a "supplemental" amount of water to Aerojet, allowing them to utilize all of their resources but, in combination with the flexible diversion schedule, meet regulatory and operations/maintenance requirements.

Detrimental points to the contract potential, also as noted by the Aerojet official, included the small contract size and the relatively high ratio of administration time necessary to put the contract into motion.

In the end, Aerojet decided against implementing a contract with DPMWD for their GET water. There was no reason given, but the e-mail wording suggested that this may be an option in the future.

The DPMWD Board has decided to keep this option active, checking in with Aerojet occasionally, but will pursue other alternatives in conjunction. The next phase of the Surface Water Utilization project will be pursued under the name "Conjunctive Use", and will focus on the potential for a change in the Point of Diversion for the District's contract water through the City of Sacramento. This work is outlined in the District's Capital Improvement Planning for 2015-2019, which includes identification of an estimated level of effort and resources to further the process to the next logical phase.

Appendix A: Bibliography

Bureau of Reclamation. August 2007. Sacramento River Water Reliability Study.

Brown and Caldwell. July 2011. Sacramento County Water Agency Urban Water Management Plan.

California Department of Water Resources. January 2011. Information to Parties Interested in Making Water Available for 2011 Water Transfers (draft).

California State Water Resources Control Board. No date. Petition Submittal and Approval Process Flow Chart *and* Petition Acceptance and Review Process.

California State Water Resources Control Board, Division of Water Rights. July 1999. A Guide to Water Transfers (draft).

California Water Code, sections 1700-1707 (change in point of diversion) and 1725-1745.11 (temporary water transfers).

Carollo. October 2011. City of Sacramento Urban Water Management Plan.

City of Sacramento. August 1968. Agreement Between City of Sacramento and Del Paso Manor County Water District.

Kennedy/Jenks Consultants. August 29, 2006. Letter to Carmichael Water District regarding Groundwater/Surface Water Exchange, Del Paso Manor Water District and Carmichael Water District, K/J 032507*00 6.01.

Kennedy/Jenks Consultants. July 2009. Del Paso Manor Water District Master Plan.

Sacramento Groundwater Authority. July 2006. Water Accounting Framework White Paper.

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Sacramento Groundwater Authority. June 2011. Water Accounting Framework Phase III Effort.

Sacramento Groundwater Authority. 2013. Basin Management Report Update 2013.

Sacramento Water Forum. January 2000. Water Forum Agreement, Section 4: Other Important Agreements.

Sacramento Water Forum. January 2000. Water Forum Agreement, Section 5: Specific Agreements and Mutual Commitments.

Sacramento Water Forum. January 2000. Water Forum Agreement, Appendix C: What is the Hodge Decision?

Western Governors' Association. December 2012. Water Transfers in the West: Projects, Trends, and Leading Practices in Voluntary Water Trading.

Appendix B: CWD Option Evaluation

NOTE: This is a copy of the memo presented to the DPMWD Board of Directors in June 2014; while some options have changed (significantly, the potential for a contract with Aerojet for GET water), the option continues to have merit for other reasons referenced in the Road Map.

Surface Water Utilization
The Carmichael Water District Option – A Discussion

Background

Del Paso Manor Water District (DPMWD, or District) has access to 2,460 AF of water through City of Sacramento via a 1968 contractual agreement. Although this water is potentially of significant value, the District has never utilized it, and the cost and effort required for the District to make use of this contractual right have not yet been determined. In addition to that, the District is interested in participating in conjunctive use in the region, and it is possible that the surface water contract may be an important tool in achieving this collaborative goal.

Driving this project is a document outlining the objectives of the effort. These objectives are:

a. Participate in conjunctive use as a member of the Water Forum, Regional Water Authority, and Sacramento Groundwater Authority.
b. Utilize Del Paso Manor Water District assets, including the current surface water contract with the City of Sacramento.
c. Act in the best interest of ratepayers, including:
    - Ensuring the security and sustainability of the region's long term water supply, including groundwater resources, and
    - Providing for water supply redundancy for Del Paso Manor Water District with the goal of increasing supply reliability in times of regulatory or hydrologic constraint.

