

Committee Member participation.

	30-Apr	1-May	2-May	29-May	30-May	26-Jun	27-Jun	30-Jul	1-Aug
Baskin, David									
Beckmann, Peter									
Engfer, Doug									
Holt, Sue									
Jacobson, Dana									
Keutmann, Charlie									
Longinotti, Rick									
Mansergh, Sarah									
Menard, Rosemary									
Mesiti-Miller, Mark									
Pepping, Greg									
Rotkin, Mike									
Slatter, Sid									
Stanojevic, Erica									
Stearns, David									

"Committee members may miss no more than 3 meetings per year. If they miss more than 3 meetings per year they forfeit their membership."

Water Supply Advisory Committee

Meeting

First session: Wednesday August 27 5:00 p.m. – 9:30 p.m.

Second session: Friday August 29 2:00 p.m. – 6:00 p.m.

**Fellowship Hall, Peace United Church of Christ
(formerly the First Congregational Church)
900 High Street, Santa Cruz**

Flow Agenda¹

First Session:

Roll Call

1. Welcome to the public and public comment (5:00-5:10)

We encourage members of the public to attend this Committee's meetings and invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but not on the meeting's agenda during the Oral Communication section at the end of Friday's session.

2. Committee member updates (5:10-5:15)

Members provide news of significant communication between them and organizations with significant interest in the development of water policy in Santa Cruz.

¹ This is the **Flow Agenda** prepared by the co-facilitators. It includes information that is excluded from the official agenda about the timing of the meeting and the content of agenda items. We expect that, as much as we hope to stick to this flow agenda, we will have to make adjustments during the meeting to the schedule and the contents described here. The Committee is required to do pretty much exactly what the official agenda says, so we get the "wiggle room" we need in the official agenda by making the official version less specific about schedule and content. You will easily recognize the official agenda by the lighthouse logo on its first page.

3. Soquel updates (5:15-5:20)

See Document C

Heidi Luckenbach updates the Committee on news from the Soquel Creek Water District.

4. Agenda Review (5:20-5:30)

The Committee reviews the agenda for both sessions of this meeting.

Desired outcomes:

- Understanding of the relevance of this meeting's tasks to the Committee's work as a whole
- Agreement on the agenda for this meeting

5. Independent Review Panel (5:30-5:45)

Rosemary Menard, with the participation of the IRP Subcommittee, has developed a short-list of candidates to serve as members of the IRP.

Desired outcome:

- Agreement on candidates to be recommended to the Water Department as members of the IRP

6. Recon Report update (5:45-6:00)

See Documents D & K

Rosemary describes updates to the Recon Report, including changes to the Supply/Demand slide deck. She will also answer questions about the System Water Losses and Water Loss Control Report.

Desired outcome:

- Understanding of changes to the Recon Report.
- Understanding of the System Water Losses and Water Loss Control Report to ensure that this responds appropriately to questions raised by a Committee member about this issue

7. Scenarios (6:00 -6:50)

This is the first in a series of closely related agenda items that together will take a substantial part of this session. The series consists of discussion to

further clarify the Scenarios and Criteria to be used in the decision making process, the decision model itself, Ratings Scales and the identification of the subcontractors that we will need to provide the facts to support this decision making. The series concludes with an exercise to preliminarily explore the Weights.

Karen Raucher leads the discussion about Scenarios for the decision making process.

Desired outcomes:

- Identification of data needed to enable us to finalize agreement on Scenarios for Recon at our next meeting. This includes an understanding of how long any such research will require, and approximately how much it will cost.
- Preliminary agreement on Scenarios to be used in Recon so that we can finalize agreement on this at our next meeting

8. Criteria (6:50-7:25)

Carie Fox leads the discussion and interactive exercise to develop Criteria and Ratings Scales based on the Scenarios developed in the previous agenda item. This will reflect our experience in the “Elements of a Decision” exercise conducted in our June meeting.

