CITY OF SANTA CRUZ

Water Department

Water Commission Agenda
Regular Meeting
7:00 p.m. – August 7, 2017
Council Chambers
809 Center Street, Santa Cruz

Agenda

Call to Order

Roll Call

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 1-12)

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. Accept the City Council actions affecting the Water Department ☆ (Pages 1-2)
2. Approve the June 5, 2017, Water Commission Minutes ☆ (Pages 3-10)
3. Update Water Commission Calendar ☆ (Pages 11-12)

Items Removed from the Consent Agenda

General Business (Pages 13-61)

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.

4. Water Supply Augmentation Strategy, Recycled Water ☆(Pages 13-18)
Recommendation: That the Water Commission receive information on the Recycled Water Feasibility Planning Study

5. Gravity Trunk Main Pipeline Condition Assessment ☆ (Pages 19-46)
Recommendation: That the Water Commission receive information about the Gravity Trunk Main Pipeline Inspection and Condition Assessment.

6. Program Management ☆(Pages 47-61)
Recommendation: That the Water Commission receive information on Upcoming Solicitation for Program Management Consulting Services.

Subcommittee/Advisory Body Oral Reports No action shall be taken on this item.

7. Santa Cruz Mid-County Groundwater Agency

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

Adjournment The next meeting of the Water Commission is tentatively scheduled for September 11, 2017, at 7:00 p.m. in a location to be determined.

☆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: 8/7/2017

AGENDA OF: August 7, 2017

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: City Council items affecting the Water Department

RECOMMENDATION: That the Water Commission accept the City Council items affecting the Water Department.

June 13, 2017

Liddell Spring Emergency Pipeline Replacement Project – Notice of Completion (WT)
Motion **carried** to accept the work of Granite Construction Inc. (Watsonville, CA) as complete and authorize the filing of a Notice of Completion for the Liddell Spring Emergency Pipeline Replacement Project.

System Development Charge Inflation Adjustment (WT)
Resolution No. NS-29,254 was adopted adjusting the System Development Charge by the inflationary factor calculated by the Handy-Whitman Construction Cost Index of water utility construction for the Pacific region, effective July 1, 2017; and rescinding Resolution No. NS-29,180.

June 27, 2017
Memorandum of Understanding Between the City of Santa Cruz and the Soquel Creek Water District Memorializing Preliminary Terms Related To "Pure Water Soquel," an Advanced Purified Groundwater Replenishment Project (PW / WT)
Motion **carried** to authorize the City Manager to execute the Memorandum of Understanding between the City of Santa Cruz and the Soquel Creek Water District memorializing preliminary terms related to "Pure Water Soquel," an Advanced Purified Groundwater Replenishment Project in a form approved by the City Attorney.

Acceptance of Clear Creek Property from Michael and Lenore Roberts (WT)
Resolution No. NS-29,268 was adopted authorizing the City Manager to accept real property commonly known as Clear Creek Property on behalf of the City of Santa Cruz from Michael and Lenore Roberts and to accept or execute on behalf of the City of Santa Cruz any and all notices, certificates of acceptance, consents, deeds, and other documents in connection therewith.

North Coast System Rehabilitation - Phase 3 Contract Change Order No. 5 (WT)
Motion **carried** authorizing the City Manager to execute Contract Change Order No. 5 in the amount of $198,000.81 for the North Coast System Rehabilitation - Phase 3 contract with Granite Construction Inc. (Watsonville, CA) in a form approved by the City Attorney.

Motion **carried** authorizing the Water Director to approve future change orders with Granite Construction Inc. for the North Coast System Rehabilitation - Phase 3 contract in a form approved by the City Attorney, for amounts that are within the approved project budget, Project c709835.

River Crossing Pipe Rehabilitation – Approval of Plans and Specifications, Authorization to Advertise for Bids and Award Contract, and Exemption from Local and Apprentice Employment (WT)
Motion **carried** to approve the plans and specifications for the River Crossing Pipe Rehabilitation Project and authorize staff to advertise for bids and award the contract and authorize exception from the local hiring requirement due to specialized nature of the construction. The City Manager is hereby authorized and directed to execute the contract as authorized by Resolution No. NS-27,563 and in a form to be approved by the City Attorney.

PROPOSED MOTION: Motion to accept the City Council items affecting the Water Department.

ATTACHMENTS: None.

CITY OF SANTA CRUZ
Water Department

Water Commission
7:00 p.m. –June 5, 2017
Council Chambers
809 Center Street, Santa Cruz

Minutes of a Water Commission Meeting

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

Roll Call
Present: L. Wilshusen (Chair), D. Engfer (Vice-Chair), D. Baskin, J. Mekis, A. Schiffrin, D. Schwarm
Absent: W. Wadlow (with notification)

Staff Present: R. Menard, Water Director; H. Luckenbach, Deputy Director/Engineering Manager Engineer; T. Goddard, Water Conservation Manager; B. Pink, Environmental Projects Analyst; N. Dennis, Principal Management Analyst; A. Poncato, Administrative Assistant III.

Others: There were two members of the public.

Statements of Disqualification – There were no statements of disqualification.

Oral Communications – There were no oral communications.

Announcements – There were no announcements.

Consent Agenda
2. Approve the May 1, 2017, Water Commission Minutes.

Commissioner Schiffrin moved the Consent Agenda Item 2 Approve the May 1, 2017, Water Commission Minutes. Commissioner Engfer seconded.
VOICE VOTE: MOTION CARRIED
AYES: All.
NOES: None.
ABSENT: W. Wadlow
ABSTAIN: D. Baskin and D. Schwarm were not present at the May 1, 2017, Water Commission meeting.

Items Removed from the Consent Agenda
1. Accept the City Council Actions Affecting Water Department.

Commissioners had questions about the information report on the Water Use Efficiency at the University of California.

The University wants to reduce their potable water use by 35 percent by 2025. What is the baseline year for this reduction?

- The baseline period is from 2005 – 2008.

How is the city involved in the Long Range Development Plan (LRDP) with the University of California Santa Cruz (UCSC)?

- The University plans to establish a community advisory committee and Water Department staff works with the University staff members on an ongoing basis related to water issues. Part of the reason that we included this information in the Council agenda item is to show that their water use is far below what was expected.

It should be noted that this report only reflects water use by students who reside on campus and does not address the student water use for those who live off campus. There could very well be a hidden increase in water use if the student population continues to grow.

- Actually, the Council item includes all water used by UCSC much, but not all of which is used by students who reside on campus. Additionally, the water system demand forecast prepared for WSAC factored in the anticipated population growth from 96,000 residents to a projected 112,000 residents by 2035, so potential growth in student population, should it occur in the community rather than on the campus would be covered by this provision.

This report is confusing. The University's water needs in the demand forecast developed during WSAC are going up to over 300 million gallons per year in 2035 but the goal in the proposed UCSC Water Action Plan is to reduce water use 35% by 2025 on a per capita (enrolled student) basis compared to the level in 2005-08.

- As discussed in the meeting, the University's water demand in 2020 was estimated in the 2005 LRDP at 349 million gallons per year. The WSAC forecast did not change that number. Rather it extended the time period for achieving that demand from 2020 to 2050.
- The basis for this decision was that information on projected enrollment beyond 2020 was unavailable and that the University's 2013 (pre-drought) demand was far below its projections from the 2005 LRDP.
- At the time of the development of the WSAC demand forecast, the University had not yet adopted what eventually became their 35% reduction target for future water use; and
- The amount of University water included in the forecast is NOT an entitlement for the University. It is a projection of their future water use that was developed due to the factors described above. Nothing about the forecast entitles them to the quantity of water included in the forecast.

Commissioner Schiffrin moved the Consent Agenda Item 1. Accept the City Council

Actions Affecting the Water Department. Commissioner Baskin seconded.
VOICE VOTE: MOTION CARRIED
AYES: All.
NOES: None.
ABSENT: W. Wadlow

General Business

3. FY 2018 Proposed Capital Improvement Program (CIP) and Operating Budget.
Ms. Dennis provided an overview of the FY 2018 Pro-Forma which included the FY 2018 Proposed (CIP) and FY 2018 Operating and Maintenance Budget.

How do you plan to keep pace with the planned CIP in those years where capital expenditures spike but there is no equivalent increase in personnel expenditures?

- We plan to hire a Program Management team to help us supplement staffing as soon as possible. The concept is that a consultant or team of consultants can add breadth and depth to staff as we begin to implement our very aggressive CIP.

The Pro Forma shows no rate increases until FY 2022. Did the City Council approve any water rate increases past 2022?

- Rate increases after FY 2021 have not been approved. We have five years of rate increases approved through FY 2021 and then we will conduct another cost of service analysis to determine the revenue requirements for the utility and possible rate increases for the next five years at that time.
- No rate increases are shown for the first few years because they are already embedded in the Pro Forma.

Capital expenditures over the next eight years are planned to total approximately $250 million dollars and it seems like the expectation is to complete the entire CIP by 2025. Is it a realistic expectation the Water Department is going to get all the projects completed in this timeframe? Was the Department going to spread out this major CIP over more years?

- The Department is not planning to spread out the CIP over more years. The Financial Plan reviewed by the Water Commission and adopted by the City Council in June of 2016 contemplated a nearly $300 million CIP that included both rehabilitation and replacement of major water supply, transmission and treatment infrastructure and development of a new water supply project by 2025.
- To avoid having both the water supply project and the infrastructure rehabilitation replacement projects in construction at the same time, the strategy has been to work on the infrastructure portion of the plan in the first five years while completing the planning work on the water supply project. Years 6 through 10 will be focused on constructing the water supply project.
- The commitment made in the Water Supply Advisory Committee (WSAC) process was to evaluate the alternative recommendation during the first five years, make a decision on which alternative to pursue in 2020 and have the water supply

project(s) implemented and online by 2025. The Department has been working very hard to get itself organized to meet these goals.

The plan outlined in the Pro Forma represents an increase in debt service costs from the current $2 million in FY 2018 to over $15.5 million in FY 2028. What portion of the ending balances required in the Pro Forma is being driven by debt service payments and maintaining the debt service coverage ratio?

- The 1.5x debt service coverage ratio, approved as part of the Long Range Financial Plan (LRFP) by the City Council and Water Commission, means your net income must be more than 1.5 times the amount of your debt service. The 50% additional annual revenues that must be collected over and above what you have to pay in debt service is a cash balance that is (and will be) applied towards the amount of "pay as you go" capital in the next fiscal year.
- During our work on the LRFP over the last two years, we carefully looked at these types of concerns. Debt service payments will represent approximately 20 to 25% of revenues in the out years. While this is a lot more than it has been historically, it is a reasonable level of debt for a utility of our size to carry and is necessary to accomplish the magnitude of capital investment over the next 8 years. It will also allow us to achieve some inter-generational equity by putting some of this financial burden on future generations who will receive the benefit of the investments that are being made in the water system for many years to come.

Is it reasonable to assume we will spend the full $32 million in FY 2020 on the Newell Creek Inlet/Outlet Pipeline project?

- We have a State Division of Safety Dams (DSOD) deadline we must meet, therefore; the projects must be completed on time.

Why is there no grant funding shown in the Pro Forma?

- It isn't appropriate to build in speculative sources of funding/revenues in the Pro Forma. However, we certainly recognize the benefits of finding grant or low interest loans to finance our projects and we are working on pursuing both grant and low interest State Revolving Fund (SRF) funding for the CIP.

What is the logic being used to determine which CIP projects we will charge staff/labor costs to?

- We focused on including projects over $2 million and projects where the staff is devoting over 50% of their time to make tracking easier for staff.
- Cash flow analysis for capital projects is also being implemented and will be included in future versions of the CIP. This analysis will support both tracking of spending and also help to inform resource allocation.

<u>Final Comments and Requests for Follow Up</u>

- Commissioners appreciated the information provided in the Pro Forma for FY 2018.
- Look into indexing those reserve funds that currently are set at a specific dollar value (e.g., the Emergency Reserve) to maintain more stable cash balances.

- Add year to year change and percent of revenue analytics to the annual budget presentation to the Commission.
- Continue to provide the summary "CIP Projects Overview" in future CIP budget presentations.
- Look into analyzing the resiliency of the water system given our experience with the winter storms and failures experienced in early 2017.
- Add a footnote to the Pro Forma to indicate that rate increases after FY 2021 as shown in the first line of the document have not been approved and are only projected rate increases based on the revenue requirements show in the Pro Forma.
- Commissioners suggested that the Department work to develop the discipline to track staff time by project for all projects, rather than just some.

Commissioner Baskin moved that the Water Commission recommend that the City Council approve the Water Department's FY 2018 Proposed CIP Budget and Operating Budget. Commissioner Mekis seconded.
VOICE VOTE: MOTION CARRIED
AYES: L. Wilshusen, D. Engfer, D. Baskin, J. Mekis, D. Schwarm
NOES: A. Schiffrin.
ABSENT: W. Wadlow

4. Water Supply Augmentation Strategy, Quarterly Work Plan Update (WSAS)
Ms. Luckenbach provided an overview of the Water Supply Augmentation Strategy (WSAS) Quarterly Work Plan Update.

What action items will the Commission make this year?

- One of the recommendations we need is the selection of element 3, which is the comparison of the recycled water and desalination alternatives. The decision to choose one of them needs to be made by the end of the calendar year as per the WSAC implementation schedule. We will also need confirmation on the criteria and the approach used to apply the criteria to do the evaluations on the recycled water and desalination alternative projects.

Will the Water Department be conducting water audits in county parks in our Outside City water service area?

- We have the funding to do more field surveys and we certainly can consider extending the approach used with City Parks to County Parks.

What is the procurement process and timeline for the Pipeloop RFQ?

- We received three statements of qualifications on June 2nd and pushed the deadline out until June 9th in hopes to get a fourth statement of qualification. There is a team in place who will begin to review the statement of qualifications beginning June 14th. There is a tentative schedule to do interviews the following week which may be pushed out a week. City Council is not meeting in July, so we could have a contract ready for City Council by August.

What involvement does UCSC have in the Advanced Treated Recycled Water project?

- One of the projects looked at in the Recycled Water study was a service area wide non-potable reuse project. It was presented as part of the options being reviewed in the February 6, 2017 Water Commission Workshop on recycled water. The 4 phases that were identified and evaluated related to the infrastructure (i.e. purple pipe) that would be needed to deliver tertiary treated wastewater to various areas of the City where there is enough irrigation demand to justify building infrastructure to deliver this product. One of the phase would be identified and evaluated would focus on UCSC irrigation demand and other potential non-potable use in dual plumbed buildings. As the City has worked on the recycled water study staff and supporting consultants have had several informal discussions with UCSC about their interest and possible participation in a possible future project.

If injection rates are reduced for whatever reason, would that fact require more wells as we currently have assumed, and do we have the space for those wells?

- The groundwater modeling scope of work includes twenty different scenarios in the Santa Margarita Basin, so we will be able to look at how many wells we need and where we would need to put them.

Have advancements in the climate change models as the science progresses changed our assumptions?

- There are two different climate-related areas of focus to think about. The first looks at a drought sequence (how long and at what frequency droughts occur) and the second looks at climate change impacts on hydrology. The technical advisory committee for the groundwater model will revisit the climate models so we have the correct predictions in terms of changed hydrology. It is currently not in the plan to revisit the recommendation from the Water Supply Advisory Committee (WSAC) to reevaluate the drought sequence. It can be done over time, but it is not a priority at this moment.

<u>Final Comments and Requests for Follow Up</u>

- Updated Water Commission work plan to be presented at the August water commission meeting.