Forsgren has continued to develop a flow chart of the possible paths that could be followed by DPMWD in the pursuit of using surface water. This flow chart identifies two main pathways: 1) make use of the current contract DPMWD has with the City of Sacramento, or 2) receive surface water from a new partner. Both of these pathways indicate numerous options, some of which are practical and logical next steps and some of which indicate creative – and possibly far-fetched – thinking.

Following the initial flow chart development and presentation to the DPMWD Board of Directors, the Board approved a series of meetings with potential partners to further understand the opportunities and challenges associated with these options. From these meetings came a variety of input. Some partners provided affirmation of pathways and we discussed additional information necessary to make a decision. Others provided the confirmation necessary to understand that the theoretical pathway was, in fact, not practical or particularly efficient. Two partners in particular provided options that had not previously been identified. Upon discussion with these partners, it was this particular series of steps that were identified by the Forsgren team and DPMWD General Manager as the priority pathway for further exploration.

Priority Pathway

Description:

Based on our preliminary analysis and initial discussions with potential project partners, the pathway that appears to best meet the project objectives involve constructing an intertie with the Carmichael Water District (CWD). Though this method would require a change in point of diversion with the State Water Resources Control Board, this is seen as preferred because of DPMWD's good working relationship with the CWD Board and staff, because of the fair pricing and

wheeling rates of CWD, and because of the lack of fluoride in the water CWD produces and delivers. While still being evaluated, this alternative is viewed as favorable.

Our first conversation with CWD suggested that changing the point of diversion from the City of Sacramento's Fairbairn Water Treatment Plant (WTP) to CWD's WTP would be a theoretically practical effort, but might yield little benefit to the District. This is for two main reasons:

3. The contract between DPMWD and the City of Sacramento is subject to Hodge, which dictates when water may be taken from the river. Historically, it looks as though DPMWD would only be able to exercise the contract three out of ten years; and
4. The CWD WTP is maxed out during much of the summer due to CWD customer demands as well as a commitment by CWD to provide water to Golden State Water Company (GSWC).

Based on these reasons, it can be seen that infrastructure to accommodate surface water getting into DPMWD may not be cost-effective due to the limited time in which it could be used.

However, upon conversation with CWD and subsequent conversations with GSWC, an alternate surface water supply was identified that could add flexibility to the DPMWD through additional redundancy, thus meeting the objectives of the Surface Water Utilization project. This alternate source is the Groundwater Extraction and Treatment (GET) water from the Aerojet activity south of the river.

Preferred Option:
Aerojet is currently pumping contaminated groundwater out of the basin south of the Lower American River (LAR) and treating that to a tertiary level, and discharging that treated groundwater into the LAR. These actions make that groundwater become surface water upon entering the river. Aerojet plans to continue this work for the next 200 years in order to remediate the contaminated basin. GSWC has contracted with Aerojet for this water, using CWD as a treatment facility, and there is the potential that DPMWD might also make use of this resource.

The proposed approach is three-fold (not necessarily in the following order):

iv. Change the point of diversion for DPMWD's 1968 contract with the City of Sacramento to CWD (in part or in whole);
v. Contract with Aerojet for additional surface water from their GET facility (amount and duration to be determined), via CWD's WTP; and
vi. Build an intertie between CWD and DPMWD along El Camino, tying the CWD and DPMWD systems together.

There are some obvious benefits and costs to this approach, as well as some that may not be so obvious. A summary list is available in the table below for Board review and discussion.

Pros	Cons
1. The combination of Aerojet and City of Sacramento water would make new infrastructure more cost effective – the facility could be used at virtually any time of year, accommodating CWD plant capacity. 2. The intertie provides and emergency response mechanism for both CWD and DPMWD. 3. The intertie provides a vehicle for the sale of groundwater by DPMWD to other parts of the Sacramento Metropolitan Region. 4. The project could also benefit CWD in times of	1. Must go through the SWRCB for a change in the point of diversion for the contracted City water. 2. Changing the point of diversion for the City contract water to a location higher on the river means that more water could be pulled out of the river sooner in the system – an environmental cost. 3. The intertie project is expensive. 4. This approach could be counter to the expectations of other surrounding agencies. 5. The legal status of Aerojet water has not been tested.

