Water Commission Agenda
Regular Meeting
7:00 p.m. – December 5, 2016
Council Chambers
809 Center Street, Santa Cruz

Water Department

Agenda

Updated 12-01-2016: Added additional items to General Business Item 6. Parade of Projects

Call to Order

Roll Call

Presentation *Organized groups may make presentations to the Water Commission. Presentations that require more than three minutes should be scheduled in advance with Water Department staff.*

Statements of Disqualification *Section 607 of the City Charter states that "…All members present at any meeting must vote unless disqualified, in which case the disqualification shall be publicly declared and a record thereof made."*

The City of Santa Cruz has adopted a Conflict of Interest Code, and Section 8 of that Code states that no person shall make or participate in a governmental decision which he or she knows or has reason to know will have a reasonably foreseeable material financial effect distinguishable from its effect on the public generally.

Oral Communications No action shall be taken on this item.

Announcements No action shall be taken on this item.

Consent Agenda (Pages 1-16)

Items on the consent agenda are considered to be routine in nature and will be acted upon in one motion. Specific items may be removed by members of the advisory body or public for separate consideration and discussion. Routine items that will be found on the consent agenda are City Council Items Affecting Water, Water Commission Minutes, Information Items, Documents for Future Meetings, and Items initiated by members for Future Agendas. If one of these categories is not listed on the Consent Agenda then those items are not available for action.

1. City Council Actions Affecting Water ☆ (accept info) (Pages 1-2)
2. Approve the November 7, 2016 Water Commission Minutes ☆ (Pages 3-8)
3. Approve Revised Financial Reserve Policy and Recommend Adoption to the City Council ☆(Pages 9-14)
4. Water Commission 2017 Meeting Calendar ☆ (Pages 15-16)

Items Removed from the Consent Agenda

General Business (Pages 17-179)

Any document related to an agenda item for the General Business of this meeting distributed to the Water Commission less than 72 hours before this meeting is available for inspection at the Water Administration Office, 212 Locust Street, Suite A, Santa Cruz, California. These documents will also be available for review at the Water Commission meeting with the display copy at the rear of the Council Chambers.

5. Discussion of the status and challenges of water transfers for in lieu recharge, including participation by staff representatives of the Soquel Creek Water District. (Pages 17-18)

Recommendation: Receive information on the status of work with regional partners on in lieu recharge.

6. Parade of Projects ☆(Pages 19-122)

Recommendation: Receive information.

7. WSAS Quarterly Review☆(Pages 123-176)

Recommendation: Receive information regarding the status of the various components of the Water Supply Augmentation Strategy and provide feedback.

8. Water Commission 2017 Draft Work Program ☆(Pages 177-179)

Recommendation: Receive and accept Draft Water Commission Work Plan as a framework to focus Water Commission Efforts in Calendar Year 2017.

Subcommittee/Advisory Body Oral Reports

Director's Oral Report No action shall be taken on this item.

Adjournment The next meeting of the Water Commission is tentatively scheduled for January 9, 2017 at 7:00 p.m. in Santa Cruz Police Department Community Room.

☆Denotes written materials included in packet

APPEALS - Any person who believes that a final action of this advisory body has been taken in error may appeal that decision to the City Council. Appeals must be in writing, setting forth the nature of the action and the basis upon which the action is considered to be in error, and addressed to the City Council in the care of the City Clerk.

Other - Appeals must be received by the City Clerk within ten (10) calendar days following the date of the action from which such appeal is being taken. An appeal must be accompanied by a fifty dollar ($50) filing fee.

The City of Santa Cruz does not discriminate against persons with disabilities. Out of consideration for people with chemical sensitivities, please attend the meeting fragrance free. Upon request, the agenda can be provided in a format to accommodate special needs. Additionally, if you wish to attend this meeting and will require assistance such as an interpreter for American Sign Language, Spanish, or other special equipment, please call Water Administration at 831-420-5200 at least five days in advance so that arrangements can be made. The Cal-Relay system number: 1-800-735-2922.

WATER COMMISSION
INFORMATION REPORT

DATE: 12/1/2016

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: City Council Items Affecting Water

City Council Meeting of November 22, 2016

2nd Reading and Final Adoption of Ordinance No. 2016-14 Amending Sections of the Santa Cruz Municipal Code Pertaining to Water Efficient Landscaping (WT)

Ordinance No. 2016-14 was adopted amending sections 16.16.020, 16.16.030, 16.16.070, 16.16.090 and 16.16.100 of the Santa Cruz Municipal Code pertaining to water efficient landscaping.

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CITY OF SANTA CRUZ
Water Department

Water Commission
7:00 p.m. –November 7, 2016
Council Chambers
809 Center Street, Santa Cruz

Minutes of a Water Commission Meeting

Call to Order Chair Wadlow called the meeting to order at 7:01 p.m. in the City Council Chambers.

Please be advised that the November 7, 2016, Water Commission meeting was filmed and can be viewed online here.

Roll Call
Present: W. Wadlow (Chair), L. Wilshusen (Vice-Chair), D. Baskin, D. Engfer, D. Schwarm, A. Schiffrin, D. Stearns
Absent: None

Staff Present: R. Menard, Water Director; H. Luckenbach Deputy Director/Engineering Manager; A. Poncato, Administrative Assistant III.

Others: 5 members of the public.

Presentation: There were no presentations.

Statements of Disqualification: There were no statements of disqualification.

Oral Communications: There were no oral communications.

Announcements: There were no announcements.

Consent Agenda
1. City Council Actions Affecting Water
2. Approve the October 3, 2016, Water Commission Minutes

Commissioner Wilshusen moved item 1. City Council Actions Affecting Water of the Consent Agenda. Commissioner Schiffrin seconded.
VOICE VOTE: MOTION CARRIED
AYES: All.
NOES: None.
ABSENT: None.

Commissioner Wilshusen moved item 2. Approve the October 3, 2016, Water Commission Minutes of the Consent Agenda. Commissioner Schiffrin seconded.
VOICE VOTE: MOTION CARRIED
AYES: All.
NOES: None.
ABSENT: None.
ABSTAIN: Commissioner Schwarm due to absence from the October 3, 2016, Water Commission meeting.

Items Removed from the Consent Agenda

No items were removed from the consent agenda.

General Business

3. Aquifer Storage and Recovery Workshop
Ms. Menard introduced Ms. Luckenbach who provided an overview of the WSAC recommendations related to winter water harvest and explained that the presentation tonight would focus on one of the options being pursued, Aquifer Storage and Recovery (ASR). She then introduced the three speakers for the workshop:

1. Mr. Robert C. Marks, P.G., C.Hg, Principal Hydrogeologist of Pueblo Water Resources, Inc.;
2. Mr. Ryan Bezzera, the City's Water Rights Attorney and a partner at Bartkiewicz, Kronick & Shanahan; and
3. Mr. Jonathan Lear, P.G., C.Hg, Senior Hydrogeologist at the Monterey Peninsula Water Management District (MPWMD) who each gave a presentation on different elements of ASR.

Robert C. Marks, Principal Hydrogeologist of Pueblo Water Resources

Mr. Marks' presentation focused on an overview of the analytical and testing work that is involved in planning for a potential ASR project and included a summary of the work he and Pueblo Water Resources are currently contracted to preview for the City to determine the feasibility of ASR as a water supply for the City. Following his presentation, Mr. Marks responded to questions.

Based on your experience, how much are we going to learn from the three test wells knowing that the project may be geographically bigger than those three locations?

- Generally speaking, what we look for in the pilot test is how does an aquifer unit respond hydraulically to injection and recovery operations, what happens to water levels in the surrounding area, and what are the water quality interactions. The findings of the test wells can be extrapolated to other areas of the basin provided that the hydrogeological conditions are similar. The collected data can also assist with making adjustments for site specific conditions.

Have you already identified potential locations for the three test wells?

- Yes, but the final decision about pilot test well locations has not yet been made.

Is there a monetary cost to the other districts that are participating in the ASR testing the City is doing? If not, will there be a cost to other districts?

- No, water districts are not being asked for any financial contribution to this stage of the ASR analysis and testing work. However, if a utility makes one of its wells available as a test well for recharge, that utility would bear the operational cost of not being able to operate that well for water supply while the testing is occurring. If the City were to use another utility's production well as part of a pilot testing program, the City, and the utility would develop the agreements necessary to keep the well owner fully informed about the progress of the work and operating constraints for the well.

Do we have sufficient water flows to complete pilot testing this winter?

- Probably, but no pilot testing will be done this winter. Pilot testing would begin next winter following completion of Phase I work, assuming that the City is not experiencing drought conditions on its San Lorenzo River supply.

How do we test the rate and capacity of extraction of water from the wells?

- We can predict the rate and capacity of injection to an ASR well by what we know about extraction from existing production wells. Injection is half of estimated extraction and pilot testing is used to, among other things, confirm these predictions.

How can we tell if private wells are pumping out more water than they have in the past?

- In both the Santa Cruz Mid-County and Santa Margarita groundwater basins, a lot of effort has gone into developing groundwater models that will be used to test various assumptions about what is going on in each basin. Included in the model inputs are the pumping of all known private wells. Both modeling results and water level data from each aquifer will be actively monitored to determine if/how water use in the basin changes after any injection of surface water, but generally we don't expect to see a significant difference in the use levels of private well pumpers.

In regards to well site availability, is there a real estate constraint or do we have to wait for a design before we can determine if there is a real estate constraint?

- One of our tasks is to do a well sighting study and we will be looking at properties in all three service areas that meet the criteria for ASR wells. So, real estate may be a constraint but we do not know that yet.

How do you assess the hydrofracturing potential?

- ASR should not be confused with the intentional over pressurization of geologic formations that can result in fracking. ASR targets a different type of aquifer and uses much lower pressures.

- To project how injected water affects head pressure within an aquifer, we use an equation based on soil mechanics that relates the head pressure within the underlying aquifer to how deep the confining layer is below ground surface and uses a formula that takes into account those factors to develop what the head limitation is.

- The target aquifers for ASR in Santa Cruz are semi-confined to confined, meaning that they are overlain by low permeability (silts and clays) layers and are under some degree of pressure. The "Hydrofracturing Limits" criterion for per-well injection capacities takes into consideration that during active injection, the heads/pressures within the target aquifer must not be increased to such an extent that they exceed pressures that would create vertical cracks in the overlying confining layers through which injected water may flow upward into overlying units or to the ground surface ('daylighting'), which would represent a potential loss of stored water. ASR wells are conservatively designed to avoid any potential for hydrofracturing.

Can you clarify the difference between ASR and in lieu recharge?

- For in-lieu, the city would provide water to other districts so they can meet their demands while resting their wells. By doing this, the idea is that the City would ultimately have access to additional groundwater resources that could be used as the City's drought supply.
- For ASR, the city would be actively injecting water into the aquifer(s), building a reservoir of stored water that it would be able to access as its drought supply in the future.

Final Comments and Requests for Follow Up
None.

Ryan Bezzera, Water Rights Attorney from Bartkiewicz, Kronick & Shanahan

Mr. Bezzera's presentation provided an overview of the water rights and regulatory permitting issues associated with ASR. Following his presentation, Mr. Bezzera responded to questions.

Is the geochemical analysis going to be used as the basis for the permit application to the State Water Resources Control Board?

- Yes and the general permit authorizing injection covers both pilot programs as well as permanent projects. The information we develop in Phase 1 of our study would be provided in a technical report as part of the application to the State to secure permits needed for Phase 2 injections.

Does the Sustainable Groundwater Management Act (SGMA) provide local groundwater sustainability agencies with the legal authority to require private wells to register and submit how much water they use?

- Yes and no. SGMA provides for and exemption for small water users – called de minimis users. De minimis users can use up to 2 acre feet of water a year (roughly 650,000 gallons) and cannot be required to meter their use. Larger users, such as agricultural users, can be required to meter and report on water use.

If the Utility decides to move forward with an ASR project and take water from the San Lorenzo River, would we need to submit an application for a new water rights permit?

- It depends. The main factor that would determine whether or not a new water right permit is needed would be whether more winter water was needed than the City currently has access to with its existing water rights and permits.

Are water agencies limited to seeking water rights for bodies of water that pass through their boundaries or can they look outside their boundaries for water?

- Water agencies are not limited to their geographical boundaries to obtain water rights.

If we want to store water in a space that is underneath someone's property, do we need to get rights from the surface owner?

- This has never been completely determined under California law but I would suspect that as long as you are not damaging their property then you probably don't need their permission.

Final Comments and Requests for Follow Up
None.

Jonathan Lear, Senior Hydrogeologist at the Monterey Peninsula Water Management District

Mr. Lear's presentation covered the Monterey Peninsula Water Management District's (MPWMD) ASR program and the experiences they have had with it. Following his presentation, Mr. Lear responded to questions.

What is the supply gap that MPWMD is trying to address?

- With the existing MPWMD ASR project and the proposed MPWMD recycled water project, the District still expects to have a supply gap that would be about 1,500-acre feet short of our needs. That gap would be filled by the proposed desal plant.

How was the public informed about the MPWMD ASR and desal project and what was the public's perception?

- The public was informed through the regularly scheduled MPWMD's Board of Directors meetings. The public embraced this project mainly because it was best for the environment and one of the least costly options.

How closely did the groundwater modeling used as you were planning your test well program correlate with the actual results you saw from your pilot testing?

- It was very close. Our model was within 3 % of observed water levels.

Final Comments and Requests for Follow Up
Keep in mind that the ASR program on the Monterey Peninsula is designed to create seasonal storage that is annually filled and depleted. The City's effort would be intended to provide longer term storage that might be filled over several years when water is available and then significantly drawn down when drought conditions occur.

Subcommittee/Advisory Body Oral Reports No items.

Director's Oral Report No action shall be taken on this item.

- Water supply situation is good.
- The next Water Commission meeting will include a quarterly Water Supply Augmentation Strategy report, a financial reserve policy update that we will be bringing to the City Council after the New Year and a draft 2017 work plan.

Adjournment Meeting adjourned at 10:17p.m. The next meeting of the Water Commission is scheduled for December 5, 2016, at 7:00 p.m. in Council Chambers.

Respectfully submitted,

Amy Poncato

Digitally signed by Amy Poncato
DN: cn=Amy Poncato, o=Water Department, ou=Administration, email=aponcato@cityofsantacruz.com, c=US
Date: 2016.12.05 10:09:57 -08'00'

Staff

WATER COMMISSION
INFORMATION REPORT

DATE: 12/1/2016

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Water Department Reserve Policy

RECOMMENDATION: Approve the Water Department Reserve Policy and Recommend Approval by the City Council.

BACKGROUND: Over the last two years, the Water Department has invested significant time and energy completing a number of tasks aimed at stabilizing the utilities finances as well as providing mechanisms to fund the $300 million Capital Improvement Program over the next 10 years. The components of this work included:

1. A comprehensive review of Water System Development Charges completed in April 2015;
2. Implementation of new System Development Charges (SDC) in July 2015;
3. Establishment of two new funds (90-Days Water Operating Fund and Water Emergency Reserve Fund) during the budget process in June 2015;
4. Completed a Cost of Service Analysis in accordance with all applicable laws, Court rulings including the provisions of Proposition 218 in June 2016;
5. Adopted a Long Range Financial Plan which details building the reserves and provides a roadmap for borrowing funds in June 2016;
6. Executed a $25 million loan agreement with the California Infrastructure and Economic Development Bank (IBank) in August 2016; and
7. Implemented a new water rate structure and 5 years of new water rates moving to a more volumetric pricing approach October 2016.

The final piece in the series of tasks is establishing a reserve policy governing the five funds which make up the Water Enterprise Funds. While the Long Range Financial Plan (LRFP) outlined the purpose, use and the mechanism by which revenue will be deposited in the various reserve funds; approval of a Water Department Financial Reserve policy will formalize the reserve fund component pf the LRFP into a succinct, City Council approved policy.

DISCUSSION: The Water Enterprise Reserve Policy establishes the purpose, goal, target funding level, use, and replenishment for the following Water Funds:

- Rate Stabilization Fund (Fund 713)

- 180-Days Cash Reserve (Funds 711 and 716)
- Emergency Reserve Fund (Fund 717)

Combined with the Water Operating Fund (Fund 711), the System Development Charges Fund (Fund 715), the Water Public Art Fund (Fund 714) and the Mount Herman June Beetle Endowment (Fund718), make up the full complement of the Water Enterprise Funds.

It is the goal of the Water Department to maintain 180 days of operating cash between the Water Operating Fund (711) and the Water 90 Day Operating Reserve Fund (716) to provide financial stability and address the seasonal nature of water sales. This goal, once fully funded, has the added benefit of maintaining the utility's bond rating and ensure competitive rates when borrowing funds.

The purpose of the Emergency Reserve Fund (Fund 717) is to provide the resources necessary to make emergency repairs as the result of unforeseen circumstances. The target funding level for the Emergency Reserve is $3.1 million.

The Rate Stabilization Fund (Fund 713) was originally created in 1993 based on a surcharge of $0.10 per CCF (100 cubic feet). The fund's ceiling was established at $2.3 million and due to interest earned, the fund now stands at almost $2.5 million. The revised Rate Stabilization Fund will be funded beginning July 1, 2017, with a $1.00 per CCF surcharge. The fund's target is $10 million. This proposed policy will replace the existing City Council Policy #34.4 which dealt with only the Rate Stabilization Fund under its previous funding mechanism which is no longer accurate.

The target funding level of the combined 180-days of operating cash will be adjusted annually with the adoption of the budget. The target level will be based on the projected operation and maintenance budget for the following year less annual debt service, capital outlay and the projected CIP. The target level of $3.1 million for the Emergency Reserve fund may be reviewed for future indexing over the next several years.

Exhibit A of the Water Department Financial Reserve Policy lists the current balances in each of the funds as well as the current target funding level. In addition, transfer of monies between funds will be governed by existing Council policy.

FISCAL IMPACT: Approval of the Water Department Financial Reserve Policy will provide Council Policy level guidance regarding the target levels, use, and replenishment of the three funds. Failure to approve the policy would be inconsistent with the Commission's prior approval of the LRFP on June 6, 2016. The attached policy implements the goals, targets, and strategy contained in the Long Range Financial Plan for the utilities various reserve funds. Further, the policy recommends a process for indexing 180-days of operating cash targeted funding levels on an annual basis.

PROPOSED MOTION: Approve the Water Department Financial Reserve Policy and recommend approval by the City Council.

ATTACHMENTS: Water Department Financial Reserve Policy

POLICY TITLE: WATER DEPARTMENT FINANCIAL RESERVE POLICY

POLICY STATEMENT:

On June 14, 2016, the City Council approved the Water Department's Long Range Financial Plan (LRFP). The LRFP provides the justification and framework for water reserve funds as described in this policy. It is the policy of the City of Santa Cruz to establish and maintain reserve funds for the Water Enterprise Fund as one part of a comprehensive program of prudent financial discipline designed to ensure a stable operating environment and supports a strong credit rating which supports lower borrowing costs when issuing bonds.

The Water Department will develop and recommend to the City Council for its approval a Long Range Financial Plan that provides the policy and fiscal management foundation for its financial reserves. At a minimum, this plan will be comprehensively reviewed and updated as needed every five years.

The Water Department will report to the City Council on Reserve Fund levels as part of its annual budget presentation to the City Council. Should the Department believe changes to this reserve policy are needed; recommendations will be made to the Council to protect the financial stability and sustainability of the Water Enterprise Funds.

I. RESERVE FUND CATEGORIES

The Water Department shall establish and maintain the reserve funds described below and as summarized in Exhibit A.

1. Rate Stabilization Fund (Fund 713)

    a) Purpose: The Water Rate Stabilization Fund reserve is intended to provide a buffer for the financial impacts to the Department's Operating and Maintenance Budget that may result from uncontrollable factors such as cooler than normal temperatures, wet weather events, an economic downturn, or greater than projected customer conservation behaviors or activities.
    b) Target Fund Level**:** The target funding level of the Rate Stabilization Reserve Fund is $10 million. Beginning with the planned July1, 2017 rate adjustment, a $1.00 surcharge per unit of water consumption (100 cubic feet or CCF) would be applied toward the goal of increasing to amount of the Rate Stabilization Reserve to a target fund level of $10 million.

2. 180-Days Cash Reserve

    a) Purpose**:** The purpose of the 180-Days of Operating Reserve is to provide financial stability, including supporting the utility in addressing cash flow issues that are an inherent result of the seasonality of water revenues. Maintaining a strong cash

reserve also helps maintain the water system's bond rating and ensure the lowest possible borrowing costs. The Water Department has chosen to meet the 180 days cash reserve requirement by adding together the annual ending fund balance from the Water Operating Fund (Fund 711) and 90-Days Cash Reserve Fund (Fund 716). Compliance with the Reserve Policy requirement for 180-days cash of operating cash will be determined annually using the combination of fiscal year ending fund balances for both funds (Fund 711) and (Fund 716).

b) Target Fund Level**:** Funds from Operating Fund (Fund 711) and 90-Day Cash Reserve Fund (Fund 716) combined goal is to achieve an ongoing 180-days cash balance. The 180-days cash balance would be indexed annually and equal to 6 months of the operating budget (see footnote). The target fund level will be reviewed and a revised target level will be established annually. The revised reserve level will be incorporated into the Department's annual budget, setting the funding level goal for the next fiscal year.

II. EMERGENCY RESERVE FUND

1. Purpose**:** Funds from the Emergency Reserve Fund (Fund 717) are intended to provide resources necessary for any emergency repairs required to ensure continued water service to customers and service areas as the result of events which are impossible to anticipate or budget for. The Emergency Reserve Fund shall be used in situations such as natural disasters or other infrastructure-related emergencies that result from major storm events, earthquakes, or other unforeseeable cause of damage to or disruption of the system that require financial resources above those that would normally be available to respond to such a situation.

2. Target Fund Level**:** The target amount for the Emergency Reserve Fund is $3.1 million. The target fund level will be reviewed annually for sufficiency. The Emergency Reserve Fund target level may be reviewed in the future for potential indexing to the operating budget.

III. USE OF RESERVE FUNDS

The use of reserve funds will follow established policy requiring City Council approval for the transfer of funds and increase in appropriations.

EXHIBIT A
FISCAL YEAR 2016-17 WATER RESERVE FUNDS

Reserve Fund(s) Category	Amount of Funding at 6-30-2016	Target Funding Level	Source of Funding
1. Rate Stabilization These funds are available to support operating costs to minimize drastic fluctuations in rates	$2.4 million	$10 million	Rate Stabilization Surcharge of $1.00 per CCF of water use
2. 180-Days Cash These funds are available to support operating costs to minimize drastic fluctuations in rates and keep borrowing costs as low as possible.	None currently. Funds from Operating Fund 711 and 90-Day Cash Reserve Fund 716 combined goal is to achieve an ongoing 180-days cash balance	$12.6 million initially indexed annually by operating budget	Water Rate Revenue
3. Emergency These funds are provided for emergencies or unplanned capital infrastructure failures.	$1.1 million	$3.1 million	Water Rate Revenue

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WATER COMMISSION
INFORMATION REPORT

DATE: 12/1/2016

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Water Commission Schedule for 2017

January 2017
(01-09-17) SC Police Community Room

February 2017
(02-06-17)

March 2017
(03-06-17)

April 2017
(04-03-17)

May 2017
(05-01-17)

June 2017
(06-05-17)

July 2017
Cancelled

August 2017
(08-07-17)

September 2017
8-28-17 Available – Last Monday in August

Monday meetings in Chambers for September
9-04-17 – Office closed for Labor Day
9-11-17 – Sister Cities
9-18-17 - Public Works Commission
9-25-17 - Available

October 2017
(10-02-17)

November 2017
(11-06-17)

December 2017
(12-04-17)

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WATER COMMISSION
INFORMATION REPORT

DATE: 12/1/2016

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Discussion of the status and challenges of water transfers for in lieu recharge

RECOMMENDATION: Receive information on the status of work with regional partners on in lieu recharge.

BACKGROUND: As part of the Water Supply Advisory Committee's (WSAC) recommendations, the Department was directed to explore the opportunities to deliver treated drinking water to local water agencies such as the Soquel Creek Water District, whose source of supply comes from over-drafted groundwater basins. The purpose of this approach, called in lieu recharge, is to allow the groundwater supplier to rest its wells and passively recharge the groundwater basin. An additional purpose considered by the WSAC was the potential opportunity for Santa Cruz to build a bank of stored water in regional aquifers, which would be used as part of Santa Cruz's drought supply.

In September 2015, the City and the Soquel Creek Water District entered into an agreement to being a short-term pilot program for the transfer of surface water from the City's north coast pre-1914 water rights to the Soquel Creek District. Since that time the following actions have occurred:

1. The City completed a CEQA process on the proposed water transfer agreement in February 2016;
2. The Soquel Creek Water District engaged a consultant to evaluate its water quality and identify any potential issues that would arise from mixing surface water and groundwater and developed a series of recommendations for actions the District should take prior to initiating water transfers;
3. Staff from both the City and the District have worked to develop an operating plan and the District has worked with the State Division of Drinking Water to identify and develop the necessary information so that its operating permit could be amended to authorize the use of an additional source of water;
4. The September 2015 agreement was revised slightly as a result of the CEQA process and some additional changes requested by the District and both agencies reviewed and authorized a final agreement in August 2016;

5. Staff from both the City and the District have continued to work on a variety of water quality issues, including consulting with and learning from consultants for and staff from other agencies such as the cities of Woodland and Davis where these long time groundwater agencies have been working to incorporate a new surface water source from the Sacramento River into their systems; and
6. As a result of these efforts, City and District staff have agreed that additional testing is needed and are working together to develop a scope of work and request for proposals process to support the identified work.

The purpose of this item is to provide the Water Commission and the public with a discussion of these efforts and to answer any questions that Commissioners have about the approach being taken to pursue this option.

FISCAL IMPACT: None

PROPOSED MOTION: Move to accept the information provided.

WATER COMMISSION
INFORMATION REPORT

DATE: 12/01/2016

AGENDA OF: December 3, 2016

TO: Water Commission

FROM: Kevin Crossley, Senior Civil Engineer

SUBJECT: Major Projects Update

RECOMMENDATION: Receive Information.

To provide context for upcoming discussion of Department's three year Draft Capital Improvement Program (CIP), the following report provides a brief update of capital projects currently underway and those recently completed by the Department. Department staff will present information on selected major projects that reflect the size and diversity of the projects that make up the CIP. The 10-year CIP is also provided as an attachment for a broader context.

North Coast System Rehab (c709835)
Springs and streams along the coast north of the City limits supply approximately 25% of the City's raw water. Some of the facilities related to these water supplies are reaching the end of their useful life. This program consists of multiple projects over the next 15 to 20 years to evaluate, rehabilitate, and replace portions of the existing infrastructure to ensure continued reliability. The original conceptual design broke the project into six phases. Phase 3 of the Project will install 18,000 feet of 24-inch pipe. Construction of Phase 3 is scheduled to be complete in early 2017. Due in part to competing priorities, the Phase 4 is currently not scheduled until FY2026.

San Lorenzo River Diversion & Tait Wells (c709872)
This project will conduct a condition assessment of the existing diversion and wells including consideration of sanding issues, potential dam replacement, the potential use of infiltration gallery, and relocation of existing wells. The project will ensure reliable and efficient diversion of water from the San Lorenzo River at Tait St. Condition assessment followed by recommended intake modifications and/or new wells. Current project consists of replacing 2 wells, rehabilitating 1 existing well, and abandoning 2 wells. The new wells and associated facilities will be complete in early 2017. The next phase will evaluate the diversion, pumps, and controls system.

Newell Creek Dam I/O Pipeline & Aerators (c701606)
The Newell Creek Dam was installed in the 1960's. A pipeline runs through the base of the dam to deliver water to the reservoir from Felton Diversion and from the reservoir to the Graham Hill

Water Treatment Plant. The pipeline rehabilitation includes inspection of the pipeline and its appurtenances which will result in rehabilitation or replacement of all or parts of the facility. Current work is focused on the preliminary design of several alternatives, coordination with the Division of Safety of Dams, and modeling of the lake to better understand options for changing operations during and following construction. Construction is currently scheduled to begin in FY2019.

Felton Diversion Replacement & Pump Station (c701602)
This project consists of an evaluation of the existing Felton Diversion dam and pump station with recommendations to rehabilitate or replace existing facilities. Alternate diversions to be considered will include horizontal collector wells and other subsurface intakes. This project will replace aging facilities and evaluate potentially more efficient ways to divert water from the San Lorenzo River at Felton. A recent evaluation of the inflatable dam has resulted in a recommendation to replace the bladder in kind. Evaluations of the horizontal collector wells are ongoing.

Water Treatment Upgrades (c700025)
Upgrades to the Graham Hill Water Treatment Plant are necessary to maintain current plant functionality, to meet new and planned regulatory requirements, and increase overall system reliability. This is a recurring project to prioritize needs and make smaller improvements. Upcoming projects include upgrades to the bulk chemical storage area, replacement of aging tube settlers, and mechanical system improvements to the flocculation and sedimentation basins.

GHWTP Filter Rehabilitation and Upgrades (c701303)
The Filter Rehabilitation Project will improve the overall condition, performance, and reliability of the granular media filters. A construction contract was awarded in July 2014; construction of the improvements started in November 2014 and is expected to be completed in early 2017.

GHWTP Concrete Tank Evaluation & Replacement (c701501)
The Concrete Tank Project will evaluate the condition of four concrete tanks located at the GHWTP. The condition assessment was completed in 2015 and recommended replacement of all four tanks. The replacement tanks would improve and modernize the treatment plant processes related to solids, backwash, and finished water. Staff is currently working with several consultants to consider sequencing the replacement of the tanks within the context of other projects at the Plant.

Water Resources Building (c701702)
The Watershed Resources Division is currently housed in several temporary trailers. This project consists of a needs assessment, design, and construction of a new office and equipment storage building. The needs assessment portion of the project has been completed, and design has started on an approximately 3,500 square foot building, located at the GHWTP property.

Gravity Trunk Main Inspection (c701504)
The Gravity Trunk Main (GTM) is a 36” diameter treated water transmission main made of bar-wrapped concrete cylinder pipe running approximately 1.5 miles between the Filtered Water Tank (FWT) at the Graham Hill Water Treatment Plant (GHWTP) and the intersection of Ocean and Kennan Streets. Built in the early 1960s along with the GHWTP, the GTM is nearly as important to the system since approximately 88% of the City’s average production flows through the GTM. Due to the essential function of this pipeline, it deserves special attention to ensure it

continues to serve us reliably. Phases 1 and 2 of the project replaced failed isolation valves and installed an inspection tool retrieval station. Phase 3 will inspect the pipeline and assess its condition. The inspection is scheduled for January 2017.

Bay St. Reservoir Reconstruction (c700313, c700027)
The Bay Street Reservoir was constructed in 1924 to store raw water from the City's North Coast sources. The facility was later re-purposed as a treated water reservoir, storing and distributing treated water from the Graham Hill Water Treatment Plant. In the mid-1970s, a roof was added to meet the requirements of the Safe Drinking Water Act. By the mid-1990s, the roof structure showed signs of deterioration and an investigation indicated structural problems which ultimately led to a full replacement of the Bay Street Reservoir with two tanks. The project was divided into 4 phases, and phases 1-3 (temporary tanks, then permanent tanks) are completed. Phase 4 consists of landscape and other property frontage improvements and will start in early 2017.

Recoat University Reservoir No. 5 (c701506)
The engineering analysis and condition assessment of the aging University 5 tank has been completed and the decision made to replace the tank in kind to ensure continued reliable service. The design is currently underway. The project should start construction in spring, 2017.

ATTACHMENTS:
Attachment A: 10-year CIP
Attachment B: Major Projects Update 2016

City of Santa Cruz 10-Year CIP by Primary Driver										
	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026
Rehabilitate or Replace										
Felton Diversion Replacement & Pump Station		1,500,000	1,500,000	1,500,000						
Laguna Dam										500,000
Majors Creek Diversion										300,000
San Lorenzo River Diversion & Tait Wells										
Newell Creek Pipeline Rehabilitation	1,000,000	1,000,000	8,000,000	8,000,000						
Newell Creek Dam I/O Pipeline & Aerators	2,000,000	2,000,000	14,000,000	12,000,000	12,000,000					
North Coast System Rehab	4,150,000									4,000,000
WTP Concrete Tank Evaluation & Replacement	600,000	3,000,000	3,000,000	3,000,000						
WTP Solids Handling	500,000									
Water Main Replacements - City Engineering	1,395,000	1,440,000	1,440,000	1,440,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Water Main Replacements - Outside Agency	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Water Main Replacements - Customer Initiated	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Water Main Replacements - Distribution	325,000	325,000	325,000	325,000	325,000	325,000	325,000	325,000	325,000	325,000
Pressure Regulating Stations	10,000	60,000	60,000	60,000						
Recoat University Reservoir No. 4	75,000	1,300,000								
Recoat University Reservoir No. 5	75,000	1,675,000								
Beltz 11	70,000	300,000								
Water Treatment Upgrades	100,000									
Subtotal	**10,600,000**	**12,900,000**	**28,625,000**	**26,625,000**	**14,125,000**	**2,125,000**	**2,125,000**	**2,125,000**	**2,125,000**	**6,925,000**
With inflation	**10,918,000**	**13,685,610**	**31,886,676**	**31,141,725**	**17,347,257**	**2,740,252**	**2,877,265**	**3,021,128**	**3,172,185**	**10,854,470**
Upgrade or Improve										
Advance Metering Infrastructure (AMI)					50,000	4,000,000	4,000,000			
Loch Lomond Rec Improvements			165,000	1,000,000						
Photovoltaic/SolarProjects		500,000								
Water Resources Building	1,000,000									
Security Camera & Building Access Upgrades	95,000									
Subtotal	**1,095,000**	**500,000**	**165,000**	**1,000,000**	**50,000**	**4,000,000**	**4,000,000**	**-**	**-**	**-**
With inflation	**1,127,850**	**530,450**	**183,801**	**1,169,642**	**61,406**	**5,158,122**	**5,416,028**	**-**	**-**	**-**
Water Supply Reliability										
Aquifer Storage & Recovery		1,075,000	325,000	300,000						
Recycled Water										
Water Supply- WSAS Implementation				1,200,000	7,200,000	6,000,000	30,000,000	30,000,000	30,000,000	
Source Water Evaluation & Implementation	400,000	500,000	3,000,000	3,000,000						
Subtotal	**400,000**	**1,575,000**	**3,325,000**	**4,500,000**	**7,200,000**	**6,000,000**	**30,000,000**	**30,000,000**	**30,000,000**	**-**
With inflation	**412,000**	**1,670,918**	**3,703,867**	**5,263,390**	**8,842,495**	**7,737,183**	**40,620,213**	**42,651,224**	**44,783,785**	**-**
Total Projects w/o Inflation	**12,095,000**	**14,975,000**	**32,115,000**	**32,125,000**	**21,375,000**	**12,125,000**	**36,125,000**	**32,125,000**	**32,125,000**	**6,925,000**
Handy-Whitman Construction Inflation Factor	**3%**	**3%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**
Total Projects with Cumulative Inflation	**12,457,850**	**15,886,978**	**35,774,344**	**37,574,757**	**26,251,158**	**15,635,558**	**48,913,507**	**45,672,352**	**47,955,970**	**10,854,470**

Attachment B

Update on Major Projects 2016

- Water Department Engineering Section

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Water For Our Future

North Coast System Rehabilitation Program – Phase 3

Kevin Crossley, P.E.