5. Update on Implementation of the Sustainable Groundwater Management Act in Mid and Northern Santa Cruz County.

Ms. Menard provided an update on Implementation of the Sustainable Groundwater Management Act in Mid and Northern Santa Cruz County basically reiterating the key points from the staff memo included in the Water Commission agenda packet.

Subcommittee/Advisory Body Oral Reports

6. Santa Cruz Mid-County Groundwater Agency (MGA)

- MGA partnered with SkyTEM and Ramboll in May to analyze the offshore interface between fresh water and salt water. A low flying helicopter collected information that will be used to forecast saltwater intrusion in Santa Cruz County.

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

- Water supply is continuing to be good.
- Algae levels in Loch Lomond have been much higher than usual and we don't anticipate using Loch Lomond as the main source of supply until August so we're watching very carefully what is going on with the lake to make sure we have the water we need later in the season.

Adjournment Meeting adjourned at 8:34 p.m. The next meeting of the Water Commission is scheduled for August 7, 2017, 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
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Staff

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WATER COMMISSION
INFORMATION REPORT

DATE: 8/3/2017

AGENDA OF: August 7, 2017

TO: Water Commission

FROM: Heidi Luckenbach, Deputy Director/Engineering Manager

SUBJECT: Update Water Commission Calendar

RECOMMENDATION: That the Water Commission accept the updated Water Commission calendar.

PROPOSED MOTION: That the Water Commission accept the updated Water Commission calendar.

ATTACHMENTS:
Attachment A Water Commission Calendar

Water Commission Action Items - 2017			
8/7/17	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
August	GB	RWFPS - Final Recommendations	Potential Action on Phase 1 Potential non-potable reuse in Winter or Spring 2018, other actions on if/as needed as part of supplemental supply recommendations to Council in late 2020 as contemplated by WSAC recommendations
	GB	Report on results of inspection of the Ocean Street Gravity Trunk Main completed earlier this year	N/A
	GB	Program Management	Recommended Contract for remainder of FY 18 Nov. 14 or 28 with potential annual amendments
9/11/17	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
September	CO	Glossary	N/A
	GB	Quarterly Update on WSAS	N/A
	GB	Source Water Monitoring, Update on Plan and Findings	N/A
	GB	Update "State of the Water System" memo (2015) -- including addressing water system resilience	Incorporated into FY 19 Budget Presentation
10/2/17	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
October	CO	4th Quarter FY2017 Financial Report	N/A
	GB	Workshop: Report on the results of the Phase I study on Aquifer Storage and Recovery (ASR Workshop 2)	To be included as part of supplemental supply recommendations to Council in late 2020 as contemplated by WSAC recommendations
	GB	Initial Presentation and Refresher Water Supply Decision Making Process, tools, criteria, potential scope of work (prelude to Workshop scheduled for November)	N/A
11/6/17	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
November	GB	Dudek Report Out on Update on Local Desal Project	To be included as part of supplemental supply recommendations to Council in late 2020 as contemplated by WSAC recommendations
	GB	Workshop: Discussuion on Water Supply Decision Making Process, tools, criteria, potential scope of work, including WSAC Change Mgmt/Adaptive Mgmt: Incorporating work completed to-date	N/A
12/4/17	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
December	CO	1st Quarter FY2018 Financial Report	N/A
	GB	Watershed health presentation	N/A
	GB	Update on the status of HCP, including status of water rights conformance	No immediate Council action on either topic contemplated -- Ultimately both items will require Council actions to certify CEQA compliance, and take other actions as needed.
1/1/18	**Calendar Type**	**Item Title**	**Council Action/Meeting Date**
January	GB	Presentation of Projects	N/A

WATER COMMISSION
INFORMATION REPORT

DATE: 8/3/2017

AGENDA OF: August 7, 2017

TO: Water Commission

FROM: Heidi Luckenbach, Deputy Director/Engineering Manager

SUBJECT: Water Supply Augmentation Strategy, Recycled Water

RECOMMENDATION: That the Water Commission receive information on the Recycled Water Feasibility Planning Study.

BACKGROUND: The City's Water Supply Advisory Committee (WSAC) recommended several strategies in their Final Agreements and Recommendations of the Water Supply Advisory Committee (WSAC) for how best to address an agreed-upon water supply gap of 1.2 billion gallons during times of extended drought. The WSAC recommendations include continued water conservation as well as the evaluation of additional water supply alternatives including the development of groundwater storage (via in lieu water transfers and aquifer storage and recovery) and recycled water and desalination.

With regards to recycled water, the WSAC timeline included the following milestones:

- End of calendar year 2016: Identify recycled water alternatives; increase understanding of recycled water (regulatory framework, feasibility, funding opportunities, public outreach, and education)
- End of calendar year 2017: Complete high level feasibility studies, as-needed demonstration testing, and conceptual level designs of alternatives; define CEQA processes, and continue public outreach and education. Select preferred Element 3.

Kennedy/Jenks Consultants was hired by the City in February 2016 to complete a Recycled Water Feasibility Planning Study (RWFPS). As has been discussed with the Commission previously, the scope of work of the RWFPS was established to accomplish, at least at a high-level, the elements of these two milestones.

The objectives of the RWFPS are broader than those embodied in the WSAC Final Report. While studying the potential for recycled water to provide water supply benefit to the City, the RWFPS also evaluated a much broader range of potential beneficial uses of the treated effluent from the City's Wastewater Treatment Facility. Study partners include the City's Public Works

Department as well as the State of California who is funding a portion of the project through the State Water Resources Control Board's Water Recycling Funding Program. In addition to project partners, project participants have included the County of Santa Cruz, County Sanitation District, Soquel Creek Water District, and the Scotts Valley Water District.

Study Process: Attachment A provides a high level overview of the process staff, consultants and regional stakeholders and partners have gone through over the last 15 months, identifying potential projects, understanding the regulatory framework for the various projects, designing projects and understanding the costs associated with each project, and finally developing a list of projects to pursue in the near, mid and long term.

Attachment B shows the various components that were mix and matched to yield 24 different projects to consider. These 24 projects were categorized by use as non-potable reuse (NPR); Seawater Barrier; Groundwater Replenishment Reuse (GRR); and Reservoir Augmentation, Streamflow Augmentation, and Direct Potable Reuse (DPR) as briefly described below.

NPR: These projects considered source water from either the City's or Scotts Valley's Wastewater Treatment Facilities (WWTFs), or raw wastewater collected upstream of either WWTFs; end use considerations included irrigation, agricultural, or process water.

Seawater Barrier: Two projects were considered using source water from either the City's WWTF or raw wastewater collected upstream of the City's WWTF; end use was a series of barrier wells.

GRR: These projects considered source water from either the City's or Scotts Valley's WWTF or raw wastewater collected upstream of the City's WWTF; end uses were injection into either the Santa Cruz Mid-County Groundwater Basin and/or the Santa Margarita Groundwater Basin.

Reservoir Augmentation, Streamflow Augmentation, and Direct Potable Reuse: Considered source water from City's WWTF; end uses to either Loch Lomond, discharge to the San Lorenzo River below the City's Tait Street Diversion, discharge upstream of the City's Graham Hill Water Treatment Plant, or discharge directly into the City's water distribution system.

DISCUSSION: Having evaluated a broad range of projects, the RWFPS selected the series of projects shown in Attachment C that could be pursued in the near, mid and long term time horizons.

Next Steps: Staff will continue to work with the various stakeholders to evaluate the feasibility and interest in the near term projects. While preliminary conversations have been held, the issues of partnerships, cost sharing, rate structuring, etc. require additional consideration. In addition, and as reflected in the Water Supply Offset values, these are not water supply augmentation projects.

With regards to the mid term projects, these are aligned with the remainder of the WSAS work plan. As staff continues to work on groundwater modeling, development of regional partnerships, pilot testing of aquifer storage and recovery and conducting the loop testing program, the details of these projects will be better defined. An update on the progress of these will be included in the Commission's September agenda packet.

And finally, while the Long Term Projects did not demonstrate any real benefit or potential at this point, staff recommends keeping them in the wings for future consideration. Two issues, in particular, may make these options a better fit: 1) regulations that would make DPR more feasible and 2) operational changes that the Department may make that would improve the benefits realized by surface water augmentation (SWA).

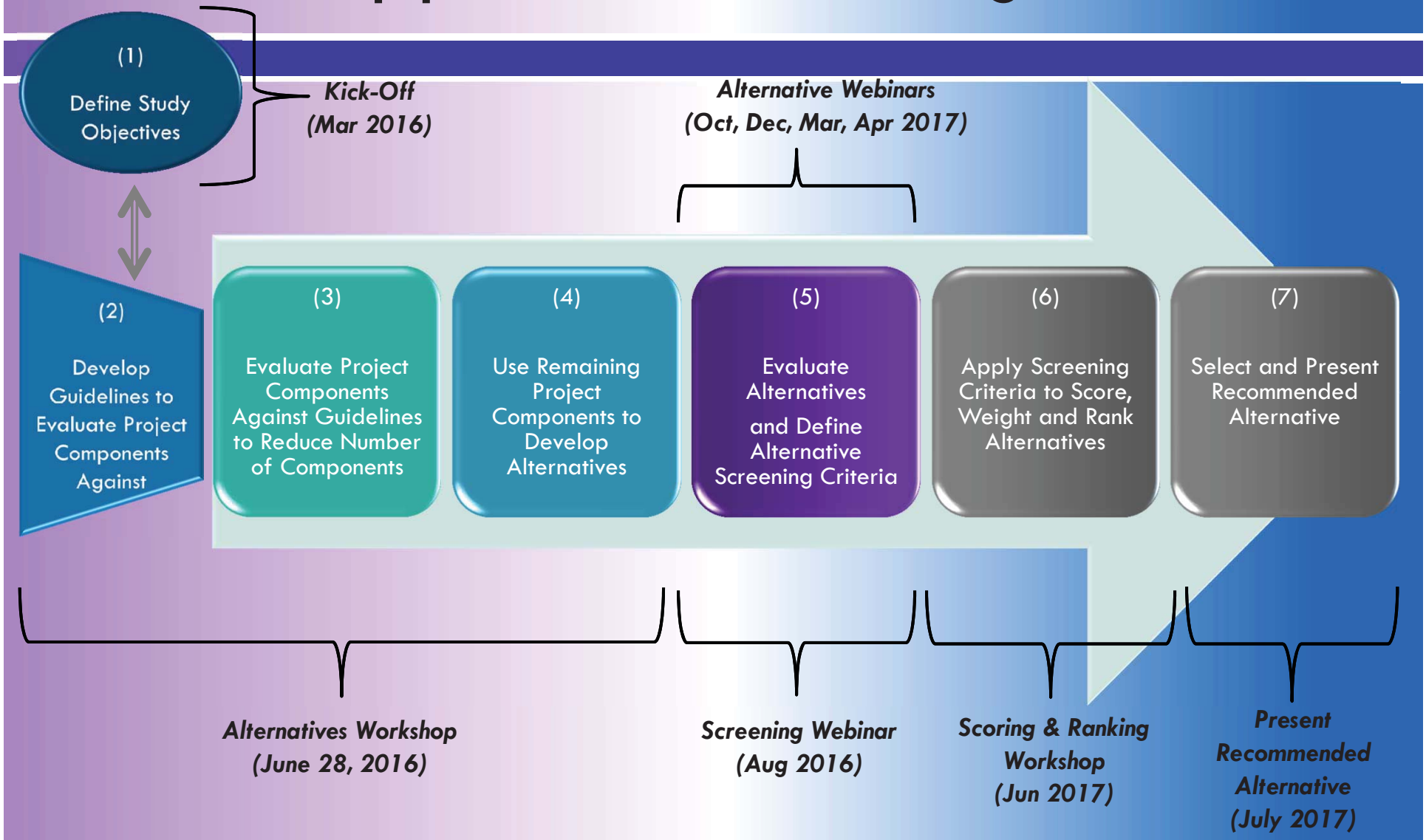
Staff will be presenting materials at the meeting to briefly summarize the study and be available for questions.

FISCAL IMPACT: None.

PROPOSED MOTION: Motion to receive information on the Recycled Water Feasibility Planning Study.

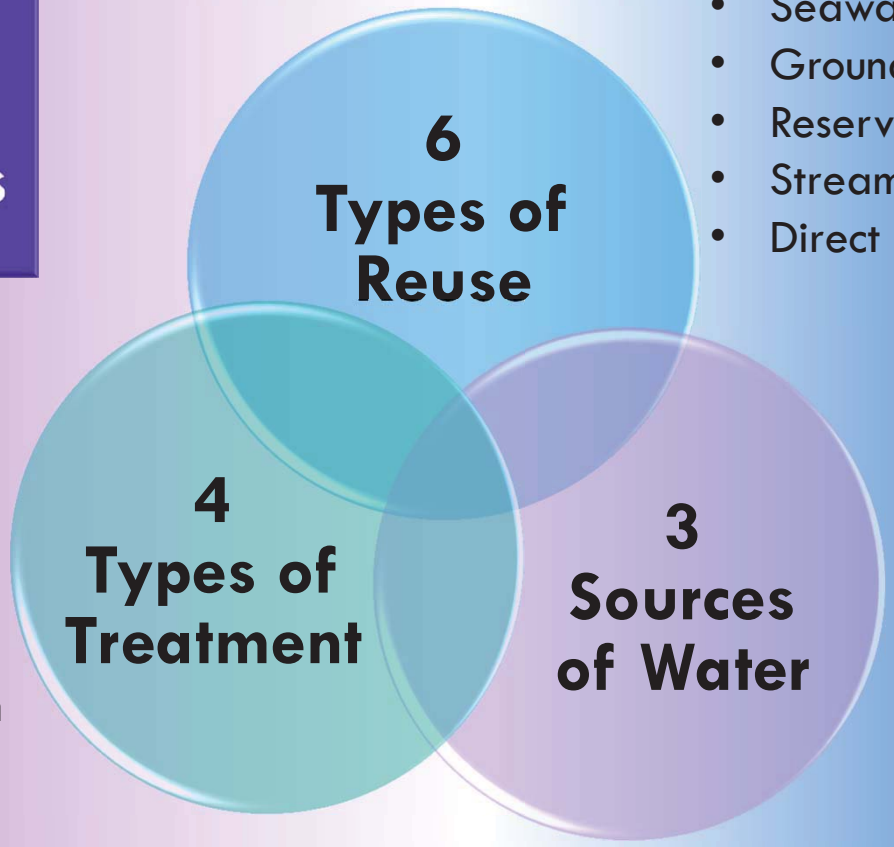
ATTACHMENTS:
Attachment A Overall Approach Flow Diagram
Attachment B Project Components
Attachment C Summary of Alternatives

Overall Approach Flow Diagram



PROJECT COMPONENTS

24 Project Components



- Non-Potable
- Seawater Intrusion Barrier
- Groundwater Replenishment
- Reservoir Augmentation
- Streamflow Augmentation
- Direct Potable Reuse