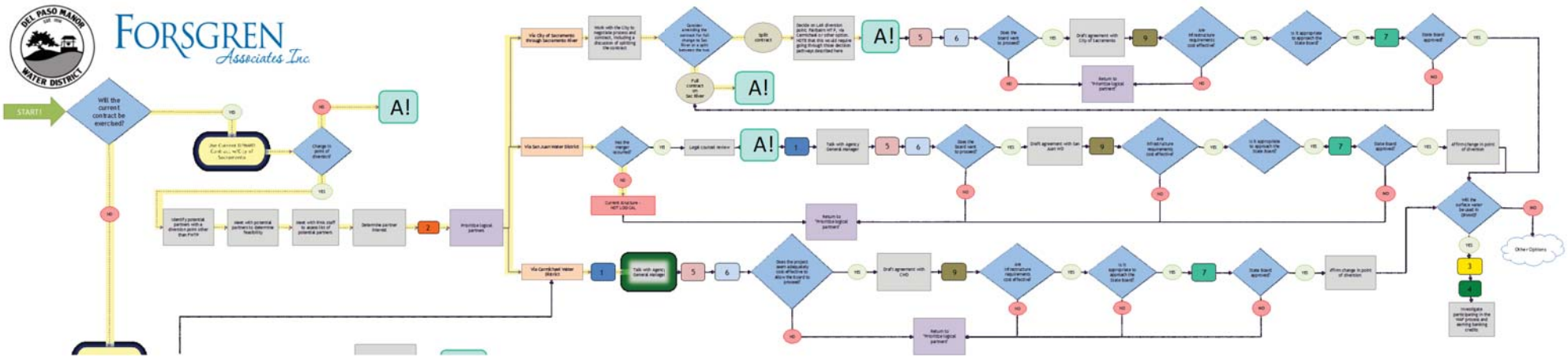
drought, or if their surface water supply is curtailed. 5. The cost of water through CWD is low and therefore makes infrastructure more cost-effective. 6. There is political will on the side of both CWD and DPMWD Boards. 7. This option has environmental incentives: – When the river is low, DPMWD can share groundwater with CWD, and – When DPMWD isn't taking the Aerojet water, it provides in-stream benefits to aquatic species and recreational activities. 8. Meets all three objectives of the DPMWD Surface Water Utilization project. 9. Using Aerojet water puts a formerly contaminated water source to beneficial use. 10. Implementing the intertie project could further help to secure a change in the point of diversion for the DPMWD-City contract water. 11. Aerojet water *may* be sold outside of Area D, and possibly outside of the region.	6. There could be limitations in seasonal water availability due to the lack of CWD WTP capacity. 7. CWD may need to implement infrastructure improvements to accommodate the intertie. 8. Surface water from the City contract cannot be sold outside of Area D (and possibly not even that per contract language).

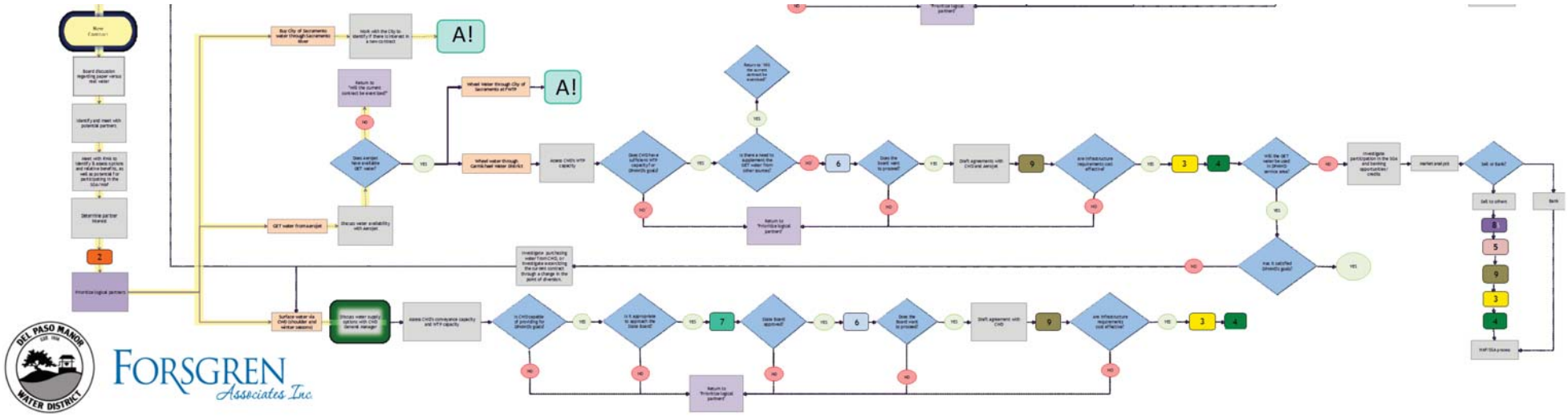
Finally, there is the question of the current interties DPMWD has with Sacramento-Suburban Water District (SSWD). Exchanging water with SSWD is problematic for reasons stated below.