Desired outcomes:

- Identification of data needed to enable agreement on the Criteria and Ratings Scales for Recon to be finalized at our next meeting. This includes an understanding of how long any such research will require, and approximately how much it will cost.
- Agreement on instructions to Stratus for the refinement of narratives for the Criteria and for Ratings Scales to be used in Recon so that we can finalize agreement on these at a later meeting

9. Online Decision Model (7:25-7:45)

Carie demonstrates the online decision model and leads a discussion of how it must be updated to reflect decisions made about Scenarios and Criteria.

Desired outcomes:

- Understanding of the online decision model
- Agreement on instructions to Philip Murphy for the updates needed to bring the decision model current with new understandings of Scenarios and Criteria

10. Subconsultant needs (7:45-8:15)

See Documents E & F

Heidi and Bob Raucher lead the discussion about the Committee's needs for subconsultants based on the agreements reached during the discussions about Scenarios and Criteria.

Desired outcome:

- Agreement on recommendations to the Water Department regarding the selection of subconsultants to support the Committee's work

11. Weights (8:15-8:30)

Carie will facilitate an exercise to preliminarily explore the use and impact of Weights in the decision model.

Desired outcome:

- Understanding of how Weights affect the decision model

12. Strategies Ideas and Alternatives Convention (8:30-9:05)

The SIAC Subcommittee provides the latest information about participation by proponents and presents recommendations for the event-related items requested by the Committee at the July meeting. We will also consider the questions to be given to Stratus at the September meeting following the SIAC event. These may include, for example, a primary sort of the proposals.

Desired outcomes:

- Agreement on the event-related data collection system(s)
- Agreement on design elements that create the "look and feel" of the event
- Agreement on the name of the event

- Agreement on elements of the event that will transform event proponents and attendees
- Agreement on further direction to the SIAC Subcommittee and the Outreach Subcommittee regarding outreach for the event
- Understanding of the ways that Stratus may assist in the handling of proposals received in the SIAC process

13. Materials resulting from the previous meeting (9:05-9:15)

See Document G and the unlabeled Action Agenda

The Committee Members' review of the Action Agenda and Meeting Summary prepared for the previous meeting.

Desired outcome:

- Agreement on final versions of the Action Agenda and Meeting Summary for July

14. Wrap up, plan for second session and evaluation of this session (9:15-9:30)

15. Adjourn (9:30)

Second Session:

Roll call

16. Public comment (2:00-2:15)

We invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but not on the meeting's agenda during the Oral Communication section at the end of this second session.

17. Correspondence received from the community (2:15-2:20)

Mike Rotkin reports on correspondence received from the community. Mike will be away for the month of September so a temporary replacement is needed for the role of Corresponding Secretary in his absence.

Desired outcomes:

- Understanding of the correspondence received
- Agreement on the appointment of a temporary Corresponding Secretary
- Agreement on any direction to be given to the Corresponding Secretary

18. Reflections on Wednesday's session (2:20-2:40)

The Committee considers the salient points from Wednesday's session and a review of the agenda for today's session.

Desired outcomes:

- Understanding of the major achievements of Wednesday's session
- Agreement on any changes to today's agenda

19. Review updated online decision model and consider Rating Scales (2:40-2:50)

The Committee reviews the changes made to the decision model to incorporate the items changed on Wednesday and to consider Ratings Scales and Uncertainty.

Desired outcomes:

- Understanding of the changes made to the online decision model
- Agreement on direction to Philip for any further changes to the online decision model including the development of Ratings Scales and any additional functionalities such as Uncertainty.

20. Subconsultant Instructions (2:50-3:15)

In light of the exploration of the new version of the online decision model, the Committee reviews its instructions to Stratus regarding the use of subcontractors and the development of Ratings Scales.

Desired outcomes:

- Identification of any changes needed to the directions previously given to Stratus regarding subcontractors
- Identification of any changes needed to the directions previously given to Stratus regarding the development of Ratings Scales

21. Strategies Ideas and Alternatives Convention (revisited) (3:15-3:45)

The SIAC Subcommittee reviews any items discussed on Wednesday that require additional direction from the Committee.