- Secondary
- On-Site Filtration
- Tertiary
- Advanced

- Santa Cruz WWTF
- Local Raw Wastewater
- Scotts Valley WWTF

Attachment C - Summary of Alternatives

Project	Brief Description	City Water Supply Offset [1]		Unit Life Cycle Costs[2]		Considerations
		(MGY)	(AFY)	($/AF)	($/CCF)	
Near Term (1-3 years) - Centralized Non-Potable Reuse						
Recommended Project: SCPWD Title 22 Project	Title 22 Upgrades at WWTF On-site use at WWTF Irrigation at nearby Parks Bulk water station / truck fill	50	150	$2,200	$5.20	• Lowest cost alternative • Shortest time to implementation • Minimal impact on City operations • Limited reuse outside of the WWTF • Selected as Recommended Project for the RWFPS
Recommended Project: BayCycle Project	Optimize tertiary production at WWTF Irrigation for Bay Street customers Potential to serve UCSC	50	160	$5,500	$12.60	• Right water for the right use • Short time to implementation • Existing regulations with straightforward permitting • High costs due to extensive infrastructure required and low demand • Selected as Recommended Project for the RWFPS
Mid Term (3-5 years) - Exploration of Groundwater Replenishment Reuse (GRR)						
Continue coordination with SqCWD and consider City opportunities for non-potable reuse and GRR	Provide SqCWD supply via existing MOU Explore GRR at Beltz Wellfield Consider facility sizing for shared facilities Advanced treatment at City or SqCWD City facilities plus shared facilities	730 to 770	2,250 to 2,370	$3,100 to $2,900	$7.10 to $6.70	• Investment in regional infrastructure realized in long term • Potential for cost-sharing and pursuing funding as a region • Potential to bank recharged water for extraction during dry years • Additional studies to confirm GW basin capacity, ability to capture recharged flow and meet all regulatory requirements • Interagency infrastructure challenges
Continue to explore City opportunities for GRR	Independent, City led GRRP at Beltz Wellfield Advanced treatment at or near WWTF Conveyance, new wells and monitoring	780	2,390	$2,900	$6.70	• City controlled project • Potential to bank recharged water for extraction during dry years • Greater water supply benefits and beneficial use • Additional studies to confirm GW basin capacity, ability to capture recharged flow and meet all regulatory requirements
Continue to explore Regional GRR in SMGB with Santa Cruz, Scotts Valley Water District, San Lorenzo Valley District and potentially SqCWD	Send effluent to an AWTF in Scotts Valley Utilize Newell Creek Pipeline to convey extracted GW to GHWTP City facilities plus shared facilities	1,170 1,170	3,580 to 3,580	$3,500 to $3,700	$8.00 $8.50	• Potential for cost-sharing and pursuing funding as a region • Highest capital cost alternatives • Longest timeline to implementation • Complex institutional arrangements and multi-agency coordination • Interagency infrastructure challenges
Long Term (5-15 Years) - Tracking Future Opportunities for Potable Reuse						
Surface Water Augmentation (SWA) in Loch Lomond Reservoir	Advanced treatment at or near WWTF Convey and blend purified water in Loch Lomond Augmentation when available reservoir capacity Outflow to GHWTP prior to potable distribution	580	1,780	$5,500	$12.60	• Potential to modify operational practices to maximize supply benefits • Potential environmental benefits to maintaining reservoir levels • High capital and unit costs due to extensive infrastructure required • Challenging regulatory, CEQA/NEPA and permitting requirements • Operational complexity for treatment and reservoir management • Additional limnological studies needed to confirm assumptions
Direct Potable Reuse (DPR) upstream of a drinking water treatment plant	Advanced treatment at or near WWTF with additional treatment barriers Convey and blend with raw water at or near Coast Pump Station prior to GHWTP Supplement potable supply year-round	1,170	3,580	$3,000	$6.90	• Maximize available beneficial use year-round • Maximize development and use of a local, sustainable new water supply • Relatively lower unit cost than other potable reuse alternatives due to limited new conveyance infrastructure needed and higher amount of reuse • Existing regulations have not been developed; no DPR project is currently permitted in California • Long timeline for implementation

1. The investigation of recycled water alternatives in the RWFPS is conducted within the context of the ability of a recycled water project to provide a new water supply to meet City demands.
Thus the demands shown represent the the average annual quantity of beneficial use within the City.
Recycled water beneficially used by project partners is considered in facility sizing to realize economies of scales from a regional project.

2. Unit life cycle costs represent the sum of annualized estimated construction cost plus annual O&M costs divided by the recycled water delivered over the life of the project to obtain a uniformly derived unit cost of water in dollars per acre-foot ($/AF) or dollars per hundred cubic feet ($/CCF)
The costs shown reflect the proportional facility cost associated with reuse in the City.
For example, the associated facilities and costs necessary for the treatment and delivery of flows for the SqCWD GRRP are not included.

WATER COMMISSION
INFORMATION REPORT

DATE: 8/3/2017

AGENDA OF: August 7, 2017

TO: Water Commission

FROM: Doug Valby, Associate Civil Engineer

SUBJECT: Gravity Trunk Main Pipeline Inspection and Condition Assessment

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RECOMMENDATION: That the Water Commission receive information about the Gravity Trunk Main Pipeline Inspection and Condition Assessment.

BACKGROUND: 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 (see attached map). Built in the early 1960s along with the GHWTP, the GTM feeds downstream transmission mains at Crossing Street, Hunolt Street, Kennan Street, Ocean Street, and Washburn Avenue. With about 88% of the City's average production flowing through the GTM and there being no other pipeline able to deliver this flow to our customers, it is perhaps the most critical pipeline in the treated water transmission system.

The pipeline gained special attention when it was discovered that its two large isolation valves had become inoperable and stuck in the open position. These valves provide flexibility to isolate critical parts of the system for maintenance, inspection, or repair while keeping the remainder of the water system in service. Replacement of the valves was completed by the fall of 2015 which also allowed for an inspection and condition assessment of the GTM.

As part of our ongoing effort to assess the condition of our critical infrastructure for probability and consequence of failure, an inspection, and analysis of the trunk main was conducted as the final phase of the gravity trunk main project. The main was inspected for key potential vulnerabilities, including active leaks, active corrosion which would compromise the structural strength of the pipe, air pockets (which can lead to corrosion), and corrosion of the steel bars wrapped around the concrete mortar coating.

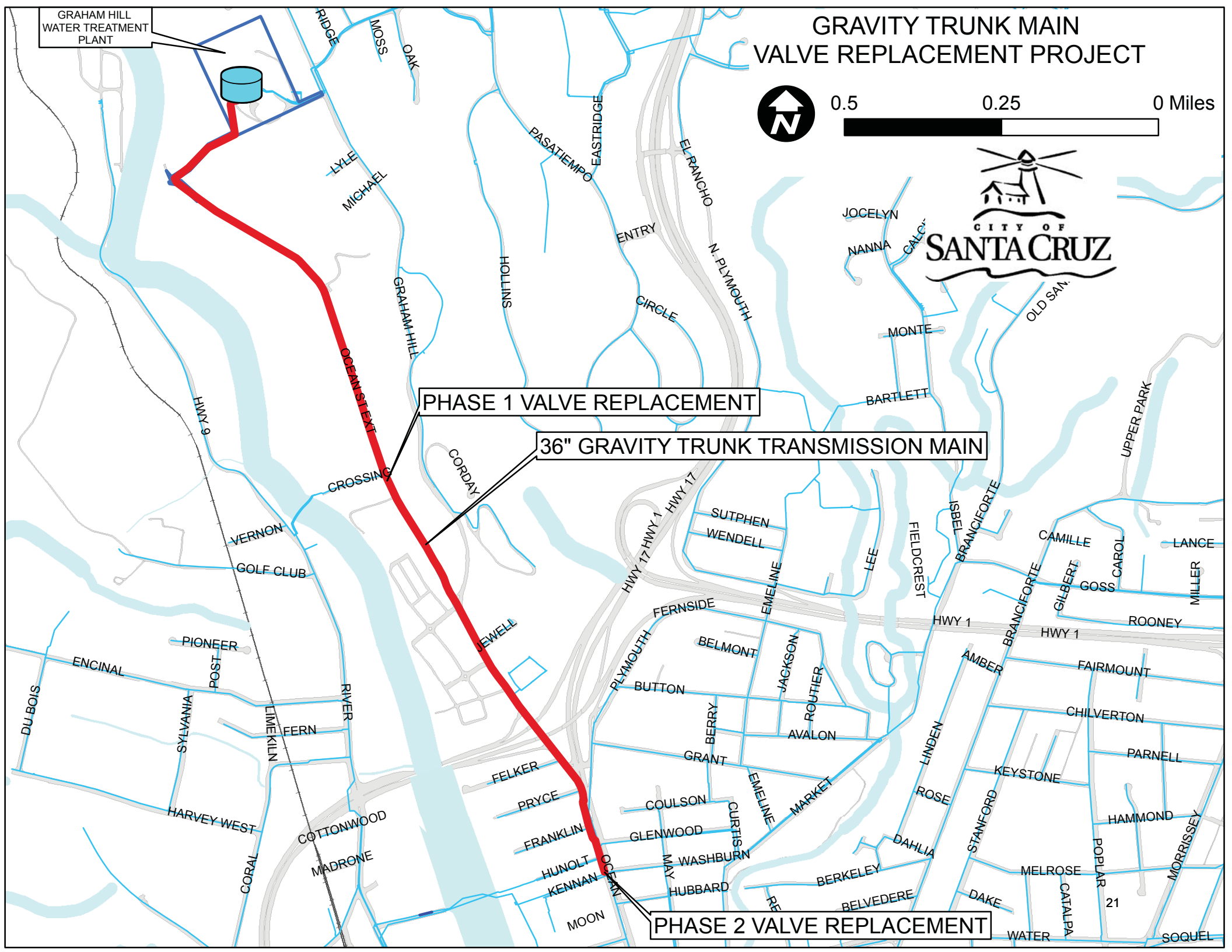
DISCUSSION: The inspection was performed the week of March 13th, 2017 and was performed over four days using three different proprietary inspection tools. The inspection itself kept us on the edge of our seats due to problems with the tools getting stuck in the pipeline. However, we were always able to free the tool and collect the inspection information needed while keeping all

customers in service. The inspection activity did result in a handful of water quality complaints since the inspection tool tended to stir up existing sediments inside the pipe. Flushing took care of that problem and follow-up sampling confirmed no health or safety issues. A report of the inspection, the detailed analysis of the inspection data, as well as a condition assessment summarization was completed by the end of May. In short, the inspection revealed that although a few minor anomalies were detected, no active leaks or corrosion cells were found and the pipeline is considered to be in excellent condition with no immediate need for repair.

FISCAL IMPACT: The total cost of the valve replacements came to $258,000 and the total cost of the inspection and condition assessment came to $253,000 for a total project cost of $511,000 as funded by CIP # c701504.

PROPOSED MOTION: Motion to receive information about the Gravity Trunk Main Pipeline Inspection and Condition Assessment.

ATTACHMENTS:
Attachment A Location map
Attachment B Inspection report


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
OCEAN ST EXT
GRAHAM HILL
RIDGE
MOSS
OAK
LYLE
MICHAEL
PASATIEMPO
EASTRIDGE
EL RANCHO
ENTRY
CIRCLE
HOLLINS
N. PLYMOUTH
JOCELYN
NANNA
OLD SAN
MONTE
BARTLETT
UPPER PARK
HWY 9
CROSSING
CORDAY
JEWELL
VERNON
GOLF CLUB
HWY 17
HWY 1
SUTPHEN
WENDELL
EMELINE
LEE
FIELDCREST
ISBEL
BRANCIFORTE
CAMILLE
LANCE
CAROL
GILBERT
GOSS
MILLER
ROONEY
FERNSIDE
PLYMOUTH
BELMONT
JACKSON
ROUTIER
BUTTON
BERRY
AVALON
GRANT
FELKER
PRYCE
FRANKLIN
HUNOLT
KENNAN
COULSON
GLENWOOD
WASHBURN
MAY
CURTIS
MARKET
HUBBARD
MOON
OCEAN
BERKELEY
BELVEDERE
DAHLIA
ROSE
LINDEN
AMBER
FAIRMOUNT
CHILVERTON
PARNELL
KEYSTONE
STANFORD
HAMMOND
POPLAR
MORRISSEY
MELROSE
CATALPA
DAKE
WATER
SOQUEL
21
PIONEER
ENCINAL
POST
DU BOIS
SYLVANIA
LIMEKILN
FERN
RIVER
HARVEY WEST
CORAL
COTTONWOOD
MADRONE

May 31, 2017
Doug Valby, P.E.
Associate Civil Engineer
City of Santa Cruz Water Department
212 Locust Street, Suite C
Santa Cruz, California 95060

Subject: 36-Inch Filtered Water Transmission Main
Summary of Leak and Gas Pocket and Electromagnetic Inspection Results

Dear Mr. Valby:

Pure Technologies U.S. Inc. (Pure Technologies) has prepared this summary of leak and gas pocket and electromagnetic results for the 36-inch Filtered Water Transmission Main. This is **not** a complete condition assessment report. The complete condition assessment report will be submitted following a discussion with the City of Santa Cruz Water Department (City) in regards to the structural evaluation as discussed in the project scope.

The 36-inch Filtered Water Transmission Main is owned and operated by the City and conveys potable water from the northwest to the southeast to the City's water distribution system. The inspected section of the pipeline starts at the filtered water tank located at the Graham Hill Water Treatment Plant and ends at the butterfly valve located at the intersection of Ocean Street and Kennan Street. The Filtered Water Transmission Main spans approximately 8,052 feet (1.53 miles) and is comprised of 36-inch bar wrapped pipe (BWP). The alignment of the main is shown in Figure 1.

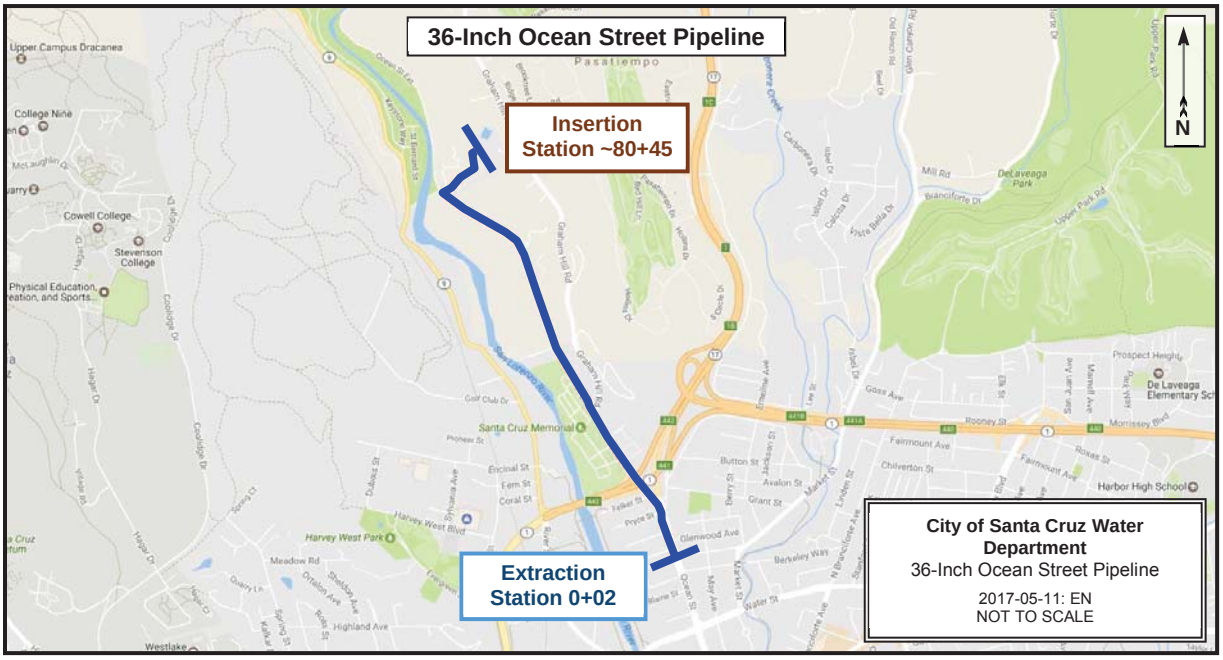


Figure 1. Alignment of the 36-Inch Filtered Water Transmission Main.