Surf City Saves
Water For Our Future

North Coast System Rehabilitation Project

- 2004 Engineering Study Recommended Replacement of Entire System
- Rebuild Pipeline and Diversions in Phases
- Prioritize segments with Leaks/High Risk

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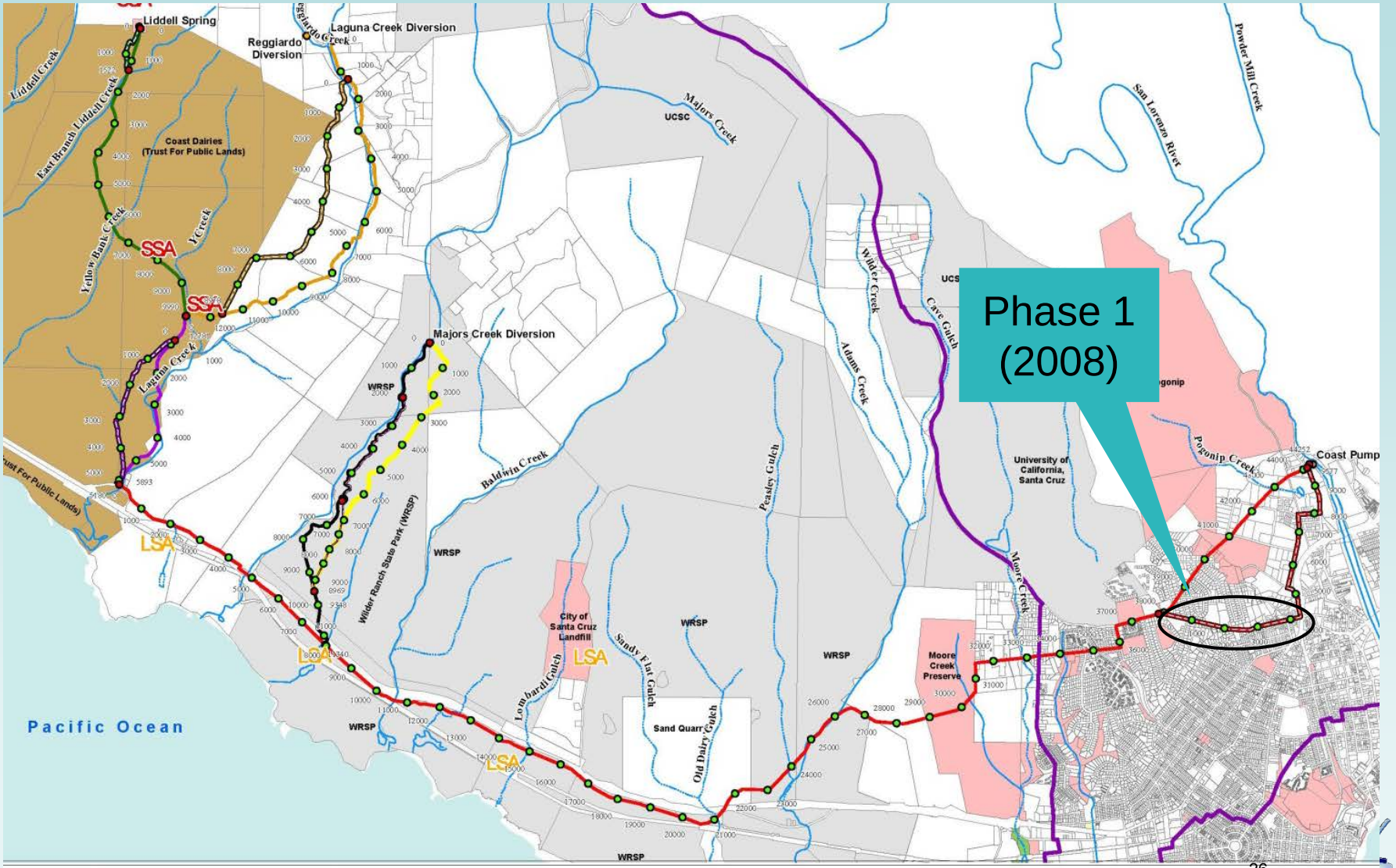
North Coast System Rehabilitation Project



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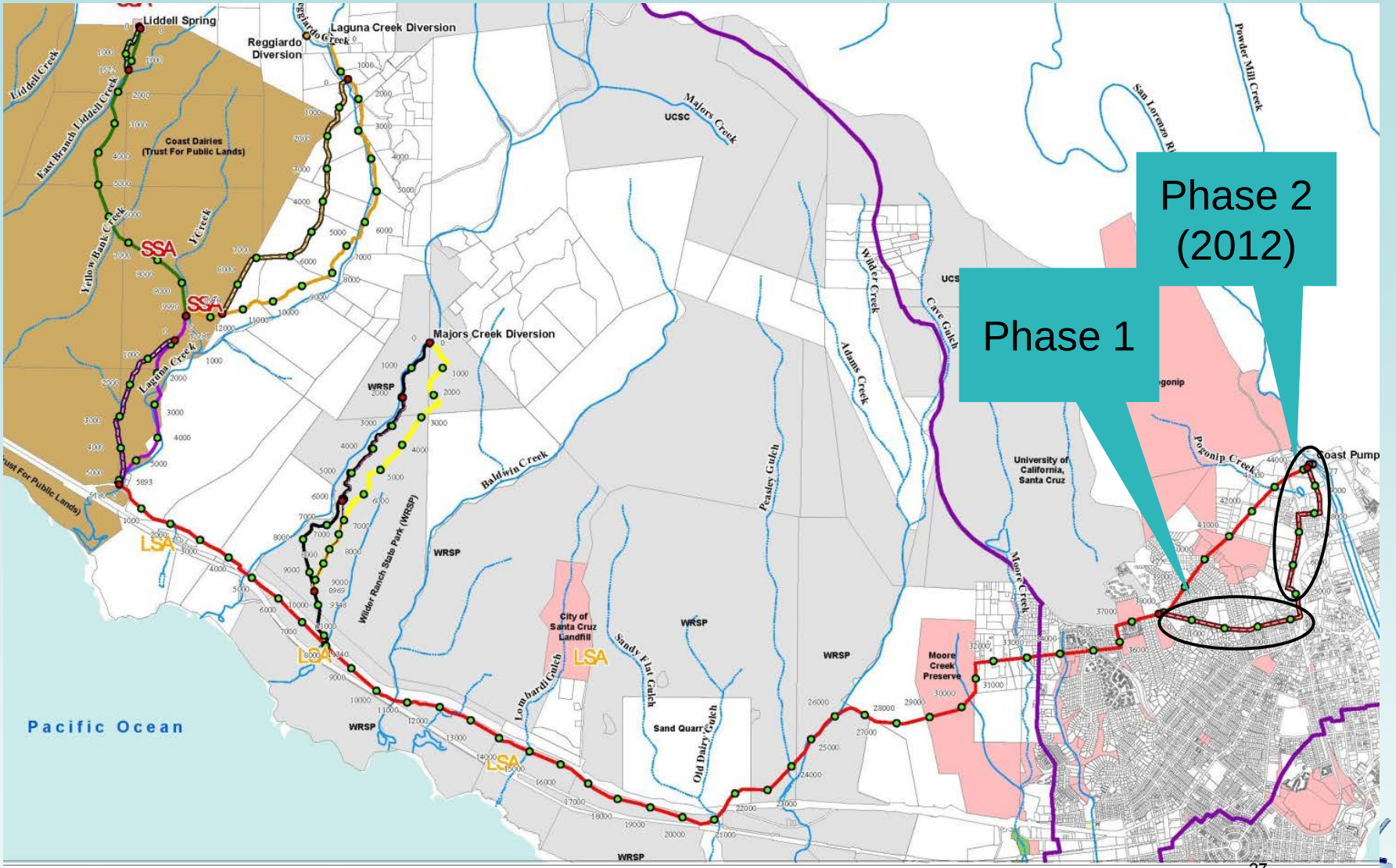
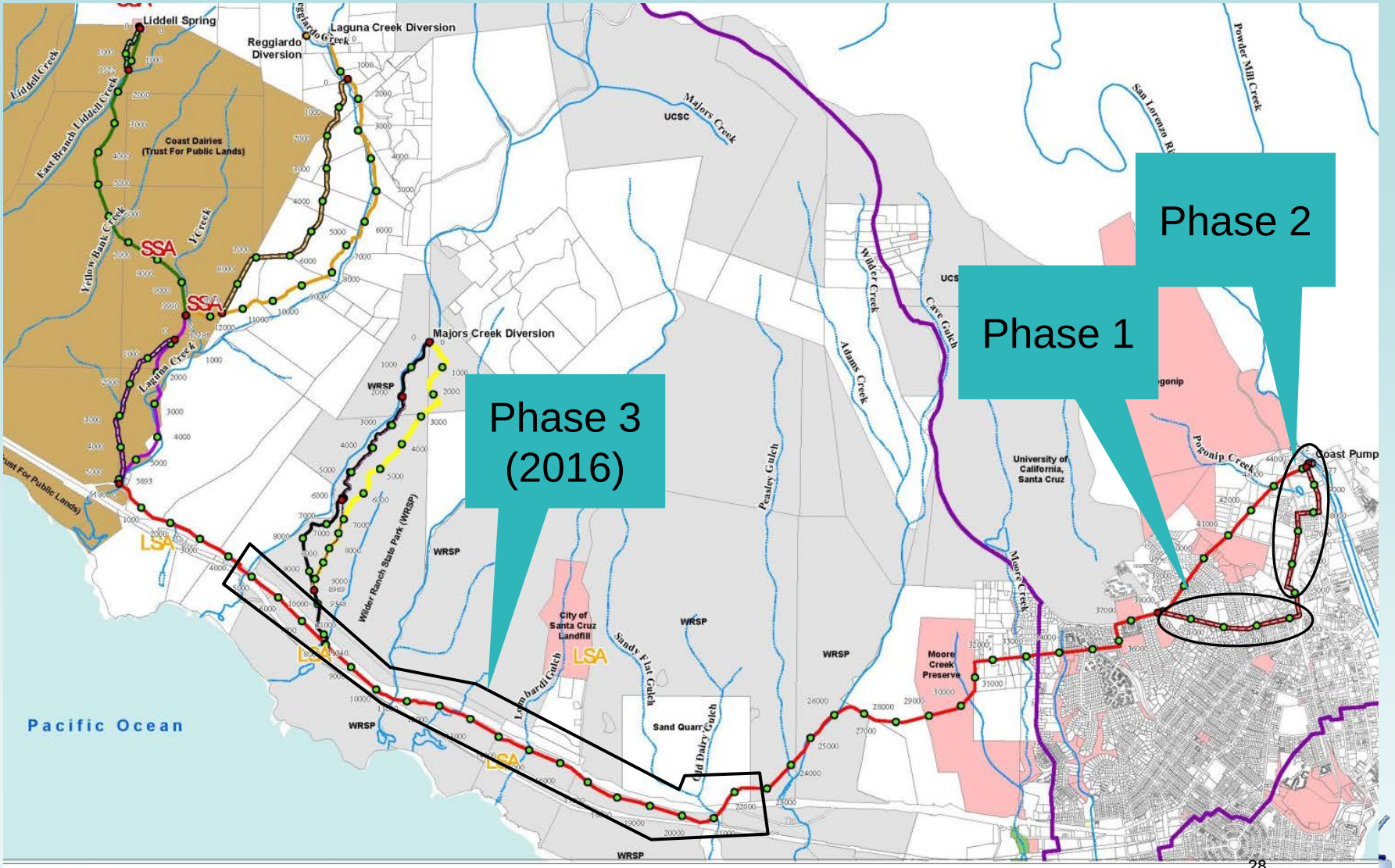
North Coast System Rehabilitation Project



Water For Our Future

North Coast System Rehabilitation Project



Water For Our Future

General North Coast Conditions

Cultural Resource Site

Highway 1

Tracks

Santa Cruz Mountain Foothills

Land Owners

55% State Parks 17% Caltrans

25% SCCRTC 3% Graniterock

Brussels

Pacific Ocean

Construction of the Lombardi Gulch HDD Crossing

Biologically Sensitive Areas

California Red-legged Frog
Federally threatened, California threatened

Western Pond Turtle
USFWS Species of Concern; CA Species of Special Concern

Western Burrowing Owl and Migratory Birds

Ohlone Tiger Beetle
Federally threatened, California threatened

Other Species

- Steelhead, Coho Salmon and Tidewater Goby could also be found within the project area.
- Steelhead and Coho Salmon are larger fish, up to several feet long, that migrate between the ocean and freshwater streams to lay eggs.
- Tidewater goby is small, typically less than 2 inches in length, and is found in brackish lagoons adjacent to the coast.

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Summary of North Coast Rehabilitation - Phase 3

Phase 3

Construction Cost

$6.4 Million

630 ft – four horizontal bore installations

1,400 ft – one horizontal directional drill installation

16,000 ft – Trenched installations

ORIGINALLY SCHEDULED TO BID IN EARLY 2016

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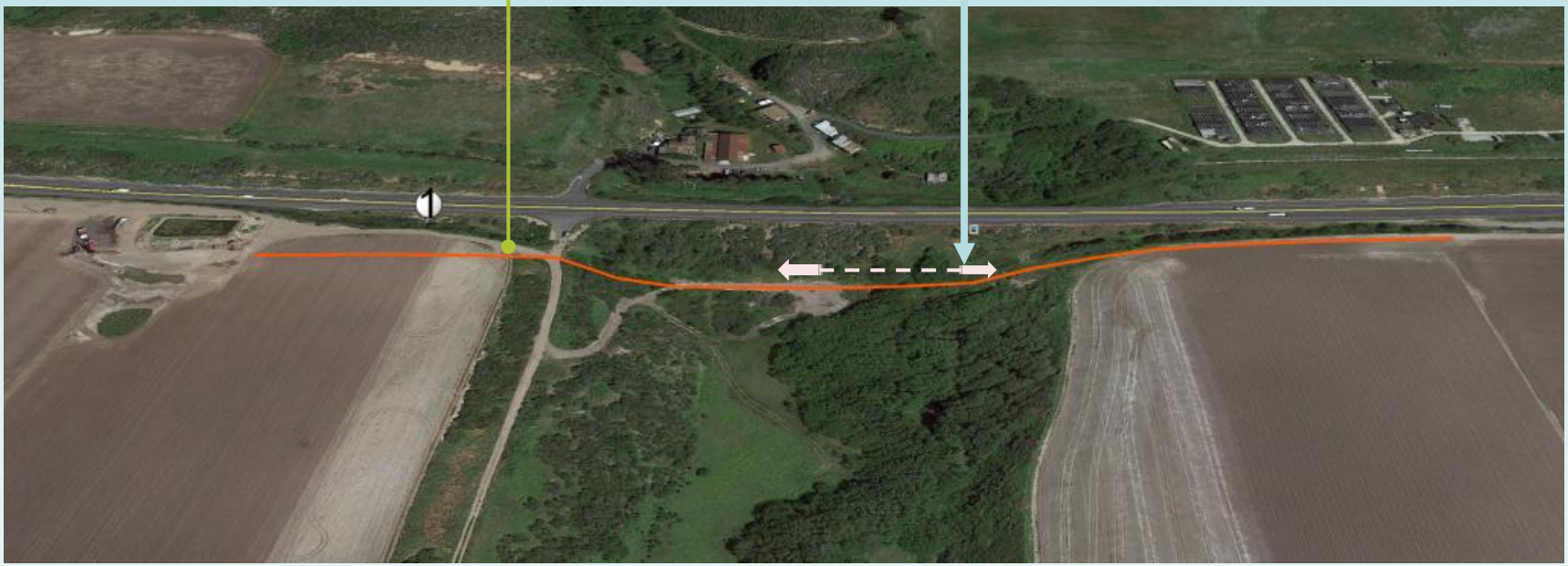
Existing Pipeline Developed Major Leak Oct. 2015

- Occurred several months prior to planned bidding
- 22 in. welded steel pipe leaking at 500,000 gallons/day

Lombardi Gulch HDD Alignment

Parallel to Existing Main



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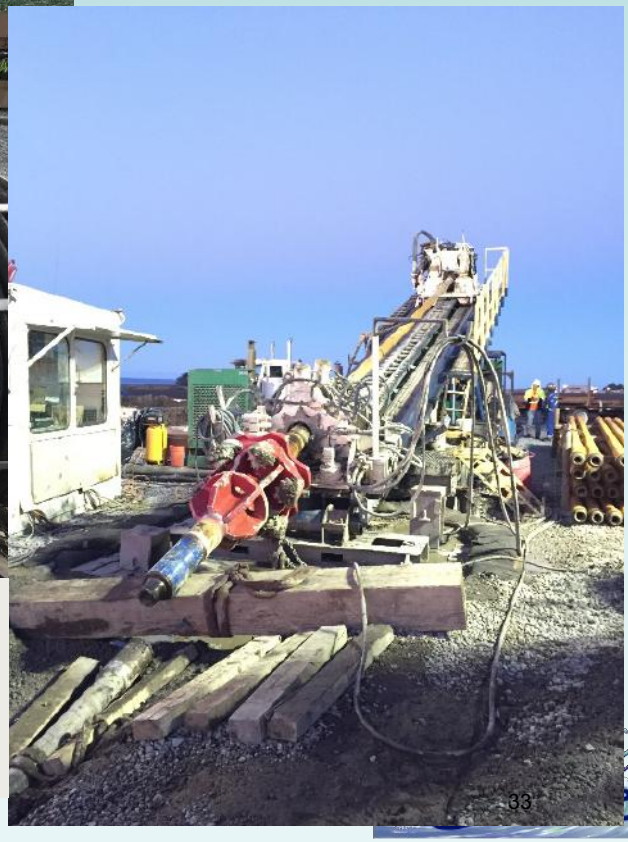
Construction of the Lombardi Gulch HDD Crossing

RIG #2 - AMERICAN AUGERS 380,000LBS. (PUSH&PULL)



During Pullback the rig exerted 47,000 lbs. to 60,000 lbs. of pull force. Pull force was expected to be about 30,000 lbs., so this pull force was higher then anticipated but well under the allowable tensile load of 307,221 lbs. for the 24-in. FPVC.

Construction of the Lombardi Gulch HDD Crossing

HDD Pullback

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Construction of the Lombardi Gulch HDD Crossing

HDD Tie-in

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Remainder of Project resumed Spring 2016

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Remainder of Project resumed Spring 2016

Artifact

Lost Dirt Hauler

90% Complete-Finish in January 2017

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CITY OF
SANTA CRUZ

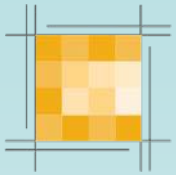

LSA


IFLAND
ENGINEERS


AECOM


ECOLOGICAL CONCERNS INCORPORATED
eci

CMAG




COVELLO
CONSTRUCTION MANAGEMENT PLUS


M
MOTT
MACDONALD
M


SANDIS


Christianson
Tree Experts Co.


CALIFORNIA
STATE PARKS
SINCE 1864


wra
ENVIRONMENTAL CONSULTANTS


THE
CROSSING
COMPANY


Graniterock


GRANITE


Allstate
BORING


McGUIRE
and
HESTER


Caltrans


JACOBS
FARM


RODONI FARMS


SCCRTC

Tait Wells Replacement Project

Kevin Crossley, P.E.

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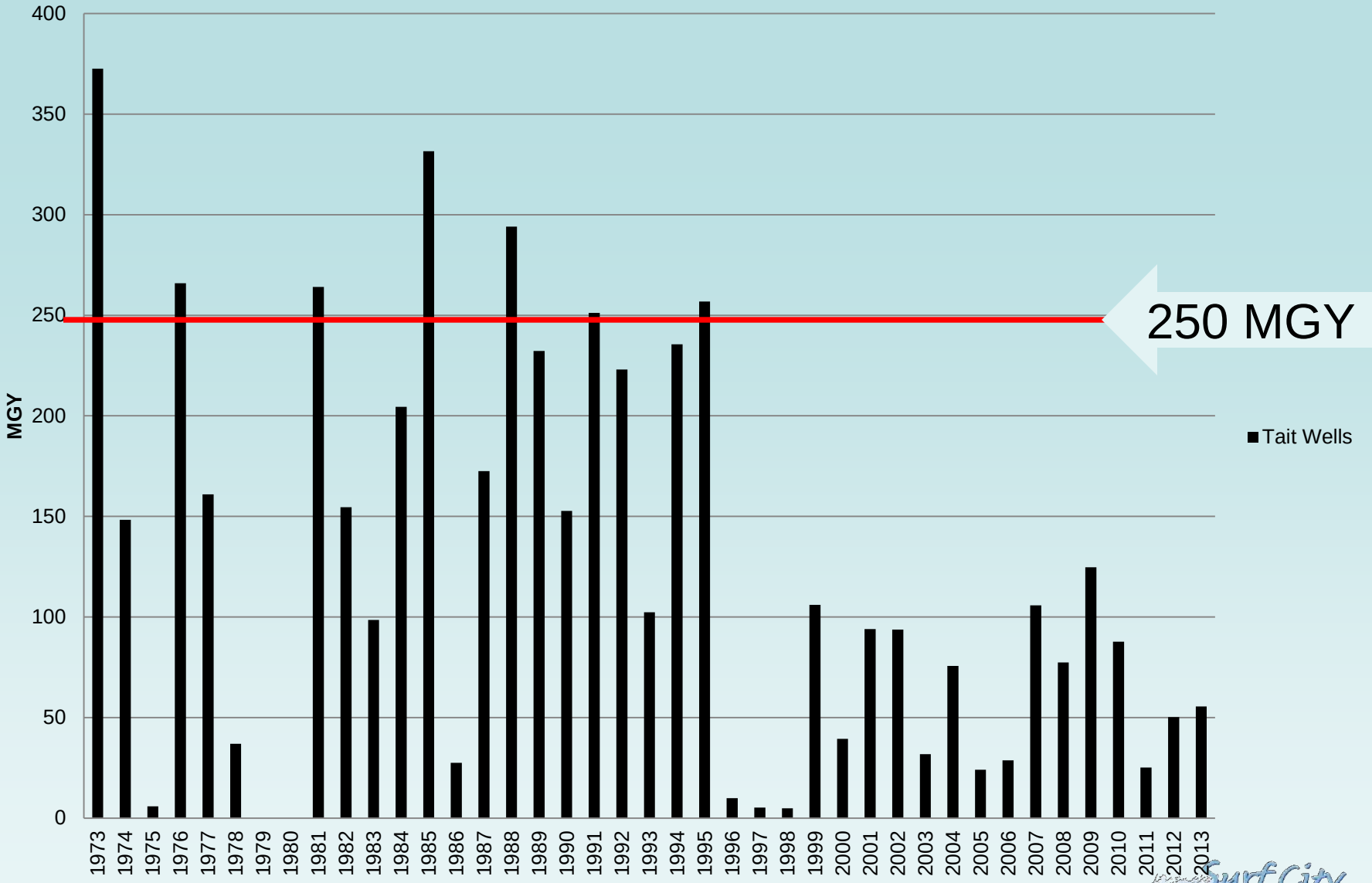
Groundwater Production MGY



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Tait Wells Replacement Project

$1,700,000

(City received a $220,000 Grant)

Phase 1 – Drill Wells

Completed June 2016

Phase 2 – Pump Stations

Will Finish January 2017

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Alluvial Aquifer Cuttings

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Installation of
14-inch stainless
column piping,
Well 3B,
June 2016

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Well 1B-Station Piping-October 2016

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Newell Creek Dam Inlet/Outlet Pipeline

Isidro Rivera, P.E.

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Water For Our Future

NCD I/O Pipeline

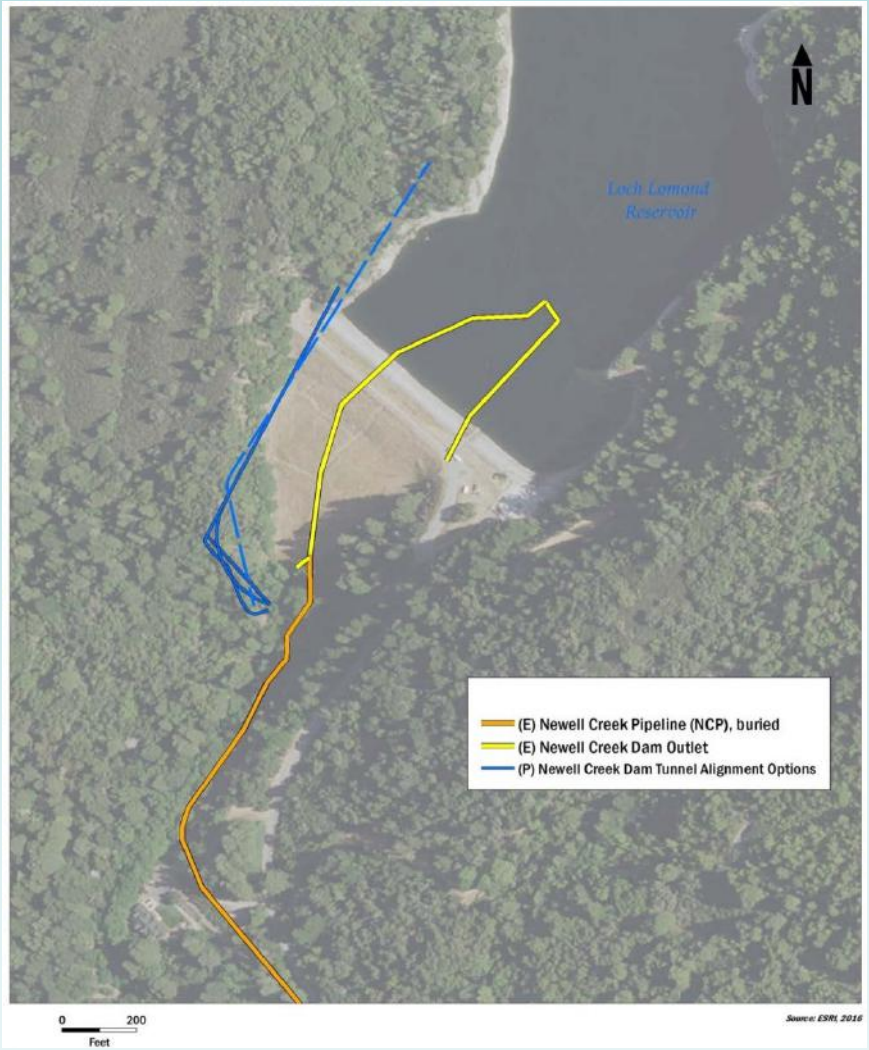
History

Date	Action
August 2012	During DSOD Inspection , the 24-inch emergency release valve was found to be stuck in the partially open partially closed position.
November 2013	DSOD required the City to provide an evaluation of the condition of the inlet/outlet pipeline and a plan of how NCD would meet emergency drawdown requirements without a fully functioning emergency release valve.
September 2014	The City submitted pipeline inspection and interim dewatering plan to DSOD
October 2014	DSOD accepted inspection and interim dewatering plan
February/March 2015	City unsuccessfully attempts to repair the 24-inch emergency release valve
April 2015	City submits status update on Interim Dewatering Plan to DSOD and requests that NCD be operated under the interim dewatering plan for 5 years
June 2015	City performs ROV inspection of pipeline (only 711 of roughly 1600 feet are inspected); inspection showed that the conduit deteriorating
June 2015	DSOD accepted the City's request to operate NCD under the proposed interim dewatering plan and required the City provide a long term strategy to address the outlet deficiencies (conduit deterioration and valve operation) within 5 years.

NCD I/O Pipeline

Project Goal

The goal of this project is to address the Newell Creek Dam outlet deficiencies to meet DSOD requirements and prevent a water supply emergency for the City while minimizing overall cost and maximizing the life of the asset.



Long Term Project Schedule

Task	DSOD Due Date
DSOD Application & Fee with 10% Design	mid-2017
50% Design	late-2017
100% Design	early-2019
Begin Construction	mid-2019
Complete Construction	mid-2021

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NCD I/O Pipeline: Rehabilitation/Replacement

Potential Alternatives To Address Deficiencies

1. Rehabilitation*
   - Pipe Lining (Sliplining, cured in place pipe)
   - Dewater Outlet Structure to repair conduit deterioration and replace 24-inch valve

2. Replacement
   - Microtunnel
   - Conventional Tunnel

* Rehabilitation option has been postponed until replacement design is developed further. To properly compare the two options we need more information about the replacement alternative in terms of actual schedule and cost. There is also a question about the feasibility of the rehabilitation alternative.

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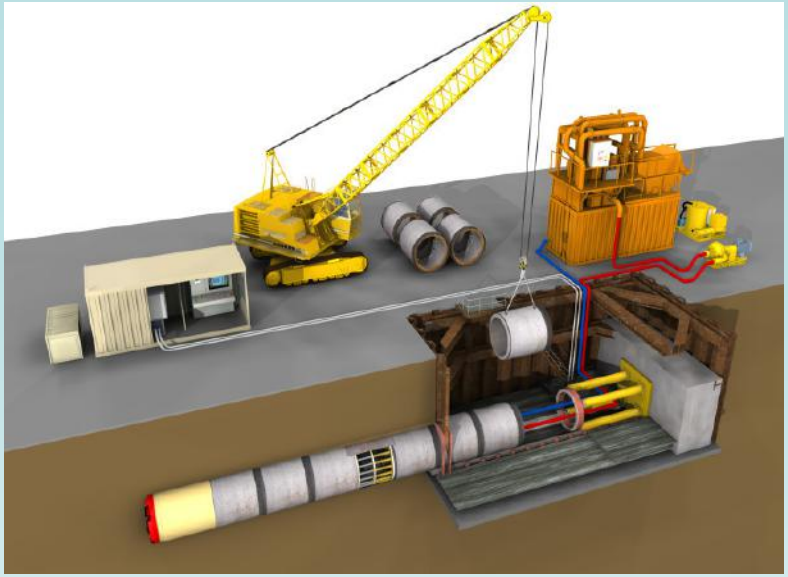
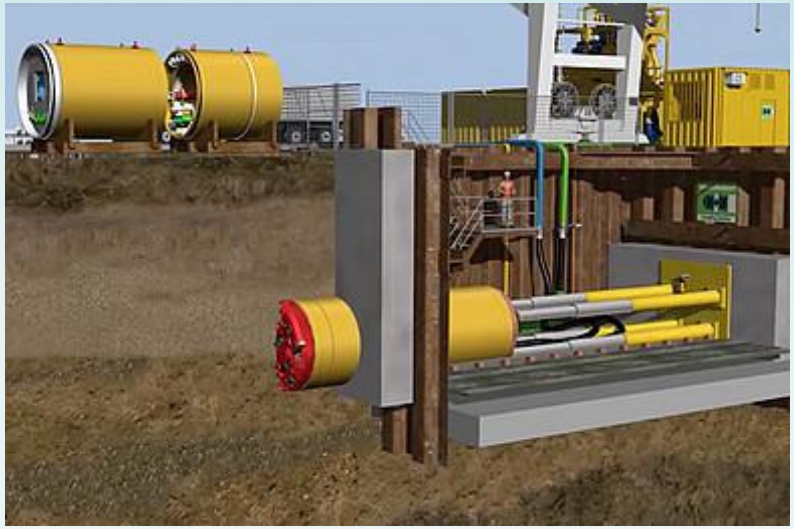
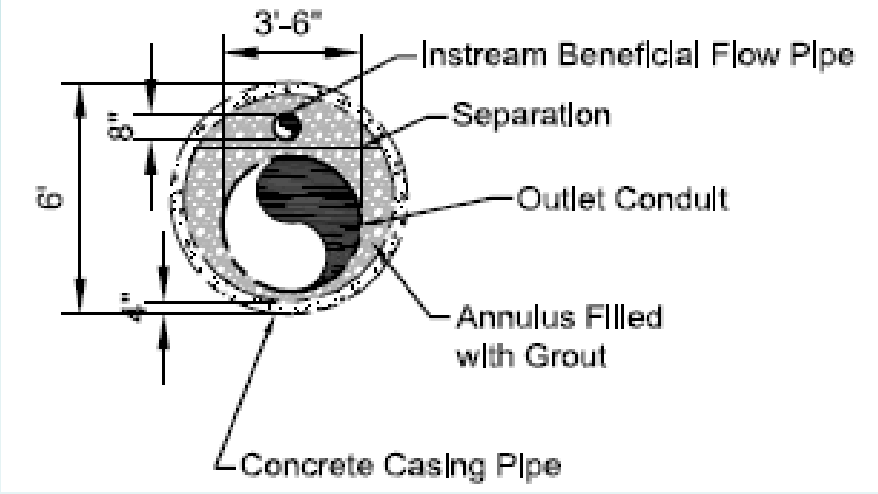
NCD I/O Pipeline: Replacement Option

Microtunnel Excavation







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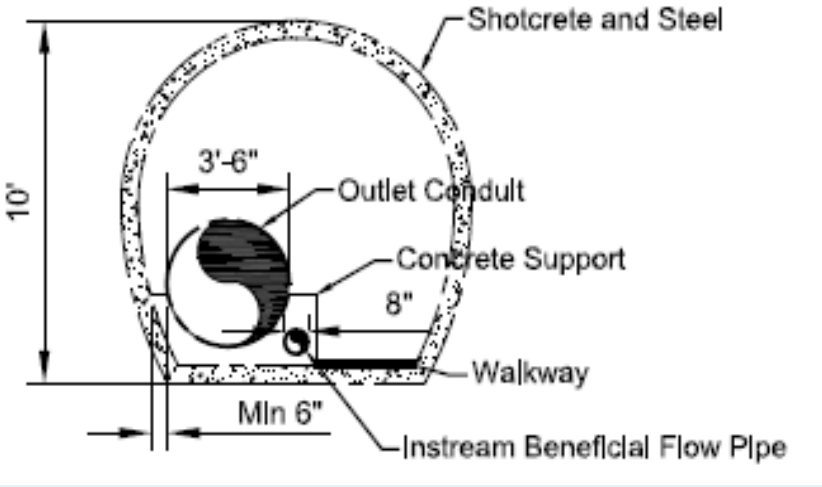
NCD I/O Pipeline: Replacement Option