Desired outcome:

- Clarification of directions to the Subcommittee

22. Recon Outreach Subcommittee update (3:45-4:00)

The Recon Outreach Subcommittee updates us on its progress.

Desired outcomes:

- Understanding of the progress with the outreach effort
- Agreement on any further direction to the Subcommittee

23. Attitudinal Survey Concept Paper (4:00-4:10)

Tina Shull describes the Attitudinal Survey to be proposed for implementation in the fall and leads a discussion of ways to request funding for this from the City Council at the first Council meeting in September.

Desired outcomes:

- Agreement on whether to recommend this Attitudinal Survey to the City Council
- Agreement on how to request funding from the Council

24. Update to Council (4:10-4:25)

See Document J

Rosemary leads the Committee's consideration of a proposed update to the City Council to be presented in September. This could include any recommendation regarding the Attitudinal Survey, a request for funding and news about the SIAC event and outreach efforts.

Desired outcomes:

- Agreement on the content of an update to the City Council in September
- Agreement on who will present the update (note that Mike, who has presented to the Council on behalf of WSAC in the past, will be absent and unable to play this role in September)

25. Decision Rules for Recon Alts (4:25-4:35)

Although the Committee will probably use its decision model to winnow the range of alternatives that will be carried forward from Recon to Real Deal, this need not be the only way to reach decisions. The Committee will consider alternatives as an initial step to reaching agreement on this in September or October.

Desired outcome:

- Identification of potential non-MCDS decision rules to be used at the end of Recon to winnow the range of alternatives to be carried forward to Real Deal

26. Vulnerability Report (4:35-4:45)

Heidi Luckenbach reviews the Water Department's *Vulnerability Report*.

Desired outcome:

- Agreement on whether to address vulnerability in greater detail in a future meeting

27. Growth (4:45-4:55)

See Document L

The Committee will review the Water Department's report "*Historic Water Demand Related to Growth*." It will also review the agreement reached at the July meeting regarding growth and the General Plan, and refine parameters for a further discussion of this in October.

Desired outcome:

- Understanding of the historic record of the relationship between water demand and growth
- Agreement on the parameters that the Committee will follow when considering growth so that we are better prepared for further discussions of this in the October meeting

28. Technical Consultant for Real Deal (4:55-5:15)

Heidi will lead a discussion about the use of Stratus for technical support during Real Deal.

Desired outcome:

- Agreement on a recommendation as to whether or not to use Stratus for technical support during Real Deal

29. Agenda for September and October (5:15-5:40)

The Committee discusses the agenda outlines for the Committee's September and October meetings.

Desired outcomes:

- Understanding of the tasks anticipated for September and October

- Agreement on direction to the co-facilitators regarding the plans for Committee meetings in September and October

30. Oral communication (5:40-5:50)

We invite public comments about items relevant to the Committee's work but not on the meeting's agenda

31. Evaluation and wrap up (5:50-6:00)

Review the session and consider items to be carried forward to the next meeting.

32. Adjourn (6:00)

Water Supply Advisory Committee

Meeting

First session: Wednesday August 27 5:00 p.m. – 9:30 p.m.

Second session: Friday August 29 2:00 p.m. – 6:00 p.m.

**Fellowship Hall, Peace United Church of Christ
(formerly the First Congregational Church)**

900 High Street, Santa Cruz

Flow Agenda¹

First Session:

Roll Call

1. Welcome to the public and public comment (5:00-5:10)

We encourage members of the public to attend this Committee's meetings and invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but not on the meeting's agenda during the Oral Communication section at the end of Friday's session.

2. Committee member updates (5:10-5:15)

Members provide news of significant communication between them and organizations with significant interest in the development of water policy in Santa Cruz.

¹ This is the **Flow Agenda** prepared by the co-facilitators. It includes information that is excluded from the official agenda about the timing of the meeting and the content of agenda items. We expect that, as much as we hope to stick to this flow agenda, we will have to make adjustments during the meeting to the schedule and the contents described here. The Committee is required to do pretty much exactly what the official agenda says, so we get the "wiggle room" we need in the official agenda by making the official version less specific about schedule and content. You will easily recognize the official agenda by the lighthouse logo on its first page.