The 36-inch Filtered Water Transmission Main was subject to a SmartBall leak and gas pocket detection survey on March 13, 2017 and a PipeDiver electromagnetic inspection on March 1 through March 16, 2017. The purpose of the SmartBall inspection was to identify and locate leaks and gas pockets while the purpose of the PipeDiver inspection was to identify and locate broken bars and areas of wall loss in the steel cylinder of the BWP.

Background Information

The Filtered Water Transmission Main was manufactured by American Pipe and Construction Company in 1960. In uly 2015, the City replaced an inoperable 2-inch isolation valve assembly with a 2-inch flanged American Water Works Association (AWWA) C515 spur gate valve located on the 36-inch Filtered Water Transmission Main at the intersection of Ocean Street Extension and Crossing Street. The valve replacement was installed under Phase 1 of CWO 201-005. In October 2015, the City replaced an inoperable 2-inch isolation valve assembly located on the 36-inch Filtered Water Transmission Main with a 2-inch flanged AWWA C515 bevel gear gate valve located at the intersection of Ocean Street and Kennan Street. The City installed a retrieval station comprised of a 2-inch flanged AWWA C50 butterfly valve, 36-inch manhole cover with frame, and 18-inch blind flange with 2-inch tap to allow removal of the PipeDiver tool. The valve replacement and retrieval station was installed under Phase 2 of CWO 201-005.

The Filtered Water Transmission Main is a critical pipeline for the City. Approximately 88 of the water produced by the Graham Hill Water Treatment Plant flows through the Filtered Water Transmission Main to the City's water distribution system, serving a population of approximately 9,000. To Pure Technologies' knowledge, this pipeline has not experienced any catastrophic failures.

Leak and Gas Pocket Detection Survey Results

The 36-inch Filtered Water Transmission Main was subject to a SmartBall leak and gas pocket detection survey on March 13, 2017, and was completed in one (1) run. The results of the inspection are summarized in Table 1. A full description on the SmartBall methodology and limitations is provided in Appendix A.

Table 1: SmartBall Inspection Summary	
Total Length Inspected:	8,052 feet
Pipe Material:	BWP
Diameter of Pipe:	36 inch
Product:	Potable Water
Total Number of Leaks:	0
Total Number of Trapped Gas Events:	0
Duration of the Inspection:	2 hours, 35 minutes
Average SmartBall Tool Velocity:	0.9 feet per second

Does not include set-up and break-down times.

The SmartBall tool was inserted through the filtered water tank at Station 79□□5 using a remotely operated vehicle (ROV) and extracted through the entry port at Station 0□00 using a telescoping net and caterpillar hoop. Photos of SmartBall insertion and extraction are shown in Figure 2.

Figure 2. Left – ROV used for insertion. Right – Telescoping net used for extraction.

The SmartBall tool was tracked above ground by Pure Technologies using sensors installed at predetermined pipeline features. A total of four (□) surface mounted sensors connected to SmartBall Receivers (SBRs) were used to track the progress of the SmartBall tool during this inspection. The tracking locations and time the SmartBall tool reached each location is included in Table 2.

Table 2: SmartBall Receiver Locations

SBR No.	Distance from Insertion	Passage Time	Location Description
SBR □1	0 feet	2:08:55 PM	Insertion at Filtered Water Tank
SBR □2	993 feet	2:23:□8 PM	Pothole location at Station 68□□8
SBR □3	□,186 feet	3:3□:12 PM	Blowoff valve at Station 38□58
SBR □□	5,311feet	3:57:56 PM	Pothole location at Station 27□36
SBR □5	8,052 feet	□:□□:13 PM	Extraction at 18-inch access manhole at Station 0□00

The tracking data collected by the SBRs can be supplemented with position data collected by the SmartBall tool to determine the velocity and distance profiles of the tool over the course of the inspection. This information is shown in Figure 3 and Figure □.

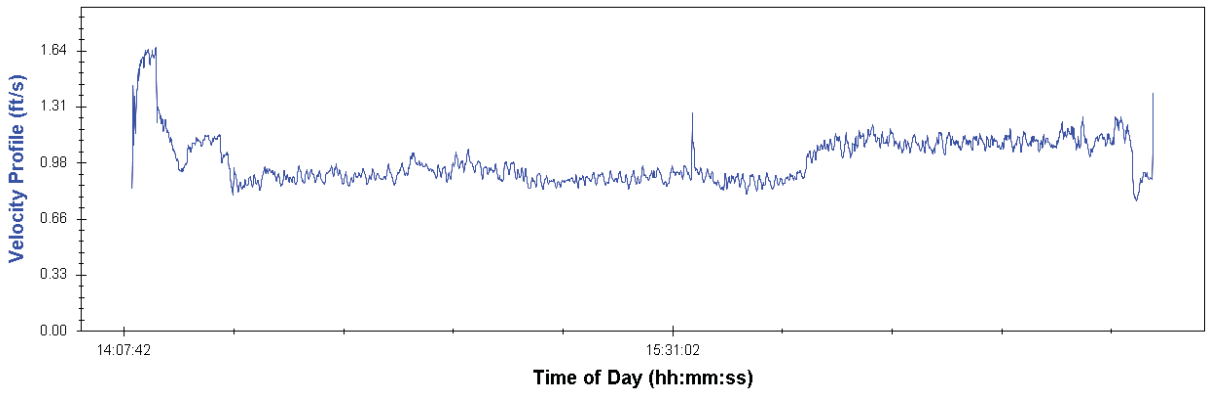


Figure 3. SmartBall tool velocity profile.

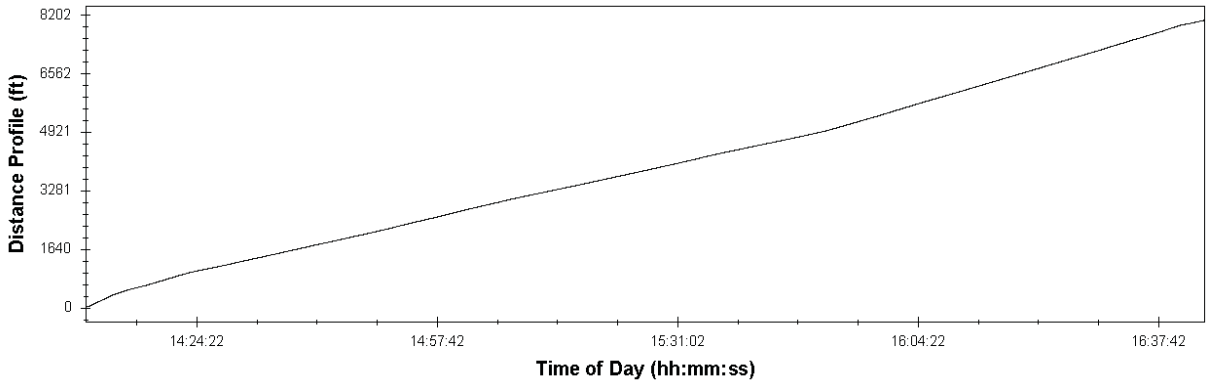


Figure 4. SmartBall tool distance profile.

The inspection identified no acoustic anomalies indicative of leaks or trapped gas throughout the entire pipeline. A leak inside a pressurized pipeline produces a distinct sound as the fluid escapes into the lower pressure atmosphere outside the pipeline. While the SmartBall tool traverses a pipeline, it continuously records acoustic data, which is later evaluated to identify acoustic anomalies consistent with leaks.

As the SmartBall tool moves toward a leak the amplitude of the sound created increases, peaks at the exact location of the leak, and then diminishes as the tool travels away. The increase and decrease of the amplitude of the audio data is critical to precisely locate leaks. Pure Technologies has invested heavily into identifying the characteristics of audio that is representative of a leak. The characteristics typical of a leak include:

- The range of fre□uencies present increases as the ball approaches the leak.
- The fre□uencies that appear first intensify as the SmartBall tool approaches the leak.
- The fre□uencies that indicate a leak are consistent as the SmartBall tool approaches the leak.

Gas trapped in a pipeline may present itself as entrained gas, gas slugs or developing gas pockets, or fully developed gas pockets. Each of these distinct forms of gas accumulations have acoustic signals that can be detected using the SmartBall tool.

A gas pocket inside a pipeline generates a distinct acoustic signal that is detectable using the SmartBall leak and gas pocket detection system. Gas pockets in pressure pipes are typically found at high points in the pipeline often due to malfunctioning or misplaced air and vacuum release valves (ARV). The acoustic signal is created by the li□uid turbulence at the air□water interface. In full, pressurized pipes, this turbulence is not present.

Electromagnetic Inspection Results

The 36-inch Filtered Water Transmission Main was subject to a PipeDiver electromagnetic survey on March 1□ through March 16, 2017, and was completed in three (3) runs using two (2) different tools. The mini PipeDiver tool was used to identify and locate broken bars and was completed in one (1) run on March 15, 2017. The 2□ detector (2□D) PipeDiver tool was used to identify and located anomalous areas of cylinder loss and was completed in two (2) runs on March 1□ and March 16, 2017. A full description of the electromagnetic technology and limitations is provided in Appendix B.

The PipeDiver tool was inserted through the filtered water tank at Station 79□□5 using a diver and extracted through the entry port at Station 0□00 by hand. Photos of the PipeDiver tools used during the inspection are shown in Figure 5.

Figure 5. Left - 24D PipeDiver tool. Right – Mini PipeDiver tool.

The inspection covered a cumulative distance of 1.52 miles and spanned a total of 262 pipes. Analysis of the data obtained during the inspection determined that no pipes in the 36-Inch Filtered Water Transmission Main displayed electromagnetic anomalies consistent with broken bar wraps. Additionally, three (3) pipes were identified with anomalous signals not characteristic of broken bar wraps that can be attributed to a change in the pipe cylinder. A summary of the results is presented in Table 3.

Table 3: Electromagnetic Inspection Summary					
Pipeline	**Diameter (inches)**	**Length (feet)**	**Number of Inspected Pipes**	**Pipes with Broken Bar Wraps**	**Pipes with Cylinder Anomalies**
Filtered Water Transmission Main	36	8,0□1	262	0	3

The City provided Pure Technologies with the pipe laying schedules and the plan and profile drawings for the majority of the inspected portions of the 36-inch Filtered Water Transmission Main. The stationing used in this report was obtained from the pipe laying schedules, where available. Where drawings were not available, the pipe lengths and stationing were extrapolated from the last known station number listed in the pipe laying schedules and the electromagnetic data.

A few differences were noted in the provided pipe laying schedules and the collected data for the 36-inch Filtered Water Transmission Main. These differences included either a pipe observed in the data that was not listed in the pipe laying schedules or vice versa, or variations in the pipe length or layout from what is stated in the pipe laying schedules. Several pipes with 2-inch outlets that were listed in the pipe laying schedules were not visible in the collected data. It is likely the size, configuration, cylinder thickness, and□or the proximity of the feature with respect to the pipe joint affected the overall detection□therefore, the presence of these features cannot be confirmed. Due to these differences and for clarity in reporting, Pure Technologies created a Pipe List. The Pipe List is provided in Appendix C as a spreadsheet and includes information that can be used to locate specific pipes.

Several pipes in the collected data were affected by the presence of noise□changes in pipeline flow. As a result, large signal variations are observed in the data, affecting the overall data □uality. The affected pipes are listed in the Pipe List and the results for these pipes are reported with less certainty.

Of the 262 pipes inspected in the 36-inch Filtered Water Transmission Main, no pipes had electromagnetic anomalies consistent with broken bar wraps. The electromagnetic analysis of the 36-inch Filtered Water Transmission Main identified three (3) pipes with anomalous signals that do not resemble the characteristics of broken bar wraps. These pipe sections identified with electromagnetic anomalies can be attributed to a change in the pipe cylinder or a change in pipe property, and have been further categorized by anomaly type based on the electromagnetic signature observed in the collected data:

- Circumferential: Anomalies in the pipe that are observed in most or all detectors (full circumference) and only affect the noted positional range of the pipe. The anomaly observed is not indicative of cylinder wall loss based on findings observed in testing on pipes at other sites.

- Feature-Like: Anomalies in the pipe that have characteristics of a possible undocumented feature.

Both the circumferential and feature-like anomaly types have signals that behave differently than the established baseline (undamaged) electromagnetic signal and indicate a region of the cylinder where a manufacturing feature or property change of the cylinder is the most likely source of the anomaly. The pipes with these anomalous signals are listed in Table □.

Table 4: Pipes with Cylinder Anomalies in the 36-Inch Filtered Water Transmission Main

Pure Reference Number	Piece Number	Low Station	Pipe Length (feet)	Pipe Class	Cylinder Anomaly Positional Range (feet)	Anomaly Type
5	3605	1+05	32	150	21.5-23.0	Feature-like
219	36217	67+89	32	150	12.0-14.0	Feature-like
248	36247	76+37	31	150	28.0-30.5	Circumferential

Cylinder Anomaly Positional Range – represents the portion of the pipe affected by the anomalous signal. Signal position is measured from low station.

Conclusions

Pure Technologies' evaluation of the 36-inch Filtered Water Transmission Main concluded that:

- No leaks or acoustic anomalies consistent with trapped gas events were identified during the leak and gas pocket detection survey.
- Of the 262 pipes inspected, no pipes had electromagnetic anomalies consistent with broken bar wraps.
- Three (3) pipes were identified to have anomalous signals likely caused by a change in the pipe cylinder. Of the three (3) pipes identified to have cylinder anomalies, one (1) pipe has been categorized to have a circumferential anomaly and two (2) pipes have been categorized to have feature-like anomalies.
- Pipes with cylinder anomalies have been categorized by anomaly type based on the electromagnetic signature observed in the collected data:
    - Circumferential: Anomalies in the pipe that are observed in most or all detectors (full circumference) and only affect the noted positional range of the pipe. The anomaly observed is not indicative of cylinder wall loss based on findings observed in testing on pipes at other sites.
    - Feature-Like: Anomalies in the pipe that have characteristics of a possible undocumented feature.

If you have any questions or require additional information, please feel free to contact me.

Sincerely,

Michelle Antilla, P.E.
Project Manager

Appendix A

SmartBall Methodology and Limitations

Overview

Figure A1.1. SmartBall Core, Foam Shell, and SmartBall Receiver (SBR).

Pure Technologies' Smart□all leak and gas pocket detection system is a free-swimming technology that detects the acoustic activity associated with leaks or gas pockets in pressurized pipelines. The Smart□all core is comprised of a water-tight aluminum alloy shell that contains a power source, electronic components, and instrumentation including an acoustic sensor, accelerometer, magnetometer, ultrasonic transmitter, and a temperature sensor. The aluminum core is encapsulated by a protective foam shell. The foam outer shell provides a larger surface area by which the device is pushed by the flow of the fluid conveyed while reducing low frequency ambient noise that is typically present in a pipeline. The Smart□all tool is deployed into the flow of a pipeline, traverses the pipeline, and is captured and e□tracted at a point downstream. □uring the inspection, the Smart□all tool's location is tracked at known points along the pipeline to correlate the inspection data with the inspected distance.