- SSWD doesn't have adequate pressure to serve DPMWD in this area, as shown by the intertie test earlier this year. The interties could work for an emergency, but otherwise aren't effective.
- Diverting from SSWD could incentivize greater political pressure and will by SSWD and the potential future merged agency.
- The cost of water from SSWD is prohibitive (upwards of $300/AF).
- SSWD cannot give DPMWD surface water, thereby not meeting the objectives of this surface water utilization project.

Appendix C: Flow Chart

NOTE: Due to its size, this document is broken up into two parts. Full copies are available through DPMWD staff.




A!
A!
YES
NO
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8

ATTACHMENT E

DPMWD-CWD Intertie Project for Conjunctive Use and Climate Adaptation

FORSGREN Associates Inc.

DPMWD-CWD Intertie Project for Conjunctive Use and Climate Adaptation

The Del Paso Manor Water District (DPMWD) is 100% dependent on groundwater. The Carmichael Water District (CWD) is becoming ever-dependent on surface water as its groundwater supply steadily dwindles due to migrating contaminants. This intertie will benefit both Districts by increasing their resiliency in the face of climate change, water quality issues, and increased pressure on regional water supply. The intertie will provide water supply redundancy for each system, and will facilitate conjunctive use by both Districts.

In addition, the DPMWD-CWD intertie project will contribute to regional reliability and flexibility, allowing other water utilities to move water in response to climate change's alteration of the hydrologic cycle and the unprecedented events accompanying it. This intertie is envisioned as part of a regional backbone that can be extended as funding and opportunities allow, thereby improving the resiliency of the individual utilities, and the region as a whole. This resiliency will enable the region to be more nimble, and better able to respond to water demands outside the region.

Envisioned for a number of years, the DPMWD-CWD intertie will link these two districts along El Camino Ave. The intertie as currently proposed will include 5,600 linear feet of 12-inch CL52 (ductile iron) pipe along the following alignment:

- Beginning at DPMWD's well 6-B (at the corner of Lusk Dr. and Eastern Ave.), the pipe will go north to El Camino Ave.
- At El Camino, the alignment turns east (right), proceeds down El Camino Ave., and connects to an existing 12-inch pipeline in CWD's system near Upham Ct.

Fire hydrants may be used in place of blowoffs if desired, and it is possible that a PRV will be necessary between the two districts. Currently it is assumed the intertie will conform to CWD Specifications.

FORSGREN Associates Inc.

DPMWD-CWD Intertie Opinion of Probable Cost - 12" CL350 Pipeline

Item	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Demobilization	LS	1	$ 200,000.00	$ 200,000.00
2	Bonds and Insurance	LS	1	$ 35,000.00	$ 35,000.00
3	Construction Staking	LS	1	$ 10,000.00	$ 10,000.00
4	Potholing	LS	1	$ 10,000.00	$ 10,000.00
5	12" CL350 Ductile Iron Pipe	LF	5600	$ 175.00	$ 980,000.00
6	12" 150B Butterfly Valves	EA	12	$ 4,000.00	$ 48,000.00
7	Connection to DPMWD	EA	1	$ 20,000.00	$ 20,000.00
8	Connection to CWD	EA	1	$ 20,000.00	$ 20,000.00
9	2" CAV	EA	2	$ 7,500.00	$ 15,000.00
10	Blowoff or Fire Hydrant	EA	4	$ 12,500.00	$ 50,000.00
11	Sawcutting	LF	11200	$ 3.00	$ 33,600.00
12	Aggregate Base	TON	2888	$ 60.00	$ 173,250.00
13	Asphalt Concrete	TON	616	$ 300.00	$ 184,800.00
14	Traffic Control	LS	1	$ 100,000.00	$ 100,000.00
15	Erosion Control and SWPPP	LS	1	$ 10,000.00	$ 10,000.00
16	Miscellaneous Work	LS	1	$ 25,000.00	$ 25,000.00
				Subtotal	$ 1,914,650.00
			20%	Contingency	$ 382,930.00
				Total	**$ 2,297,580.00**