3. Soquel updates (5:15-5:20)

See Document C

Heidi Luckenbach updates the Committee on news from the Soquel Creek Water District.

4. Agenda Review (5:20-5:30)

See Documents A & B (B is a secured document without a label)

The Committee reviews the agenda for both sessions of this meeting.

Desired outcomes:

- Understanding of the relevance of this meeting's tasks to the Committee's work as a whole
- Agreement on the agenda for this meeting

5. Independent Review Panel (5:30-5:45)

See Document T

Rosemary Menard, with the participation of the IRP Subcommittee, has developed a short-list of candidates to serve as members of the IRP.

Desired outcome:

- Agreement on candidates to be recommended to the Water Department as members of the IRP

6. Recon Report update (5:45-6:00)

See Documents D, K & P

Rosemary describes updates to the Recon Report, including changes to the Supply/Demand slide deck. She will also answer questions about the System Water Losses and Water Loss Control Report.

Desired outcome:

- Understanding of changes to the Recon Report.
- Understanding of the System Water Losses and Water Loss Control Report to ensure that this responds appropriately to questions raised by a Committee member about this issue

7. Scenarios (6:00 -6:50)**See Documents R & S**

This is the first in a series of closely related agenda items that together will take a substantial part of this session. The series consists of discussion to further clarify the Scenarios and Criteria to be used in the decision making process, the decision model itself, Ratings Scales and the identification of the subcontractors that we will need to provide the facts to support this decision making. The series concludes with an exercise to preliminarily explore the Weights.

Karen Raucher leads the discussion about Scenarios for the decision making process.

Desired outcomes:

- Identification of data needed to enable us to finalize agreement on Scenarios for Recon at our next meeting. This includes an understanding of how long any such research will require, and approximately how much it will cost.
- Preliminary agreement on Scenarios to be used in Recon so that we can finalize agreement on this at our next meeting

8. Criteria (6:50-7:25)

Carie Fox leads the discussion and interactive exercise to develop Criteria and Ratings Scales based on the Scenarios developed in the previous agenda item. This will reflect our experience in the "Elements of a Decision" exercise conducted in our June meeting.

Desired outcomes:

- Identification of data needed to enable agreement on the Criteria and Ratings Scales for Recon to be finalized at our next meeting. This includes an understanding of how long any such research will require, and approximately how much it will cost.
- Agreement on instructions to Stratus for the refinement of narratives for the Criteria and for Ratings Scales to be used in Recon so that we can finalize agreement on these at a later meeting

9. Online Decision Model (7:25-7:45)

Carie demonstrates the online decision model and leads a discussion of how it must be updated to reflect decisions made about Scenarios and Criteria.

Desired outcomes:

- Understanding of the online decision model
- Agreement on instructions to Philip Murphy for the updates needed to bring the decision model current with new understandings of Scenarios and Criteria

10. Subconsultant needs (7:45-8:15)

See Documents E & F

Heidi and Bob Raucher lead the discussion about the Committee's needs for subconsultants based on the agreements reached during the discussions about Scenarios and Criteria.

Desired outcome:

- Agreement on recommendations to the Water Department regarding the selection of subconsultants to support the Committee's work

11. Weights (8:15-8:30)

Carie will facilitate an exercise to preliminarily explore the use and impact of Weights in the decision model.

Desired outcome:

- Understanding of how Weights affect the decision model

12. Strategies Ideas and Alternatives Convention (8:30-9:05)

See Document N

The SIAC Subcommittee provides the latest information about participation by proponents and presents recommendations for the event-related items requested by the Committee at the July meeting. We will also consider the questions to be given to Stratus at the September meeting following the SIAC event. These may include, for example, a primary sort of the proposals.