Identifying Leaks and Gas Pockets

Acoustic Anomalies Representing Leaks

A leak inside a pressurized pipeline produces a distinct sound as the fluid escapes into the lower pressure atmosphere outside the pipeline. While the Smart□all tool traverses a pipeline, it continuously records acoustic data, which is later evaluated to identify acoustic anomalies consistent with leaks.

As the Smart□all tool moves toward a leak the amplitude of the sound created increases, peaks at the e□act location of the leak, and then diminishes as the tool travels away. The increase and decrease of the amplitude of the audio data is critical to precisely locate leaks. Pure Technologies has invested heavily into identifying the characteristics of audio that is representative of a leak. The characteristics typical of a leak include:

- The range of frequencies present increases as the ball approaches the leak.
- The frequencies that appear first intensify as the Smart□all tool approaches the leak.
- The frequencies that indicate a leak are consistent as the Smart□all tool approaches the leak.

□uring the data analysis process, the acoustic properties of potential leaks are evaluated to estimate their magnitude. Pure Technologies reports leaks in three (3) categories: small, medium

and large. Small leaks are estimated to be in the range of 0 - 2 gallons per minute (gpm). Medium leaks are estimated to be in the range of 2 - 10 gpm and large leaks are estimated to be greater than 10 gpm.

One method to confirm the effectiveness of the Smart□all technology is to generate a controlled pipeline leak during the inspection. This leak, termed a simulated leak, is created by mounting equipment to an e□isting appurtenance that allows for a measured release of water from the pipeline. □uring analysis, the acoustic signature of the simulated leak is first used to confirm the accuracy and sensitivity of the Smart□all tool. It is also used to correlate the acoustic characteristics of a leak to the volume of water leaking.

Acoustic Anomalies Representing Gas Pockets

□as trapped in a pipeline may present itself as entrained gas, gas slugs or developing gas pockets, or fully developed gas pockets. Each of these distinct forms of gas accumulations have acoustic signals that can be detected using the Smart□all tool.

A gas pocket inside a pipeline generates a distinct acoustic signal that is detectable using the Smart□all leak and gas pocket detection system. □as pockets in pressure pipes are typically found at high points in the pipeline often due to malfunctioning or misplaced air and vacuum release valves (A□□). The acoustic signal is created by the liquid turbulence at the air□water interface. In full, pressurized pipes, this turbulence is not present.

SmartBall Tracking

Tracking the Smart□all tool during an inspection is critical so that detected acoustic anomalies can be located after the inspection. The location of the Smart□all tool is determined using an accelerometer inside the tool and tracking equipment mounted on the pipeline e□terior.

The Smart□all tool contains an on-board accelerometer that records the rotation of the tool as it traverses the transmission main. This rotational data can be used to generate a velocity profile, which can then be used to generate a distance profile of the tool throughout the inspection.

Figure A1.2. SMS Adhered to Pipe Exterior.

In addition to the distance profile, the location of the Smart□all tool is tracked via equipment termed Smart□all □eceivers (S□□s). An S□□ is comprised of a surface mounted sensor (SMS), □PS receiver, and a processing computer. The SMS is mounted to the pipeline at planned locations and is connected to the S□□ via a coa□ial cable. The S□□ and SMS combination detect ultrasonic pulses emitted from the Smart□all tool during the inspection. The S□□s determine the time taken for the pulse to travel from the Smart□all tool to the S□□, which is used to calculate

the distance between the Smart□all tool and S□□. This tracking data is combined with the distance profile to provide the most accurate understanding of the position of the Smart□all tool throughout the inspection.

Limitations of the SmartBall Technology

All non-destructive testing technologies have unique capabilities and limitations that affect the accuracy and efficacy of the technology. The Smart□all tool has the following limitations:

- **Minimum Pressure:** The acoustic activity associated with a leak is derived from the pressure differential between the inside and outside of the pipe wall. With little to no pressure differential, the Smart□all tool will not detect leakage as there will be no associated acoustic activity. Pure Technologies recommends a minimum pressure of 15 pounds per square inch (psi) for leak detection inspections□ however, under ideal conditions leaks have been detected in pipelines with pressures as low as 5 psi. There is no minimum pressure recommendation for the detection of areas of trapped gas.
- **Ambient Noise:** The Smart□all technology detects and reports anomalies that have acoustic characteristics similar to leaks on pressurized pipelines. □owever, other forms of ambient noise may be identified during the data analysis. For medium and large leaks, there is very little that can match these acoustic characteristics□therefore, these events are reported with a high degree of certainty. For small leaks, there may be other forms of ambient noise with similar acoustic signatures, making these signals more difficult to evaluate. Pure Technologies has invested significant resources into characterizing acoustic events and consequently asserts that leaks described in this report are leaks, unless otherwise noted. □owever, unknown pressure reducing valves, cracked valves in close pro□imity to the subject pipeline, interconnected pipelines that have not been completely isolated, and leaks in pipelines immediately adjacent to the subject pipeline can contain a similar acoustic signature and could be reported as leaks. Cars, pumps, boat traffic, and other forms of common ambient noise should not be reported as leaks as they generate different acoustic signatures.

Appendix B

Electromagnetic Inspection Limitations

Primary Focus of Electromagnetic Inspection

Assessing the condition of a □WP transmission main is a challenging task that is best performed using a combination of non-destructive testing technology, internal visual inspection and sounding, engineering science, and e□periential judgment. The primary goal of an inspection is to provide an understanding of the condition of the structural component that provides the pipe's strength— the reinforcing bar and steel cylinder. An electromagnetic inspection provides a non-destructive method of evaluating the baseline condition of the bar wraps. Electromagnetic inspections ascertain a magnetic signature for each pipe to identify anomalies that are produced by zones of broken bar wraps. □arious characteristics associated with an anomaly (length, magnitude, phase shift, etc.) are evaluated to provide an estimate of the number of broken bar wraps. This inspection method is able to quantify the amount of bar wrap damage and is the best method of determining the baseline condition of a pipeline.

Background and Theory of Electromagnetic Inspection

For many years, it has been possible to e□ploit the concept of eddy currents to measure structural properties in metals. The application of a time-varying magnetic field to metal structures can create internal electric currents as free electrons are driven by the field along discontinuities in the metal itself. Many applications of this phenomenon have been developed to detect damaged sections in steel and iron pipelines.

For □WP, a different mechanism e□ists that can be used to determine the structural condition of the pipe. Eddy currents that are generated in a bar wrap can flow along the length of the bar wrap, generating a solenoidal field (see *Figure B.1*). If the current is interrupted by a break in the bar wrap, the field will be affected.

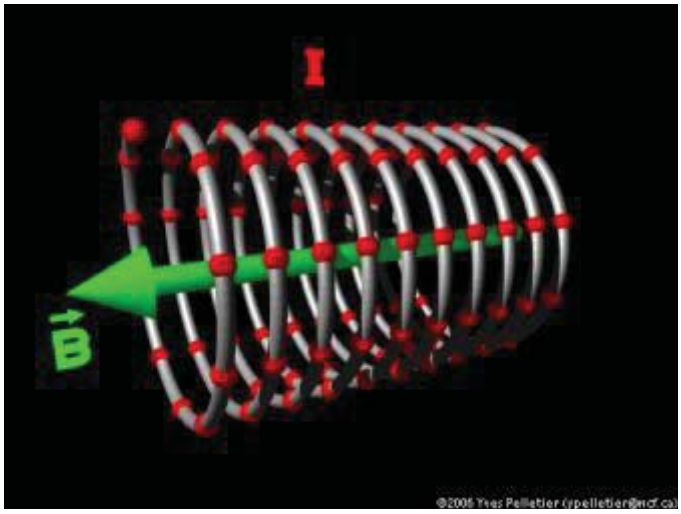


Figure B.1: Electric currents induced by time-varying magnetic field

The electromagnetic system used by Pure Technologies generates eddy currents in the bar wrap and detects where the field is altered by the presence of breaks in the reinforcing bar.

To create an electric current in the reinforcing bar, the Pure Technologies electromagnetic system generates a magnetic field inside a □WP. A signal generator outputs a low frequency alternating electric current (typically less than 100 □z) into a coil of wire (known as an e□citer coil) positioned near the inner surface of the pipe. The magnetic field generated by this coil e□tends through the concrete core, steel cylinder, and finally into the bar wrap. As the coil travels along the length of the pipe, the field moves as well, creating a localized magnetic field that then generates eddy currents in the reinforcing bar. As long as there are no breaks in the bar wrap, the current will flow uniformly along the bar□however, where a broken bar wrap e□ists, a discontinuity in the current forms. As the magnetic field passes over the section of the broken bar, currents are generated that form opposing magnetic field lines.

□etectors are placed on the opposite side of the pipe from the e□citer coil to record the variations in the magnetic field that are created when broken bar wraps interrupt the current flow. Analyzing and interpreting the response of the magnetic field allows for estimates of the number of broken bar wraps and the appro□imate location of the broken bar wraps along the length of the pipe.

Analysis Considerations

Electromagnetic inspections detect electromagnetic anomalies, or differences, in the e□pected induced field of a □WP. Anomalies that are consistent with broken bar wraps in □WP are of particular importance□however, the induced field of interest is small and other interference can mask or distort the size and shape of the electromagnetic signal, affecting the ability to detect and quantify broken wraps. The accuracy of the broken bar wrap detection and quantification process on any given pipe depends on a number of factors including, but not necessarily limited to:

- Accuracy and completeness of the information supplied by the client
- Type and configuration of pipe being inspected
- Availability of relevant calibration information
- Type, comple□ity, location, and number of distressed regions on a given pipe
- Inspection conditions observed in the pipe during the data collection period

Accuracy and completeness of the information supplied by the client. The inspection system is sensitive to all magnetic properties of a pipe, including cylinder thickness and composition, bar spacing and diameter, and the number of bar wraps. Pure Technologies uses the information provided by the client to perform the analysis. □rawings that indicate the e□act location of pipe features and varying pressure classes are used to correlate the inspection data. □rawings that indicate how each class of pipe is constructed (cylinder thickness, bar diameter and spacing, etc.) are used to identify and quantify regions of distress. □iscrepancies in the drawings and the data may affect the accuracy of the analysis.

Unknown or sealed appurtenances along the pipeline. Although most appurtenances e□hibit a signal that is different and distinguishable from broken bar wraps, in some cases, the signals are similar and an appurtenance could be misinterpreted as broken bar wraps if it is not listed on the drawings and not visible during the inspection.

Existence of ferromagnetic (steel) materials near the pipeline. When extra steel is located in close proximity to the pipeline, it can cause a signal distortion that may mask broken bar wraps or could cause anomalies that may be misinterpreted as broken bar wraps.

Changes in bar diameter and bar pitch. Broken bar wraps are estimated by measuring the physical length of an anomaly and entering it into a mathematical model known as a calibration curve. Calibration curves are based on either field testing of a similar pipe or mathematical modeling. If this information is not correct, the quantity of broken bar wraps will likely be incorrectly estimated.

Changing distance of the bar wrap and steel cylinder. If, during manufacturing of the pipe, there is variation in the distance of the reinforcing bar and the steel cylinder, the resultant signal during an electromagnetic inspection may vary, possibly mimicking broken bar wraps. Typically, it is unknown if there are any pipes affected by this issue as only excavation and forensic analysis can reveal manufacturing defects.

Discontinuities or variations such as abnormal welding in liner construction. These discontinuities can mask actual damage or mimic damage where none exists. This situation could cause over or under estimation of the number of broken bar wraps.

Proximity to power lines. In some cases, power lines can cause distortion in the signal due to the stray magnetic fields. This can limit the effectiveness of the analysis if the distortion is too severe. This interference is rare but is noted for completeness of this document.

Motion. Impacts, uneven pipe floor, excessive debris, and vibration all produce distortion which can cause overestimation of broken bar wraps or may mask actual damage. The inspection crew takes every effort to move the tool smoothly to ensure optimum data quality. Detailed field notes document excessive cart motion for analysis consideration, reducing the possibility of misinterpretation due to excessive motion. In addition, a sensitive accelerometer is integrated into the design of the cart, which allows analysts to determine where there was excessive cart motion and identify anomalous signals due to motion.

Type and Configuration of Pipe Being Inspected

The sensitivity to broken bar wraps is affected by the type of pipe being inspected. The following information on detection limits is based on previous calibration testing performed by Pure Technologies.

Bar Wrapped Pipe (AWWA C-303).

Bar wrapped pipe is similar in form to PCCP (AWWA C-301) but with several important distinctions. The primary difference is that the pipes use -inch or thicker steel bars rather than the thinner prestressing wire for the structural support on the pipe.

Feature Pipes. The electromagnetic technology is able to detect distressed regions in some feature pipes however, due to the impact of the feature on the signal, results are presented with less certainty for regions of the pipe near fittings, manholes, blowoff valves, or other features.

Short Pipes. As the joint effect span is constant regardless of the pipe length, its overall effect on a pipe will increase as the length of the pipe decreases. This means that for short pipes, a shorter length along the barrel of the pipe will remain unaffected by the joint signal and thus be analyzable. In addition, as short pipes typically make up a small portion of the pipe inventory inspected, there are not as many baselines (background signals) available for comparison. This makes the identification of distress on shorter pipes more challenging.

Details of Estimates of Broken Bar Wraps

Break Position. The data signal for a distressed region will vary along the length of a given pipe. Small numbers of broken bar wraps in the middle of a pipe are easier to detect and measure than distress at the joint. Low to moderate quantities of broken bar wraps within appro□imately 18 inches of the joint may be difficult to identify and quantify due to the increased presence of steel at the joint and the distress signal may be overcome by the much larger effect of the joint steel. Small quantities of broken bar wraps near the joint may not be detected and the accuracy of those that are detected may be less than those closer to the center of the pipe. Additionally, broken bar wraps are more difficult to detect and quantify at the bell end of the pipe than at the spigot end of the pipe, due to the fact that a portion of the bell section will overlap the spigot end. The number of broken bar wraps required for the signal to be detectable and quantifiable depends on the joint configuration, pro□imity of the center of the break region to the joint, and whether it is the bell or spigot end. □ecause of this, the estimated number of broken bar wraps near the center of a pipe will be provided with greater confidence than broken bar wraps near the joints, especially near the bell end.

End Effects. End effects refer to changes in the data signal near the end of a pipe (bell or spigot) that are due to a variety of installation methods of the pipe joint itself. End effects do not refer to distress at the joint. □eveled spigots, pulled joints, mitered joints, butt straps, closure pieces, steel fittings, etc., will all affect the data signal at the end of a pipe in some way. □esearch in this specific area has provided methods for analysts to determine if the signal is due to an end effect, or true end distress. The differences are subtle and e□amination of client records can provide the additional information necessary to conclude whether a particular data signal represents end effects or end distress. In the case where both end effects and end distress e□ist, quantification is more challenging.

Non-contiguous Broken Bar Wraps. This occurs when broken bar wraps are scattered amongst non-broken bar wraps.

□uring the inspection, a broad magnetic field is projected onto the reinforcing bar (several inches wide)□therefore, it is difficult to analyze individual bar wrap. When broken bar wraps are separated by non-broken bar wraps, the non-broken bar wraps can be masked by the distress signals and may appear broken. Non-contiguous broken bar wraps may lead to an anomaly that is larger than the actual associated bar damage. The estimated number of broken bar wraps in any report normally assumes a region of consecutive broken bar wraps e□ist for each break region. This assumption is the only assumption that can be made without additional information, which may be obtained from field verification.