Assumptions:

1. T-trench paving with 3-4" new asphalt and 4-6" new AB
2. 100% hauloff of trench spoils
3. Trench section to be sand in pipe zone (6" below, both sides and 12" above pipe)
4. Trench section to be class 2 AB for intermediate backfill (top of pipe zone to bottom of asphalt)
5. 42" cover
6. One sawcut each side of trench
7. New fire hydrants as blowoffs
8. The high contingency percentage is due to construction unknowns

FORSGREN Associates Inc.

DPMWD-CWD Intertie Opinion of Probable Cost - 12" CL52 Pipeline

Item	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Demobilization	LS	1	$ 200,000.00	$ 200,000.00
2	Bonds and Insurance	LS	1	$ 35,000.00	$ 35,000.00
3	Construction Staking	LS	1	$ 10,000.00	$ 10,000.00
4	Potholing	LS	1	$ 10,000.00	$ 10,000.00
5	12" CL52 Ductile Iron Pipe	LF	5600	$ 190.00	$ 1,064,000.00
6	12" 150B Butterfly Valves	EA	12	$ 4,000.00	$ 48,000.00
7	Connection to DPMWD	EA	1	$ 20,000.00	$ 20,000.00
8	Connection to CWD	EA	1	$ 20,000.00	$ 20,000.00
9	2" CAV	EA	2	$ 7,500.00	$ 15,000.00
10	Blowoff or Fire Hydrant	EA	4	$ 12,500.00	$ 50,000.00
11	Sawcutting	LF	11200	$ 3.00	$ 33,600.00
12	Aggregate Base	TON	2888	$ 60.00	$ 173,250.00
13	Asphalt Concrete	TON	616	$ 300.00	$ 184,800.00
14	Traffic Control	LS	1	$ 100,000.00	$ 100,000.00
15	Erosion Control and SWPPP	LS	1	$ 10,000.00	$ 10,000.00
16	Miscellaneous Work	LS	1	$ 25,000.00	$ 25,000.00
				Subtotal	$ 1,998,650.00
				20% Contingency	$ 399,730.00
				Total	**$ 2,398,380.00**

Assumptions:

1. T-trench paving with 3-4" new asphalt and 4-6" new AB
2. 100% hauloff of trench spoils
3. Trench section to be sand in pipe zone (6" below, both sides and 12" above pipe)
4. Trench section to be class 2 AB for intermediate backfill (top of pipe zone to bottom of asphalt)
5. 42" cover
6. One sawcut each side of trench
7. New fire hydrants as blowoffs
8. The high contingency percentage is due to construction unknowns

FORSGREN Associates Inc.

DPMWD-CWD Intertie Opinion of Probable Cost - 18" CL350 Pipeline

Item	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Demobilization	LS	1	$ 275,000.00	$ 275,000.00
2	Bonds and Insurance	LS	1	$ 50,000.00	$ 50,000.00
3	Construction Staking	LS	1	$ 10,000.00	$ 10,000.00
4	Potholing	LS	1	$ 10,000.00	$ 10,000.00
5	18" CL350 Ductile Iron Pipe	LF	5600	$ 250.00	$ 1,400,000.00
6	18" 150B Butterfly Valves	EA	12	$ 7,500.00	$ 90,000.00
7	Connection to DPMWD	EA	1	$ 20,000.00	$ 20,000.00
8	Connection to CWD	EA	1	$ 20,000.00	$ 20,000.00
9	3" CAV	EA	2	$ 10,000.00	$ 20,000.00
10	Blowoff or Fire Hydrant	EA	4	$ 12,500.00	$ 50,000.00
11	Sawcutting	LF	11200	$ 3.00	$ 33,600.00
12	Aggregate Base	TON	3465	$ 60.00	$ 207,900.00
13	Asphalt Concrete	TON	616	$ 300.00	$ 184,800.00
14	Traffic Control	LS	1	$ 100,000.00	$ 100,000.00
15	Erosion Control and SWPPP	LS	1	$ 10,000.00	$ 10,000.00
16	Miscellaneous Work	LS	1	$ 25,000.00	$ 25,000.00
				Subtotal	$ 2,506,300.00
			20%	Contingency	$ 501,260.00
				Total	**$ 3,007,560.00**