Conventional Tunnel Excavation



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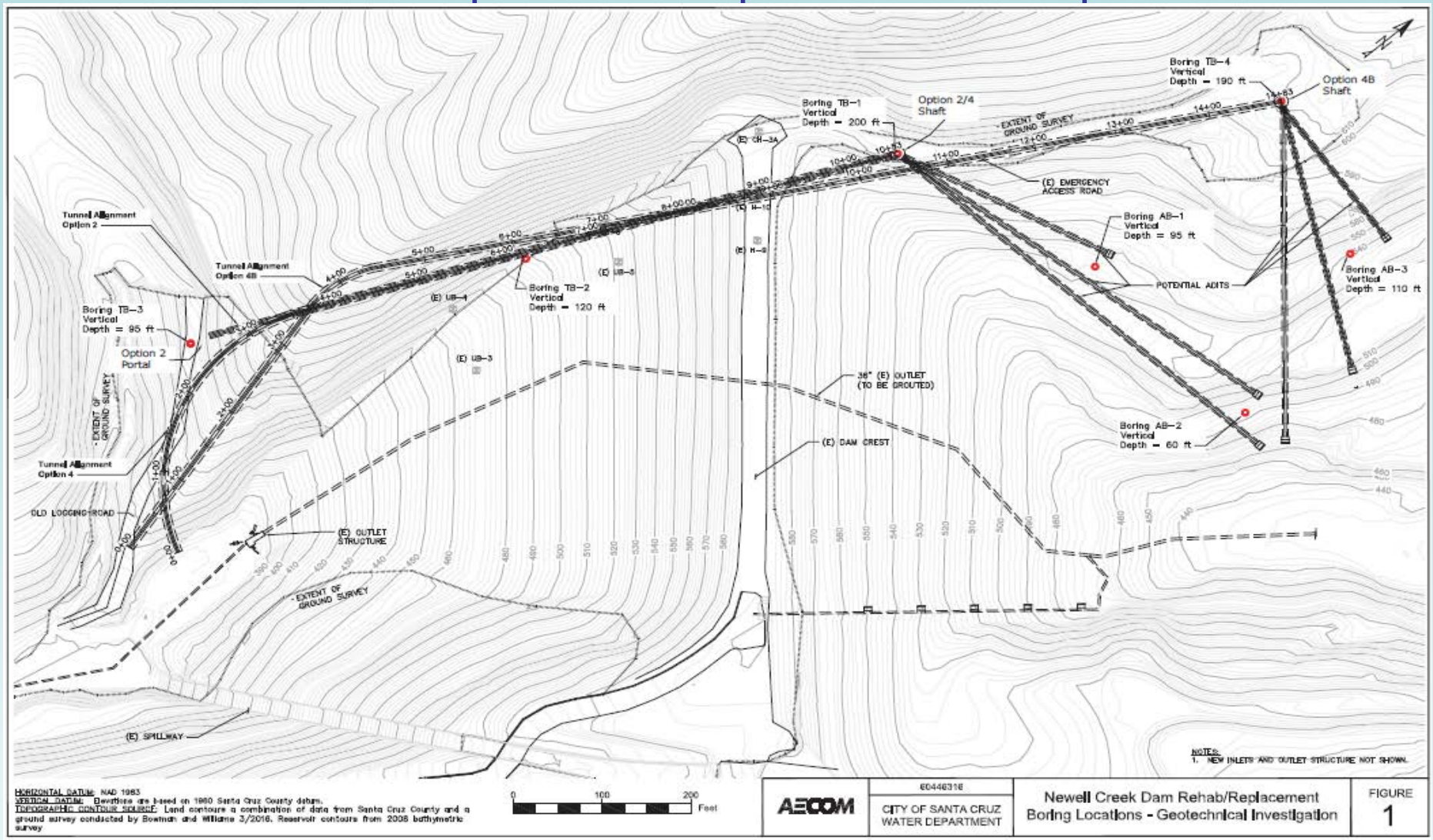
NCD I/O Pipeline: Replacement Options



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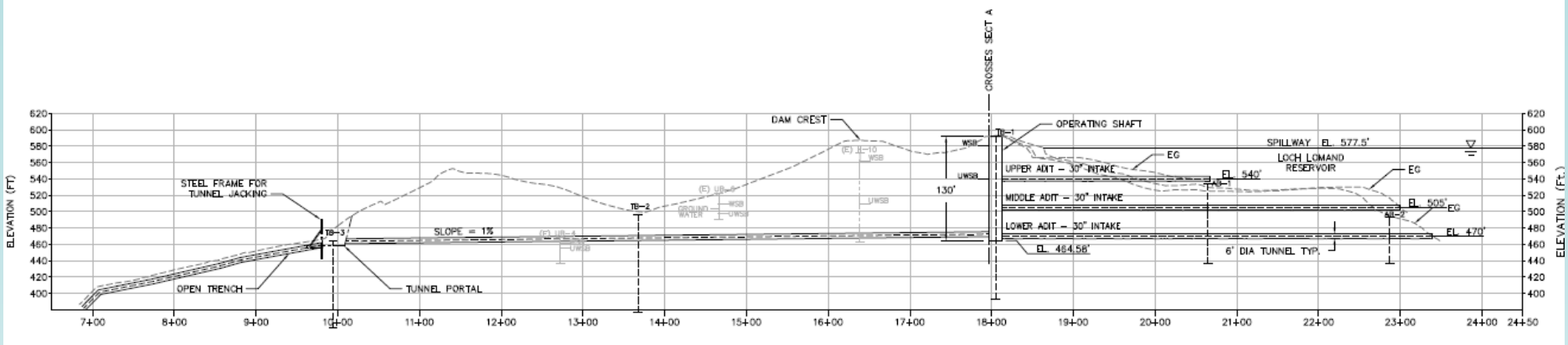
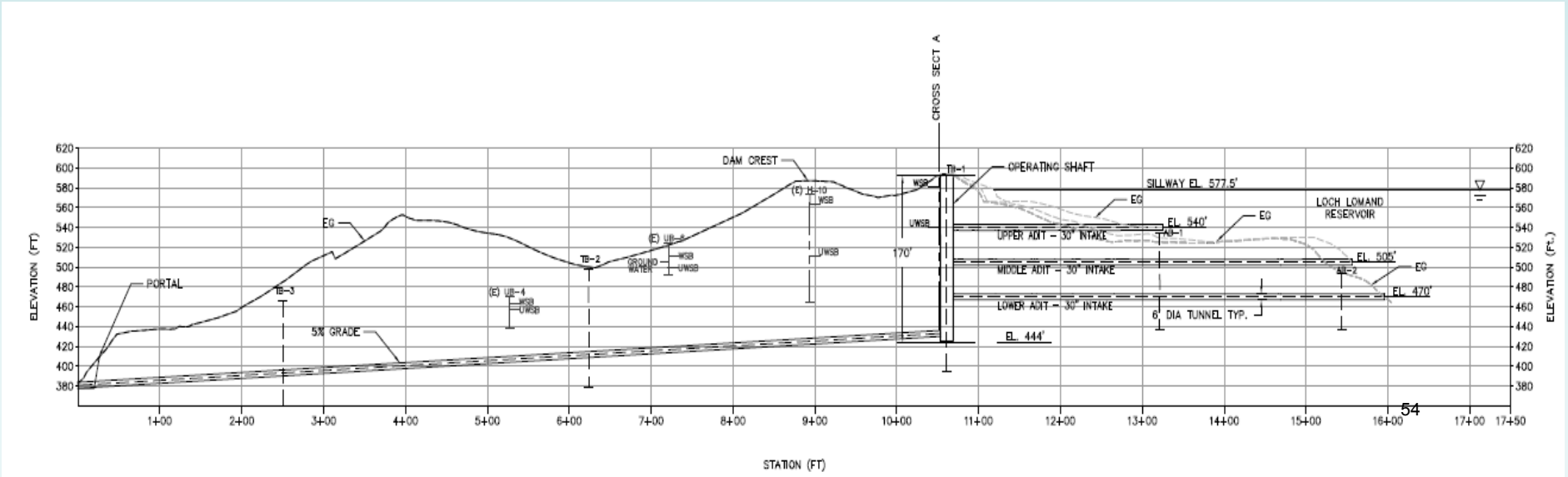
NCD I/O Pipeline: Replacement Option

Tunnel Alignment Options

Microtunnel



Conventional Tunnel



NCD I/O Pipeline: Replacement Option

Replacement Tunnel Order of Magnitude Cost Estimate

Item	Description	Option 1 Rounded Cost		Option 2 Rounded Cost		Option 3 Rounded Cost		Option 4 Rounded Cost	
		Dry Install	Wet Install	Dry Install	Wet Install	Dry Install	Wet Install	Dry Install	Wet Install
1	Outlet Tunnel (72" dia. and 1500' long) Excaved via microtunnel and 42" Pipe	4,500,000	4,500,000	-----	-----	-----	-----	-----	-----
1	Outlet Tunnel (72" dia. and 800' long) Excaved via microtunnel and 42" Pipe	-----	-----	2,100,000	2,100,000	-----	-----	-----	-----
1	Outlet Tunnel (72" dia. and 915' long) Excaved via microtunnel and 42" Pipe	-----	-----	-----	-----	2,400,000	2,400,000	-----	-----
1	Outlet Tunnel (120" dia. and 1100' long) Excaved with roadheader and 42" Pipe	-----	-----	-----	-----	-----	-----	6,400,000	6,400,000
2	Inlet Adit - Upper 72 in dia microtunnel/30 in pipe	600,000	1,100,000	700,000	1,400,000	700,000	1,400,000	700,000	1,400,000
3	Inlet Adit - Middle 72 in dia microtunnel/30 in pipe	900,000	1,700,000	1,300,000	2,600,000	1,300,000	2,600,000	1,300,000	2,600,000
4	Inlet Adit - Lower 72 in dia microtunnel/30 in pipe	1,100,000	2,100,000	1,400,000	2,800,000	1,400,000	2,800,000	1,400,000	2,800,000
5	Tunnel Portal Construction	600,000	600,000	400,000	400,000	600,000	600,000	400,000	400,000
6	Operating Shaft Construction (16 foot finished dia)	600,000	600,000	500,000	500,000	600,000	600,000	600,000	600,000
7	Shaft Permanent Structure (permanent concrete lining, 1 ft thick)	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
8	Shaft Permanent Structure (piping and misc. metal)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
9	Outlet Structure including valving	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
10	Pipeline Connection from outlet tunnel to NC pipeline 22 in	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
11	Valves - 3 Gate Valves 30 in	300,000	400,000	300,000	400,000	300,000	400,000	300,000	400,000
12	Inlet structure - 3	500,000	600,000	500,000	600,000	500,000	600,000	500,000	600,000
13	Fishscreens - 3	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
14	Abandonment of existing outlet facilities	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
15	Open Trench connection to new outlet structure 42 in pipe	-----	-----	200,000	200,000	-----	-----	-----	-----
	Total	**13,700,000**	**16,200,000**	**12,000,000**	**15,600,000**	**12,400,000**	**16,000,000**	**16,200,000**	**19,800,000**
	Total incl 50% Construction Contingency	**20,550,000**	**24,300,000**	**18,000,000**	**23,400,000**	**18,600,000**	**24,000,000**	**24,300,000**	**29,700,000**
	Total incl 50% Soft Costs	**30,825,000**	**36,450,000**	**27,000,000**	**35,100,000**	**27,900,000**	**36,000,000**	**36,450,000**	**44,550,000**

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NCD I/O Pipeline: Replacement Option

Next Steps

- Complete and evaluate geotech investigation program
- Continue to develop the replacement alternative
  - Advance preferred options depending on geotech investigation findings
- Prepare 10% design
  - Develop recommended inlet arrangement
  - Develop recommended outlet structure arrangement
  - Prepare preliminary construction schedule and cost estimate
- Confirm environmental and permitting requirements; develop detailed scope for CEQA

Questions?

Surf City Saves
Water For Our Future

Newell Creek Dam Inlet/Outlet Pipeline

Isidro Rivera, P.E.

Surf City Saves
Water For Our Future

NCD I/O Pipeline

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NCD I/O Pipeline

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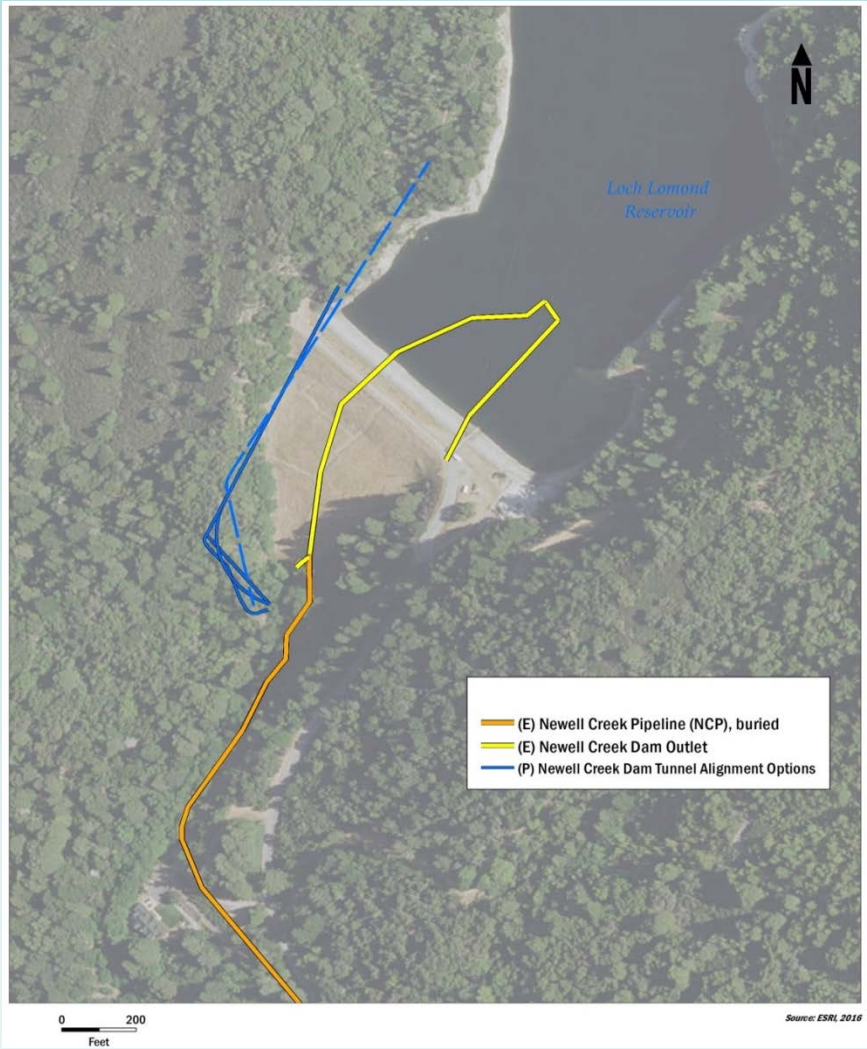

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Water For Our Future

NCD I/O Pipeline: Rehabilitation/Replacement

Potential Alternatives To Address Deficiencies

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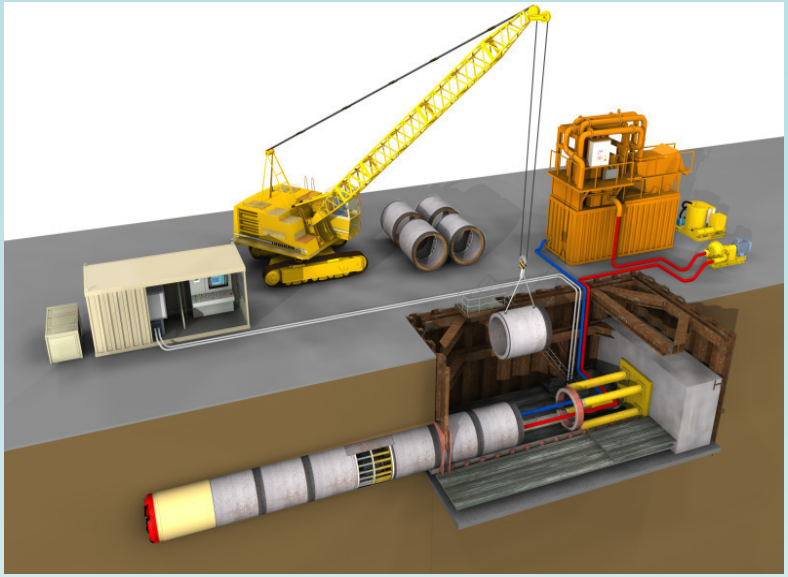
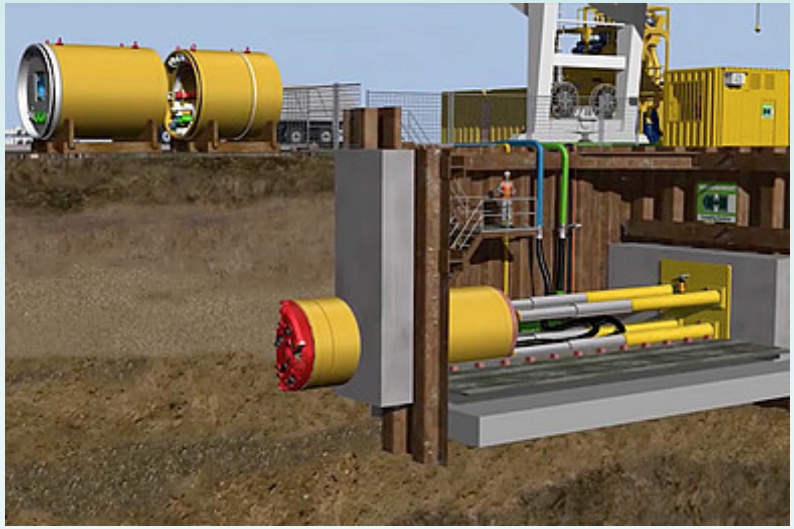
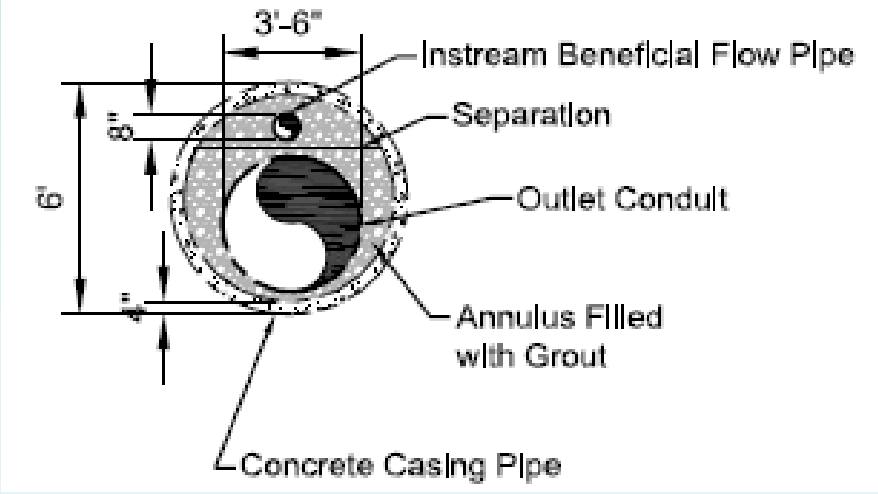
NCD I/O Pipeline: Replacement Option

Microtunnel Excavation







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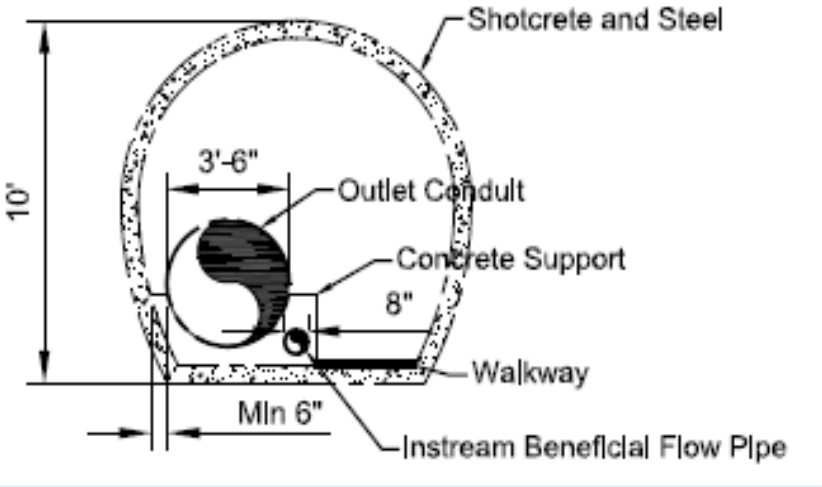
NCD I/O Pipeline: Replacement Option

Conventional Tunnel Excavation



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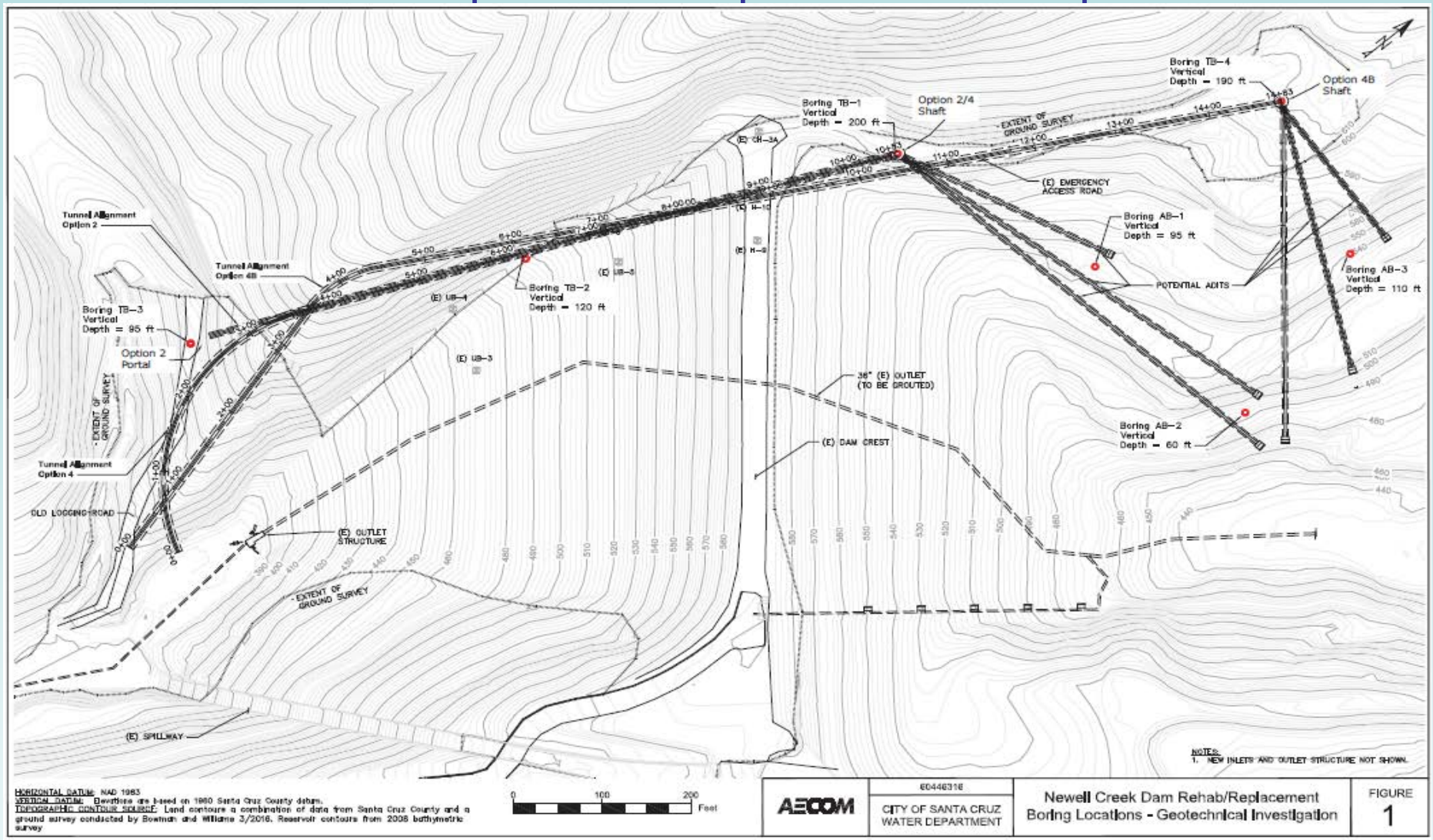
NCD I/O Pipeline: Replacement Options



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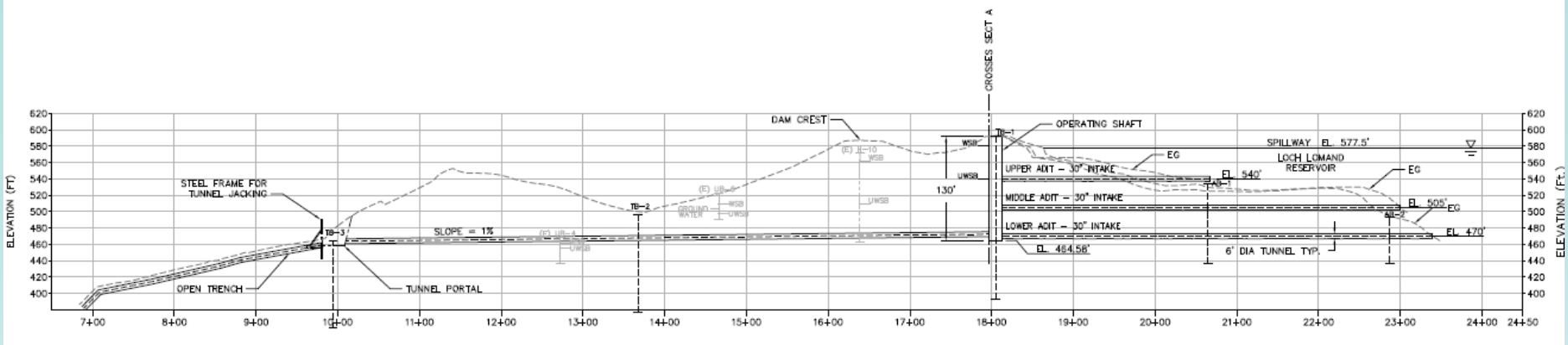
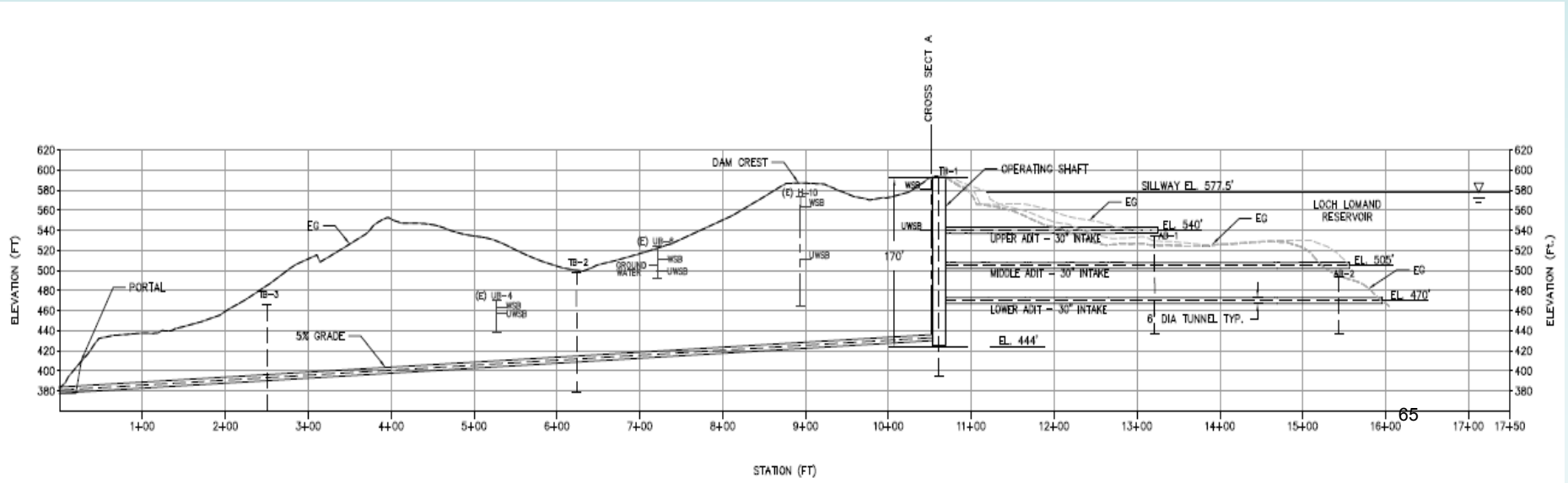
NCD I/O Pipeline: Replacement Option

Tunnel Alignment Options

Microtunnel



Conventional Tunnel



NCD I/O Pipeline: Replacement Option

Replacement Tunnel Order of Magnitude Cost Estimate

Item	Description	Option 1 Rounded Cost		Option 2 Rounded Cost		Option 3 Rounded Cost		Option 4 Rounded Cost	
		Dry Install	Wet Install	Dry Install	Wet Install	Dry Install	Wet Install	Dry Install	Wet Install
1	Outlet Tunnel (72" dia. and 1500' long) Excaved via microtunnel and 42" Pipe	4,500,000	4,500,000	-----	-----	-----	-----	-----	-----
1	Outlet Tunnel (72" dia. and 800' long) Excaved via microtunnel and 42" Pipe	-----	-----	2,100,000	2,100,000	-----	-----	-----	-----
1	Outlet Tunnel (72" dia. and 915' long) Excaved via microtunnel and 42" Pipe	-----	-----	-----	-----	2,400,000	2,400,000	-----	-----
1	Outlet Tunnel (120" dia. and 1100' long) Excaved with roadheader and 42" Pipe	-----	-----	-----	-----	-----	-----	6,400,000	6,400,000
2	Inlet Adit - Upper 72 in dia microtunnel/30 in pipe	600,000	1,100,000	700,000	1,400,000	700,000	1,400,000	700,000	1,400,000
3	Inlet Adit - Middle 72 in dia microtunnel/30 in pipe	900,000	1,700,000	1,300,000	2,600,000	1,300,000	2,600,000	1,300,000	2,600,000
4	Inlet Adit - Lower 72 in dia microtunnel/30 in pipe	1,100,000	2,100,000	1,400,000	2,800,000	1,400,000	2,800,000	1,400,000	2,800,000
5	Tunnel Portal Construction	600,000	600,000	400,000	400,000	600,000	600,000	400,000	400,000
6	Operating Shaft Construction (16 foot finished dia)	600,000	600,000	500,000	500,000	600,000	600,000	600,000	600,000
7	Shaft Permanent Structure (permanent concrete lining, 1 ft thick)	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
8	Shaft Permanent Structure (piping and misc. metal)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
9	Outlet Structure including valving	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
10	Pipeline Connection from outlet tunnel to NC pipeline 22 in	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
11	Valves - 3 Gate Valves 30 in	300,000	400,000	300,000	400,000	300,000	400,000	300,000	400,000
12	Inlet structure - 3	500,000	600,000	500,000	600,000	500,000	600,000	500,000	600,000
13	Fishscreens - 3	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
14	Abandonment of existing outlet facilities	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
15	Open Trench connection to new outlet structure 42 in pipe	-----	-----	200,000	200,000	-----	-----	-----	-----
	Total	**13,700,000**	**16,200,000**	**12,000,000**	**15,600,000**	**12,400,000**	**16,000,000**	**16,200,000**	**19,800,000**
	Total incl 50% Construction Contingency	**20,550,000**	**24,300,000**	**18,000,000**	**23,400,000**	**18,600,000**	**24,000,000**	**24,300,000**	**29,700,000**
	Total incl 50% Soft Costs	**30,825,000**	**36,450,000**	**27,000,000**	**35,100,000**	**27,900,000**	**36,000,000**	**36,450,000**	**44,550,000**

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NCD I/O Pipeline: Replacement Option

Next Steps

- Complete and evaluate geotech investigation program
- Continue to develop the replacement alternative
  - Advance preferred options depending on geotech investigation findings
- Prepare 10% design
  - Develop recommended inlet arrangement
  - Develop recommended outlet structure arrangement
  - Prepare preliminary construction schedule and cost estimate
- Confirm environmental and permitting requirements; develop detailed scope for CEQA

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Questions?