Background Signal Variations. The electromagnetic data signal is sensitive not only to physical differences in pipeline properties (bar diameter and spacing, cylinder thickness, etc.), but it is also sensitive to any magnetic differences in the steel components of the pipe. Pipe manufacturers may use different material suppliers for the various components of the pipes within a pipeline. Even though two pipes are manufactured e□actly the same physically, if the steel for the cylinder and the reinforcing bar come from different suppliers, they will likely have slightly different magnetic properties, which will result in variations in the background signals.

Much like the fingerprint, every pipe in a pipeline, no matter how alike they are supposed to be, will e□hibit a slightly different background signal. Since distress is quantified by measuring the distressed pipe signal relative to a background signal, any variations in background signals can affect the accuracy of the distress measurement and ultimately the estimate of the number of broken bar wraps.

Number of Break Regions. □esults are predicted with greater accuracy for pipes containing single distressed regions than for pipes containing multiple distress regions. As the number of distress regions per pipe increases, or as these regions become closer together, the comple□ity of the interpretation increases. In some cases, distress regions can interact with each other from an electromagnetic standpoint to create signals of varying comple□ity. In cases where the distress signal spans a wide region, a specific break position may not be provided. Instead the length of the damage zone will be shown and an appro□imate range of suspected broken bar wraps will be given.

Significantly distressed pipes (where most or all of the bar wraps are broken along the entire length of a pipe) are sometimes difficult to distinguish from pipes that just have different properties than the pipes around them. □etermining if the signal change is due to changing pipe properties or significant distress is partially dependent on the accuracy and completeness of the information made available by the client, but there are also specific checks in the analysis methodology that are applied to make this distinction.

Other Factors

There are often overlaps amongst the key issues listed above and there may or may not be other factors related to these issues that decrease the level of confidence in the results presented in the report. Wide variations in manufacturing processes may not impact the structural performance of the pipe but can significantly affect the electromagnetic properties. The list of factors includes ones that are known, unknown, controllable, and uncontrollable. Some can be confirmed during e□cavation or inspection and some can be eliminated by studying construction records, although errors in these records are common. In all cases, every effort is made to consider the various factors during analysis□however, it should be noted that the results provide an estimate of the broken bar wraps in a pipe section based on all the information available and assuming that the signal changes are caused by discontinuity in the reinforcing bar.

Glossary and Abbreviations

AV:	Air □alve
BO:	□lowoff
BWP:	□ar Wrapped Pipe
ECP:	Embedded Cylinder Pipe
EL:	Elbow
EM:	Electromagnetic
LCP:	Lined Cylinder Pipe
OL:	Outlet
MH:	Manhole
NSS:	Non-Shorting Strap
PCP:	Prestressed Concrete Pipe
PCCP:	Prestressed Concrete Cylinder Pipe
RCP:	□einforced Concrete Pipe
RCCP:	□einforced Concrete Cylinder Pipe
SP:	Short Pipe Length
SS:	Shorting Strap
STD:	Standard Pipe Length
TO:	Turn Out
VS:	□ent Structure
PW:	Pumping Well

Amplitude: A component of the data signal produced during pipeline inspection, amplitude is an indication of signal strength.

Anomalous Pipe: A pipe that produces a data signal that cannot be interpreted as distressed or distress-free due to some irregularity. This irregularity may be due to une□plained signal influence during the inspection process or due to the properties of the pipe itself.

Calibration: A controlled inspection of a pipe similar to the in situ pipe that is performed to determine the e□pected signal response. The data signal recorded while inspecting the in situ pipes is then compared to this signal to estimate number of broken bar wraps. Calibration typically requires the destructive testing of a removed pipe.

Distressed Pipe: A pipe that e□hibits electromagnetic anomalies consistent with broken bar wraps. The amount of distress can be estimated by comparing the distress signal with the signal obtained during the calibration process.

Distressed Region: A section of pipe that e□hibits electromagnetic anomalies consistent with broken bar wraps. There may be one or more regions of distress in any distressed pipe.

Downstream: In the direction of water flow.

Feature: Fi□tures in the pipeline that affect the inspection (e.g., Manholes, Air □alves, Tees, Elbows).

Feature Pipe: Pipes with features that may be used to locate distressed pipes. The feature pipes cannot be analyzed for distress at or near the feature due to the signal distortion caused by the presence of the feature.

Joint: An area of the pipeline where two pipe ends are fi□ed together. Typically, pipe ends are joined spigot to bell□however, special pipes are available that join two bells ends or two spigot ends.

Phase: A component of the data signal produced during pipeline inspection, phase is a representation of the signal's travel time.

Rank: Listing of pipes with respect to the total number of broken bar wraps in the pipe (descending order).

Pipe: Single section of pipe, from bell end to spigot end.

Upstream: Against the direction of water flow.

Appendix C

Electromagnetic Pipe List

City of Santa Cruz Water Department
36-Inch Ocean Street Pipeline

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Bar Wraps

Pure Reference Number	Piece Number	Low Station	Pipe Length (feet)	High Station	Reported Class	Break or Cylinder Anomaly Region Location (feet from Low Station)	Number of Broken Bar Wraps by Region	Total Number of Broken Bar Wraps	Cylinder Anomaly Type	Layout	Comments
Extraction Point: Towards 24" Butterfly Valve at Intersection of Kenna Street and Ocean Street											
1	3601	0+02	36	0+38	150					RED	36"x24" Reducer.
2	3602	0+38	32	0+70	150						
3	3603	0+70	3	0+73	150					AV	2" AV @ Station 0+71.
4	3604	0+73	32	1+05	150						
5	3605	1+05	32	1+37	150	21.5-23.0			Feature-like	C	
6	3606	1+37	32	1+69	150						
7	3607	1+69	32	2+01	150						
8	3608	2+01	32	2+33	150						
9	3609	2+33	32	2+65	150						
10	3610	2+65	32	2+97	150						
11	3611	2+97	22	3+19	150						
12	3612	3+19	32	3+51	150						
13	3613	3+51	32	3+83	150						
14	3614	3+83	32	4+15	150						
15	3615	4+15	32	4+47	150						
16	3616	4+47	32	4+79	150						
17	3617	4+79	32	5+11	150						
18	3618	5+11	16	5+27	150					AV	2" AV @ Station 5+25.
19	3619	5+27	32	5+59	150					OL	3" OL @ Station 5+50.
20	3620	5+59	22	5+81	150						
21	3621	5+81	32	6+13	150						
22	3622	6+13	14	6+27	150						
23	3623	6+27	32	6+59	150						
24	3624	6+59	32	6+91	150						
25	3625	6+91	32	7+23	150						
26	3626	7+23	32	7+55	150						
27	3627	7+55	32	7+87	150						
28	3628	7+87	32	8+19	150						
29	3629	8+19	32	8+51	150						
30	3630	8+51	32	8+83	150						
31	3631	8+83	32	9+15	150						
32	3632	9+15	32	9+47	150						
33	3633	9+47	32	9+79	150						
34	3634	9+79	32	10+11	150						
35	3635	10+11	32	10+43	150						
36	3636	10+43	32	10+75	150						
37	3637	10+75	32	11+07	150						
38	3638	11+07	32	11+39	150						
39	3639	11+39	32	11+71	150						
40	3640	11+71	32	12+03	150						
41	3641	12+03	32	12+35	150						
42	3642	12+35	32	12+66	150						
43	3643	12+66	32	12+98	150						
44	3644	12+98	32	13+30	150						
45	3645	13+30	32	13+62	150						
46	3646	13+62	32	13+94	150						
47	3647	13+94	32	14+26	150						
48	3648	14+26	32	14+58	150						
49	3649	14+58	32	14+90	150						
50	3650	14+90	32	15+22	150						
51	3651	15+22	32	15+54	150						
52	3652	15+54	32	15+86	150						
53	3653	15+86	32	16+18	150						
54	3654	16+18	32	16+50	150						
55	3655	16+50	32	16+82	150						
56	3656	16+82	32	17+14	150						
57	3657	17+14	32	17+46	150						
58	3658	17+46	32	17+78	150						
59	3659	17+78	32	18+10	150						
60	3660	18+10	32	18+42	150						
61	3661	18+42	32	18+74	150						
62	3662	18+74	32	19+06	150						
63	3663	19+06	32	19+38	150						
64	3664	19+38	32	19+70	150						
65	3665	19+70	32	20+02	150						
66	3666	20+02	32	20+34	150						
67	3667	20+34	32	20+66	150						
68	3668	20+66	32	20+98	150						
69	3669	20+98	32	21+30	150						
70	3670	21+30	32	21+62	150						
71	3671	21+62	32	21+94	150						
72	3672	21+94	32	22+26	150						
73	3673	22+26	32	22+58	150						
74	3674	22+58	32	22+90	150						
75	3675	22+90	32	23+22	150						
76	3676	23+22	32	23+54	150						
77	3677	23+54	32	23+86	150						
78	3678	23+86	32	24+18	150						
79	3679	24+18	32	24+50	150						
80	3680	24+50	32	24+82	150						
81	3681	24+82	32	25+14	150						
82	3682	25+14	32	25+46	150						
83	3683	25+46	32	25+78	150						
84	3684	25+78	32	26+10	150						
85	3685	26+10	32	26+42	150						
86	3686	26+42	32	26+74	150						
87	3687	26+74	32	27+05	150						
88	3688	27+05	32	27+37	150					AV	AV @ Station 27+35 not visible in data.
89	3689	27+37	32	27+69	150						
90	3690	27+69	32	28+01	150						
91	3691	28+01	32	28+33	150						
92	3692	28+33	32	28+65	150						
93	3693	28+65	32	28+97	150						
94	3694	28+97	32	29+29	150						
95	3695	29+29	32	29+61	150						

City of Santa Cruz Water Department
36-Inch Ocean Street Pipeline

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Bar Wraps

Pure Reference Number	Piece Number	Low Station	Pipe Length (feet)	High Station	Reported Class	Break or Cylinder Anomaly Region Location (feet from Low Station)	Number of Broken Bar Wraps by Region	Total Number of Broken Bar Wraps	Cylinder Anomaly Type	Layout	Comments
96	3696	29+61	32	29+93	150						
97	3697	29+93	32	30+25	150						
98	3698	30+25	32	30+57	150						
99	3699	30+57	32	30+89	150						
100	36100	30+89	32	31+21	150						
101	36101	31+21	32	31+53	150						
102	36102	31+53	32	31+85	150						
103	36103	31+85	32	32+17	150						
104	N/A	32+17	32	32+49	150						
105	36104	32+49	32	32+81	150						
106	36105	32+81	32	33+13	150						
107	36106	33+13	32	33+45	150						
108	36107	33+45	32	33+77	150						
109	36108	33+77	32	34+09	150						
110	36109	34+09	32	34+41	150						
111	36110	34+41	32	34+73	150						
112	36111	34+73	32	35+05	150						
113	36112	35+05	32	35+37	150						
114	36113	35+37	32	35+69	150						
115	36114	35+69	32	36+01	150						
116	36115	36+01	32	36+33	150						
117	36116	36+33	32	36+65	150						
118	36117	36+65	32	36+96	150						
119	36118	36+96	32	37+28	150						
120	36119	37+28	32	37+60	150						
121	36120	37+60	32	37+92	150						
122	36121	37+92	32	38+24	150						
123	36122	38+24	17	38+41	150						
124	36123	38+41	5	38+46	150					RED	36"x24" Reducer.
125	N/A	38+46	4	38+50	150					VAL	24" Valve @ Station 38+48.
126	36124	38+50	19	38+69	150					RED	24"x36" Reducer. 20" OL @ Station 38+58.
127	36125	38+69	32	39+01	150						
128	36126	39+01	32	39+33	150						
129	36127	39+33	32	39+65	150						
130	36128	39+65	32	39+97	150						
131	36129	39+97	32	40+29	150						
132	36130	40+29	32	40+61	150						
133	36131	40+61	32	40+93	150						
134	36132	40+93	32	41+25	150						
135	36133	41+25	32	41+57	150						
136	36134	41+57	32	41+89	150						
137	36135	41+89	32	42+21	150						
138	36136	42+21	32	42+53	150						
139	36137	42+53	32	42+85	150						
140	36138	42+85	32	43+17	150						
141	36139	43+17	32	43+49	150						
142	36140	43+49	32	43+81	150						
143	36141	43+81	32	44+13	150						
144	36142	44+13	32	44+45	150						
145	36143	44+45	32	44+77	150						
146	36144	44+77	32	45+09	150						
147	36145	45+09	32	45+41	150						
148	36146	45+41	32	45+73	150						
149	36147	45+73	32	46+05	150					AV	2" AV @ Station 45+74 not visible in data.
150	36148	46+05	32	46+37	150						
151	36149	46+37	32	46+69	150						
152	36150	46+69	32	47+01	150						
153	36151	47+01	32	47+33	150						
154	36152	47+33	32	47+65	150						
155	36153	47+65	32	47+97	150						
156	36154	47+97	32	48+29	150						
157	36155	48+29	32	48+61	150						
158	36156	48+61	32	48+93	150						
159	36157	48+93	32	49+25	150						
160	36158	49+25	32	49+57	150						
161	36159	49+57	32	49+89	150						
162	36160	49+89	32	50+21	150						
163	36161	50+21	32	50+53	150						
164	36162	50+53	32	50+85	150					OL	3" OL @ Station 50+65.
165	36163	50+85	32	51+17	150						
166	36164	51+17	32	51+49	150						
167	36165	51+49	32	51+81	150						
168	36166	51+81	32	52+13	150						
169	36167	52+13	32	52+45	150						
170	36168	52+45	32	52+77	150						
171	36169	52+77	32	53+09	150						
172	36170	53+09	32	53+41	150						
173	36171	53+41	32	53+73	150						
174	36172	53+73	32	54+05	150						
N/A	36173	54+05	32	54+37	150						32ft STD in pipe laying schedules. Pipe does not exist in data.
175	36174	54+37	8	54+45	150						
176	36175	54+45	32	54+77	150						
177	36176	54+77	32	55+09	150						
178	36177	55+09	32	55+41	150						
179	36178	55+41	32	55+73	150						
180	36179	55+73	32	56+05	150						
181	36180	56+05	32	56+37	150						
182	36181	56+37	32	56+69	150						
183	36182	56+69	32	57+01	150						
184	36183	57+01	32	57+33	150						
185	36184	57+33	32	57+65	150						
186	36185	57+65	32	57+97	150						
187	36186	57+97	32	58+29	150						
188	N/A	N/A	32	N/A	N/A						Not listed in pipe laying schedules. Data indicates 32ft STD.
189	36187	58+29	32	58+61	150						
190	36188	58+61	32	58+93	150						

City of Santa Cruz Water Department
36-Inch Ocean Street Pipeline

Electromagnetic Inspection Results
Pipe Sections that Exhibit Electromagnetic Anomalies Consistent with Broken Bar Wraps