Assumptions:

1. T-trench paving with 3-4" new asphalt and 4-6" new AB
2. 100% hauloff of trench spoils
3. Trench section to be sand in pipe zone (6" below, both sides and 12" above pipe)
4. Trench section to be class 2 AB for intermediate backfill (top of pipe zone to bottom of asphalt)
5. 42" cover on pipe
6. One sawcut each side of trench
7. New fire hydrants as blowoffs
8. The high contingency percentage is due to construction unknowns

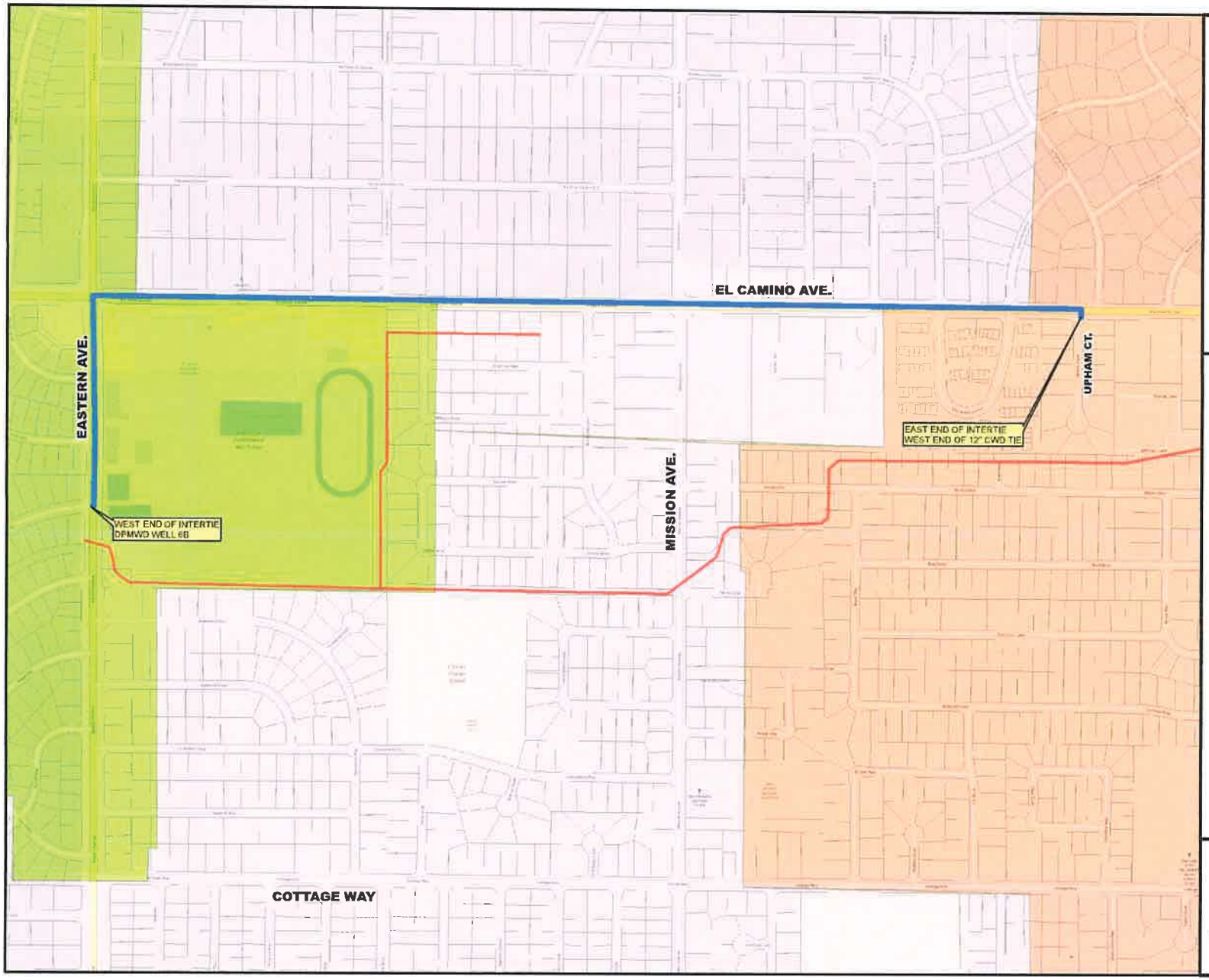
FORSGREN Associates Inc.