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Attachment B

Felton Diversion Rubber Bladder Replacement

Matt Zeman

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Felton Diversion

Current rubber bladder installed 1985

Fourteen patches from falling rock damage, gunfire, impacts from floating debris

Rubber degrades and is becoming more brittle…it's reached end-of-life

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Felton Diversion

Replace bladder late summer 2017

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Graham Hill Water Treatment Plant
Flocculation / Sedimentation Basins

Matt Zeman

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Flocculation / Sedimentation basins

Purpose is to mix pre-treatment chemicals to reduce turbidity and remove suspended particles from incoming raw water

Maintenance demands are becoming high on this aging equipment as its reliability decreases

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Flocculation / Sedimentation basins

Valve actuation stems are old and distort when operated

Flocculator drive shaft are warped and prematurely wear out bearings, causing some shafts to break apart

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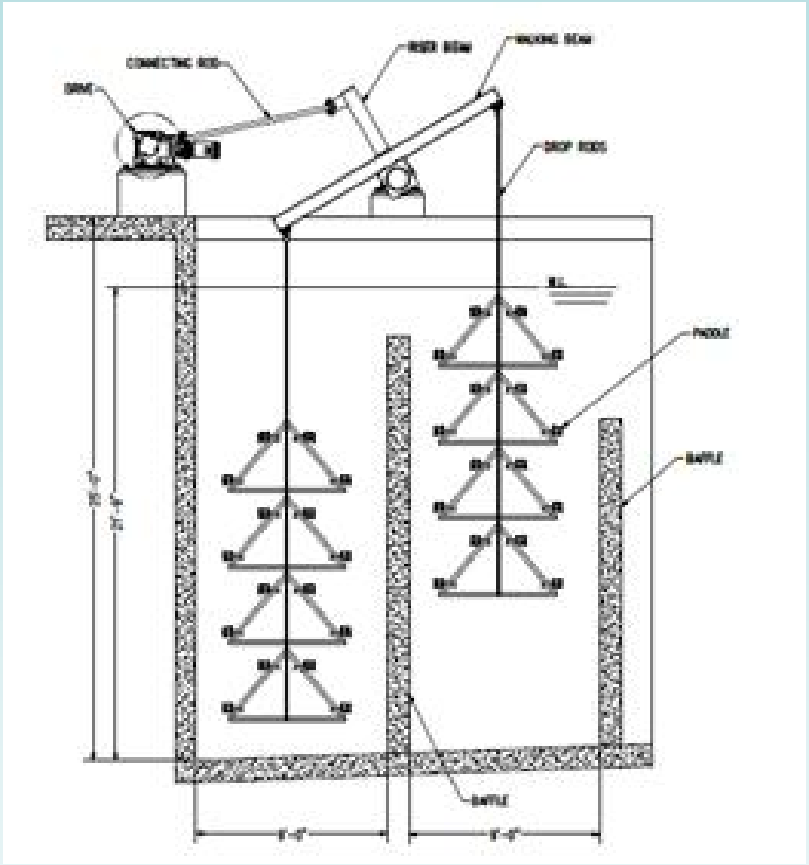
Flocculation / Sedimentation basins

Investigate process upgrades that could relocate the working parts above the waterline



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Flocculation / Sedimentation basins

Basin integrity is a critical part of the treatment process

Basin walls are in rough shape with exposed aggregate and cracks

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Flocculation / Sedimentation basins

Tube settlers at the end of the sedimentation process are at the end-of-life and break off in potato chip-like pieces, clogging the sludge removal equipment and downstream meter

Investigate whether to replace in-kind or if there's a benefit to an upgraded alternative

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Graham Hill Water Treatment Plant Filter Rehabilitation and Upgrades

Matt Zeman

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GHWTP Filter Rehabilitation and Upgrades

PROJECT PURPOSE

1. Improve filter performance
2. Address backwash issues
3. Piping improvements (address air-binding and corrosion issues)
4. Add seismic reinforcing and new coatings

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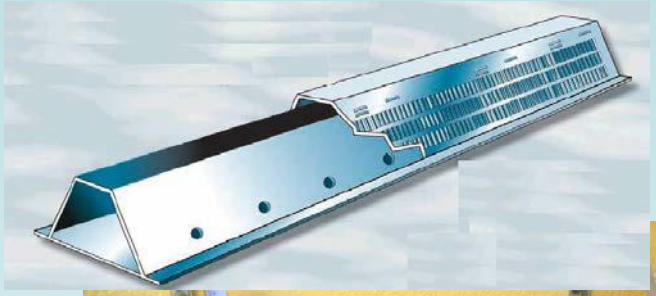
Improve Performance (Replace Underdrains)

Existing

Clay Tile Underdrain

NEW

Stainless Steel Folded Plate Underdrain



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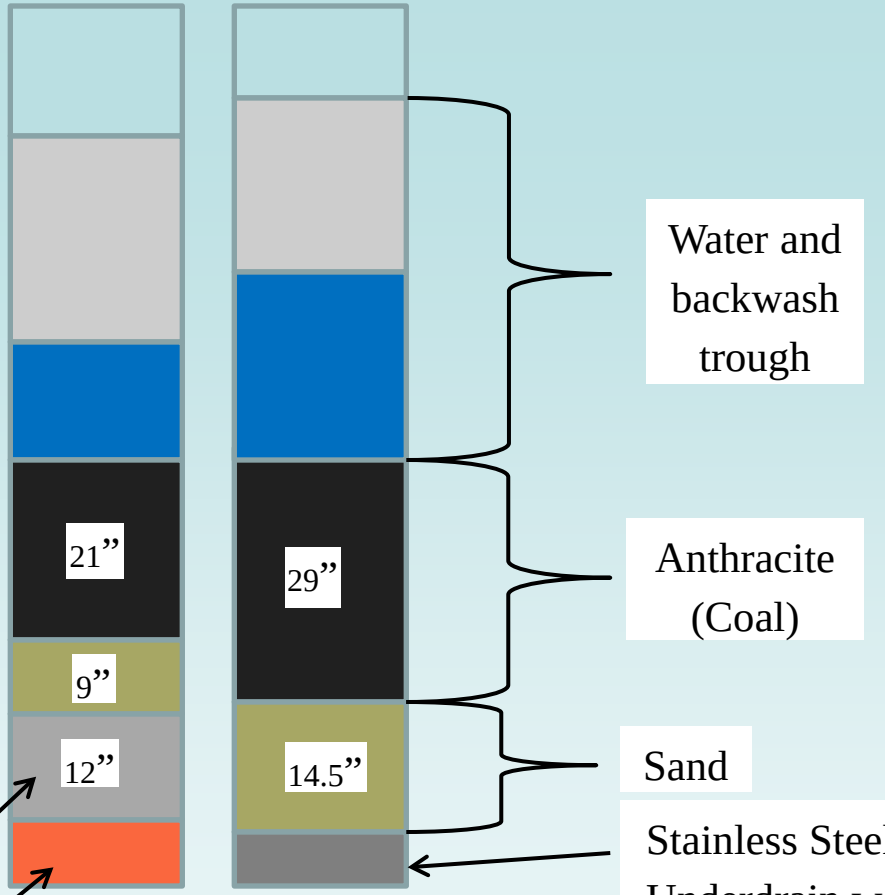
Improve Performance (Media Replacement)



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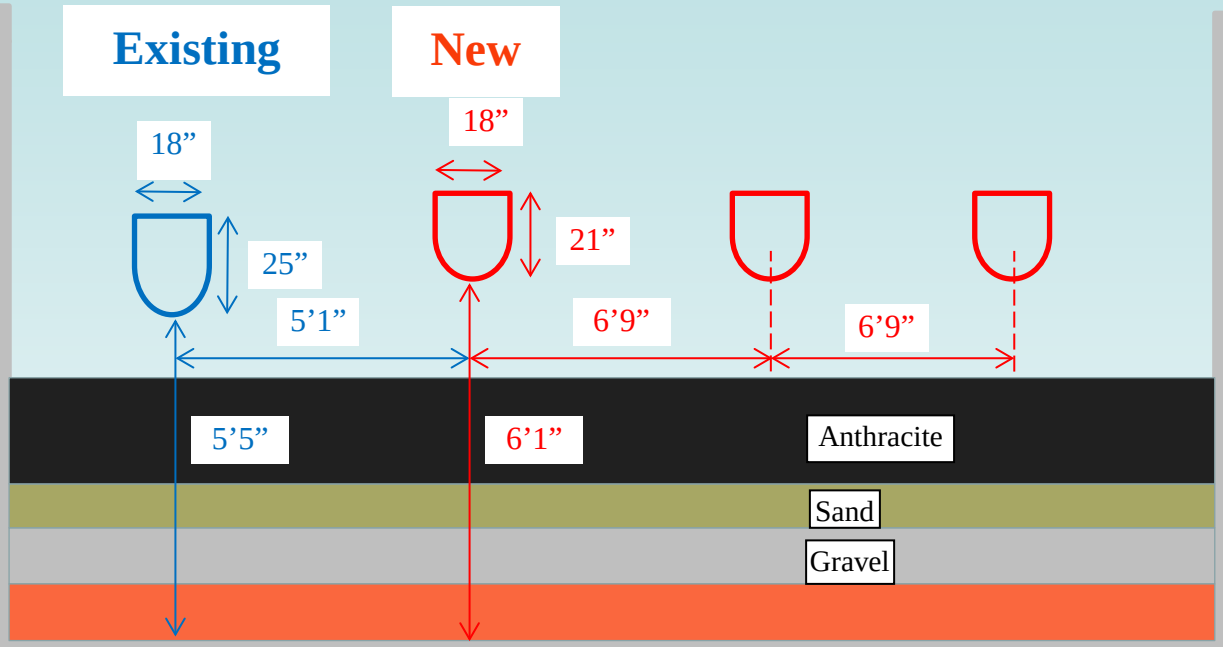
Address Backwash Issues

1. Make Washwater Trough Improvements
2. Add Polymer System to Backwash Water

Correct Horizontal trough spacing to provide uniform backwash rates



Shorten trough depth and move vertically to allow for more media depth

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Filter construction

From this:

Demolish tile underdrains

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Filter construction

Contain the entire filter

Sandblast walls and repair cracks

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Filter construction

Paint!

Watch it dry…

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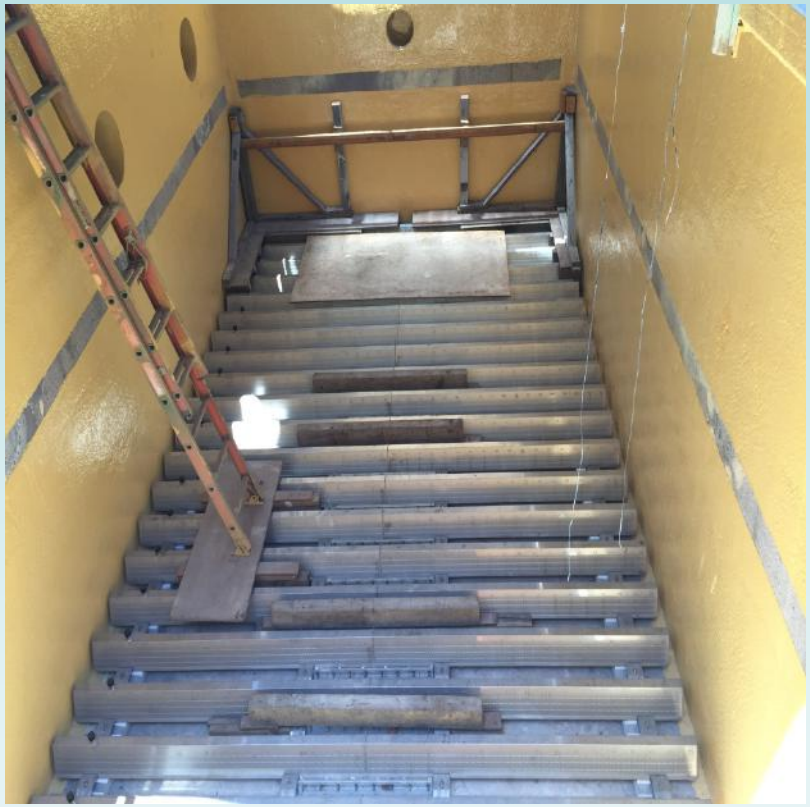
Filter construction



Install stainless underdrains

Install structural seismic reinforcement

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Filter construction

Underdrains + structural braces + washwater troughs then gravel, sand and anthracite

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Filter construction

To this!

Disinfect the filter and start making clean water

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Polymer system addition

Since the plant has no filter to waste capability, polymer can now be injected directly into the backwash water stream to mitigate high turbidity in the filtered water after backwashing

New grate at polymer injection quill should help avoid future backwash pipe corrosion

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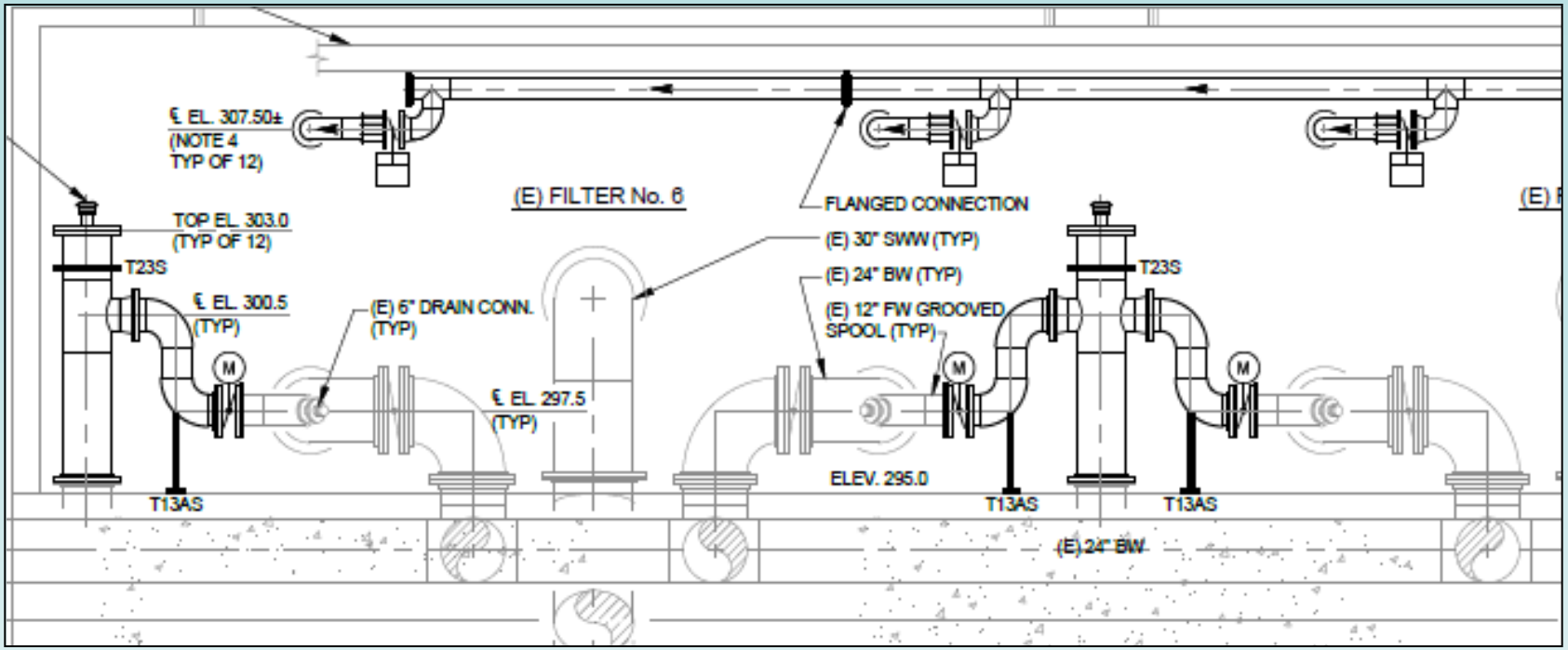
Piping Improvements



Address Air-binding issues by installing standpipes and create a vented discharge that raises the Hydraulic Grade Line to eliminate vacuum condition in filtered water pipe

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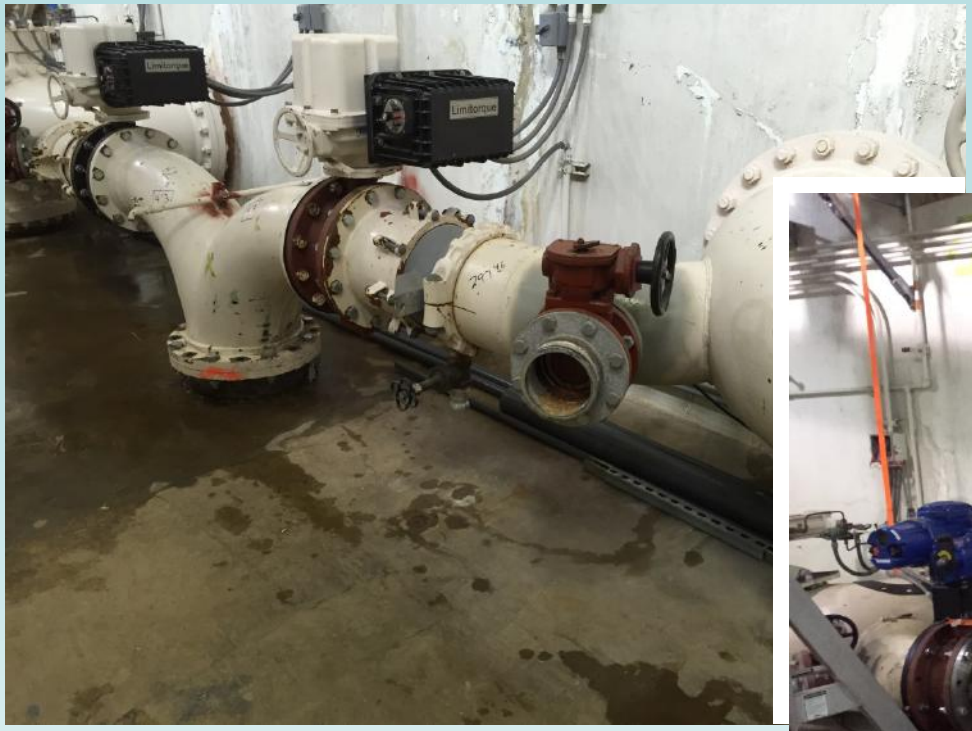
Piping Improvements



Old effluent pipe layout

New effluent standpipes

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Piping Improvements

Updated Filter Gallery…still awaiting new paint

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Concrete Tanks at the GHWTP

Kalen Dodd, P.E.

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Design Criteria

Pre-stressed Concrete Tank	Design Earthquake	Performance Standard	Loss of Contents	Importance Factor, I
Filtered Water Tank (FWT)	2,500 yr	Immediate Service	No Loss of Contents	1.5
Wash Water Reclamation Tank (WWRT)	500 yr	30-Day Repair	No Loss of Contents	1.25
Sludge Storage Tank (SST)	500 yr	30-Day Repair	No Loss of Contents	1.25
Wash Water Storage Tank (WWST)	2,500 yr	Immediate Service	No Loss of Contents	1.5

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Seismic Performance

Prestressed Concrete Tank	H_W	H_L	Approx. Capacity, MG	Max Seismic Resistance Force of Tank	Seismic Importance Factor (I_E)	Total Hoop Force in Seismic Event	Factor of Safety
Filtered Water Tank	32'	30'	1.0	87,802	1.25	129,953	0.67
		30'	1.0		1.50	141,897	0.61
		18'	0.6		1.25	91,160	0.96
		15'	0.5		1.50	91,159	0.96
Wash Water Reclamation Tank	24'-7"	22'	0.83	70,242	1.25	101,869	0.68
		22'	0.83		1.50	111,668	0.62
		14'	0.46		1.25	70,894	0.99
		12'	0.4		1.50	71,852	0.98
Sludge Storage Tank	24'-7"	22'	0.83	70,242	1.25	101,869	0.68
		22'	0.83		1.50	111,668	0.62
		14'	0.46		1.25	70,894	0.99
		12'	0.4		1.50	71,852	0.98
Wash Water Storage Tank	17'-2"	15'	0.51	50,173	1.25	67,973	0.73
		15'	0.51		1.50	74,427	0.67
		10'	0.33		1.25	50,410	0.99
		9'	0.3		1.50	52,343	0.96

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Recommendation

Pre-stressed Concrete Tank	Structural Risks in Design Earthquake and Tank Full	Estimated Remaining Life	Recommendation for Rehabilitation
Filtered Water Tank (FWT)	Possible Failure and Loss of Contents	<10 yrs	Major Rehabilitation or Replacement
Wash Water Reclamation Tank (WWRT)	Possible Failure and Loss of Contents	<10 yrs	Major Rehabilitation or Replacement
Sludge Storage Tank (SST)	Possible Failure and Loss of Contents	< 5 yrs	Major Rehabilitation or Replacement
Wash Water Storage Tank (WWST)	Possible Failure and Loss of Contents	<10 to 15 yrs	Major Rehabilitation or Replacement

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Water Resources Management Building

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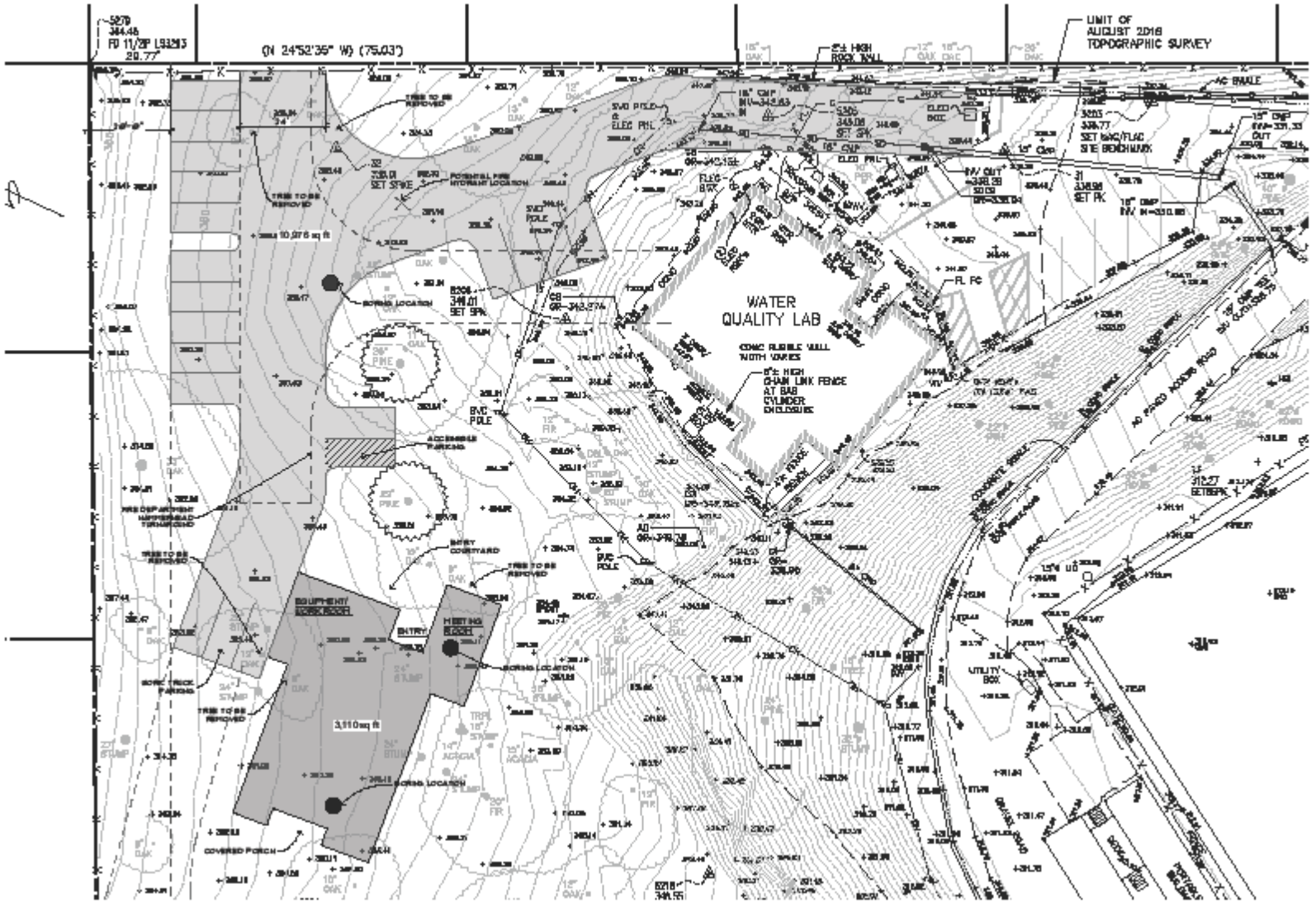

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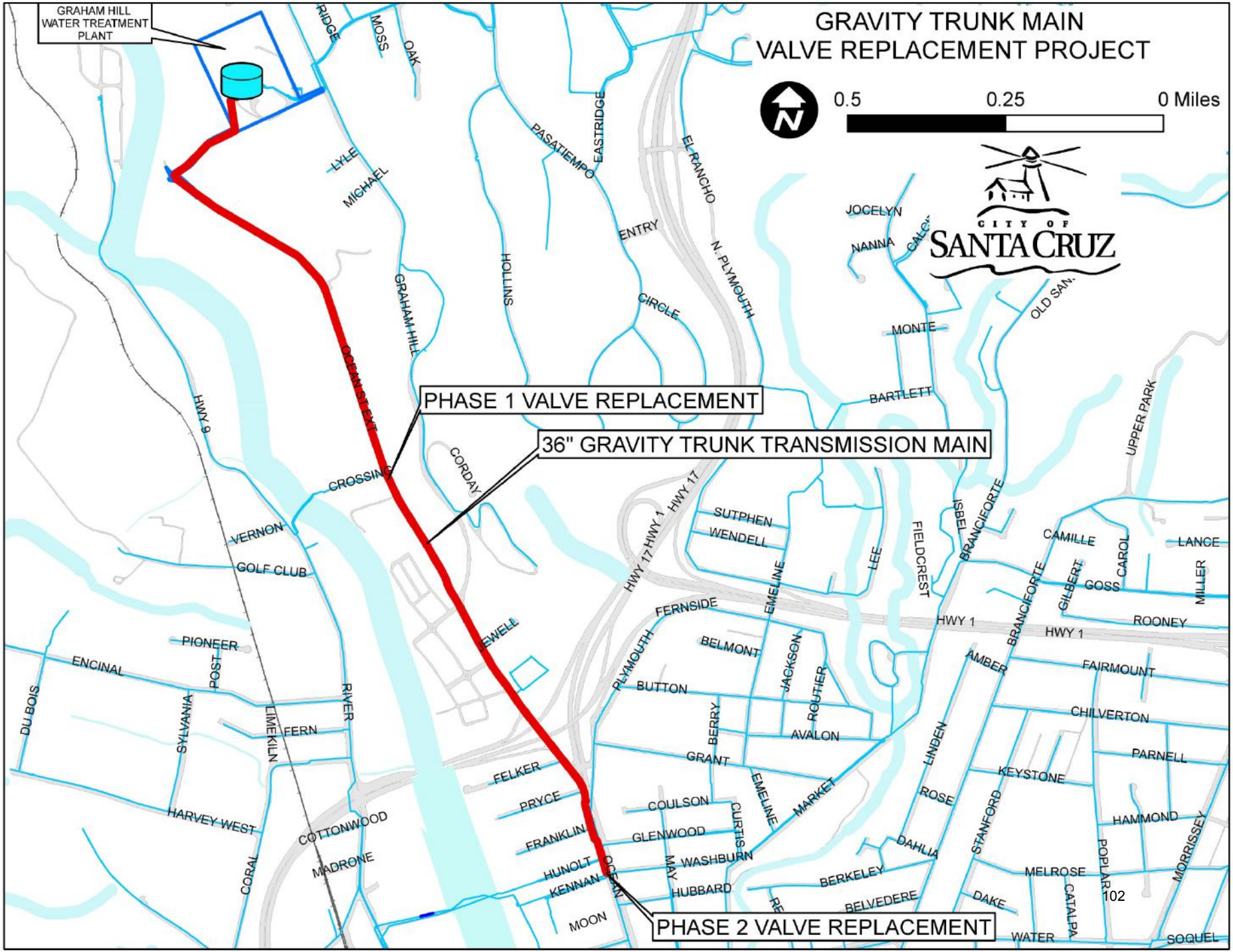
Trunk Transmission Main Inspection and Condition Assessment Project

Doug Valby, P.E.


GRAHAM HILL WATER TREATMENT PLANT
GRAVITY TRUNK MAIN VALVE REPLACEMENT PROJECT
0.5
0.25
0 Miles
CITY OF SANTA CRUZ
PHASE 1 VALVE REPLACEMENT
36" GRAVITY TRUNK TRANSMISSION MAIN
PHASE 2 VALVE REPLACEMENT
RIDGE
MOSS
OAK
LYLE
MICHAEL
PASATIEMPO
EASTRIDGE
EL RANCHO
ENTRY
HOLLINS
N. PLYMOUTH
CIRCLE
GRAHAM HILL
OCEAN ST EXT
JOCELYN
NANNA
OLD SAN.
MONTE
BARTLETT
UPPER PARK
HWY 9
CROSSING
CORDAY
VERNON
GOLF CLUB
HWY 17
HWY 1
SUTPHEN
WENDELL
LEE
FIELDCREST
ISBEL
BRANCIFORTE
CAMILLE
CAROL
LANCE
GILBERT
GOSS
MILLER
ROONEY
FERNSIDE
EMELINE
PLYMOUTH
BELMONT
JACKSON
ROUTIER
BUTTON
AMBER
FAIRMOUNT
CHILVERTON
PARNELL
KEYSTONE
HAMMOND
MORRISSEY
POPLAR
CATALPA
SOQUEL
WATER
DAKE
MELROSE
BERKELEY
BELVEDERE
DAHLIA
STANFORD
LINDEN
ROSE
MARKET
CURTIS
BERRY
AVALON
GRANT
COULSON
GLENWOOD
WASHBURN
HUBBARD
MAY
OCEAN
HUNOLT
KENNAN
MOON
FELKER
PRYCE
FRANKLIN
PIONEER
ENCINAL
POST
DU BOIS
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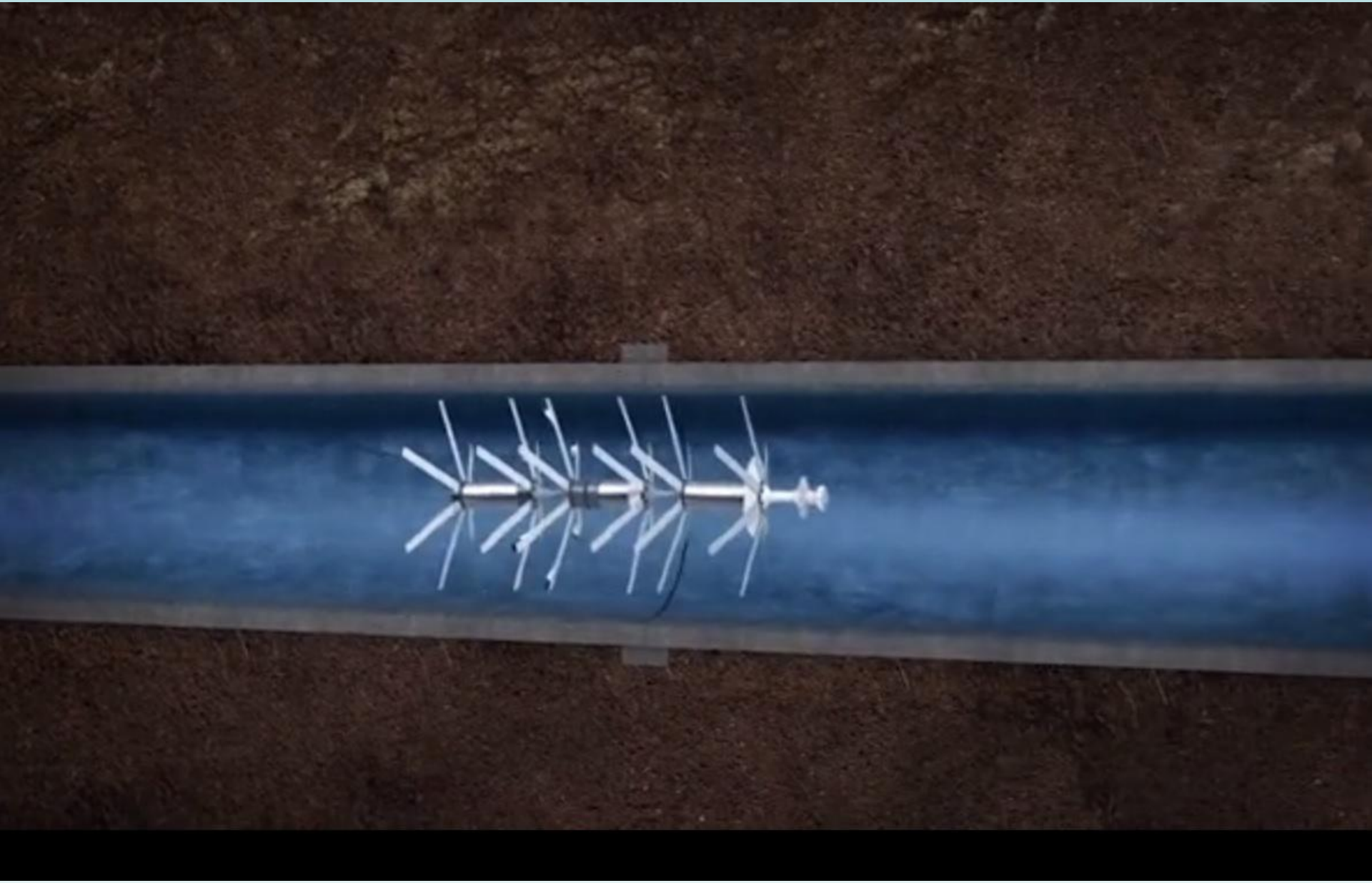
FERN
RIVER
HARVEY WEST
CORAL
COTTONWOOD
MADRONE
LEWELL



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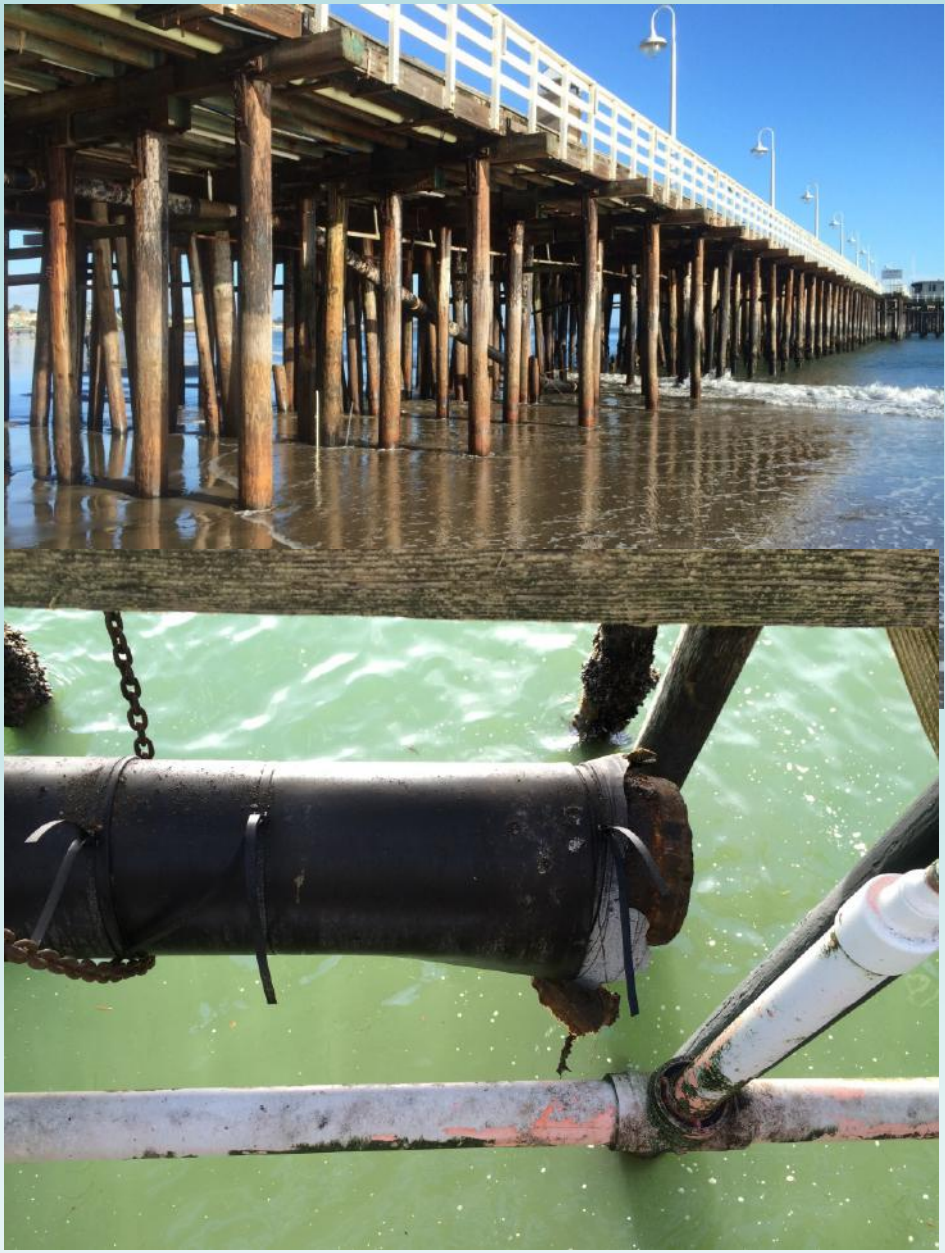

Santa Cruz Wharf Emergency Water Main Replacement Project

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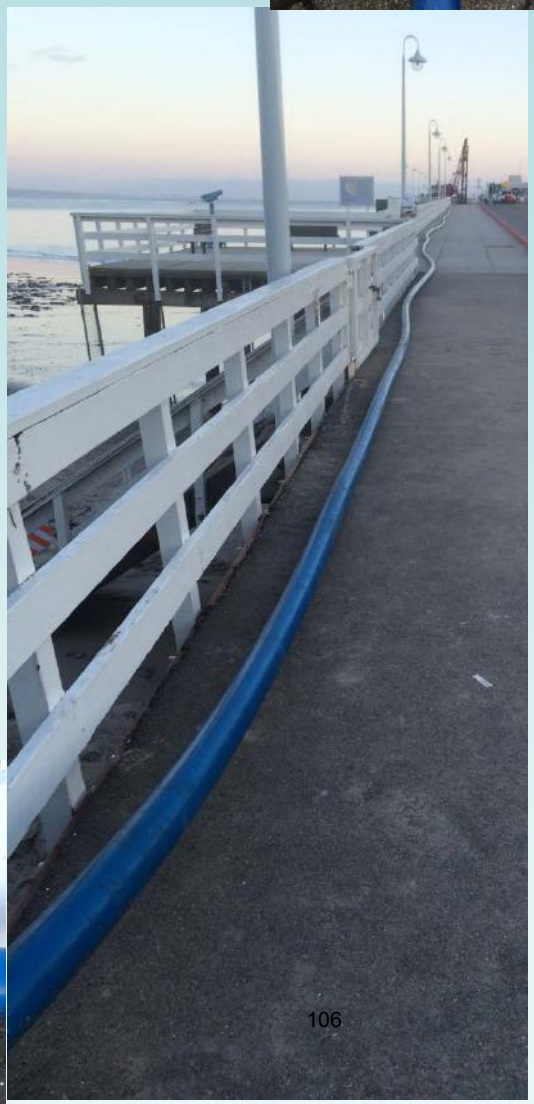