Pure Reference Number	Piece Number	Low Station	Pipe Length (feet)	High Station	Reported Class	Break or Cylinder Anomaly Region Location (feet from Low Station)	Number of Broken Bar Wraps by Region	Total Number of Broken Bar Wraps	Cylinder Anomaly Type	Layout	Comments
191	36189	58+93	32	59+25	150						
192	36190	59+25	32	59+57	150						
193	36191	59+57	32	59+89	150						
194	36192	59+89	32	60+21	150						
195	36193	60+21	32	60+53	150						
196	36194	60+53	32	60+85	150						
197	36195	60+85	32	61+17	150						
198	36196	61+17	32	61+49	150						
199	36197	61+49	32	61+81	150						
200	36198	61+81	32	62+13	150						
201	36199	62+13	32	62+45	150						
202	36200	62+45	32	62+77	150						
203	36201	62+77	32	63+09	150						
204	36202	63+09	32	63+41	150						
205	36203	63+41	32	63+73	150						
206	36204	63+73	32	64+05	150						
207	36205	64+05	32	64+37	150						
208	36206	64+37	32	64+69	150						
209	36207	64+69	32	65+01	150						
210	36208	65+01	32	65+33	150						
211	36209	65+33	32	65+65	150						
212	36210	65+65	32	65+97	150						
213	36211	65+97	32	66+29	150						
214	36212	66+29	32	66+61	150						
215	36213	66+61	32	66+93	150						
216	36214	66+93	32	67+25	150						
217	36215	67+25	32	67+57	150						
218	36216	67+57	32	67+89	150						
219	36217	67+89	32	68+21	150	12.0-14.0			Feature-like	C	
220	36218	68+21	8	68+29	150					AV	2" AV @ Station 68+27.
221	36219	68+29	32	68+61	150						
222	36220	68+61	32	68+93	150						
223	36221	68+93	32	69+25	150						
224	36222	69+25	32	69+57	150						
225	36223	69+57	32	69+89	150						
N/A	36224	69+89	32	70+21	150						32ft STD in pipe laying schedules. Pipe does not exist in data.
226	36225	70+21	21	70+42	150						
227	36226	70+42	32	70+64	150						22ft SP in pipe laying schedules. Data indicates 32ft STD.
228	36227	70+64	16	70+80	150						
229	36228	70+80	32	71+11	150						
230	36229	71+11	23	71+34	150						
231	36230	71+34	32	71+64	150						
232	36231	71+64	32	71+94	150						
233	36232	71+94	32	72+25	150						
234	36233	72+25	32	72+56	150						
235	36234	72+56	32	72+88	150						
236	36235	72+88	18	73+06	150						
237	36236	73+06	32	73+37	150						
238	36237	73+37	32	73+67	150						
239	36238	73+67	32	73+98	150						
240	36239	73+98	32	74+29	150						
241	36240	74+29	32	74+60	150						
242	36241	74+60	32	74+92	150						
243	36242	74+92	32	75+24	150						
244	36243	75+24	19	75+43	150						
245	36244	75+43	32	75+74	150						
246	36245	75+74	32	76+06	150						
247	36246	76+06	32	76+37	150						
248	36247	76+37	31	76+66	150	28.0-30.5			Circumferential	C	
249	36248	76+66	30	76+93	150						
N/A	36249	76+93	2	76+95	150						2ft SP in pipe laying schedules. Pipe does not exist in data.
250	N/A	76+95	20	77+15	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
251	N/A	77+15	15	77+30	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
252	N/A	77+30	10	77+40	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
253	N/A	77+40	32	77+72	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
254	N/A	77+72	32	78+04	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
255	N/A	78+04	32	78+36	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
256	N/A	78+36	32	78+68	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
257	N/A	78+68	32	79+00	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
258	N/A	79+00	32	79+32	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
259	N/A	79+32	32	79+64	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to change in pipeline flow.
260	N/A	79+64	17	79+81	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to flow change.
261	N/A	79+81	32	80+13	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to flow change.
262	N/A	80+13	32	80+45	N/A						Pipe laying schedules not available. Pipe length reported with less certainty due to flow change.
Insertion Point: Towards Santa Cruz Water Treatment Plant											

City of Santa Cruz Water Department

36-Inch Ocean Street Pipeline

#	Any number within a pipe indicates the total number of broken bar wraps in that pipe.
C	Cylinder Anomaly.
OL	Feature (MH, AV, BO, OL etc.)
	Pipes listed in laying schedules but not observed in data.

Station numbers in black font indicate numbers obtained directly from client's documents.
Station numbers in grey font indicate numbers calculated by Pure Technologies.

The stationing was obtained from the pipe laying schedules, where available. Where pipe laying schedules were not available, the pipe lengths and stationing were estimated from the electromagnetic data.

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WATER COMMISSION
INFORMATION REPORT

DATE: 8/3/2017

AGENDA OF: August 7, 2017

TO: Water Commission

FROM: Kevin Crossley, Senior Engineer

SUBJECT: Program Management Services

RECOMMENDATION: That the Water Commission receive information on Solicitation for Program Management Consulting Services.

BACKGROUND: In the next ten years, the Department will implement a Capital Improvement Program (CIP) that includes a planned $300 million in capital investments and reinvestments in the water system.

Delivering the improvements that have been identified cannot realistically occur without some significant increase in the organization's managerial, technical, analytical, and administrative support capabilities. After reviewing several alternate approaches for meeting its staffing needs, the Department has determined that a program management strategy is an approach that holds great promise for both delivering the right kinds of skills and expertise to help the Department meet its needs and to provide the flexibility to support the Department as those needs evolve over time. In particular, the program management strategy offers several advantages over simply "staffing up" in several significant ways:

- Senior Experience: The Program Manager is expected to have at least 15 years of experience successfully running large, diverse infrastructure programs, similar to the Santa Cruz Program. Reporting to the Program Manager will be other members of program management team who are also expected to have extensive experience in infrastructure master planning, water treatment design, pipeline design, project controls, project management, and construction management.
- Organizational Systems and Structure: To deliver a CIP that will in some years be three times larger than the historic annual CIP, the Department will need to implement improved administrative, budgetary, and document control systems. The Program Manager will also provide a framework for prioritizing projects, assessing risk, and facilitating important decisions at key milestones.
- Staff Flexibility: The program management model provides a high degree of staffing flexibility which is important because the types of staff and skills will evolve overtime as

the program and projects progress. Initially, the program emphasis will be on planning, pre-engineering, and establishment of the program controls, schedule, and budget. As the projects become more defined, the staff emphasis will be on design, design review, and permitting. During construction, the program management team will have a strong slant towards project management and construction management.

- Skills Building through Integrated Teams: The program management team will be a blended team composed of both consultant and city staff. The team will be physically collocated to maximize opportunities for the more senior consultant staff to train and mentor City staff. In this way, once the program winds down, the City will continue to benefit from the improved organizational capacity built through the delivery of the program.

DISCUSSION: As currently envisioned, the Program will be made up of a subset of CIP projects that are more difficult or complex. Those projects could include raw water transmission main projects, treatment plant projects, and supplemental supply projects, once those are defined. The Program Manager's scope or work will be broadly organized into four tasks: 1) Program Administration, 2) Planning/Predesign, 3) Design Management, and 4) Construction Management. The advertisement for services was issued at the beginning of August 2017, and staff expects to finalize the contract by the end of November 2017.

FISCAL IMPACT: The estimated fee for the program management consultant is between $1.5 to $3 million for the first year.

PROPOSED MOTION: Motion to receive information on Solicitation for Program Management Consulting Services.

ATTACHMENTS:
Attachment A Request for Qualifications-Program Management

Request for Qualifications

Program Management Services for the City of Santa Cruz Water Department

Water Engineering
212 Locust Street Suite C
Santa Cruz, CA 95060
www.cityofsantacruz.com

Statement of Qualifications Due: September 7, 2017, by 4:00 p.m.

Table of Contents

Request for Qualifications/Summary Scope of Solicitation
The City of Santa Cruz Water Department is soliciting Statements of Qualifications (SOQ) from firms with expertise in providing program management services for a water utility organization that is facing a significant increase in its Capital Improvement Program. In particular the Department is interested in receiving SOQs from firms or teams of firms with experience in completing planning and preliminary engineering and environmental review work for a range of water utility projects. Example projects include raw water transmission facilities, water treatment facilities, providing construction management expertise, and in augmenting City staff in the design and delivery of a diverse range of solutions to address aging infrastructure, evolving drinking water and environmental regulations, and supply augmentation strategy.

1. Communication/RFQ Contact

For the City, the primary contact is:

Kevin Crossley, Senior Engineer
City of Santa Cruz Water Department
212 Locust Street, Suite C, Santa Cruz CA 95060
Email: kcrossley@cityofsantacruz.com

2. Selection Process and Schedule

A. Process

Parties interested in being considered to provide these services are requested to submit their SOQs on or before 4:00 p.m. on Thursday, September 7, 2017. The selection process will occur in two phases-Phase 1 will score on qualification alone and Phase 2 will consider both qualifications, a proposal, and cost.

- During Phase 1, SOQs will be evaluated by an Evaluation Committee comprised of City staff using the criteria established in Section 8. Semi-finalists will then be invited to interview with the Evaluation Committee. During the interview, semi-finalists may be asked to make an oral presentation, and/or respond to pre-established questions.

- During Phase 2, the top two rated firms will be asked to prepare a scope of work and cost proposal. Respondents will then be re-ranked based on 70% for qualifications and 30% for price.

All responsive firms will be given equal opportunity to provide any requested additional information to the City. Any interviews will be scheduled on a mutually agreed upon date and will be at no cost to the City. The Evaluation Committee will use all available information to rank the semi-finalists in order of their ability to best meet the needs of the City.

B. RFQ Timeline

Milestone	**Date**
Pre-proposal meetings	August 21-25 2017
Deadline for Questions	August 24, 2017
SOQ's Due	September 7, 2017
Interviews of shortlisted firms	September 20-29 2017
Complete Scoping/Negotiations	October 24, 2017
Award	November 14, 2017

3. Pre-Proposal Meeting and Answers to Questions

A. A pre-qualifications meeting is not required, however; interested firms may request a 2-hour meeting prior to the proposal due to date, if desired. The meetings will be scheduled from 10:00 AM to 2:00 PM August 21 to 25. Meetings will be scheduled on a first call basis. Please call Amy Poncato at (831) 420-5206 or email at aponcato@cityofsantacruz.com.

B. Requests for information or questions shall be submitted in writing **ten (10)** business days prior to the proposal deadline. Written clarification, or addenda, will be sent to all individuals or firms on the document holders list, no later than **five (5)** business days prior to the proposal deadline. All questions shall be submitted in writing via email to the City's primary contact listed above. In the email subject line, please include the following text: "RFQ for Program Management Services"

4. Prevailing Wage Requirements

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations (DIR). The contractor will be responsible for verifying compliance with all prevailing wage laws and regulations for all subcontractors.

A. As required by § 1770 and subsequent sections of the California Labor Code, the Contractor and all subcontractors shall pay no less than the prevailing rate of wages as determined by the Director of the California Department of Industrial Relations as applicable to the date of the Construction Agreement.

B. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in the Labor Code, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work at the time the contract is awarded. Refer to DIR website, www.dir.ca.gov, to register and to find the correct wage rates and answers to questions related to prevailing wage requirements.

C. The Contractor and all subcontractors must submit to the Labor Commissioner of the DIR, at regular intervals (weekly, biweekly, or monthly), electronic certified payroll records as specified by SB 854. Payroll records shall contain all the information required pursuant to Labor Code Section 1776 and be signed under penalty of perjury.

D. The Contractor will post job site notices prescribed by DIR regulation.

5. Overview of the Santa Cruz Water Department CIP

A. Background

Over the last several years, the City of Santa Cruz Water Department staff has been engaged in several key planning efforts involving augmentation of its water supply to improve reliability and resiliency to droughts and an initiative to address aging infrastructure through a major investment in rehabilitation and replacement of back-bone infrastructure including raw water transmission and surface water treatment facilities. Most recently, the Santa Cruz City Council accepted the recommendations of the Water Supply Advisory Committee (WSAC) and directed staff to develop and implement a Water Supply Augmentation Strategy (WSAS), see Attachment A WSAC Final Report. The WSAS has since been incorporated into the Department's ten year Capital Improvement Program (CIP). The City Council also took action to adopt the Water Department's proposed Long Range Financial Plan in June of 2016, see Attachment B, Long Range Financial Plan, to review both the financial plan and the ten year CIP. The Department now has a financial road map for the implementation of a ten year Capital Improvement Program (CIP) that includes a planned ~$300 million in capital investments and reinvestments in the water system.

The CIP effectively touches every aspect of the water system, from replacement of aging infrastructure (via replacement programs for finished water pipelines, tanks, pressure regulating stations), to projects with regulatory drivers (e.g., the Newell Creek Dam Inlet/Outlet Pipeline), to the projects associated with the recommendations of the WSAC (i.e., significant investments in surface water treatment, new raw water transmission facilities, and the development of one or more projects to augment water supply to reduce the system's vulnerability to droughts).

The Department has a very capable, but relatively small engineering group, and it is not considered feasible or desirable to substantially increase the size of its internal engineering staff in order to manage the much larger, more complex, and more dynamic CIP. Please see Attachment C-Department Organizational Structure. Department management recognizes that delivering the improvements that have been identified cannot realistically occur without some significant increase in the organization's managerial, technical, analytical, and administrative support capabilities.

After reviewing several alternate approaches for meeting its staffing needs, the Department has determined that a program management strategy is an approach that holds great promise for both delivering the right kinds of skills and expertise to help the department meet its needs and to provide the flexibility to adapt to support the Department in meeting its needs as they evolve over time.

B. Santa Cruz Program Scope

The Santa Cruz Program (Program) will be made up of a portion, but not all of the Department's CIP. The Program is currently envisioned to include the following project types within the CIP:

Project Name	**Program Scope**
Graham Hill Water Treatment Plant-Upgrades	Update outdated facility plan, consider alternate surface water treatment strategies, investigate feasibility of a second water treatment plant, execute projects to replace/enhance surface water treatment capabilities
North Coast System Rehabilitation	Replace approximately 10 miles of 10 to 24-inch raw water transmission pipeline, replace 2-dams.
Newell Creek Pipeline Replacement	Replace 16 miles of 24-inch raw water transmission main
Supplemental Water Supply	Based on outcome of current supply studies (est. completion 2020), implement one or several supplemental supply projects (Aquifer Storage and Recovery, and/or Desal)

C. Program Structure

Conceptually, the Department is currently thinking of the Program Management strategy ("Program") organized in four tasks as described in more detail below that includes planning, overseeing design and project management, construction management, all layered with ongoing administrative tasks, processes, and programs. This contract will ultimately be for all phases. The specialized experience and expertise of program management team members who have worked to define projects through the early phases of project development would be especially important in assisting the Department in addressing some of the complexities typically surrounding this work.

From a staffing standpoint, the Department is committed to supporting the Program with a Senior Engineer (1 FTE), who would function as the Program Director/Coordinator, and support staff that may include assistant/associate engineers (2 FTE), planning (1 FTE), and administrative (0.5FTE) and the balance of staff would come from the Consultant. It is the City's expectation that the Program Manager and City staff will physically integrate at the Department's

administration offices in downtown Santa Cruz, or collocate at a local offsite location as appropriate.

D. Schedule

Program startup, planning, and preliminary engineering is anticipated to take 18 months starting in Fall of 2017. Design, construction, and project close-out is anticipated to take 5-7 years starting after planning and preliminary design. Workload is anticipated to be variable with the Program Manager dedicating the appropriate time deemed sufficient to successfully complete these duties to the satisfaction of the Department.

6. Potential Scope of Services

A. Introduction

As mentioned previously, the Water Department has a 10-year CIP of ~$300million. The City desires a Consultant to provide program management services to ensure the successful development and completion of projects included in the Program, on time and on budget.

The City considers a Program Manager and a project manager different in that a Program Manager will spend significant time and effort integrating the various complex activities and projects associated with the upgrade, communicating to stakeholders, and negotiating plan changes related to the work. There may be a project manager (or managers) who will be responsible for integrating all aspects of various projects into a functional and effectively respond to the Department's infrastructure needs. Fundamentally, the Program Manager will be holistically involved with all aspects of the Program from the preliminary design to project close out and ensure all of these efforts are integrated.