DPMWD-CWD Intertie Opinion of Probable Cost - 18" CL52 Pipeline

Item	Description	Unit	Quantity	Unit Price	Total
1	Mobilization and Demobilization	LS	1	$ 275,000.00	$ 275,000.00
2	Bonds and Insurance	LS	1	$ 50,000.00	$ 50,000.00
3	Construction Staking	LS	1	$ 10,000.00	$ 10,000.00
4	Potholing	LS	1	$ 10,000.00	$ 10,000.00
5	18" CL52 Ductile Iron Pipe	LF	5600	$ 265.00	$ 1,484,000.00
6	18" 150B Butterfly Valves	EA	12	$ 7,500.00	$ 90,000.00
7	Connection to DPMWD	EA	1	$ 20,000.00	$ 20,000.00
8	Connection to CWD	EA	1	$ 20,000.00	$ 20,000.00
9	3" CAV	EA	2	$ 10,000.00	$ 20,000.00
10	Blowoff or Fire Hydrant	EA	4	$ 12,500.00	$ 50,000.00
11	Sawcutting	LF	11200	$ 3.00	$ 33,600.00
12	Aggregate Base	TON	3465	$ 60.00	$ 207,900.00
13	Asphalt Concrete	TON	616	$ 300.00	$ 184,800.00
14	Traffic Control	LS	1	$ 100,000.00	$ 100,000.00
15	Erosion Control and SWPPP	LS	1	$ 10,000.00	$ 10,000.00
16	Miscellaneous Work	LS	1	$ 25,000.00	$ 25,000.00
				Subtotal	$ 2,590,300.00
			20%	Contingency	$ 518,060.00
				Total	**$ 3,108,360.00**

Assumptions:

1. T-trench paving with 3-4" new asphalt and 4-6" new AB
2. 100% hauloff of trench spoils
3. Trench section to be sand in pipe zone (6" below, both sides and 12" above pipe)
4. Trench section to be class 2 AB for intermediate backfill (top of pipe zone to bottom of asphalt)
5. 42" cover
6. One sawcut each side of trench
7. New fire hydrants as blowoffs
8. The high contingency percentage is due to construction unknowns



DEL PASO MANOR WATER DISTRICT
WATER SYSTEM PLANNING STUDY

MAP 1
INTERTIE SERVICE AREA

N
W E
S

0 250 500 750 Feet

FORSGREN Associates Inc

Legend

- Intertie
- Existing Slough
- Parcels
- Carmichael W.D.
- Del Paso Manor W.D.
- Sacramento Sub. W.D.

Map by: N. Patterson
Forsgren Associates Inc.
Date Created: 6/6/2017

Information as displayed on map is for Planning Purposes only. The data is approximate in terms of content and location and has been sourced from local, state, and national government agencies. Please contact Forsgren Associates Inc. with questions. 916.638.1119

ATTACHMENT 4

From: Ebrahimi, Mona G.
Sent: Monday, April 11, 2022 6:02 AM
To: General Manager
Subject: Grant Funding Opportunities

Good morning Alan,

You asked for resources the District may use to research grant funding opportunities. I will forward you specific ones as I become aware of them. In the meantime, staff may review the following:

https://www.grants.ca.gov/

Mona G. Ebrahimi
Shareholder

KRONICK

Kronick Moskovitz Tiedemann & Girard
1331 Garden Hwy, 2nd Floor
Sacramento, CA 95833

916.321.4500 | T
916.321.4555 | F

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