CAT
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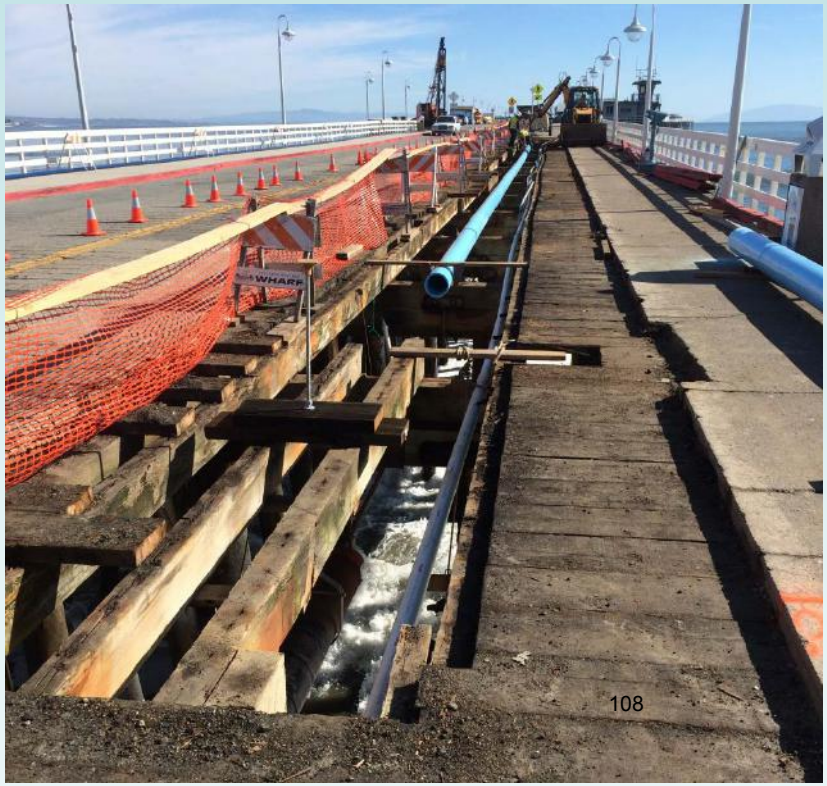
McELROY


WHARF

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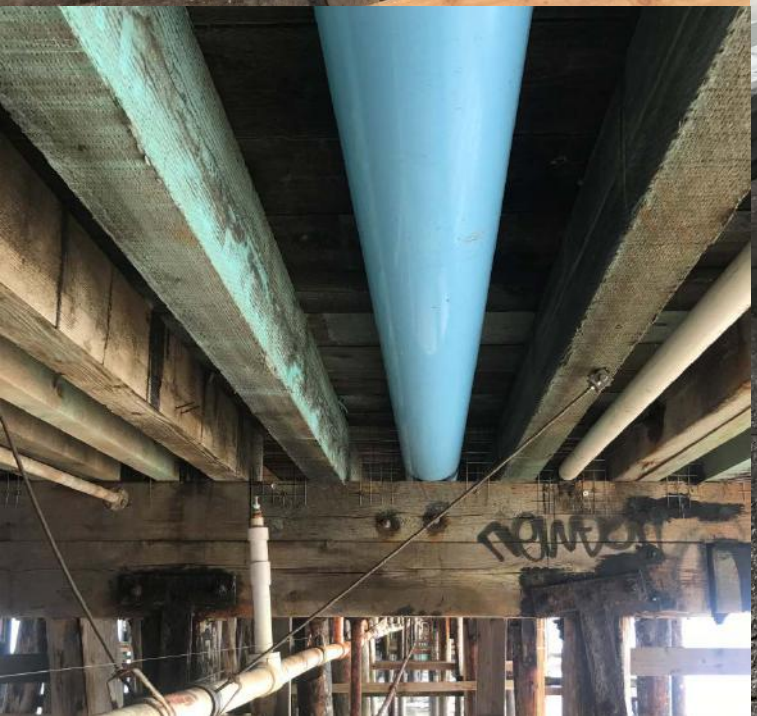
WHARF



Bay Street Reservoir Replacement Project

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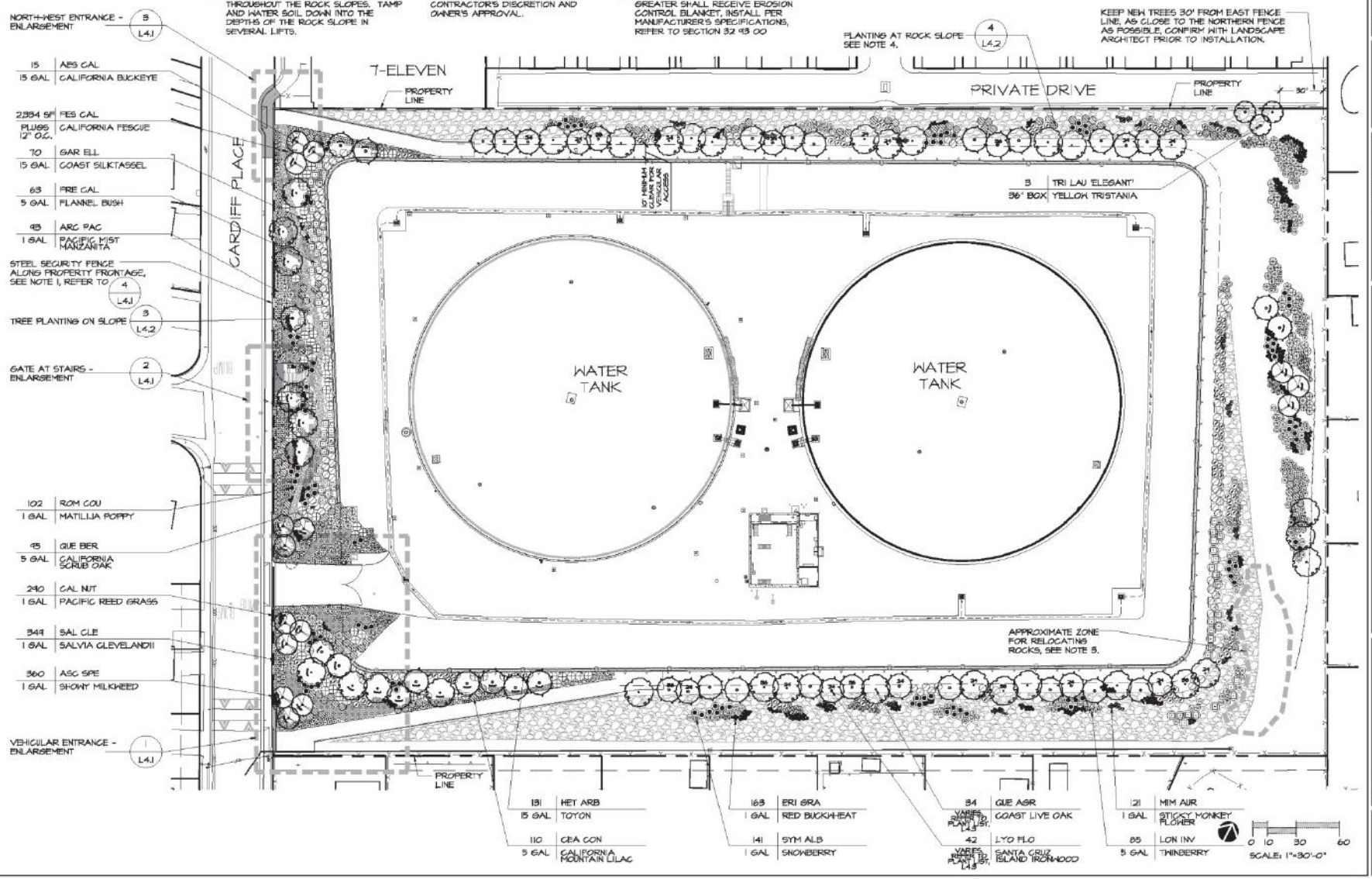
NOTES:

1. CONTRACTOR TO FIELD MEASURE DIMENSIONS OF NEW GATES AND FENCING. CONFIRM EXTENT OF FENCING WITH OWNER'S REPRESENTATIVE PRIOR TO PURCHASE AND INSTALLATION.
2. EXCESS SOIL SHALL BE REDISTRIBUTED THROUGHOUT THE ROCK SLOPES. TAMP AND WATER SOIL DOWN INTO THE DEPTHS OF THE ROCK SLOPE IN SEVERAL LIFTS.
3. USE DISPLACED ROCKS FOR TREE PLANTING ON SLOPE, SEE DETAIL 3, SHEET L4.2. EXCESS ROCKS SHALL BE RELOCATED TO EAST FACING SLOPE AT EAST AREA OF PROPERTY. CONFIRM PLACEMENT WITH OWNER'S REPRESENTATIVE PRIOR TO RELOCATION. CONTRACTOR MAY OFF-HAUL EXCESS ROCKS AT CONTRACTOR'S DISCRETION AND OWNER'S APPROVAL.
4. PLANTING ALONG ROCK SLOPE SHOWN IN PLAN IS APPROXIMATE AND MAY VARY DUE TO EXISTING CONDITIONS. CONTRACTOR TO COORDINATE WITH LANDSCAPE ARCHITECT TO ASSIST AND APPROVE FINAL PLANT PLACEMENT PRIOR TO INSTALLATION.
5. ALL EXPOSED SLOPES 3:1 OR GREATER SHALL RECEIVE EROSION CONTROL BLANKET, INSTALL PER MANUFACTURER'S SPECIFICATIONS, REFER TO SECTION 32 93 00



NO.	DATE	REVISION
1.		
2.		
3.		
4.		
5.		

J.L. JAMISON — No. 6168 — Exp. 4/30/11 — STATE OF CALIFORNIA

Project: CITY OF SANTA CRUZ WATER DEPARTMENT
BAY STREET RESERVOIR
200 CARDIFF PLACE SANTA CRUZ, CA

Sheet Title: LANDSCAPE PLAN

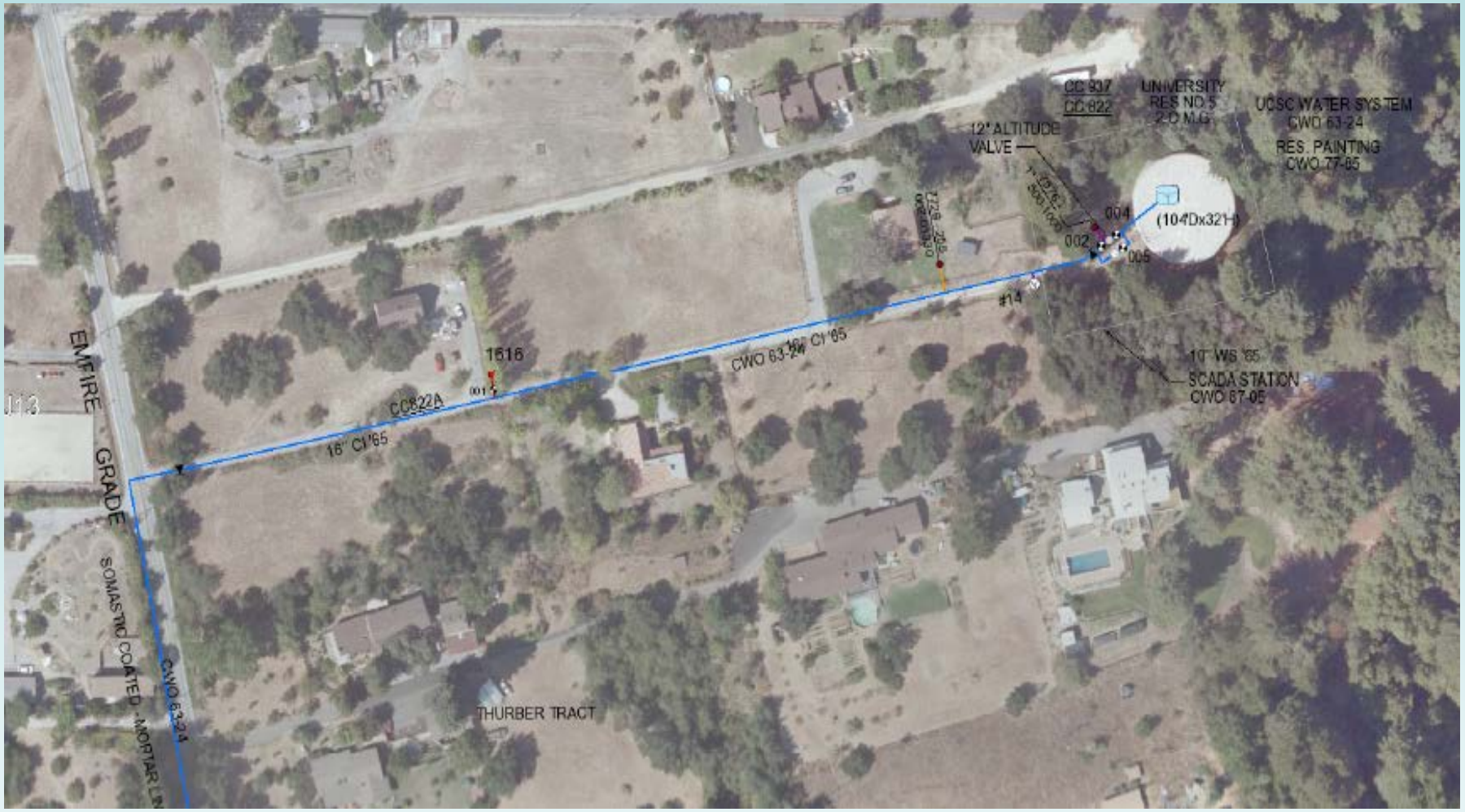
Job No. 07-108
Scale:
Drawn By: ED
Issued: NOVEMBER 10, 2010

L4.0

U5 Tank Replacement

Taylor Ronne, Associate Engineer

U5 Tank Location



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U5 Tank Replacement

Background:

- Constructed in 1965 as part of the West-side and UC Santa Cruz expansion and is the highest reservoir in the Department system.
- Reservoir Storage = 2 Million Gallons
- Service Area: Primarily UC Santa Cruz but also provides emergency and fire storage for the Department water system.
- Demands: 300,000 – 500,000 gallons per day while the University is in session.

U2 Tank >

Rehabilitation Complete
Addition of New Maintenance Tank

< U5 Tank

Inspection / Investigation Complete
Planning/Design – In Progress
Construction – Spring 2017

U4 Tank >

Inspection / Investigation next year

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U5 Tank Condition

	Quantity of Members with a Condition Rating (CR) of:					
	Repairable			Non-repairable		
Type	5	4	3	2	1	0
Columns		6	1			
Girders		6				
Outer Rafters			9	27	12	
Inner Rafters		24				
Roof Plates		Remainder	12 (Locations)	3 (Locations)		

Replacement vs. Rehabilitation

Benefits

Risk

Cost

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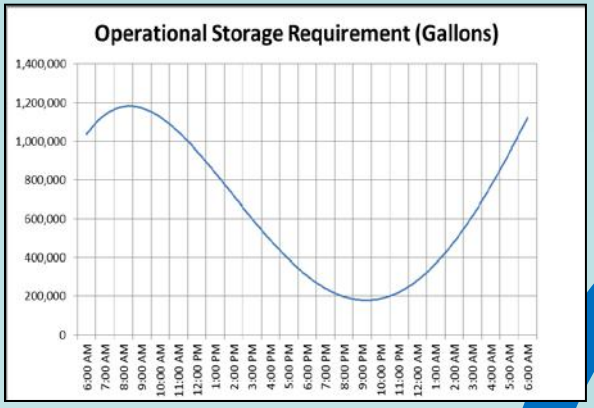
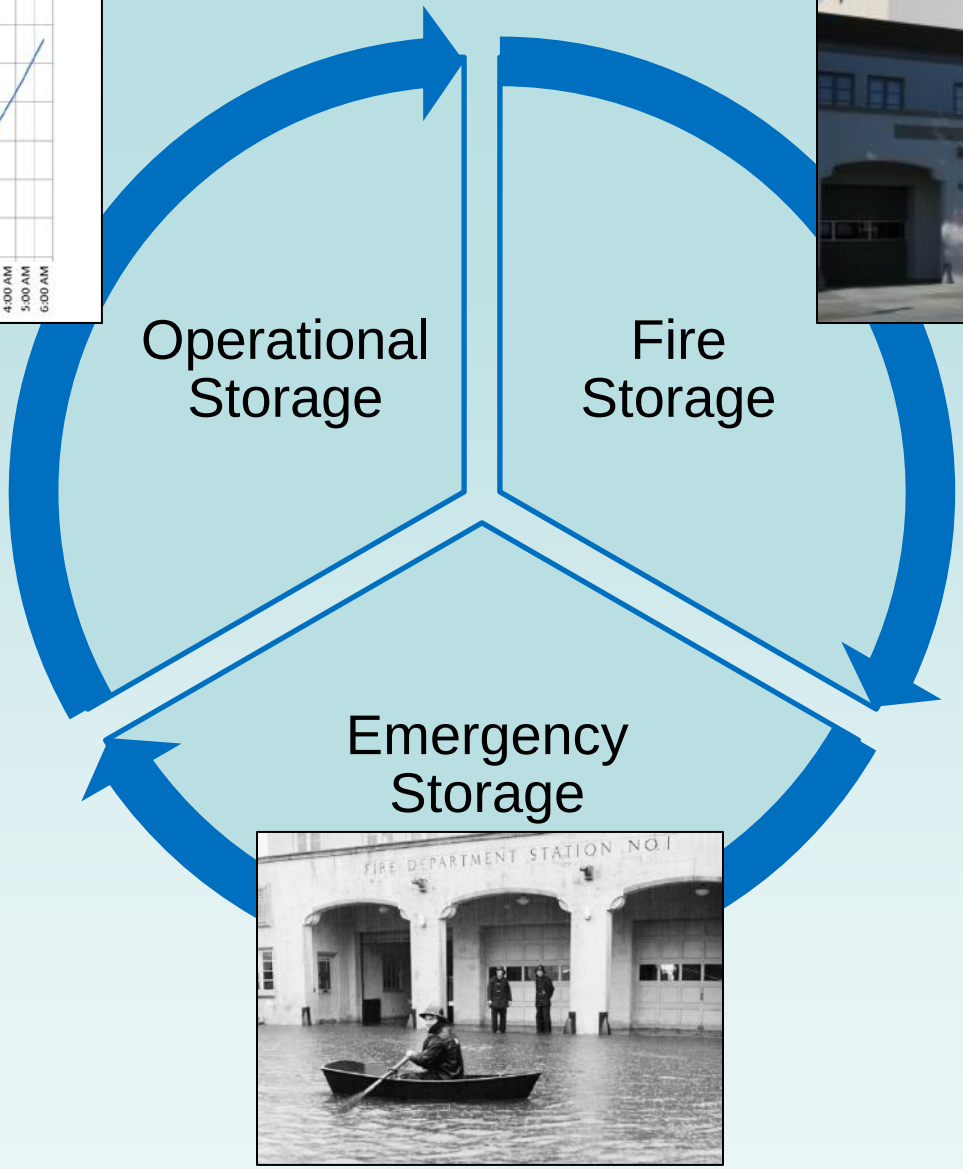
U5 Tank Replacement

Project Basis:

- Use Lessons Learned from U2 Tank
- Plan for the Next 50 Years
  - Size
  - Structural Design – Seismic, Corrosion, Reinforcement
  - Maintenance
  - Water Quality Objectives
  - Other Improvements
    - 16” Cast Iron Pipeline Replacement & 65,000 Gallon Maintenance Tank

U5 Tank Sizing





Surf City Saves
Water For Our Future

Project Status

- Schedule:
  - November – March 2017 – Design
  - April 2017 – January 2018 - Construction

- Community Outreach – In Progress

- Design (Current):
  - Geotechnical & Environmental Survey
  - New Tank Design
  - New Maintenance Tank Design
  - Pipeline Replacement

- Construction (2017):
  - Maintenance Tank → Bypass Pipe → Main Replacement → Remove/Replace U5 Tank

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Water For Our Future

WATER COMMISSION
INFORMATION REPORT

DATE: 11/29/16

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Heidi Luckenbach, Deputy Director/Engineering Manager

SUBJECT: Water Supply Augmentation Strategy, Quarterly Work Plan Update

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RECOMMENDATION: Receive information regarding the status of the various components of the Water Supply Augmentation Strategy and provide feedback.

BACKGROUND: As per the Final Agreements and Recommendations of the Water Supply Advisory Committee (WSAC), the Water Commission shall receive quarterly updates on the status of the various elements of the recommended plan. This is the fourth quarterly update. Elements of the Water Supply Augmentation Strategy (WSAS) include In Lieu water transfers with neighboring agencies, Aquifer Storage and Recovery, Recycled Water, and Seawater Desalination. Demand management, via implementation of the Long Term Water Conservation Master Plan, is foundational to the WSAS. The following report provides an update on the various efforts recommended by the Water Supply Advisory Committee (WSAC), accepted by the City Council in late 2015 and recently incorporated into the approved 2015 Urban Water Management Plan as directed by the Council.

DISCUSSION: Progress and status of the various WSAS-related work is described in detail below as well as that of other projects related to but not specifically articulated in the WSAS.

Demand Management

The primary activity in the Water Conservation Section over the last three months has involved the implementation of new water rates, principally the budget-based rates for irrigation accounts (No. 3 of 35 measures in the Water Conservation Plan). The new irrigation rates/rate structure went live with November bills, along with other water rate changes, including the Infrastructure Reinvestment Fee, that was adopted by City Council in August. Staff is continuing to work with IT on programming changes to the EDEN utility billing system to improve presentation of the irrigation rate details on the bill. In the meantime, there are two workshops being planned for early 2017 focusing on new irrigation rates, and a web page summarizing the new system, including a calculator, summary of rates, and related information (FAQ) has been developed to assist customers in transitioning to the new

system: http://www.cityofsantacruz.com/departments/water/monthly-water-costs-calculator/landscape-water-budgets

Work has continued on System Water Loss Control (No.1 of 35 measures) following the presentation given to the Water Commission on the project in September. Staff has completed the distribution system water audit for calendar year 2015. Several staff including representatives from Distribution, Engineering and the Meter Shop participated in a statewide training on water audit techniques and data validation process before mandatory water loss reporting takes effect next year. Additional testing of water production and sales meters is planned as part of that effort.

On November 22, 2016, City Council adopted revisions to the City's Water Efficient Landscape ordinance to stay current with changes in California state regulations. This item (No. 22 of 35 measures) went before the Commission early in 2016 but was sent back by Council to staff for more work. The new landscape standards will take on any building permit applications submitted after December 22, 2016.

The City's rain barrel program (No. 28 of 35 measures) opened again for online ordering in mid-October. The first distribution event will be held December 3 at the Corporation Yard. Another distribution event is planned later in January.

The Water Department, led by the Customer Service section, has recently formed an internal work group to explore the costs and benefits of Advanced Metering Infrastructure, or AMI (No 2. of 35 measures). AMI was not envisioned in either the CIP or the conservation plan until after 2020. However, the Department has been forced to consider other options sooner because the current radio-read system is aging and steadily failing. The Department is evaluating costs between Sensus, our current vendor which is a fixed network type system, against a cellular product. About 15 percent of the City's existing meters, about 4,000 total, use Sensus AMI technology. Last month, the department installed 20 of the cellular products at various points around the service area as a pilot test. Conservation staff is participating in this work group focusing on potential leak detection capabilities of AMI as well as the opportunity to enhance customer awareness of water use based on data being more accessible to them.

Finally, it's worth mentioning that two of the City's conservation staff were selected to give presentations at professional conferences this fall. One presentation involved the water conservation master planning effort; the other involved the recent water loss control project. In addition, staff has been honored to participate over the last few months in a statewide process to develop a long-term conservation policy framework covering urban water use. The draft framework includes new water use targets that go beyond the current 20x2020 requirements and involve more rigorous and comprehensive water shortage planning. The process has been led by staff members of the California Department of Water Resources and the State Water Resources Control Board. A public review draft report is expected to be released in the next few days and will be finalized with the Urban Advisory Group's input in early January 2017.

In Lieu Water Transfers
As a separate item on the agenda, the Water Commission will receive information and have the opportunity to discuss the status of this component of the WSAS. No additional information is provided herein.

Aquifer Storage and Recovery (ASR) – Phase I Work
Status

- Consultant: Pueblo Water Resources
- Contract Signed: February 2016
- Project Partners: NA
- Engaged Stakeholders: SqCWD, County of Santa Cruz, Scotts Valley Water District
- Amount Spent: $77,682.50
- Amount Remaining: $368,687.50
- Status: On schedule.

Key meetings (Meetings of note in the reporting quarter include the following.)

- October & November 2016: Series of meetings with Pueblo and Gary Fiske to discuss modeling assumptions and model runs.
- November 2016: ASR Workshop for Water Commission

Pueblo is currently under contract for Phase 1 of a potentially three phase evaluation process.

- Phase 1 – Paper study/modeling/siting study
- Phase 2 – Pilot study
- Phase 3 – Full Scale Implementation

<u>Task 1.1 Existing Well Screening</u>
The purpose of this task is to identify three existing wells as candidates for Phase 2 pilot ASR testing. Pueblo has issued the final draft of the Technical Memorandum (TM) summarizing their approach, findings, and recommendations. (See Attachment A.) The recommendations include identification of an existing production well in service areas of the City, Scotts Valley Water District, and Soquel Creek Water District. Discussions with these agencies are ongoing. As stated in the TM, the selection of ASR pilot testing wells is iterative.

> "For example, the geochemical interaction modeling may identify a fatal flaw (e.g., precipitation or dissolution reactions) that may render one of the wells less desirable than identified herein. Furthermore, while it is our preliminary opinion that use of existing wells for ASR pilot testing does not represent a significant risk to the wells' service lives or production capacities (and is common practice for ASR feasibility investigations), we acknowledge that a prudent operation may not want to put these facilities at risk, regardless of how insignificant. As such, it is our opinion that SCWD needs to gauge the other District's willingness to participate in the planned ASR feasibility investigation, testing program and project development as soon as possible." (Pueblo November 2016)

Practically speaking, the City and consultant will continue to closely evaluate the opportunities and limitations of each potential pilot well and adjust the plan accordingly. And it may be possible for example to pilot only at Beltz 12 and infer to other locations in the basin what is learned from Beltz 12.

<u>Task 1.2 Site specific injection capacity analyses</u>
Pueblo has submitted the first draft of this memo and it is under review by staff.

Task 1.3 Geochemical Interaction analysis
As mentioned last quarter, this task is not scheduled to be completed until Quarter 2 of 2017. No additional information is available.

Task 1.5 Well Siting Study
As mentioned last quarter, work on this task will accelerate in Quarter 4 of 2016. No additional information is available.

Groundwater Models
A key component of the ASR study continues to be the completion and use of the groundwater models for the Purisima and the Santa Margarita groundwater basins. The Santa Margarita groundwater model is complete and will be used to understand the potential recharge opportunities in the Santa Margarita. The City, in conjunction with Pueblo, is developing a Santa Margarita ASR concept and will work with SVWD and their groundwater modeler to better understand its feasibility. SVWD has recently made a change with regards to their modeling consultant and is now contracted with Hydrometrics WRI for these services.

The Purisima groundwater model continues to be developed by Hydrometrics WRI. The schedule remains on track for completion in fall 2016.

There are numerous modeling scenarios being contemplated for both basins. Staff is recommending that Pueblo contract directly with Hydrometrics for groundwater modeling services for both the Purisima and Santa Margarita models through the existing Phase 1 contract they currently have with the City. This will be accomplished via a contract amendment drafted in early 2017.

Issue(s)
As last reported, the issue being grappled with was establishing a common understanding of what the ASR study needs to be evaluating given the work and assumptions performed for the WSAC and the parallel work being done by SqCWD and SVWD. The meetings held in October and November, with staff from all three agencies as well as consultants, has clarified the various scenarios that will be considered. (See Attachment B for a summary of modeling assumptions.)

Recycled Water Feasibility Study (RW)

Status
- Consultant: Kennedy/Jenks Consultants
- Contract Signed: February 2016
- Project Partners: Water and Public Works Departments
- Engaged Stakeholders: County of Santa Cruz – Water Resources Division, Santa Cruz County Sanitation District, Scotts Valley Water District, Soquel Creek Water District, State of California – SWRCB
- Funding: State of California $75,000; City Public Works, $35,000; Water, remainder
- Amount Spent: $175,887.84
- Amount Remaining: $310,112.16
- Contract Amendment No. 1: $26,357

- New Contract Amount: $512,357
- Schedule: On schedule.

Key meetings (in addition to monthly project status meetings, meetings of note in the reporting quarter include the following)

- October 2016, Alternatives Webinar Part I
- December 2016: Alternatives Webinar Part II

The focus in the last quarter has been to evaluate in more detail the list of alternatives being considered. These are shown Attachment C.

These alternatives are being discussed via a series of webinars with project partners, stakeholders, and the consultant as follow.

- Alternatives Webinar Part I (see Attachment D for presentation materials from this webinar) focused on Non Potable Reuse projects (Centralized and Decentralized NPR as well as SqCWD-led GWRR).
- Alternatives Webinar Part II will focus on Streamflow Augmentation, Surface Water Augmentation, and Direct Potable Reuse.
- Alternatives Webinar III (not yet scheduled) will focus on Santa Cruz GWRR.

Issue(s)
An important part of this study as well as the ASR study is referred to as a siting study. The purpose of a siting study is to locate wells for permanent installations to accomplish the goals of the project. Data used for a siting study include property ownership, current use, size, cost and availability; hydrogeologic conditions and the ability for the site (and new well) to meet the goals of the project; constructability and long term maintenance issues. Because of the similarities of this study and the ASR study (i.e., ASR and groundwater replenishment using treated wastewater), staff had initially contemplated having the siting studies done under the ASR Phase 1 scope of work by Pueblo. However, this was not included in the Pueblo scope and a change order is being signed to include this in the KJ scope.

Other (Source Water Monitoring, Newell Creek Pipeline Evaluation, Felton Diversion)
Source Water Monitoring: An increased allocation of $200,000 has been made in this fiscal year towards this effort which includes development of a comprehensive source water monitoring plan focusing on the San Lorenzo River and Newell Creek, implementation of that plan, and analysis of the results.

Staff has drafted a source water sampling plan and selected Trussell Technologies Inc. to develop jar testing procedures, provide a peer review of the sampling plan, and assist with data organization and interpretation. Several online analyzers have been purchased and installed. Trussell will provide a Technical Memorandum after approximately 6 months of data collection and a second following approximately one year.

Felton Diversion: Staff is reviewing a TM submitted by our consultant following a mid-October site inspection of the inflatable dam. The report recommends replacing the rubber bladder as soon as feasible. At 31 years old, patched in several locations, and becoming hardened and brittle, the bladder has reached the end of its service life. Some of the infrastructure (anchor bolts and anchor plates) appear in good condition and should be able to be re-used with minor touch-up repair to corroded areas.

The rubber dam replacement is scheduled for late summer 2017 when the river level is low. The rubber bladder is no longer available domestically and will be manufactured overseas and shipped. Lead time on the bladder is about 6 months.

Outreach and Communication
In addition to ongoing monthly reports to the community via email newsletters and media releases, WSAC members gathered for a friendly reunion and update of progress on Recommendations on November 15, 2016. The WSAC progress report is being prepared and will be going out to the community in December.

FISCAL IMPACT: None.
PROPOSED MOTION: Accept the report of the Status of the Water Supply Augmentation Strategy, Quarterly Work Plan Update.

ATTACHMENTS:
Attachment A1, A2 and A3: Technical Memorandum Task 1.1, final draft Pueblo Water Resources (Nov 2016), Well Location Map and Spreadsheet
Attachment B: ASR Modeling Assumptions, City of Santa Cruz (Nov 2016)
Attachment C Santa Cruz RWFPS Preliminary List of Alternatives Being Considered
Attachment D Alternatives Webinar I Presentation Materials, Kennedy/Jenks (Oct 2016)

TECHNICAL MEMORANDUM
Pueblo Water Resources, Inc.
4478 Market St., Suite 705
Ventura, CA 93003
Tel: 805.644.0470
Fax: 805.644.0480

To:	Santa Cruz Water Department	Date:	November 23, 2016
Attention:	Isidro Rivera	Project No:	15-0111
Copy to:	Heidi Luckenbach Kevin Crossley		
From:	Robert C. Marks, P.G., C.Hg Principal Hydrogeologist		
Subject:	Santa Cruz ASR Project – Phase 1 Feasibility Investigation; Task 1.1 Existing Wells Screening **REVISED DRAFT**		

INTRODUCTION

Presented in this Technical Memorandum (TM) is an evaluation of existing municipal production wells owned by the Santa Cruz Water Department (SCWD), Soquel Creek Water District (SqCWD) and Scotts Valley Water District (SVWD) that could serve as potential Aquifer Storage and Recovery (ASR) pilot testing wells. The purpose of the evaluation is to rank the existing wells based on their relative suitability to serve as ASR pilot testing wells. Based on the rankings, one preferred well in each of the three service areas is identified.

BACKGROUND

The SCWD is evaluating the feasibility of an Aquifer Storage and Recovery (ASR) project to meet projected shortfalls in City water supplies. ASR is a method of "banking" water in an aquifer during times when excess surface water is available (typically wet periods), and subsequent recovery of the water from the aquifer when needed (typically dry periods). ASR utilizes dual-purpose injection/recovery wells for the injection of water into aquifer storage and the subsequent recovery of the stored water by pumping. In order to feasibly implement ASR, the following four basic project components are required:

1. A supply of excess surface water for injection.
2. A system for the diversion, treatment and conveyance of water between the source and groundwater storage basin.
3. A suitable groundwater basin with available storage space.
4. Wells to inject and recover the stored water.

As applied to Santa Cruz, ASR would involve the diversion of "excess" winter and spring flows from the San Lorenzo River via the Tait Street Diversion facility, treated to potable standards at the Graham Hill Water Treatment Plant (GHWTP), then conveyed through the existing (and/or improved) water distribution system(s) to future ASR wells located in the

Soquel-Aptos Groundwater Basin (S-AGB) and/or the Santa Margarita Groundwater Basin (SMGB). In this context, "excess" flows are those flows that exceed SCWD demands and in-stream flow requirements and are within water rights.

As a sub-consultant to the City's Water Supply Advisory Committee (WSAC) Technical Team, Pueblo Water Resources, Inc. (PWR) performed an initial reconnaissance-level study[1] (Recon-Study) of the feasibility, potential yields, and costs of ASR for the SCWD. The scope of the Recon-Study was limited to evaluating readily available existing information to develop conceptual components of an ASR project for the WSAC to consider. Based on the available information, the Recon-Study findings indicated that ASR appeared to be technically feasible with no obvious fatal flaws[2].

Based on the findings of the Recon-Study, an implementation strategy for further technical feasibility investigation and advancement of an ASR project was developed through the WSAC that consisted of three basic phases:

- **Phase 1 – Technical Feasibility Analyses**: Performance of higher-level technical feasibility investigations that were beyond the scope of the Recon-Study, including the use of groundwater modeling, completion of site-specific injection capacity and geochemical interaction analyses, and development of an ASR pilot testing program.
- **Phase 2 – Pilot ASR Testing**: Performance of an ASR pilot testing program and assessment of probable ASR system performance, costs and schedule to complete build-out of the ASR system.
- **Phase 3 – Project Implementation**: Development of full-scale ASR project basis-of-design, construction of ASR system facilities (perhaps incrementally), establishment of ASR project operational parameters, and long-term operation of project to achieve target storage volumes.