Consultant shall furnish Program Management personnel, including a dedicated person or persons to provide Program Manager Services as required for Program. The Program Manager shall be responsible for all matters related to this project and shall be an effective liaison amongst the City, design consultants, the contractor, and construction managers, such that the impact of the project on regular City operations is minimized. The Program Manager is expected to work at least 75% of the time from the City offices, and reside near enough to the City such that an on-site response time of one hour or less can be accommodated.

The Program, as currently contemplated, would be organized under the four(4) tasks as follows:

1) Program Administration
2) Planning and Preliminary Engineering
3) Design Management
4) Construction Management

The Program Manager shall be required to have significant experience in large program and project oversight and implementation similar to those identified above. While it is desired that the Program Manager is a licensed Civil Engineer, registered in the State of California, appropriate professionals in other closely related disciplines will be seriously considered. The Program Manager shall possess clear and effective verbal and written communication skills and have the interest and ability to work in a team oriented collaborative work environment. They should expect to work closely with and must demonstrate proficiency in communicating effectively with City operations staff.

B. Description of Tasks

The Program Manager is expected to provide a diverse range of services. A menu of potential services is described below and will be refined during the subsequent scoping process.

Task 1: Program Administration

(Note: these tasks will occur during startup of the Program as well as during implementation.)

- Review current CIP and other key planning documents (Water Quality and System Improvement Study, WSAC Recommendations, Urban Water Management Plan)
- Develop a Program Charter which may include:
  - Program Scope
  - Master Program Schedule
  - Program Budget Review
  - Conduct Evaluation of Program Resources and Planning
- Program Management Plan:
  - Develop Program Administrative Procedures (Document Management, Filing Systems, Project Manager Requirements),
  - Data Management, QA/QC Plan
- Review, evaluate, and coordinate projects at various points such as planning, preliminary design, final design, and plans and specifications for the project, and ensure their readiness for advertising for construction. The Program Manager shall review and make recommendations for revisions that will improve project delivery. Facilitate meetings and ensure communication among all parties.
- Gain understanding of the definition of and ensure the Program fulfills the City's goals of compliance, capacity, efficiency, operational flexibility, innovation, community outreach, and sustainability.
- Manage program by acting as lead person, ensuring that all aspects of the Program are addressed and the project is completed in a professional manner.
- Assist in the preparation and administration of program budgets.
- Complete resource planning to identify the required consultant and city staff resources to complete various projects.
- Coordinate with City staff and consultants on a variety of citizen outreach programs. Coordinate with the City on interaction with the news media and respond to questions relating to the project on an as needed basis. This may include print ads and website development and/or maintenance to keep the public informed of any activities that may affect their service.

Task 2: Planning and Preliminary Engineering

- Engage staff, consultants, and community (where appropriate) in the planning, special studies, preliminary design, development of design documents, and construction.
- Perform studies, research files, records, plans, and maps.
- Revise the Graham Hill Water Treatment Plant facilities master plan.
- Update the North Coast System Pipeline project sequencing plan.
- Prepare a preliminary engineering study to replace the Newell Creek Pipeline.
- Coordinate and integrate supplemental water supply studies
- Specify and implement pilot studies.
- Conduct condition assessments.
- Prepare capital and O&M cost estimates and that will feed back into long range financial planning and the 10-year CIP.
- Develop permitting plans and assist staff with permit applications.
- Complete or oversee completion of necessary work to ensure CEQA Compliance.
- Consider and recommend a project delivery method such as Design-Bid-Build, CMAR, or Design-Build.

Task 3: Design/Design Management

(Note: The Program Manager will at all times serve in the capacity of an extension of City staff and will not perform work that would interfere with the design engineer's liability for intent of the design. For the duration of the PM Contract, firms on the Program Management Team will be ineligible to bid on any subsequent projects for the Water Department.)

- Develop System Design Standards for civil, structural, mechanical, electrical and instrumentations systems to be used by all designers.
- Prepare RFQs for design, value engineering as applicable and, constructability review of final design as applicable.
- Incorporate Asset Management into designs
- Coordinate with City staff on the submittal of financing application(s) and other required financing documents to the appropriate entity.
- Prepare and coordinate the required documents for pre-qualifying construction contractors.
- Assist staff with final authorizations to advertise and contract award.
- Review project schedule(s) which includes all notification timelines noted on all permits, agreements, and contract documents

Task 4: Construction/Construction Management

(Note: Consultant Program Manager is expected to perform Construction Management services.)

- Provide Construction Managers and Inspectors
- Administer consultant contracts for support services while effectively monitoring costs and deadlines.
- Upon receipt of Contractor's schedule, evaluate and confer with the City regarding workability of the schedule or suggest changes that may improve the schedule. Attend various meetings as a representative of the City, and chair weekly on-site construction meetings with the Contractor and construction management staff.
- Verify construction management records, including record drawings, and maintain appropriate records and files; prepare comprehensive technical reports and agenda reports related to assignments.
- Make presentations to City staff, Council, and private groups as necessary.
- Track all Contractor documented concerns, potential claims, and claims and ensure timely response. Develop appropriate resolutions as possible, in consultation with the City.
- Review project construction and assist in maintaining construction documents.
- Review and monitor Requests for Information (RFI) from Contractor and Cost Request Bulletins (CRB) from the City.
- Process construction related expenses and reimbursements.
- Track project construction schedule and provide updates of construction status to the City no less than biweekly.
- Work closely with City staff on coordinating work with regulatory agencies and private entities, completing public relations work as needed or assigned.
- Track all costs of construction, construction management, and project management, and work with the City staff on the funding status of the project. Review all change order and extra work expenditures with City staff.
- Complete project closeout work, including record drawings, organization of project paperwork, and clear statements of any outstanding issues and recommended action or position on the issue.
- Lead Startup and Commissioning work
- Develop O&M Documentation Standards and Turnover Criteria

7. Statement of Qualifications s Organization, Format, and Length

A. General

SOQ's should provide straightforward, concise descriptions of the respondent's capabilities to satisfy the City's requirements. Emphasis should be on completeness, brevity, and clarity of content.

B. Organization

The SOQs shall provide the information requested and be organized into sections as follows:

Section	Content
A	Cover Letter and Acknowledgement of Addenda
B	Program Understanding
C	Firm Qualifications
D	Key Project Personnel Qualifications
E	Supporting Resources
F	Attachments (Resumes, Letters of Commitment)

C. Format

Please submit eight (8) hard copies and a digital copy of the SOQ on CD/DVD or thumb drive. Do not email SOQ's. SOQ's shall be organized in the order described above and separated with labeled section dividers. The SOQ's may be bound any way except in 3-ring binders.

D. Length

Please to limit the response to 30 pages. One side of an 8 ½" by 11" will count as one page, one side of an 11" by 17" will count as two pages; blank pages, front and back covers, table of contents, cover letter and tab dividers do not count towards page limit; the minimum font size is 12 point for the main text. Double-sided format and use of recycled paper and binding are recommended. Supporting documentation such as resumes (max four pages) shall be in an attachment and not counted towards the page limit.

Parties interested in being considered for this contract are requested to submit their Statements of Qualifications by 4:00 p.m., Thursday, September 7, 2017, to:

City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060
Attention: Kevin Crossley

City reserves the right to determine the extent, duration, and limit of consultant's services. Such services shall be described in an overall work program to be developed by the consultant and approved by the City promptly upon notification of selection. Any deviation from the scope and general work-hour duration of the work program must be approved beforehand in writing by the City. The SOQs shall provide the information requested and be organized into sections as follows:

8. Evaluation Criteria

A review panel will evaluate and score each SOQ based on the following criteria:

SOQ Content	Weighting
A. Cover Letter	0 points
B. Program Understanding	10 points
C. Firm Qualifications and Experience	30 points
D. Key Personnel Qualifications	40 points
E. Supporting Resources	20 points
F. Attachments	0 points
Total	100 points

Respondents shall include the following information in their SOQs:

A. Cover Letter (0 points)
The SOQs shall include a letter of transmittal attesting to its accuracy, signed by an individual authorized to execute binding legal documents on behalf of the proposing firm, combination of firms or joint venture. The cover letter shall provide the name, address, email, telephone and facsimile numbers of the proposed Project Manager, serving as the primary contact for the company. Include a statement that any commitments made in the SOQ are valid for a period of not less than 180 days.

B. Program Understanding (10 points)
In this section, the respondent should demonstrate its understanding of the Santa Cruz Program and its general approach to the delivery of program management services using an integrated program management approach on large complex water infrastructure programs. This section should demonstrate a clear and concise understanding of program management based on the general description of the purpose of the program. The respondent should be knowledgeable in best practices to address program issues and offer innovative ideas. It is also important that the respondent demonstrates an ability to synthesize technical information and communicate this information in verbal, written, and graphic form.
This section should:

- Provide your understanding of a general work plan that describes how the respondent would organize and conduct work for the program. This plan should provide all major phases of the program.
- Provide a description of the respondent's methodology for managing work tasks and coordination, sequencing and control systems to accomplish the work utilizing an integrated program management team.

C. Firm Qualifications and Experience (30 points)
In this section, the respondent should first describe its team and sub- consultants. The information on the team should include:

- Describe the firm's experience in providing program management services for large complex programs similar to the Santa Cruz Program. If the respondent is a team of firms, describe the teaming arrangement e.g. prime/sub, joint venture, etc. and describe the team's experience working individually and together on programs similar to the Santa Cruz Program.
- Describe the firm's (or team's) areas of expertise and the business rationale from the viewpoint of the Santa Cruz program participants.
- Describe particularly innovative integrated program management solutions that the respondent has used to accomplish the client's goals. Specifically, describe what methods were used to create success in an integrated program management model.
- Describe the firm's (or team's) experience with representing owners while procuring and contracting for project delivery using design-bid-build, design-build, and construction management at risk. Describe your experience with methods to determine the appropriate project delivery systems for the Santa Cruz Program.
- Demonstrate the ability of the team to deliver projects within the Santa Cruz Program.

Provide a brief description of at least three relevant programs in which program management services were provided by your firm over the last 10 years that demonstrate the capabilities of the firm and any sub-consultants that are being proposed. The response should address the following:

Describe the similar programs, by name, type, location, and date, performed within the last 10 years which best characterizes the respondent's ability to meet the objectives of the Santa Cruz Program. Detail the work that is similar to the types of work required for the Santa Cruz Program. Identify the specific roles of the proposed program team in those projects. Include when the work was completed and approximate cost of the work your firm provided as well as total program cost. Include the contact name, address, phone number, fax number and e-mail of the client contact person as a reference for each program description provided.

D. Key Personnel Qualifications (40 points)

- Provide an organizational chart that identifies key personnel and their proposed roles for this program. Provide a description of the expertise of all referenced staff including qualifications and relevant program experience. All key personnel should have the years of experience consistent with their position and level of responsibility within the program. Provide the individual role and date range of each referenced assignment for each individual proposed for the program team that demonstrates their overall work experience, education/training, publications, and specific experience in working within an integrated program management team on a major water supply program.

- Minimum key personnel are identified below. Please list any other key personnel as appropriate. A single person may be proposed for several roles. For each of these key personnel specifically addresses the following requirements:
  a) Demonstrate the proposed **Program Manager's** individual qualifications and experience managing water infrastructure programs including integrated, interdisciplinary teams for complex programs such as the Santa Cruz Program.
  b) Demonstrate the proposed **Master Planner's** individual qualifications and experience managing and integrating water resource and water treatment planning efforts, and facility master planning such as the Santa Cruz Program.
  c) Demonstrate the proposed **Program Design Manager's** individual qualifications and experience of managing the design of facilities similar to the Santa Cruz Program and describe their experience of managing the design work of firms other than their own.
  d) Demonstrate the proposed **Water Treatment Plant Design Manager's** individual qualifications and experience of managing the design of water treatment plants similar to

the Santa Cruz Program and describe their experience of managing the design work of firms other than their own.

e) Demonstrate the proposed **Pipelines Manager's** individual qualifications and experience of managing the design of pipelines similar to the Santa Cruz Program and describe their experience of managing the design work of firms other than their own.

f) Demonstrate the proposed **Program Controls Manager's** individual qualifications and experience in the development and utilization of program management information systems for programs similar to the Santa Cruz Program.

g) Demonstrate the proposed **Construction Managers'** individual qualifications and experience in programs similar to the Santa Cruz Program.

- Identify the program management experience of other personnel.
- Provide a client reference for of the designated key personnel for the program including the phone number, fax number, and e-mail for each client contact.
- Provide a chart that cross-references the named key personnel and other staff with their individual program experience. If not described in the Firm Qualifications the programs should be identified, by name, type, location, and date, performed within the last 10 years which best characterizes the individuals experience with programs similar to the Santa Cruz Program. Identify the specific roles the individual had in these programs. Include when the work was completed and approximate cost of the work contributed to by the individual.
- Provide a list of other key individuals proposed by respondent for the program team that would support the completion of the program. Summarize each team member's area of responsibility, expertise, directly related experience, and qualifications for this work. These individuals could include staff with experience in:
    1. Alternative delivery procurement and contracting
    2. Risk management
    3. Decision analysis
    4. Procurement strategies/ materials pre-purchasing
    5. Others areas as proposed by respondent
- List current assignments and provide percentage (%) of time available for all staff to be committed to the Santa Cruz Program and when each staff member could begin their assignment. For all Key Personnel please provide a letter signed by them to be submitted along with their four-page resume in the Supporting Information section that states their availability and willingness to commit to their proposed position with the Santa Cruz Program.

E. Supporting Resources (20 points)

Describe the technical and support resources available to assist in achieving the Santa Cruz Program objectives for the program. Include human resources and hard assets that will be necessary for the efficient and effective completion of the Program. For the area of human resources please describe your firms' ability to ramp up or ramp down staffing as needs change over the course of the Santa Cruz Program. Please provide examples and client references for when and how this has occurred. Please also provide examples of the project controls and other program management support systems (hardware and software) that have been used on programs similar to the Santa Cruz Program and how those systems were used by both the firms and clients' program management staff. Please provide client references for individuals who have used these systems.

TOTAL: 100 points

9. Public Records

SOQs received will become the property of the City. All SOQs, evaluation documents, and any subsequent contracts will be subject to public disclosure per the "California Public Records Act," California Government Code, sections 6250 – 6270. All documents related to this solicitation will become public

records once discussions and negotiations with proposers have been fully completed and an award has been announced.

Appropriately identified trade secrets will be kept confidential to the extent permitted by law. Any SOQ section alleged to contain proprietary information will be identified by the proposer in boldface text at the top and bottom as "PROPRIETARY." Designating the entire SOQ as proprietary is not acceptable and will not be honored. Submission of an SOQ will constitute an agreement to this provision for public records. Fee Schedules are not considered proprietary information by law.

10. City Rights and Options

The City, at its sole discretion, reserves the following rights:

1. To reject any, or all SOQs or information received pursuant to this RFQ;
2. To supplement, amend, substitute or otherwise modify this RFQ at any time by means of written addendum;
3. To cancel this RFQ with or without the substitution of another RFQ or prequalification process;
4. To request additional information;
5. To verify the qualifications and experience of each respondent;
6. To require one or more respondents to supplement, clarify or provide additional information in order for the City to evaluate SOQs submitted;
7. To hire multiple contractors to perform the necessary duties and range of services if it is determined to be in the best interests of the City: and
8. To waive any minor defect or technicality in any SOQ received.

Attachment A: WSAC Final Report (Appendices provided by hyperlink only)
Attachment B: Long Range Financial Plan
Attachment C: Department Organizational Structure