The City is currently performing the above Phase 1 technical feasibility investigation. The purpose of this TM it to identify three (3) existing wells (one in each service area) as candidates for future Phase 2 ASR pilot testing. The three candidate wells identified herein are planned to be further evaluated during Phase 1 as part of planning for Phase 2 ASR pilot testing. Specifically, the wells will be analyzed for the following:

- Site-Specific Injection Capacity Analyses: Screening-level injection capacity estimates were developed in the Recon-Study and are utilized here as part of the well selection process. These preliminary estimates need to be refined through analysis of a variety of additional factors that were beyond the scope of the initial well screening. These refined site-

[1] Pueblo Water Resources, Inc. (May 2015), *Reconnaissance-Level Evaluation of ASR and IPR*, Technical Memorandum prepared for Stratus Consulting, Inc.

[2] The details of the Recon-Study will not be repeated here. The reader is referred to the Recon-Study for additional background on the ASR concept, details on the feasibility study findings, and the implementation plan.

specific injection capacities will form the basis for planning of the Phase 2 ASR pilot tests at each individual well site.

- Geochemical Interaction Modeling: There is the potential for adverse geochemical reactions to occur as a result of mixing GHWTP and native ground waters within the aquifer mineral matrices[3]. The potential for such reactions needs to be evaluated prior to any actual injection testing.

The results of the above future analyses will serve to further verify the technical feasibility of ASR operations and provide the basis for planning of the Phase 2 ASR pilot testing programs at each of the subject wells.

Specific areas of investigation during Phase 2 ASR pilot testing are planned to include the following:

- Determine hydraulic response of well and aquifers to ASR operations.
- Assess the occurrence and rate of well plugging from ASR operations.
- Determine optimum backflushing parameters to maintain well performance.
- Evaluate the influence, migration, and drift of injected water in the aquifer zone.
- Observe water quality stability and/or changes during aquifer storage.
- Establish design and operating parameters for an expanded and/or long-term ASR program.

In general, the Phase 2 ASR pilot testing program will be designed to mimic actual ASR well operations (i.e., injection, storage, and recovery) at an existing well to develop the above information, which is necessary for designing and permitting permanent ASR well facilities. As such, the criteria for selection of existing wells are based largely on the extent to which the existing wells are similar to planned permanent ASR wells in terms of aquifer completion, estimated injection rates, and well construction characteristics.

FINDINGS

The SCWD is investigating the ASR potential for wells located within groundwater basins underlying the water distribution system service areas of the SCWD, SqCWD and SVWD. The SCWD and SqCWD service areas overly the Soquel-Aptos Groundwater Basin (SAGB) and the SVWD service area overlies the Santa Margarita Groundwater Basin (SMGB). These areas and the existing municipal well locations are shown on **Figures 1 and 2**, respectively. A database for information on these wells was compiled based on available data provided by SCWD, SqCWD and SVWD, and is presented in **Appendix A**.

[3] For example, precipitation reactions (e.g., calcite formation) that can lead to well plugging or dissolution reactions (e.g., leaching of metals) that lead to undesirable water quality of stored and recovered waters.

SCORING AND WEIGHTING SYSTEM

The primary purpose of the future Phase 2 ASR pilot testing will be to replicate as closely as possible actual project ASR well operations. As such, the evaluation and ranking of existing wells to serve as potential Phase 2 ASR pilot testing wells is based primarily on factors that represent as closely as possible the eventual permanent ASR project wells. These selection factors can be generally categorized into the following three primary areas:

1. Target Aquifer Completion
2. Estimated Injection Capacity
3. Well Construction Features

Each of the various factors within each of the above categories are individually scored on a basic scale of 1 to 3 (poor, fair, and good, respectively) and then weighting factors are applied in accordance with their relative importance to the needs of a successful ASR pilot testing program as follows:

- Target Aquifer Completion: This is the single most important factor. The primary purpose of pilot testing is to evaluate hydraulic response and water-quality interactions during ASR operations. If a given well is not completed in one of the aquifers targeted for permanent ASR wells, it is of little value to the program. We have assigned a weighting factor of 16.7 for a maximum possible score of 50 points (3 x 16.7 = 50).

- Estimated Injection Capacity: The results of the Recon-Study indicated planning level per-well injection capacities of approximately 350 gallons per minute (gpm) appeared feasible. It is very important to conduct pilot testing at rates that are comparable to the planned permanent ASR wells in order to develop representative well and aquifer hydraulic response data. We have assigned a weighting factor of 11.7 for a maximum possible score of 35 points (3 x 11.7 = 35).

- Well Construction Features: It is desirable, but not critical, that the pilot testing wells be constructed as similarly as possible to permanent ASR wells to provide the most representative testing results. There are five primary well construction features evaluated, as opposed to a single factor for the above two categories. Accordingly, we have assigned a weighting factor of 1 to this category for a maximum possible score of 15 points (5 x 3 = 15).

The above-described scoring and weighting system is summarized in **Table 1** below:

Table 1. Scoring and Weighting Summary

Factor	Maximum Unweighted Score	Weighting Factor	Maximum Weighted Score
Target Aquifer Completion	3	16.7	50
Estimated Injection Capacity	3	11.7	35
Well Construction Features	15	1.0	15
Total Maximum Possible Score			**100**

TARGET AQUIFER COMPLETIONS

The success of an aquifer recharge project depends on the ability to physically place water into the aquifer and to effectively store and retrieve this previously stored water. The hydrogeology of the aquifer system is the primary factor controlling the rate at which water can be injected, the amount that can be stored, and the ability to recover the stored water. The hydrogeologic factors affecting the feasibility of an ASR program include groundwater basin structure and geometry, hydrostratigraphy, aquifer hydraulic parameters, and water-level conditions.

The hydrogeologic settings of the S-AGB and SMGB were described and evaluated in the Recon-Study, the details of which will not be repeated here. In summary, the results of the Recon-Study's evaluation of hydrogeologic settings, aquifer hydraulic parameters, estimates of available storage capacity, and preliminary injection capacity analyses allowed for general identification of target aquifers for ASR wells.

For the Purisima Aquifer, it was recommended that aquifer units Tu, AA and A should be targeted as being the most transmissive zones and for having the greatest theoretical per-well injection capacities. The overlying aquifers units BC through F appear to be less transmissive and, therefore, considered less favorable for ASR wells. Furthermore, aquifer unit A is understood to outcrop on the seafloor just offshore of Soquel Point, whereas the Tu and AA aquifer units are believed to outcrop much further offshore (e.g., in the walls of the Monterey Bay Submarine Canyon). As such, the potential for hydraulic losses of stored water may be greater for the A unit compared to the Tu and AA units (the issue of hydraulic losses is planned to be evaluated with groundwater modeling).

For the SMGB / Scotts Valley Subarea, the Lompico Sandstone (Tlo) would be the most favorable target aquifer for ASR wells, with the Butano Formation (Tb) secondarily favorable, based both on aquifer hydraulic characteristics and estimated amounts of available storage. The Santa Margarita Sandstone (Tsm) is the least favorable for ASR wells due to the lack of saturated sediments for well backflushing (all injection wells must be periodically backflushed to limit plugging and maintain capacity).

Given the above, aquifer completion ranking for this screening evaluation are summarized in **Table 2** below:

Table 2. Primary Aquifer Completion Ranking

Aquifer Completed	Ranking	Score
S-AGB - Western Purisima		
Tu - AA	Good	3
A	Fair	2
BC	Poor	1
SMGB - Scotts Valley Subarea		
Tlo	Good	3
Tb	Fair	2
Tsm	Poor	1

The unweighted scores for each of the existing wells in the SCWD, SqCWD and SVWD based on the above factors are summarized in **Table 3** below. As shown in **Table 3**, based solely on aquifer completion considerations, for the Purisima Aquifer Beltz 10 and Beltz 12 are the highest scoring SCWD wells, with O'Neill Ranch and Main St. the highest scoring SqCWD wells. For the Scotts Valley Subarea, SVWD Well Nos. 10A, 11A and 11B scored the highest based on target aquifer completion.

ESTIMATED INJECTION CAPACITIES

Screening-level estimates of injection capacities of existing wells in the three service areas analysis were developed as part of the Recon-Study. The details of the methodology are presented in the Recon-Study and will not be repeated here; however, in summary, the preliminary per-well injection capacity estimates were based on the following factors:

1. Reported existing pumping capacity[4].
2. Specific injectivity is assumed to be one-half of existing specific capacity.
3. Available freeboard for water level drawup within well casings is based on the distance between Spring 2012 static water levels and ground surface (i.e., no pressurized injection).

The estimated injection capacity is the minimum of the three factors (i.e., injection capacity is not allowed to exceed reported pumping capacity).

[4] As currently equipped.

Table 3. Aquifer Completion Scores

Well Owner	Well Name	Well Depth (ft bgs)	Screened Intervals (ft bgs)	Aquifer(s) Screened	Rank	Score
SCWD	Beltz 8	210	100 - 180	A	Fair	2
	Beltz 9	230	110 - 200	A	Fair	2
	Beltz 10	362	100 - 140 200 - 271 301 - 327 337 - 357	AA - A	Fair	2
	Beltz 12	650	200 - 290 310 - 390 410 - 470 550 - 640	Tu - AA	Good	3
SqCWD	O'Neill Ranch	655	200 - 300 340 - 420 470 - 540 550 - 650	Tu - AA	Good	3
	Garnet	300	164 - 177 190 - 290	A	Fair	2
	Main St.	656	232 - 246 280 - 376 424 - 448 472 - 496 544 - 644	Tu - AA	Good	3
	Rosedale	570	210 - 240 266 - 310 324 - 336 350 - 400 438 - 494 530 - 560	AA - A	Fair	2
	Tannery II	620	385 - 605	A	Fair	2
	Estates	930	305 - 380 440 - 510 660 - 920	A - BC	Poor	1
SVWD	Well # 3B	1,700	700 - 730 880 - 1050 1180 - 1370 1400 - 1670	Tbu	Fair	2
	Well # 7A	1,470	700 - 900 1000 - 1150 1250 - 1450	Tbu	Fair	2
	Well # 9	360	155 - 195 315 - 355	Tsm	Poor	1
	Well # 10A	460	280 - 380 400 - 450	Tlo	Good	3
	Well # 11A	518	399 - 419 459 - 469 495 - 515	Tlo	Good	3
	Well # 11B	537	350 - 390 425 - 470 502 - 517	Tlo	Good	3

Based on the results of the Recon-Study's analysis of the theoretical injection capacities of existing wells, estimated injection rates ranging between approximately 100 to 900 gpm were developed. For planning purposes, an average per-well injection capacity of 350 gpm (0.5 mgd) for new ASR wells in both the Purisima Aquifer and Scotts Valley Subarea appeared feasible. Preliminary ASR project cost estimates developed during the WSAC in terms of the numbers of ASR wells required to meet the City's projected water-supply shortfall were based on this per-well injection capacity assumption. Accordingly, estimated injection capacity ranking for this screening evaluation of existing wells are summarized in **Table 4** below:

Table 4. Injection Capacity Ranking

Injection Capacity (gpm)	Ranking	Score
> 300	Good	3
100 - 300	Fair	2
< 100	Poor	1

The unweighted scores for each of the existing wells in the SCWD, SqCWD and SVWD based on the above factors are summarized in **Table 5** below.

Table 5. Estimated Injection Capacity Scores

Well Owner	Well Name	Pumping Capacity (gpm)		Est. Inj. Cap. (gpm)	Rank	Score
		Original	Recent			
SCWD	Beltz 8	800	200	180	Fair	2
	Beltz 9	700	225	225	Fair	2
	Beltz 10	350	150	70	Poor	1
	Beltz 12	700	700	330	Good	3
SqCWD	O'Neill Ranch	700	540	420	Good	3
	Garnet	800	580	600	Good	3
	Main St.	NA	810	370	Good	3
	Rosedale	NA	870	350	Good	3
	Tannery II	NA	960	405	Good	3
	Estates	1000	560	920	Good	3
SVWD	Well # 3B	500	300	300	Good	3
	Well # 7A	1350	300	300	Good	3
	Well # 9	700	110	110	Poor	2
	Well # 10A	400	320	320	Good	3
	Well # 11A	200	100	100	Poor	1
	Well # 11B	510	315	315	Good	3

As shown **Table 5**, all of SqCWD's wells in the Purisima Aquifer have estimated injection capacities in excess of 300 gpm. Beltz 12 is the highest scoring SCWD well. For the Scotts Valley Subarea, SVWD Well Nos. 3B, 7A, 10A and 11B are the highest scoring wells.

WELL CONSTRUCTION FEATURES

New ASR wells should have common design features that maximize the injection capacity, limit potential plugging rates, and extend well service lives. General design considerations for any new ASR well include the following:

1. For injection rates up to 350 gpm, well casing diameter of at least 12-inches in order to limit downhole velocities and maximize injection capacity.
2. Constructed entirely of stainless steel casing and wire-wrapped screen to limit plugging and extend well service lives.

Since one of the objectives of selecting existing wells for Phase 2 ASR pilot testing is to emulate the characteristics of eventual permanent new ASR wells, the above construction features of existing wells would be more desirable than other types of construction. In addition, wells constructed with mild steel casings tend to corrode over time, which can lead to potential structural instability during rapid flow reversals that occur during ASR operations, sloughing of deposits from internal casing sidewalls, and result in unrepresentatively high plugging rates; therefore, well age is an additional consideration for selecting ASR pilot testing wells. Accordingly, well construction ranking for this screening evaluation of existing wells are as follows:

Table 6. Well Construction Features Ranking

Construction Feature	Type / Range	Ranking	Score
Age	< 10 yrs	Good	3
	10 - 20 yrs	Fair	2
	> 20 yrs	Poor	1
Upper Casing	> 14 in	Good	3
Diameter	10 - 14 in	Fair	2
	< 10 in	Poor	1
Blank Casing	Stainless Steel	Good	3
Material	HSLA	Fair	2
	Carbon Steel	Poor	1
Screen Material	Stainless Steel	Good	3
	HSLA	Fair	2
	Carbon Steel	Poor	1
Screen Type	Wire-Wrapped	Good	3
	Louvers	Fair	2
	Mill Slots	Poor	1

The unweighted scores for each of the existing wells in the SCWD, SqCWD and SVWD based on the above factors are summarized in **Table 7** below:

Table 7. Well Construction Features Scores

Well Owner	Well Name	Well Age			Casing Dia.			Blank Material			Screen Matierial			Screen Type			Total Score
		Age (yrs)	Rank	Score	Dia. (in)	Rank	Score	Type	Rank	Score	Type	Rank	Score	Type	Rank	Score	
SCWD	Beltz 8	18	Fair	2	14	Good	3	CS	Poor	1	SS	Good	3	WR	Good	3	12
	Beltz 9	18	Fair	2	14	Good	3	CS	Poor	1	SS	Good	3	WR	Good	3	12
	Beltz 10	12	Fair	2	8	Poor	1	SS	Good	3	SS	Good	3	WR	Good	3	12
	Beltz 12	4	Good	3	16	Good	3	SS	Good	3	SS	Good	3	WR	Good	3	15
SqCWD	O'Neill Ranch	4	Good	3	16	Good	3	SS	Good	3	SS	Good	3	WR	Good	3	15
	Garnet	21	Poor	1	12	Fair	2	HSLA	Fair	2	SS	Good	3	WR	Good	3	11
	Main St.	30	Poor	1	16 x 12	Good	3	CS	Poor	1	SS	Good	3	WR	Good	3	11
	Rosedale	33	Poor	1	12	Fair	2	CS	Poor	1	SS	Good	3	WR	Good	3	10
	Tannery II	15	Fair	2	16	Good	3	CS	Poor	1	SS	Good	3	WR	Good	3	12
	Estates	31	Poor	1	16 x 12	Good	3	CS	Poor	1	SS	Good	3	Louvers	Fair	2	10
SVWD	Well # 3B	21	Poor	1	16	Good	3	CS	Poor	1	CS	Poor	1	unknown	Poor	1	7
	Well # 7A	25	Poor	1	16	Good	3	CS	Poor	1	SS	Good	3	Louvers	Fair	2	10
	Well # 9	36	Poor	1	12	Fair	2	CS	Poor	1	SS	Good	3	WR	Good	3	10
	Well # 10A	9	Good	3	12	Fair	2	HSLA	Fair	2	SS	Good	3	WR	Good	3	13
	Well # 11A	19	Fair	2	12 x 10	Fair	2	CS	Poor	1	SS	Good	3	WR	Good	3	11
	Well # 11B	17	Fair	2	14 x 12	Good	3	CS	Poor	1	SS	Good	3	WR	Good	3	12

As shown in **Table 7**, SCWD's Beltz 12 and SqCWD's O'Neill Ranch wells scored the highest based on well construction features in the Purisima Aquifer. SVWD's Well No. 10A scored the highest for the Scotts Valley Subarea.

EXISTING WELL RANKING SUMMARY

A summary of the weighted scores and rankings presented above for the various existing SCWD, SqCWD and SVWD wells is presented in **Table 8** below.

As shown in **Table 8**, SCWD's Beltz 12 and SqCWD's O'Neill Ranch wells scored the highest for the Purisima Aquifer with scores of 100 points each. For the Scotts Valley Subarea, SVWD's Well No. 10A scored the highest with 98 points. All three of these wells are completed in the most targeted aquifers for ASR, have preliminary estimated injection capacities in excess of 300 gpm, and are constructed largely of stainless steel with wire-wrapped screen designs. These features are consistent with those of permanent ASR wells and, as such, are excellent candidates for Phase 2 ASR pilot testing (and possibly conversion to permanent ASR wells).

Table 8. Existing Well Ranking Summary

Well Owner	Well Name	Aquifer Completion			Est. Injection Capacity			Well Construction Features			Grand Total Score	Rank
		Score	WT Factor	Total Score	Score	WT Factor	Total Score	Score	WT Factor	Total Score		
SCWD	Beltz 8	2	16.7	33	2	11.7	23	12	1	12	69	2
	Beltz 9	2	16.7	33	2	11.7	23	12	1	12	69	2
	Beltz 10	2	16.7	33	1	11.7	12	12	1	12	57	3
	Beltz 12	3	16.7	50	3	11.7	35	15	1	15	**100**	**1**
SqCWD	**O'Neill Ranch**	3	16.7	50	3	11.7	35	15	1	15	**100**	**1**
	Garnet	2	16.7	33	3	11.7	35	11	1	11	80	5
	Main St.	3	16.7	50	3	11.7	35	11	1	11	96	2
	Rosedale	2	16.7	33	3	11.7	35	10	1	10	79	4
	Tannery II	**2**	**16.7**	**33**	**3**	**11.7**	**35**	**12**	**1**	**12**	**81**	**3**
	Estates	1	16.7	17	3	11.7	35	10	1	10	62	6
SVWD	Well # 3B	2	16.7	33	3	11.7	35	7	1	7	76	4
	Well # 7A	2	16.7	33	3	11.7	35	10	1	10	79	3
	Well # 9	1	16.7	17	2	11.7	23	10	1	10	50	6
	Well # 10A	3	16.7	50	3	11.7	35	13	1	13	**98**	**1**
	Well # 11A	3	16.7	50	1	11.7	12	11	1	11	73	5
	Well # 11B	3	16.7	50	3	11.7	35	12	1	12	97	2

It is noted, however, that Beltz 12 and O'Neill Ranch are both completed in the same principal aquifers (Tu – AA) and are located within approximately 1,800 feet of each other in the same general area of the basin (refer to **Figure 1**). As such, these two wells are arguably redundant for purposes of an ASR pilot testing program in the Purisima Aquifer. The next highest scoring SqCWD wells are Main St. and Tannery II; however, Main St. is also completed within the Tu – AA units and is, therefore, similarly demerited as O'Neill Ranch. Given that a signification portion of the available storage in the S-AGB for ASR likely includes the A unit, some permanent ASR wells may need to also target the A unit in order for the project to achieve its storage volume goals; therefore, including a well that is completed in the A unit as part of the ASR pilot testing program is highly desirable. Given these considerations, we recommend that SqCWD's Tannery II well be utilized for Phase 2 ASR pilot testing, rather than O'Neill Ranch (assuming Beltz 12 is also utilized).

CONCLUSIONS and RECOMENDATIONS

Based on the findings of the screening of existing municipal wells in the western Purisima Aquifer of the S-AGB and the Scotts Valley Subarea of the SMBG on the basis of target aquifer completions, estimated injection capacities, and well construction features, we conclude that the following wells are the preferred candidates for Phase 2 ASR pilot testing:

- SCWD Beltz 12
- SqCWD Tannery II
- SVWD Well No. 10A

We recommend that the SCWD begin discussions with SqCWD and SVWD to obtain their agreement for the potential use of their wells for ASR pilot testing in order to advance the investigation as planned and outlined below. This should include providing those districts with PWR's Recon-Study and the WSAC Final Report (if the City hasn't already done so), as well as

this TM so the districts are aware of both the technical feasibility work that has already been completed and what the SCWD's plans are for advancing an ASR project.

The immediate next steps in advancing the investigation for each of these wells in preparation for Phase 2 ASR pilot testing include the following:

1. Performance of detailed site-specific injection capacity analysis of a variety of constraining factors that were beyond the scope of the preliminary screening-level injection capacity analysis, including the following:
    a. Well hydraulic response to both non-pressurized and pressurized casing injection
    b. Well backflushing capacity
    c. Downhole velocity constraints
    d. Aquifer hydraulic fracturing potential
    e. Offsite impacts potential
2. Collection of water samples and performance of field parameter measurements for a variety of specialized water-quality parameters necessary for geochemical interaction modeling at all three candidate ASR pilot testing wells and the GHWTP.
3. Submission of well drilling cuttings samples for aquifer mineralogy analyses.
4. Performance of 3-component geochemical interaction modeling of various mixes of the native groundwater and injected GHWTP water within the aquifer mineral matrices. The purpose of the geochemical modeling is to predict the potential for adverse geochemical interactions to occur (i.e., precipitation and/or dissolution reactions).

Two additional TMs (one regarding site-specific injection capacity analysis and one regarding geochemical interaction potential) will be prepared documenting the results and findings from the above analyses.

It is noted that the selection process for ASR pilot testing wells may be somewhat iterative. For example, the geochemical interaction modeling may identify a fatal flaw (e.g., precipitation or dissolution reactions) that may render one of the wells less desirable than identified herein. Furthermore, while it is our preliminary opinion that use of existing wells for ASR pilot testing does not represent a significant risk to the wells' service lives or production capacities (and is common practice for ASR feasibility investigations), we acknowledge that a prudent operation may not want to put these facilities at risk, regardless of how insignificant. As such, it is our opinion that SCWD needs to gauge the other District's willingness to participate in the planned ASR feasibility investigation, testing program and project development as soon as possible.

CLOSURE

This memorandum has been prepared exclusively for the City of Santa Cruz Water Department for the specific application to the City of Santa Cruz ASR Feasibility – Phase 1 Investigation. The findings and conclusions presented herein were prepared in accordance with generally accepted hydrogeologic practices. No other warranty, express or implied, is made.

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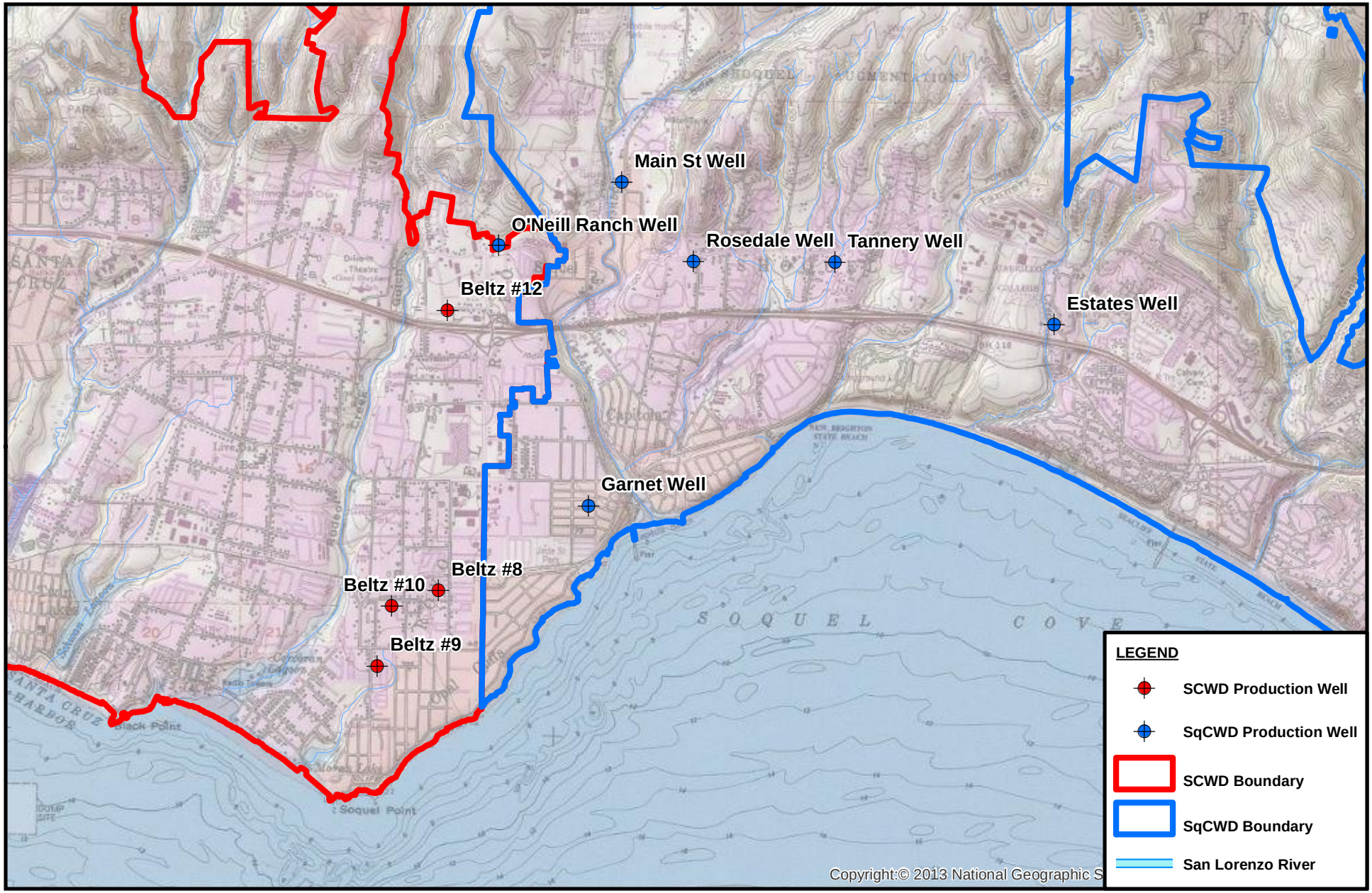
FIGURES

APPENDIX A
EXISTING WELL DATABASE

Attachment A2



PUEBLO water resources

N
W E
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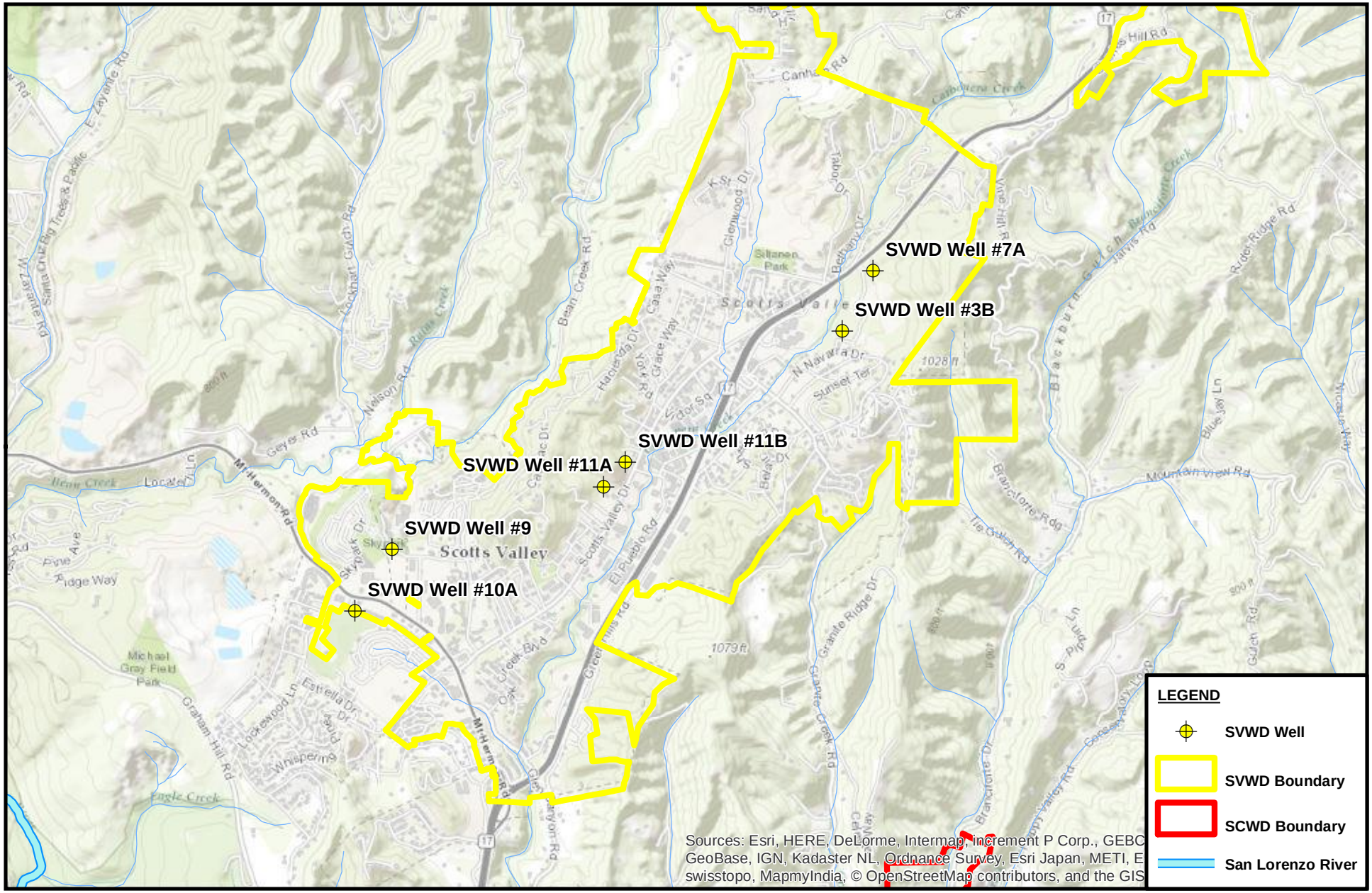
1 inch = 3,000 feet

0 1,500 3,000 6,000 Feet

FIGURE 1. WELL LOCATION MAP - WESTERN PURISIMA AREA
Santa Cruz ASR Project - Phase 1 Feasibility Investigation
City of Santa Cruz



PUEBLO water resources

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1 inch = 3,000 feet

0 1,500 3,000 6,000 Feet

FIGURE 2. WELL LOCATION MAP - SCOTTS VALLEY SUBAREA
Santa Cruz ASR Project - Phase 1 Feasibility Investigation
City of Santa Cruz

Well Owner	Well Name	Well Construction										Hydrogeoloy					Well Performance					
		Year Drilled	Age (yrs)	Drilling Method	Depth (ft bgs)	Dia (in)	Casing Material	Screen Material	Screen Intervals (ft bgs)	Screen Length (ft)	Screen Type	Slot Openings (in)	Aquifer(s) Screened	Aquifer Trans. (gpd/ft)	Distance to Coast (ft)	Cuttings Avail. (Y/N)	Nearest MW (ft)	Pumping Capacity (gpm)		Specific Capacity (gpm/ft)		Perf. Loss	Est. Inj. Cap. (gpm)
																		Original	Recent	Original	Recent		
SCWD	Beltz 8	1998	18	Reverse	210	14	CS	SS	100 - 180	80	WR	0.035	A	27,300	2,300	N	25	800	200	22.0	9.8	55%	180
	Beltz 9	1998	18	Reverse	230	14	CS	SS	110 - 200	90	WR	0.040	A	32,460	2,000	N	475	700	225	21.0	10.4	50%	225
	Beltz 10	2004	12	Direct	362	8	SS	SS	200 - 271 301 - 327 337 - 357	157	WR	0.030 0.020 0.030	AA - A	32,600	3,000	N	30	350	150	11.1	2.7	76%	70
	Beltz 12	2012	4	Reverse	650	16	SS	SS	310 - 390 410 - 470 550 - 640	320	WR	0.040	Tu - AA - A	18,480	6,200	Y	80	700	700	8.5	8.5	0%	330
SqCWD	O'Neill Ranch	2012	4	Reverse	655	16	SS	SS	340 - 420 470 - 540 550 - 650	350	WR	0.060	Tu - AA	16,900	6,900	Y	1,750	700	540	11.7	14.8	-26%	420
	Garnet	1995	21	Direct	300	12	HSLA	SS	164 - 177 190 - 290	113	WR	0.055	A	33,510	900	N	95	800	580	15.0	10.9	27%	600
	Main St.	1986	30	Reverse	656	16 x 12	CS	SS	280 - 376 424 - 448 472 - 496 544 - 644	285	WR	0.075	Tu - AA	29,170	6,700	N	35	NA	810	15.4	9.7	37%	370
	Rosedale	1983	33	Direct	570	12	CS	SS	266 - 310 324 - 336 350 - 400 438 - 494 530 - 560	220	WR	0.050	AA - A	NA	4,400	N	10	NA	870	11.0	5.5	50%	350
	Tannery II	2001	15	Reverse	620	16	CS	SS	385 - 605	220	WR	0.050	A	15,110	3,300	N	3,100	NA	960	10.7	13	-21%	405
	Estates	1985	31	Reverse	930	16 x 12	CS	SS	440 - 510 660 - 920	405	Louvers	0.075	A - BC	17,950	2,900	N	15	1000	560	11.2	5.0	55%	920
SVWD	Well # 3B	1995	21	Reverse	1700	16	CS	CS	880 - 1050 1180 - 1370 1400 - 1670	660	unknown	0.040	Tbu	3,325	NA			500	300	1.6	1.4	13%	300
	Well # 7A	1991	25	Reverse	1470	16	CS	SS	1000 - 1150 1250 - 1450	550	Louvers	0.040	Tbu	8,000	NA			1350	300	4.6	1.0	78%	300
	Well # 9	1980	36	Direct	360	12	CS	SS	155 - 195 315 - 355	80	WR	0.080	Tsm	unknown	NA			700	110	3.1	0.9	71%	110
	Well # 10A	2007	9	Reverse	460	12	HSLA	SS	280 - 330 400 - 450	150	WR	0.040	Tlo	15,100	NA			400	320	5.3	3.2	40%	320
	Well # 11A	1997	19	Dual Rotary	518	12 x 10	CS	SS	459 - 469 495 - 515	50	WR	0.012	Tlo	4,500	NA			200	100	2.0	0.8	60%	100
	Well # 11B	1999	17	Dual Rotary	537	14 x 12	CS	SS	425 - 470 502 - 517	100	WR	0.012	Tlo	17,160	NA			510	315	5.5	2.7	51%	315

WATER DEPARTMENT
MEMORANDUM

DATE: November 18, 2016

TO: Gary Fisk, Robert Marks, Heidi Luckenbach, Kevin Crossley, File

FROM: Isidro Rivera

SUBJECT: ASR Modeling Assumptions

This brief memo shall serve as the basis for clarifying and providing additional information regarding some of the assumptions that will feed into the Confluence model regarding the Aquifer Storage and Recovery (ASR) model runs.

Assumptions that need clarification include:

1. Volumetric loss rate for in-lieu
2. In-lieu recharge rate
3. Diversions from San Lorenzo River
4. Definition of the In-Lieu + ASR Scenario

The in-lieu recharge analyses presented for Building Block 1 used a 40% loss rate rather than the 20% loss rate for the ASR in Building Block 2 with the justification that ASR provides a higher degree of active control over the amount of water that is recharged into the basins. However, moving forward, a 20% loss rate shall be assumed for both ASR and in-lieu scenarios and should only account for hydraulic losses in the basins. No additional percentage of water stored for possible use other Districts will be assumed.

As stated in Building Block 1 used by the WSAC, the recharge rate under the in-lieu strategy is limited by the winter demands of Scotts Valley Water District (SVWD) and Soquel Creek Water District (SqCWD). Based on reporting data provided by the Districts, the wintertime demands (2014-2015) are 0.9 MGD for SVWD and 2.6 MGD for SqCWD; for a total of 3.5 MGD. Because these demands are currently met by 100% groundwater, it was assumed that a total of 3.5 MGD would be injected into the groundwater basins. However, the 2.6 MGD demand used for SqCWD is their total system demand and includes pumping from both the Purisima and Aromas aquifers. Because the City would potentially be injecting and extracting solely from the Purisima aquifer, only production/demands from the Purisima by SqCWD should be accounted for in the recharge total. Wintertime demands by SqCWD during the 2014-2015 time period from October-April for the Purisima aquifer averaged 1.7 MGD. In addition, because the City would be injecting into the Santa Margarita Groundwater Basin (SMGB), from which both the SVWD San Lorenzo Valley Water District (SLVWD) extract groundwater from, the wintertime demand of SLVWD shall also be accounted for in the in-lieu recharge total. Adding the

wintertime demand of SLVWD (0.6 MGD[1]) to the revised wintertime demand of SqCWD (1.7 MGD) and the wintertime demand for SVWD (0.9 MGD) would give a new revised recharge rate of 3.2 MGD for the in-lieu scenario. This revised in-lieu scenario assumes that all three districts would be willing partners with the City.

During the WSAC process, in order to answer the question "How much water is available for capture and storage from winter flows?" the following modeling assumptions were made in regards to diversions from the San Lorenzo River[2]:

1. Winter flows can be captured up to the full limitation set by current water rights at both Felton and Tait Streets
    a. Felton: 20 cfs in all months other than September (7.8 cfs in September) up to a limit of 3,000 acre-feet
    b. Tait: 12.2 cfs year round with no annual limit
2. A place to store water will be found (virtual reservoir)
3. Unlimited Infrastructure Capacity
    a. Infrastructure related constraints were removed (transmission from Felton and the virtual reservoir, transmission between Tait and virtual reservoir, and transmission from Graham Hill and the virtual reservoir)

It is important to note that the above assumptions were made for the ASR, Off-Stream Winter Storage and Ranney Collectors alternatives, but not for the in-lieu alternative. It is also worth noting that winter flows were to be captured up to the full limitations set by the current water rights with the assumption that water rights issues associated with place of use were not an obstacle, thus the removal of the infrastructure related constraints. Because the issue with place of use for Felton Diversion has not been finalized and is not a given, this assumption should not be carried forward for the first set of modeling runs.

Instead, ASR and in-lieu should be modeled with the current infrastructure limitations at Felton Diversion, i.e., perform model runs with the current Tait Street Diversion capacity (7.5 MGD) limitations as the starting point. This approach will allow us to stay within our water rights constraints and will allow us to test the system as it's currently set up. If diversions from Tait alone does not provide enough recharge to support extraction of the entire 1.2 BG yield goal, subsequent model runs should allow for direct diversion at Felton Diversion. This subsequent analysis would show how much additional diversion capacity is needed to achieve the entire reliability goal and might also demonstrate that change of use petition for the Felton Diversion is required in order to make the ASR or in-lieu project viable. For this analysis the City would like to tabulate the volume of water sent from Felton to Loch Lomond and the Virtual Reservoir.

The WSAC final report presents project yields for an in Lieu and ASR scenario, but did not present any results for a combination In-Lieu + ASR scenario. For the combination In-Lieu+ASR scenario (Scenario 3 and 6) in the scenario table, Confluence should be structured so that the In-Lieu component is served first, and then any remaining water is dispatched to the ASR system, as opposed to making the ASR system the priority over the In-Lieu element.

[1] Groundwater production data provided by SLVWD used to determine daily winter time demand average rate of 0.6 MGD for the time period between October 2015 through end of March 2016.
[2] Per Raucher, Stratus and Fiske Memorandum dated 4/24/2015

In summary, the following assumptions for the initial set of modeling runs should be used:

1. **Volumetric loss rate for in-lieu and ASR shall be 20%**
2. **In-lieu recharge rate of 3.2 MGD shall be used**
3. **Start model runs with diversions from San Lorenzo River from Tait only and with current water right limitations**
4. **For the combination In- Lieu+ASR scenario, Confluence should be structured so that the In-Lieu component is served first, and then any remaining water is dispatched to the ASR system**

Table 3: Santa Cruz RWFPS - Preliminary List of Alternatives for Further Development

Alternative	Sub Alt	Description	Source Water	Treatment		Use	Notes
Alternative 1 – Centralized Non-Potable Reuse	1a	Santa Cruz PWD Phase 2 Project	Santa Cruz WWTF	Tertiary Treatment at SC WWTF	3°	In-plant uses, truck filling and demonstration site (park near WWTF)	Current plan is for 175 gpm Capacity. Project going out for RFP soon.
	1b	Maximize tertiary treatment at the SC WWTF			3°	Unrestricted use in Santa Cruz including UC Santa Cruz. (Sites TBD)	- RW delivered to be limited by available space at the SCWWTF for tertiary or the identified NPR demand in SC Service area. - Independent of a SqCWD project (there is sufficient supply to serve both)
Alternative 2 – Decentralized Non-Potable Reuse	2	UC Santa Cruz	Local Raw Wastewater (UCSC)	MBR at UCSC	3°	On campus uses (irrigation, agricultural, cooling towers, dual-plumbed facilities)	UCSC to look into a proposed location for the scalping plant. No clear spot for it yet and it wasn't identified by Carollo either. They have concerns about O&M requirements and getting operators licenses, permitting etc. Response from UCSC will guide whether this stays in or drops out.
Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GWRR) Project	3a	Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (DO NOT serve NPR users along the way)	Santa Cruz WWTF	None ~~On-Site Treatment at NPR Customer sites~~	2° + filter	No NPR Customers along secondary pipelines alignment from SC WWTF to AWTF were deemed suitable for on-site treatment for reuse	- Keep this alternative to serve as a baseline cost for 3b-3e. - There will be no Santa Cruz demands served nor costs incurred for this alternative
	3b	Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way)		Tertiary Treatment at SC WWTF	3°	NPR Customers along tertiary pipeline alignment from SC WWTF to AWTF	These alternatives will focus on facilities needed to utilize RW utilized within the Santa Cruz Service Area only. - upsizing conveyance to serve NPR customers in Santa Cruz + SqCWD services areas along alignment - additional treatment to serve NPR customers in Santa Cruz + SqCWD services areas along alignment - additional treatment to recharge in SC GW Basin (3c and 3e only) - available space at the AWTF site to produce enough purified water to recharge requirements at the SqCWD GWRR sites + a Santa Cruz GWRR site - new City owned wells to extract recharged groundwater -proportional cost sharing of facilities (TBD) - other cost sharing items (TBD)
	3c	Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF o recharge Santa Cruz GWRR (DO NOT serve NPR users along the way)		Advanced Treatment at SqCWD Headquarters	AWT	Deliver purified water from SqCWD AWTF to Santa Cruz GWRR injection sites	
	3d	Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way)		Advanced Treatment at SC WWTF	AWT	NPR Customers along pipeline alignment from SC WWTF to SqCWD injection sites	
	3e	Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way)			AWT	GWRR in Santa Cruz (Beltz Well Field) and NPR customers along pipeline alignments	
Alternative 4 – Santa Cruz GWRR Project	4a	Santa Cruz GWRR with AWTF at SC WWTF (DO NOT serve NPR users along the way)	Santa Cruz WWTF	Advanced Treatment at SC WWTF	AWT	Suitable Santa Cruz GWRR site(s) to be defined in the ASR Study. Once extracted, recharged water would be distributed through the existing potable water distribution system.	The parallel ASR study is assuming a full-scale ASR system to consist of a total of eight (8) 0.5 million gallon per day (mgd) ASR wells; - 4 wells in the SCWD service area (i.e., the Beltz well field) - 2 wells in the SqCWD service area - 2 wells in the SVWD service area * need to confirm it the RWFPS is only looking at 2 wells in the SCWD service area (1 mgd? or more) * discuss if we want to keep DA Porath on the table given findings in the SqCWD RWFPS
	4b	Santa Cruz GWRR with AWTF of secondary effluent at off-site location (DO NOT serve NPR users along the way)		Advanced Treatment off-site (location TBD)	AWT		
	4c	Santa Cruz GWRR with MBR + AWTF at DA Porath PS (DO NOT serve NPR users along the way)	Local Raw Wastewater (SCCSD)	MBR + Advanced Treatment	AWT		
Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir	5	Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir (DO NOT serve NPR users along the way)	Santa Cruz WWTF	Advanced Treatment off-site (Delaware Site shown for planning purposes only)	AWT	Reservoir augmentation in Loch Lomond for blending and storage, to be conveyed to the GHWTP and enter the City's potable water distribution system.	- RW delivered to be limited by 1) available flow in summer months after meeting other demands (in-plant use + SqCWD deliveries) 2) reservoir dilution and retention time based on available flow and most recent SWA requirements - brine to be discharged through existing ocean outfall
Alternative 6 – Streamflow Augmentation	6	AWTF of secondary effluent with discharge to the San Lorenzo River d/s of Tait Street Diversion (DO NOT serve NPR users along the way)	Santa Cruz WWTF	Advanced Treatment off-site (Delaware Site shown for planning purposes only)	AWT	Augment San Lorenzo River flows to maintain habitat, meet future fish release requirement, and allow for increased diversions to expand future drinking water supplies.	Key consideration: Nitrogen TMDL in the river. - A discharge facility would consist of a multi-port diffuser, to blend and direct flows downstream. - Potential concerns may arise related to the proximity of the discharge to the point of diversion. - One discharge facility and site will be provided, no mixing/modeling will be performed.
Alternative 7 – Direct Potable Reuse	7	Raw Water Blending at Graham Hill WTP (via Coast PS)	Santa Cruz WWTF	Advanced Treatment off-site (Delaware Site shown for planning purposes only)	AWT	The advanced treated water would be blended with raw water coming from North Coast sources, the San Lorenzo River, and Loch Lomond water at the Coast Pump Station, and further treated at the GHWTP prior to distribution as finished water, suitable for drinking.	- RW delivered to be limited by available flow in summer months after meeting other demands (in-plant use + SqCWD deliveries) - High turbidity and high TOC in GHWTP source water. Consider synergies between GHWTP and AWPF when evaluating siting and blending.

Attachment D

City of Santa Cruz Recycled Water Facilities Planning Study

Alternatives Webinar Part I

October 18, 2016

** Includes amended notes to reflect discussion at workshop*

Agenda

- Approach & Objective
- Recycled Water Supply
- NPR Market Assessment and Demand
- NPR Treatment Requirements
- NPR Alternatives
  - Quantitative Results
  - Cost Comparison
- Qualitative Considerations
- Open Discussion

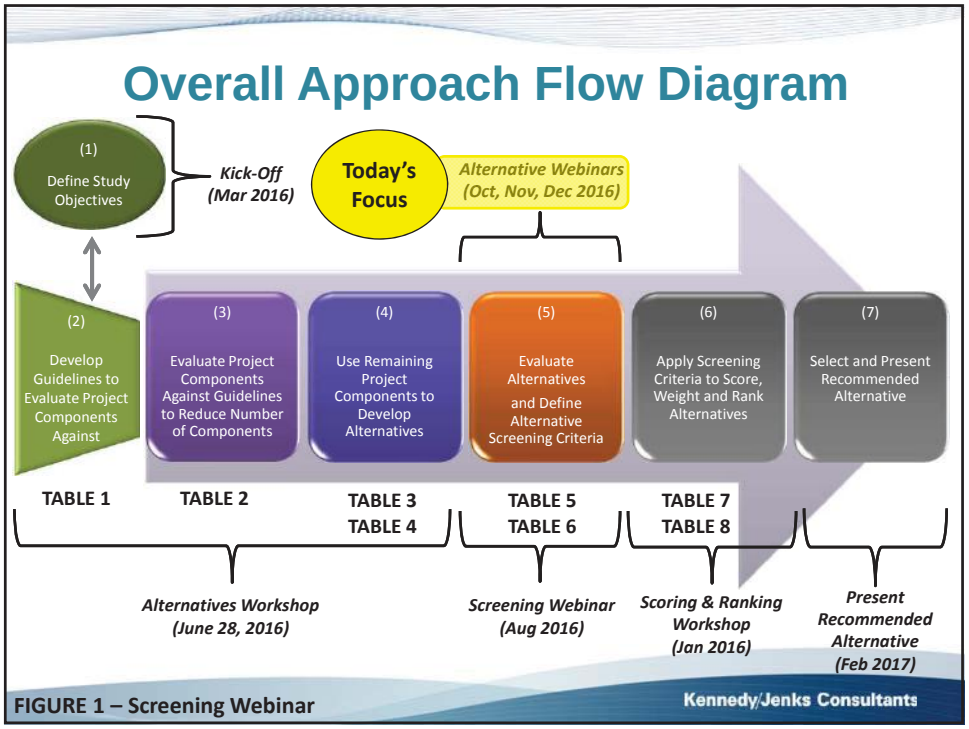

FIGURE 1 – Screening Webinar

Alternatives Webinar Objective

- **Objective:** Present preliminary evaluation for non-potable reuse (NPR) alternatives using preliminary maps, tables and figures to illustrate facility locations, capacities and preliminary costs.
- **Goal:** Obtain input and clarify assumptions
- **Action Items:** Response to specific requests for information, update alternatives, and memorialize discussion points to support scoring of alternative projects.

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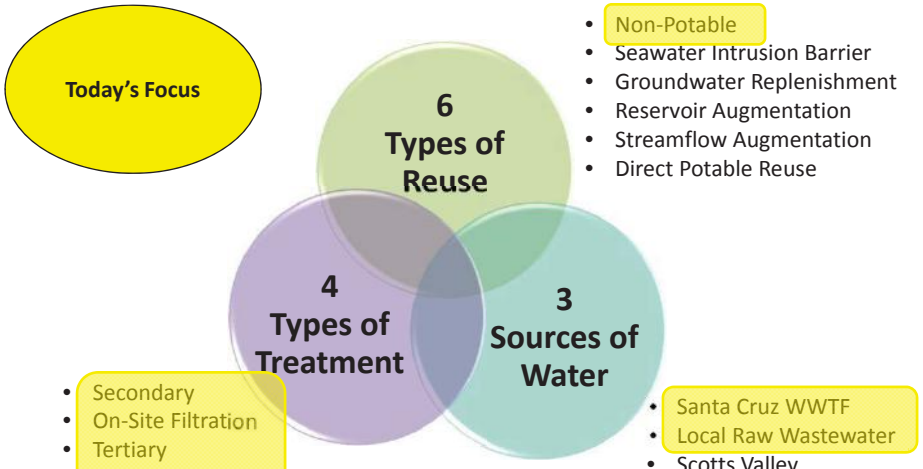
Project Components

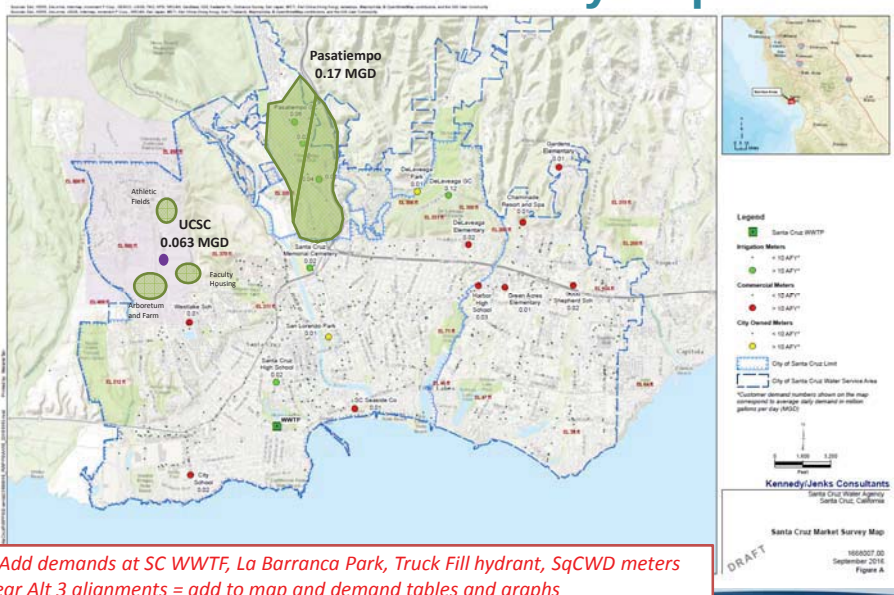


Recycled Water Supply

	Effluent (MGD)	2015	2008 - 2016 Average
Dry Weather Flow (June)	Average	6.1	7.1
	Minimum	5.4	5.1
Wet Weather Flow (Dec)	Average	8.4	9.0
	Maximum	20.9	28.8

- 2015 econometric analysis of demand and forecast shows average annual wastewater flow increase by 0.18 MGD (about 1%)
  - 2015 flow data is used

NPR Market Survey Map



** Add demands at SC WWTF, La Barranca Park, Truck Fill hydrant, SqCWD meters near Alt 3 alignments = add to map and demand tables and graphs*

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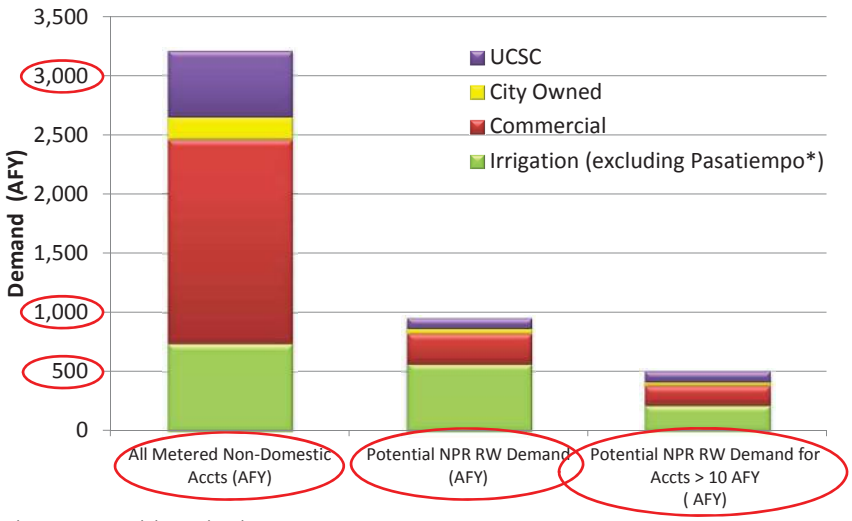
Estimated NPR RW Demand



Typical Santa Cruz total demand is about 7,500 AFY

- ✓ *Add SqCWD meters near Alt 3 alignments as a new stacked bar.*
- ✓ *Add Caltrans, SC WWTF and Truck fill (new category or integrate)*

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Estimated NPR RW Demand

Account Type	All Metered Non-Domestic Accts		Potential NPR RW Demand		Potential NPR RW Demand for Accts > 10 AFY	
	MGD	AFY	MGD	AFY	MGD	AFY
Irrigation (excluding Pasatiempo*)	0.66	736.25	0.50	563.54	0.19	213.10
Commercial	1.54	1727	0.23	257	0.15	166
City Owned	0.17	189	0.03	37	0.02	26
UCSC	0.50	559	0.08	93	0.08	93
Others	0.00	8	0.00	0	0.00	0
TOTAL	**2.87**	**3219**	**0.85**	**951**	**0.45**	**499**

~50% of annual potable water demand

Recycled water can only be served to be subset of non-domestic users

About half of the demand is from very small users

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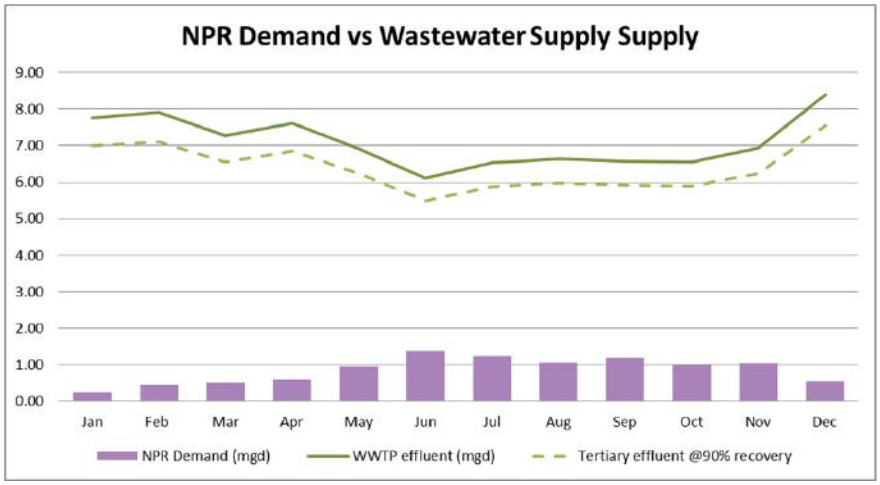
Supply and Demand



Sufficient effluent to meet NPR demands in Santa Cruz service area (0.85 mgd, 950AFY)

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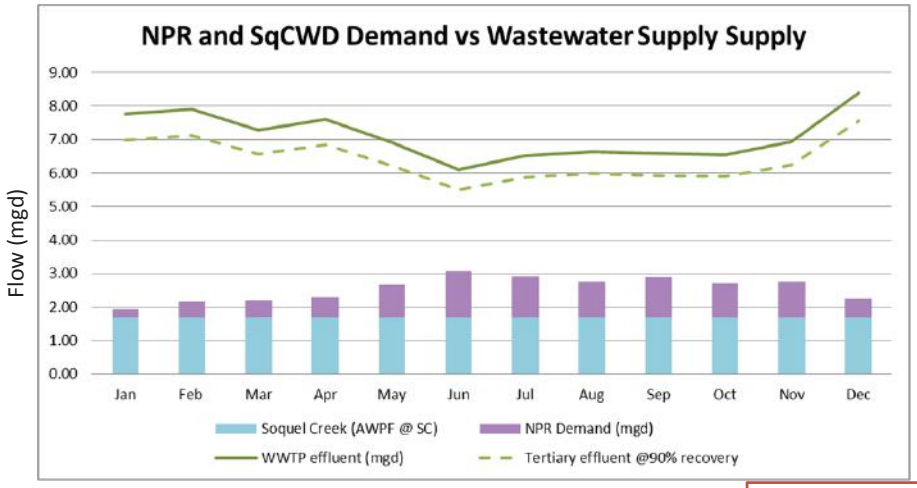
Supply and Demand



Sufficient effluent to meet NPR demands in Santa Cruz service area + SqCWD groundwater recharge demand (1.7 mgd, 1,900 AFY)

To be updated with added demands

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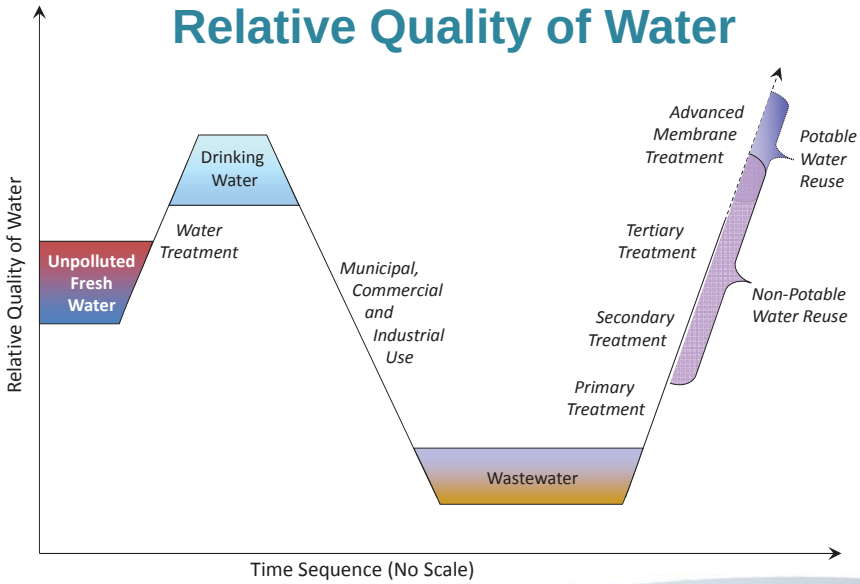
Relative Quality of Water



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Treatment Evaluation for NPR of *- Secondary Effluent -*

Reuse Type	Treatment				Uses
	Primary	Secondary	Filtration	Disinfection	
Non-Potable Undisinfected Secondary					• Restricted irrigation • Not for use with edible portion of food crops
Non-Potable Disinfected Secondary (both 23 or 2.2)					• Less restricted irrigation • Cemeteries, freeway landscaping, restricted golf courses • Not for use with edible portion of food crops

Reuse with Secondary Effluent was removed from further consideration in the Alternatives Development Workshop due to:

- Limited use in Santa Cruz
- Minimal benefit to water supply
- Public acceptance issues

Graphics by Trussell

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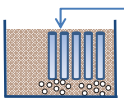
Treatment Evaluation for NPR of *- Tertiary Effluent -*

Reuse Type		Treatment				Uses
		Primary	Secondary	Filtration	Disinfection	
Non-Potable Disinfected Tertiary	Granular Media Filter (GMF)					• Unrestricted irrigation • Food crops • Parks, playgrounds, unrestricted golf courses
	Membrane filter (MF/UF)					
	Membrane Bioreactor (MBR)					

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Satellite Treatment of Secondary Effluent

(Photo: Waterworks Engineers)

Described by manufacturer as a "self-cleaning microfiber water-filters for treatments as fine as 2 micron that provides cartridge filter performance without cartridge filter replacement", which indicates performance similar to a tertiary media filter.

Treatment Evaluation for NPR of *- Advance Treated Effluent -*

Reuse Type	Treatment*	Uses
Potable Reuse With Secondary Feedwater	Membrane Filtration; Reverse Osmosis; Ultraviolet Light/Advanced Oxidation	• Potable and non-potable applications

Unrestricted AWT for reuse, as discussed the Alternatives Development Workshop:

- Beyond regulatory requirement for NPR
- Significantly higher cost/energy
- Keep as an option for customers along pipeline alignments that carry advanced treated water for potable reuse

**Based on the proposed treatment train for the SqCWD GRRP Feasibility Study.*

Graphics by Trussell

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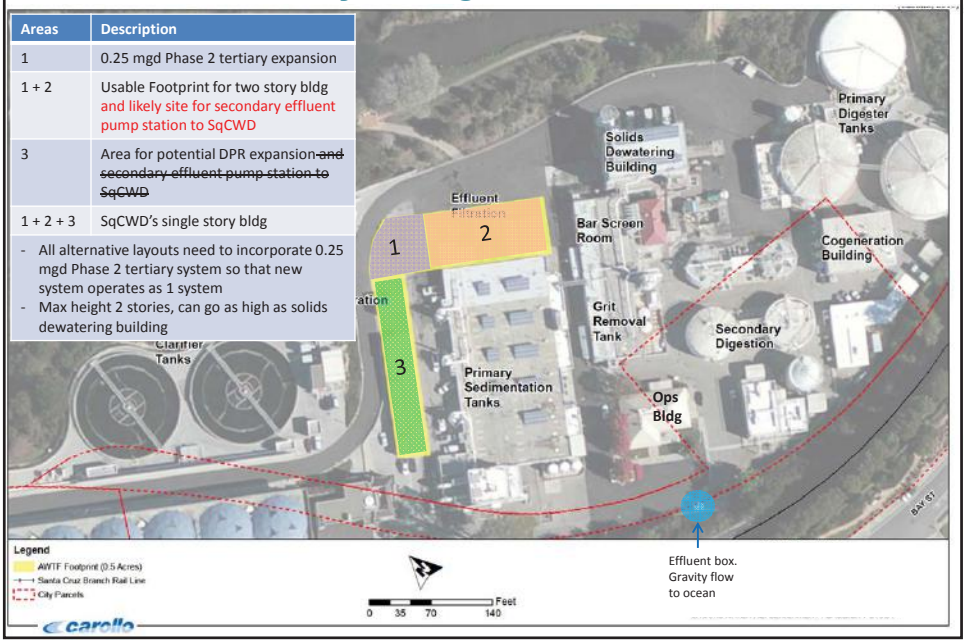
Treatment Facility Siting at the Santa Cruz WWTF

Areas	Description
1	0.25 mgd Phase 2 tertiary expansion
1 + 2	Usable Footprint for two story bldg and likely site for secondary effluent pump station to SqCWD
3	Area for potential DPR expansion ~~and secondary effluent pump station to SqCWD~~
1 + 2 + 3	SqCWD's single story bldg

- All alternative layouts need to incorporate 0.25 mgd Phase 2 tertiary system so that new system operates as 1 system
- Max height 2 stories, can go as high as solids dewatering building



Alternatives for Further Evaluation

- Alternative 1 – Centralized Non-Potable Reuse
- Alternative 2 – Decentralized Non-Potable Reuse
- Alternative 3 – Santa Cruz Participation in SqCWD-led GWRR Project*

** NPR projects only*

- Alternative 4 – Santa Cruz GWRR Project
- Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir
- Alternative 6 – Streamflow Augmentation
- Alternative 7 – Direct Potable Reuse

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Preliminary capital & annualized costs

- Capital Costs
  - Treatment
  - Pipelines
  - Pump Stations
  - Storage
  - Site Retrofit
- Annualized capital & O&M costs for alternative comparison
- Further inputs to confirm the following after webinar
  - Phasing of capital costs
  - Pipeline special crossing costs
  - Energy and labor costs
  - Interest and contingencies
  - Retrofit costs

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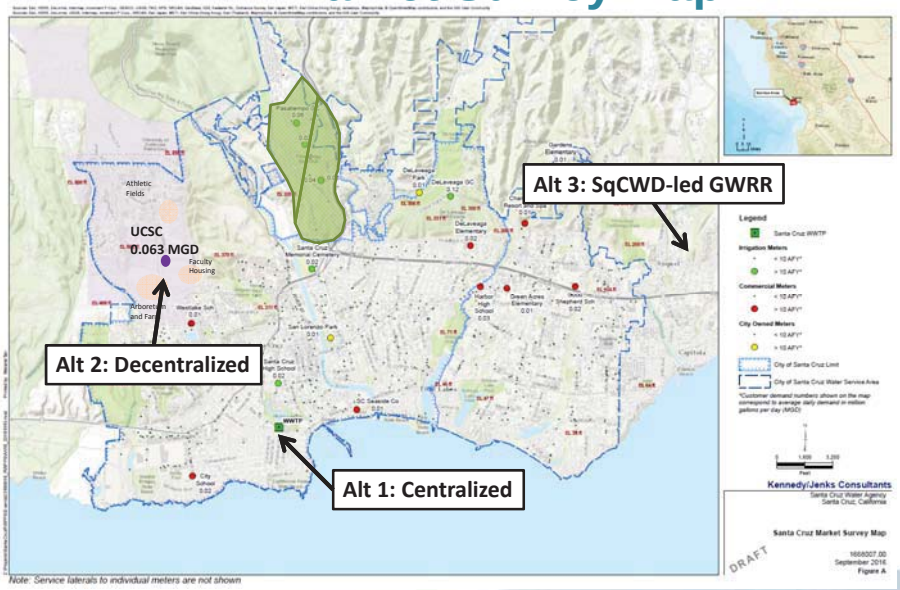
NPR Market Survey Map



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Alternatives 1: Centralized Non-Potable Reuse

Alternative	Sub Alt	Description	Source Water	Treatment		Use
Alternative 1 – Centralized Non-Potable Reuse	1A	Santa Cruz PWD Phase 2 Project	Santa Cruz WWTF	Tertiary Treatment at SC WWTF	3°	In-plant uses, truck filling and demonstration site (park near WWTF)
	1B	Maximize tertiary treatment at the SC WWTF			3°	Unrestricted use in Santa Cruz including UC Santa Cruz

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Alternative 1A: Santa Cruz PWD Phase 2 Project

0.25 MGD tertiary treatment capacity to meet in-plant needs and provide irrigation to La Barranca Park

✓ *Add pipeline to truck fill hydrant on California street*

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Alternative 1A: Santa Cruz PWD Phase 2 Project

- Project Size
  - 0.25 MGD tertiary treated recycled water
- Facilities
  - No new filters needed
  - Chlorine Contact Basin #2
  - Interconnecting Piping
  - Chemical dosing System
  - Control System
  - Other Miscellaneous Components – including pipeline to La Barranca Park
- RFP expected to be released late 2016

** Add demand and associated pipeline for hydrant at California street*

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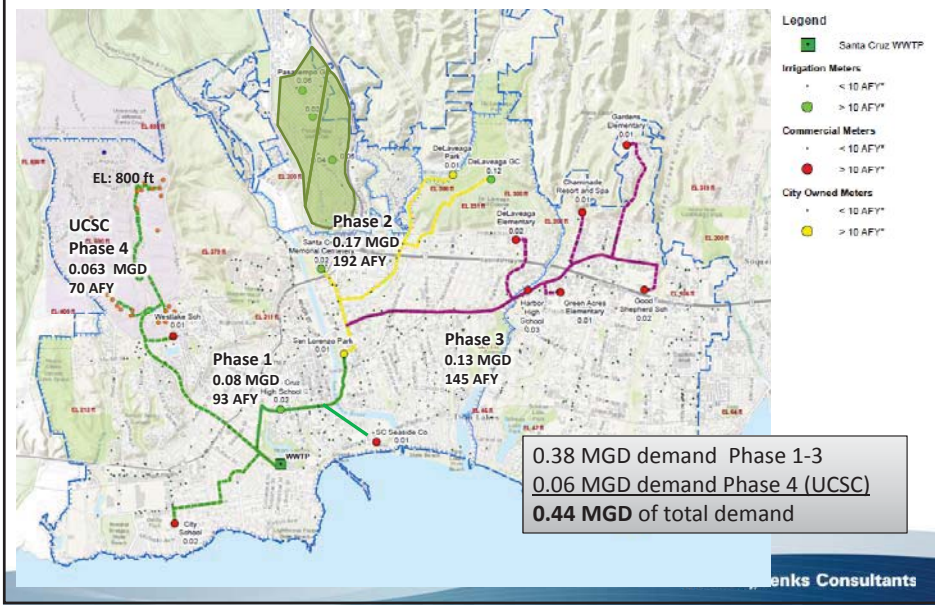
Alternative 1B: Maximize tertiary treatment at the SC WWTF



0.38 MGD demand Phase 1-3
0.06 MGD demand Phase 4 (UCSC)
0.44 MGD of total demand

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Alternative 1B: Maximize tertiary treatment at the SC WWTF

	Phase 1 (To San Lorenzo Park)	Phase 2 (To DeLaveaga Park & Golf Course)	Phase 3 (To Good Shepherd School)	Phase 4 (To UCSC)	Total
NPR Demand	0.06 MGD/ 71 AFY	0.17 MGD/ 192 AFY	0.13 MGD/ 145 AFY	0.06 MGD/ 71 AFY	**0.44 MGD/ 493 AFY**
Treatment Capacity	0.11 MGD	0.24 MGD	0.18 MGD	0.09 MGD	**0.62 MGD**
Pipelines	29,000 LF – 6"	20,000 LF – 6"	31,000 LF – 6"	14,000 LF – 6"	**17.5 miles**
Pump Stations	80 gpm 50 HP	-	500 gpm 90 HP	100 gpm, 50 HP	
Storage	To be determined by hydraulic modeling				
# of Customer Sites	7	13	29	3 clusters	**52**

Treatment capacity based on summer flow factor = 1.35
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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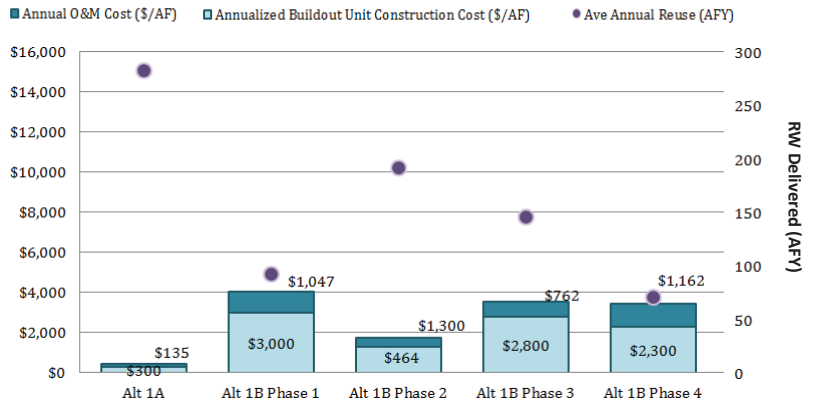
Alternative 1A and 1B



Capital Cost ($mil)	$1.6	$4.9	$4.3	$7.0	$2.8

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Alternatives 2: Decentralized Non-Potable Reuse

Alternative	Sub Alt	Description	Source Water	Treatment		Use
Alternative 2 – Decentralized Non-Potable Reuse	2	UC Santa Cruz	Local Raw Wastewater (UCSC)	MBR at UCSC	3°	On campus uses (irrigation, agricultural, cooling towers, dual-plumbed facilities)

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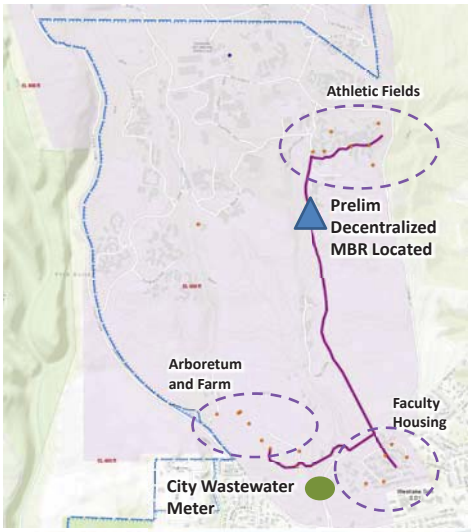
Alternatives 2: Decentralized Non-Potable Reuse at UCSC



- Project Size
  - 0.063 MGD tertiary treated recycled water
- Facilities
  - Decentralized MBR
  - Pipelines
  - Small Pump station
  - Pipelines
- Available sewer flows to be confirmed

✓ *Confirm that potential demand from UCSC dual plumbed building has been captured*

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Alternatives 2: Decentralized Non-Potable Reuse at UCSC

	Decentralized MBR
NPR Demand	0.06 MGD / 71 AFY
Treatment Capacity	0.09 MGD
Pipelines	~2 miles of 6" pipeline
Pump Stations	TBD – depends on location of MBR, which depends on available WW flows
Storage	To be determined by hydraulic modeling
# of Customer Sites	3 clusters

Treatment capacity based on summer flow factor = 1.35
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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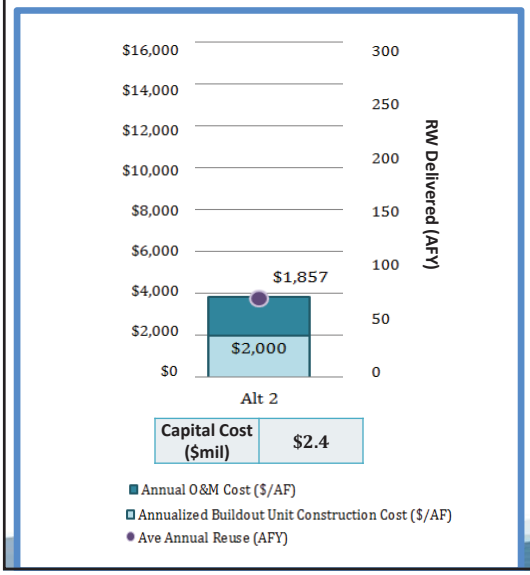
Alternatives 2: Decentralized Non-Potable Reuse at UCSC



Preliminary capital & annualized costs

- To confirm location of MBR on UCSC campus
  - Available sewer flow
  - Land availability
- O&M costs would depend on location of facilities

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Alternative 3: Santa Cruz Participation in a SqCWD-led GWRR

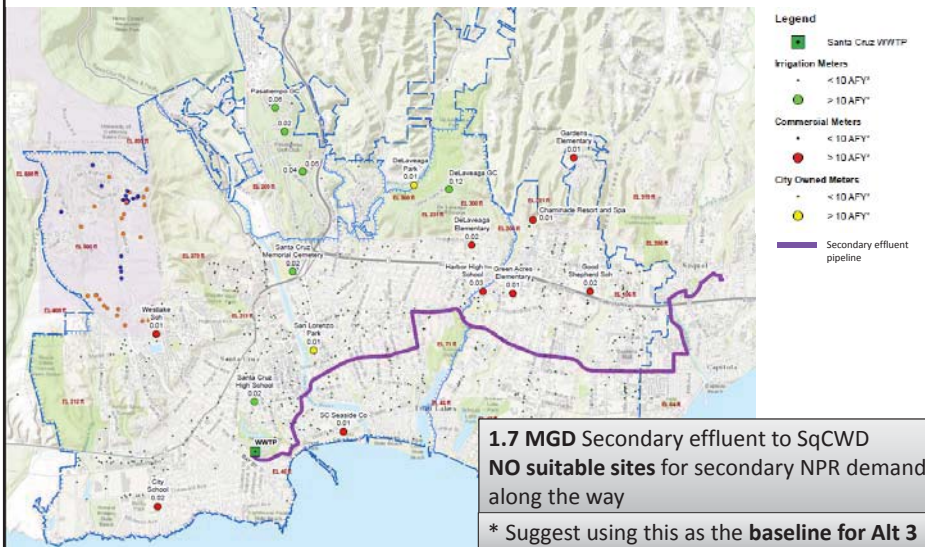
TABLE 3

Sub Alt	Description	Source Water	Treatment		Use
3a	Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way)		On-Site Treatment at NPR Customer sites	2° + filter	NPR Customers along secondary pipelines alignment from SC WWTF to AWTF
3b	Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way)		Tertiary Treatment at SC WWTF	3°	NPR Customers along tertiary pipeline alignment from SC WWTF to AWTF
3d	Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way)		Advanced	AWT	NPR Customers along pipeline alignment from SC WWTF to SqCWD injection sites

Today's focus is NPR in Santa Cruz - Only includes Alts 3a, 3b and 3d

Apply to all Alt 3:
- ✓ *To include Caltrans irrigation demand*
- ✓ *To include SqCWD NPR demand*
- ✓ *Update pump station sizing*
- ✓ *Identify one pipeline alignment for use in the RWFPS alternative comparison*

Alternative 3A: Secondary Effluent to SqCWD + NO NPR along the way



1.7 MGD Secondary effluent to SqCWD
NO suitable sites for secondary NPR demand along the way

* Suggest using this as the **baseline for Alt 3**

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Alternative 3A: Secondary Effluent to SqCWD NPR along the way

	Facilities
NPR Demand	0
SqCWD Demand	1.7 MGD Effluent
Treatment Capacity	No additional treatment required
Pipelines	7 miles – 14”
Pump Stations	2,800 gpm, 25 HP (or with booster station) *Update to reflect SqCWD constant flow*
Storage	To be determined by hydraulic modeling
Customer Sites	0

No NPR demand along the way.
All 1.7 mgd RW delivered is going to SqCWD

Treatment capacity based on summer flow factor = 1.35
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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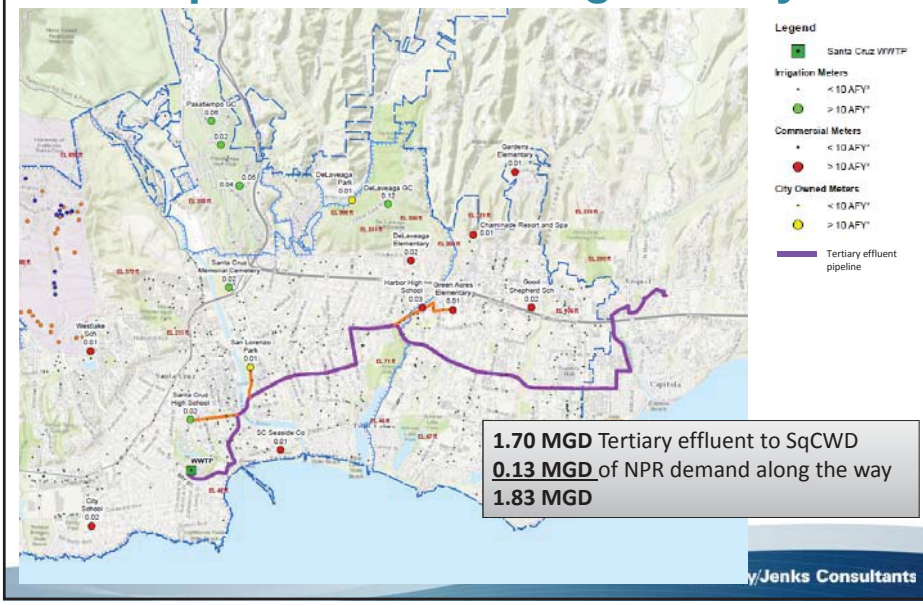
Alternative 3B.1: Tertiary Effluent to SqCWD + NPR along the way



1.70 MGD Tertiary effluent to SqCWD
0.13 MGD of NPR demand along the way
1.83 MGD

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Alternative 3B: Tertiary Effluent to SqCWD + NPR along the way

	Facilities
NPR Demand	0.13 MGD
SqCWD Demand	1.7 MGD Effluent
Treatment Capacity	1.87 MGD
Pipelines	7,700 LF – 6" (distribution) 7 miles – 16" (transmission – 2" larger than baseline Alt 3A)
Pump Stations	3,000 gpm, 760 HP (or with booster station) *Update to reflect SqCWD constant flow and NPR peak flow*
Storage	To be determined by hydraulic modeling
# of Customer Sites	43

Treatment capacity based on summer flow factor = 1.35 for NPR demand + no summer flow factor for SqCWD effluent demand
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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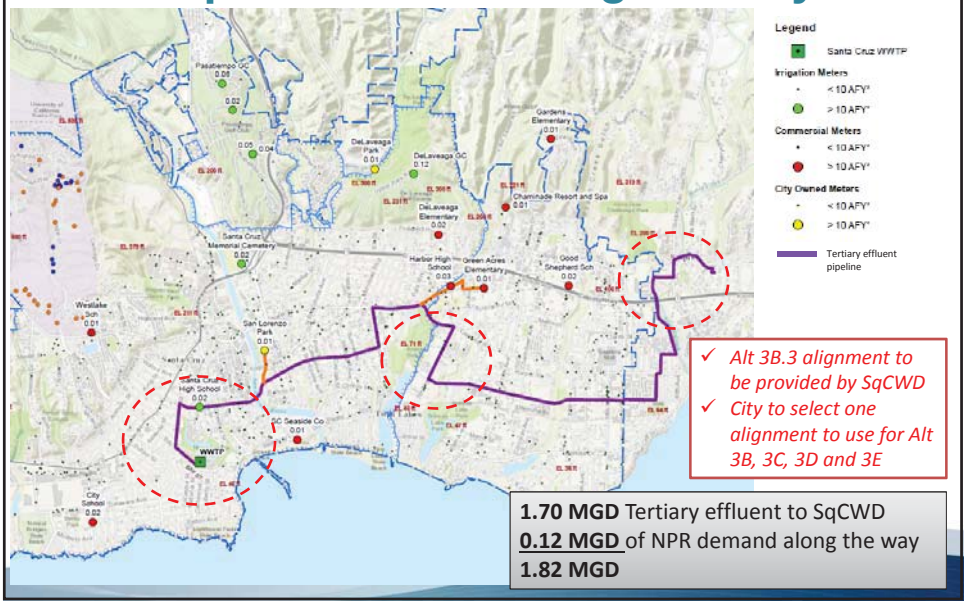
Alternative 3B.2: Tertiary Effluent to SqCWD + NPR along the way



- ✓ *Alt 3B.3 alignment to be provided by SqCWD*
- ✓ *City to select one alignment to use for Alt 3B, 3C, 3D and 3E*

1.70 MGD Tertiary effluent to SqCWD
0.12 MGD of NPR demand along the way
1.82 MGD

Alternative 3B.2: Tertiary Effluent to SqCWD + NPR along the way

	Facilities
NPR Demand	0.12 MGD
SqCWD Demand	1.7 MGD Effluent
Treatment Capacity	1.86 MGD
Pipelines	5,300 LF – 6" (distribution) 8.35 miles – 16" (transmission – 2" larger than baseline Alt 3A)
Pump Stations	3,000 gpm, 850 HP (or with booster station) *Update to reflect SqCWD constant flow and NPR peak flow*
Storage	To be determined by hydraulic modeling
Customer Sites	32

Treatment capacity based on summer flow factor = 1.35 for NPR demand + no summer flow factor for SqCWD effluent demand
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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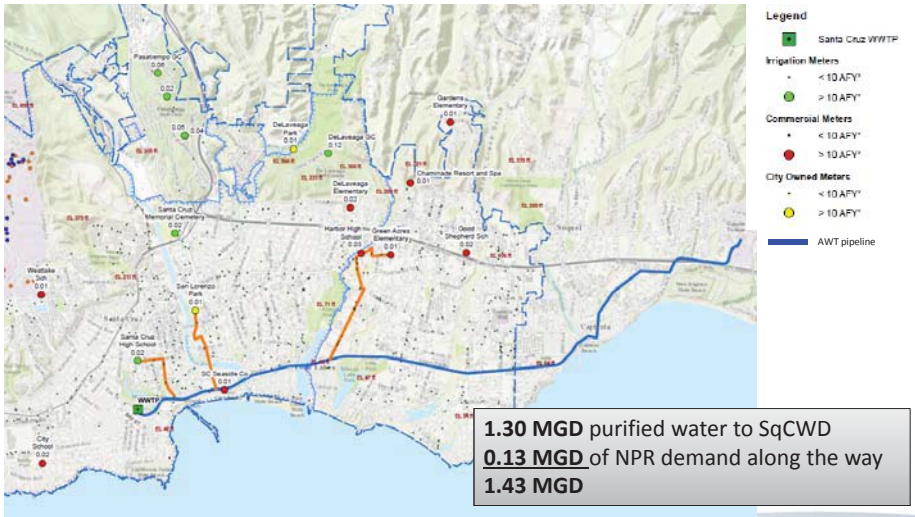
Alternative 3D: AWT @ SC WWTF send to SqCWD + NPR along the way



1.30 MGD purified water to SqCWD
0.13 MGD of NPR demand along the way
1.43 MGD

✓ *Confirm that potential commercial user demands consider high quality of AWT water, as compared to tertiary water offered for other alternatives*

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Alternative 3D: AWT @ SC WWTF sent to SqCWD + NPR along the way

	Facilities
NPR Demand	0.13 MGD
SqCWD Demand	1.3 MGD AWT Product Water
Treatment Capacity	0.18 MGD
Pipelines	4,200 LF – 6" (distribution) 7 miles – 14" (transmission)
Pump Stations	2,400 gpm, 215 HP (or with booster station) *Update to reflect SqCWD constant flow and NPR peak flow*
Storage	To be determined by hydraulic modeling
Customer Sites	34

Treatment capacity based on summer flow factor = 1.35 for NPR demand + no summer flow factor for SqCWD effluent demand
Pipeline and pump station sizing based on peak hourly demand, with pumping over 9 hours a day

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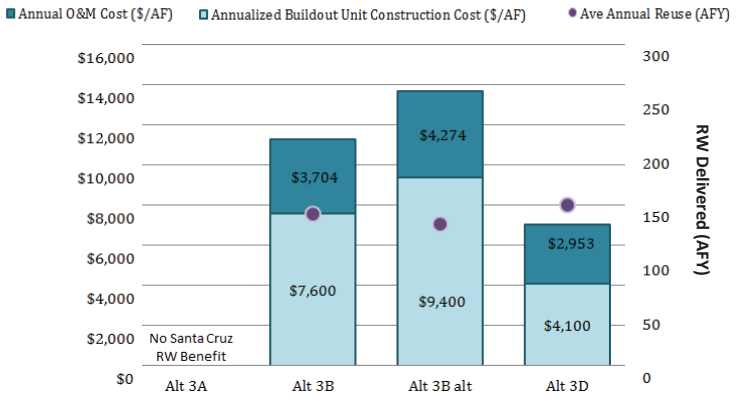
Alternative 3A, 3B.1, 3B.2 and 3D



Capital Cost ($mil)	n/a ~~$16.8~~	$18.7	$21.5	$10.7

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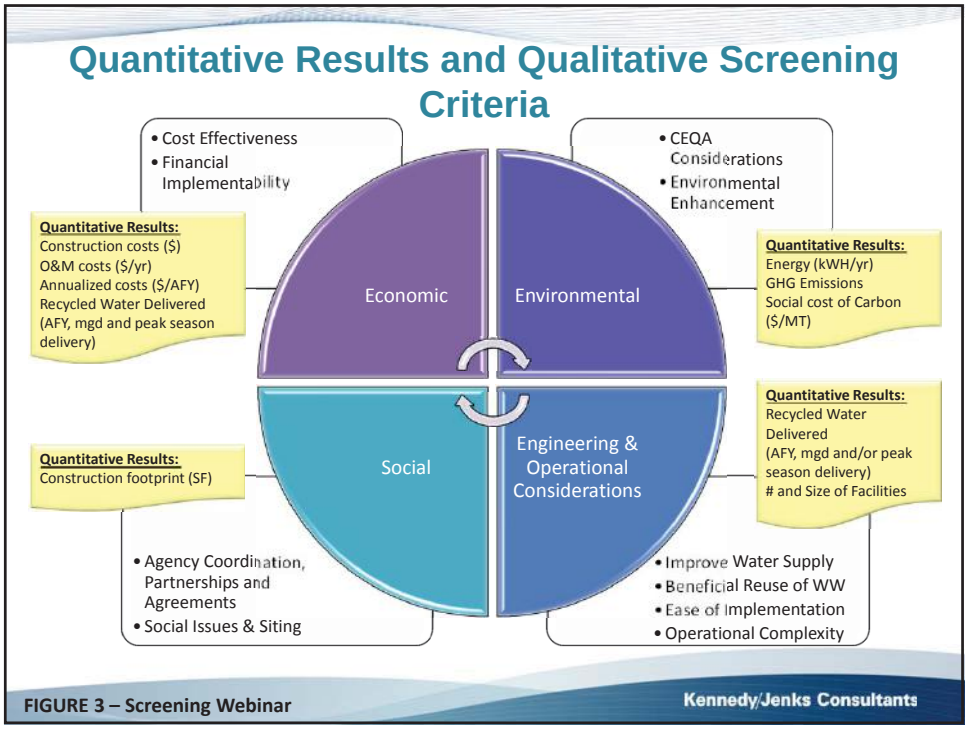
Quantitative Results and Qualitative Screening Criteria
• Cost Effectiveness
• Financial Implementability
Quantitative Results:
Construction costs ($)
O&M costs ($/yr)
Annualized costs ($/AFY)
Recycled Water Delivered (AFY, mgd and peak season delivery)
• CEQA Considerations
• Environmental Enhancement
Quantitative Results:
Energy (kWH/yr)
GHG Emissions
Social cost of Carbon ($/MT)
Economic
Environmental
Social
Engineering & Operational Considerations
Quantitative Results:
Construction footprint (SF)
Quantitative Results:
Recycled Water Delivered (AFY, mgd and/or peak season delivery)
and Size of Facilities
• Agency Coordination, Partnerships and Agreements
• Social Issues & Siting
• Improve Water Supply
• Beneficial Reuse of WW
• Ease of Implementation
• Operational Complexity
FIGURE 3 – Screening Webinar
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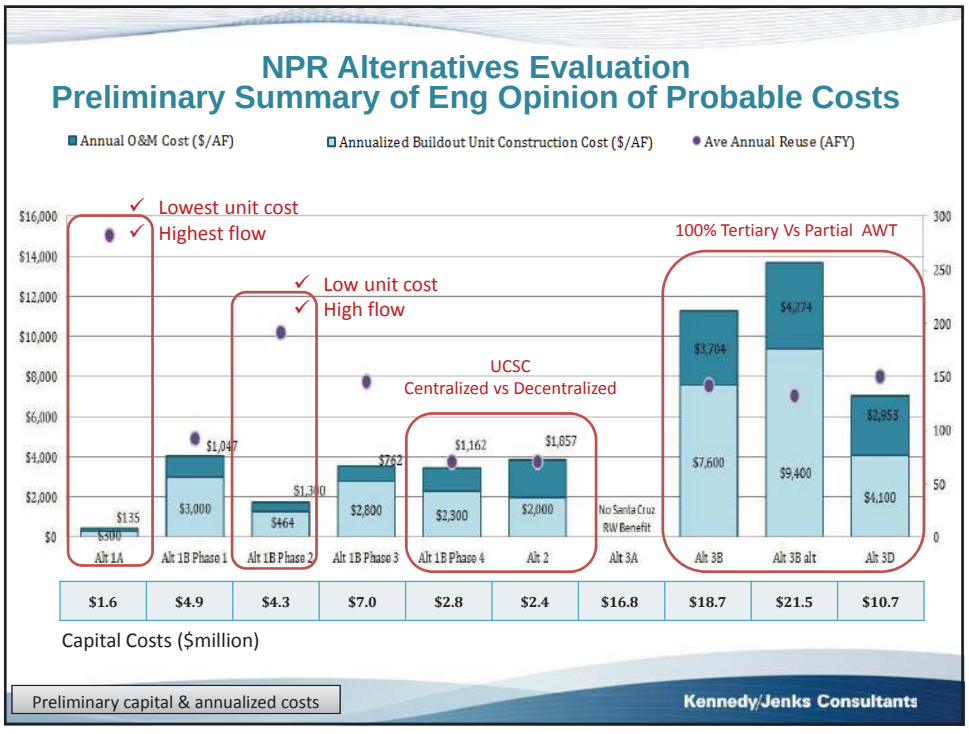
NPR Alternatives Evaluation
Preliminary Summary of Eng Opinion of Probable Costs
Annual O&M Cost ($/AF)
Annualized Buildout Unit Construction Cost ($/AF)
Ave Annual Reuse (AFY)
✓ Lowest unit cost
✓ Highest flow
✓ Low unit cost
✓ High flow
UCSC
Centralized vs Decentralized
100% Tertiary Vs Partial AWT
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
300
250
200
150
100
50
0
$135
$300
$3,000
$1,047
$464
$1,310
$2,800
$762
$2,300
$1,162
$2,000
$1,857
No Santa Cruz RW Benefit
$7,600
$3,704
$9,400
$4,274
$4,100
$2,953
Alt 1A
Alt 1B Phase 1
Alt 1B Phase 2
Alt 1B Phase 3
Alt 1B Phase 4
Alt 2
Alt 3A
Alt 3B
Alt 3B alt
Alt 3D
$1.6
$4.9
$4.3
$7.0
$2.8
$2.4
$16.8
$18.7
$21.5
$10.7
Capital Costs ($million)
Preliminary capital & annualized costs
Kennedy/Jenks Consultants

NPR Alternatives Evaluation
Summary of QUANTITATIVE Results

				Recycled Water Delivered				Estimated Costs			Energy / Others				
Alternative	Sub Alt	Description	Treatment Level	Ave Annual Reuse (AFY)	Average Annual Flow (MGD)	Peak Season Deliveries (AF in Summer - June)	Peak Hourly Flow (MGD)	Estimated Construction Cost ($mil)	Annual O&M Cost ($mil/yr)	Total Annual Cost ($/AF)	Unit Energy of RW Delivered (KWH/AF)	GHG Emissions (MTCO2/yr)	Social Cost of Carbon ($)	Footprint (SF)	Number and Size of Facilities
Non Potable Reuse	Alt 1A	Centralized Non-Potable Reuse - Santa Cruz PWD Phase 2 Project	3°	282	0.25	32	1.04	$2	$0.0	$435	TBD	TBD	TBD	TBD	TBD
	Alt 1B	Centralized Non-Potable Reuse - Maximize tertiary treatment at the SC WWTF	3°	501	0.45	42	1.34				TBD	TBD	TBD	TBD	TBD
		Phase 1		93	0.08	11	0.34	$5	$0.1	$4,047	TBD	TBD	TBD	TBD	TBD
		Phase 2		192	0.17	22	0.71	$4	$0.1	$1,764	TBD	TBD	TBD	TBD	TBD
		Phase 3		146	0.13	17	0.54	$7	$0.1	$762	TBD	TBD	TBD	TBD	TBD
		Phase 4		71	0.06	8	0.26	$3	$0.1	$1,162	TBD	TBD	TBD	TBD	TBD
	Alt 2	Decentralized Non-Potable Reuse	3°	71	0.06	8	0.26	$2	$0.1	$3,857	TBD	TBD	TBD	TBD	TBD
SqCWD Led GWRR	Alt 3A	Secondary Effluent to SqCWD + NPR along the way	2° + filter	1,903	1.70	159	5.10	$0	$0.0	$0	TBD	TBD	TBD	TBD	TBD
	Alt 3B	Tertiary Effluent to SqCWD + NPR along the way	3°	141	0.13	175	5.62	$19	$0.5	$11,304	TBD	TBD	TBD	TBD	TBD
	Alt 3B alt	Tertiary Effluent to SqCWD + NPR along the way	3°	132	0.12	174	5.59	$22	$0.6	$13,674	TBD	TBD	TBD	TBD	TBD
	Alt 3C	Secondary Effluent to SqCWD + SC GWRR (AWT @ SqCWD)	AWT												
	Alt 3D	AWT @ SC WWTF sent to SqCWD + NPR along the way	AWT	150	0.13	17	0.55	$11	$0.6	$13,674	TBD	TBD	TBD	TBD	TBD
	Alt 3E	AWT @ SC WWTF sent to SqCWD + NPR along the way + SC GWRR	AWT												
SC GWRR	Alt 4A	Santa Cruz GWRR Project - Advanced treatment at SCWWTF	2°												
	Alt 4B	Santa Cruz GWRR Project - Advanced treatment at off-site	2°												
	Alt 4C	Santa Cruz GWRR Project - MBR + AWPF at DA Porath	AWT												
SWA	Alt 5	Surface Water Augmentation (SWA) in Loch Lomond Reservoir	AWT												
Stream Aug	Alt 6	Streamflow Augmentation	AWT												
DPR	Alt 7	Direct Potable Reuse	AWT												

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NPR Alternatives Evaluation
QUALITATIVE Considerations

Categories	Alternatives Screening Criteria	General Comments on NPR
ENGINEERING & OPERATIONAL CONSIDERATIONS	Improve Water Supply	Ability to fill City water supply gap, supplement supply in peak season, timeline for implementation
	Beneficial Reuse of Wastewater	Maximizes reuse of wastewater now and/or does not limit future options to fully utilize wastewater
	Ease of Implementation	Permitability, construction complexity, flexibility for phasing and potential for expansion
	Operational Complexity	Treatment requirements and impacts to WWTF, facility siting
ECONOMIC	Cost Effectiveness	Relative unit costs
	Financial Implementability	Relative capital costs and tradeoffs
ENVIRONMENTAL	CEQA Considerations	Potential impacts and mitigation requirements
	Environmental Enhancement	Opportunity to enhance ecosystem and social cost of carbon (GHG emissions)
SOCIAL	Agency Coordination, Partnerships and Agreements	Level of effort and willingness to work together
	Social Issues & Siting	Public acceptance and local disruption

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OPEN DISCUSSION

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Next Steps

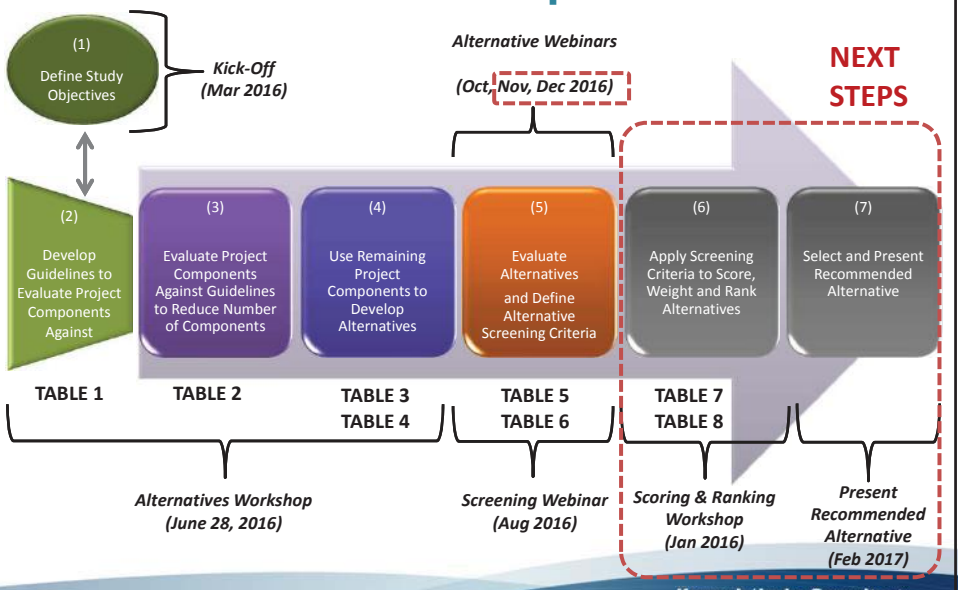

FIGURE 1 – Screening Webinar

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QUESTIONS

Kennedy/Jenks: Dawn Taffler DawnTaffler@KennedyJenks.com
Melanie Tan MelanieTan@KennedyJenks.com

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WATER COMMISSION
INFORMATION REPORT

DATE: 11/29/16

AGENDA OF: December 5, 2016

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Draft Water Commission Work Plan for Calendar Year 2017

RECOMMENDATION: Receive and accept Draft Water Commission Work Plan as a framework to focus Water Commission Efforts in Calendar Year 2017

BACKGROUND: Preparing a work plan for the Water Commission creates an opportunity for staff and Water Commissioners to discuss the key issues that will be coming before the Water Commission in the coming calendar year.

DISCUSSION: The attached draft 2017 Water Commission Work Plan is indicative of where the Department is in dealing with many of the issues it faces. Apart from a relatively few items related to the annual budget and the Capital Improvement Program, the Department is largely focused on implementing established direction received from the City Council. This means that fewer of the items in 2017 will be Commission action items than was the case in 2016 where we were dealing with so much of the organization's financial underpinnings and creating the organizational framework needed to support implementation of the Water Supply Advisory Committee (WSAC) recommendations and the needed investments and reinvestments in the water system's aging infrastructure.

A continuing item on the Water Commission's 2017 work plan is the quarterly update item on the Water Supply Augmentation Strategy (WSAS). These ongoing discussions of the Department's work to implement the WSAS help both Water Commissioners and the public follow along as the Department works towards the water supply reliability decisions that will be made by the City, with the advice of the Water Commission, in 2020.

With the success of the very interesting and engaging workshop on aquifer storage and recovery that took place at the Commission's November 2016 meeting, the Department expects to be bringing forward additional workshops that are focused on WSAS elements that we are evaluating during the feasibility assessment phase of implementing the WSAC's recommendations.

FISCAL IMPACT: None.

PROPOSED MOTION: Accept staff's draft Water Commission work plan as a framework to focus Water Commission Efforts in calendar year 2017.

12-5-16 Working Draft – Calendar 2017 Water Commission Work Plan

Water Commission Work Plan Item	Date of Anticipated City Council Action on Water Commission Recommendations
January 9, 2016	
➢ Review of WSAC Recommendations – Overview of work that needs to be done to support decision-making in 2020, including WSAS work plan products to be produced in calendar 2017	➢ Council Presentation on progress on implementing the WSAS
➢ Commission review and action on a Water Department proposed Quarterly Financial Report for the Water Commission	
➢ Water Commission review and comment on draft Memorandum of Agreement with Scotts Valley Water District and San Lorenzo Valley Water District for collaborative work on water transfers and exchanges including potential in lieu and aquifer storage and recovery projects	
February 6, 2017	
➢ Election of Officers	
➢ Peak Season 2017 Water Supply Outlook – First Look	
➢ Recycled Water Workshop (Study Presentation and Discussion)	
➢ Water Commission recommendation to the Council on a Memorandum of Agreement with Scotts Valley Water District and the San Lorenzo Water District on collaborative work on water transfers and exchanges	➢ City Council Action on Memorandum of Agreement with Scotts Valley Water District and the San Lorenzo Water District on collaborative work on water transfers and exchanges
March 6, 2017	
➢ Presentation on FY 2018 – FY 2027 Draft Capital Improvement Plan (CIP)	➢
➢ Quarterly Update on WSAS	
➢ Update on status of work on a habitat conservation plan for coho salmon and steelhead trout	
April 3, 2017	
➢ Water Commission action on FY 2018-2027 CIP	➢ City Council action on the FY 2018-2020 CIP (note the Council will look at the 10 year plan but only consider a 3 year plan, and actually takes action only on the first year of the CIP)
➢ Presentation on proposed FY 2018 Operations and Maintenance Budget	
➢ Peak Season 2017 Water Supply Outlook – Department Recommendation for Water Commission review and action	➢ Peak Season 2017 Water Supply Outlook – Council Action
➢ Report out on the results of the ASR hydrogeochemical testing	➢
May 1, 2017	
➢ Water Commission recommendation on the Water Department's FY 2018 Operations and Maintenance Budget	➢ Council Action on the City's Operating Budget (includes the Water Department)
➢	
➢	
➢	
June 5, 2017	
➢ Quarterly Update on WSAS	
➢ Water Commission update on regional activities to implement the California Sustainable Groundwater Management Act	
July 3, 2017	
➢ Recommend Cancelling as this falls the Monday before the 4th of July	
August 7, 2017	
➢	
➢	
➢	
September 4, 2017 (likely reschedule to the 11th)	
➢ Quarterly Update on WSAS	
➢	
October 2, 2017	
➢ Report on the results of the Phase I study on Aquifer Storage and Recovery (ASR Workshop 2)	
➢	
November 6, 2017	
➢	
➢	
December 4, 2017	
➢ Quarterly Update on WSAS	
➢	

Unscheduled Items – Note these items will be scheduled when time is available and they are ready for presentation to/discussion with the Water Commission –

- **Overview of the Department's system maintenance program**
- **Water affordability**
- **Asset management program**