Desired outcomes:

- Agreement on the event-related data collection system(s)
- Agreement on design elements that create the “look and feel” of the event
- Agreement on the name of the event
- Agreement on elements of the event that will transform event proponents and attendees
- Agreement on further direction to the SIAC Subcommittee and the Outreach Subcommittee regarding outreach for the event
- Understanding of the ways that Stratus may assist in the handling of proposals received in the SIAC process

13. Materials resulting from the previous meeting (9:05-9:15)

See Document G and the unlabeled Action Agenda (Document H)

The Committee Members’ review of the Action Agenda and Meeting Summary prepared for the previous meeting.

Desired outcome:

- Agreement on final versions of the Action Agenda and Meeting Summary for July

14. Wrap up, plan for second session and evaluation of this session (9:15-9:30)

15. Adjourn (9:30)

Second Session:**Roll call****16. Public comment (2:00-2:15)**

We invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but not on the meeting's agenda during the Oral Communication section at the end of this second session.

17. Correspondence received from the community (2:15-2:20)

Mike Rotkin reports on correspondence received from the community. Mike will be away for the month of September so a temporary replacement is needed for the role of Corresponding Secretary in his absence.

Desired outcomes:

- Understanding of the correspondence received
- Agreement on the appointment of a temporary Corresponding Secretary
- Agreement on any direction to be given to the Corresponding Secretary

18. Reflections on Wednesday's session (2:20-2:40)

The Committee considers the salient points from Wednesday's session and a review of the agenda for today's session.

Desired outcomes:

- Understanding of the major achievements of Wednesday's session
- Agreement on any changes to today's agenda

19. Review updated online decision model and consider Rating Scales (2:40-2:50)

The Committee reviews the changes made to the decision model to incorporate the items changed on Wednesday and to consider Ratings Scales and Uncertainty.

Desired outcomes:

- Understanding of the changes made to the online decision model
- Agreement on direction to Philip for any further changes to the online decision model including the development of Ratings Scales and any additional functionalities such as Uncertainty.

20. Subconsultant Instructions (2:50-3:15)

In light of the exploration of the new version of the online decision model, the Committee reviews its instructions to Stratus regarding the use of subcontractors and the development of Ratings Scales.

Desired outcomes:

- Identification of any changes needed to the directions previously given to Stratus regarding subcontractors
- Identification of any changes needed to the directions previously given to Stratus regarding the development of Ratings Scales

21. Strategies Ideas and Alternatives Convention (revisited) (3:15-3:45)

The SIAC Subcommittee reviews any items discussed on Wednesday that require additional direction from the Committee.

Desired outcome:

- Clarification of directions to the Subcommittee

22. Recon Outreach Subcommittee update (3:45-4:00)

The Recon Outreach Subcommittee updates us on its progress.

Desired outcomes:

- Understanding of the progress with the outreach effort
- Agreement on any further direction to the Subcommittee

23. Attitudinal Survey Concept Paper (4:00-4:10)**See Document M**

Tina Shull describes the Attitudinal Survey to be proposed for implementation in the fall and leads a discussion of ways to request funding for this from the City Council at the first Council meeting in September.

Desired outcomes:

- Agreement on whether to recommend this Attitudinal Survey to the City Council
- Agreement on how to request funding from the Council

24. Update to Council (4:10-4:25)**See Document J**

Rosemary leads the Committee's consideration of a proposed update to the City Council to be presented in September. This could include any recommendation regarding the Attitudinal Survey, a request for funding and news about the SIAC event and outreach efforts.

Desired outcomes:

- Agreement on the content of an update to the City Council in September
- Agreement on who will present the update (note that Mike, who has presented to the Council on behalf of WSAC in the past, will be absent and unable to play this role in September)

25. Decision Rules for Recon Alts (4:25-4:35)

Although the Committee will probably use its decision model to winnow the range of alternatives that will be carried forward from Recon to Real Deal, this need not be the only way to reach decisions. The Committee will consider alternatives as an initial step to reaching agreement on this in September or October.

Desired outcome:

- Identification of potential non-MCDS decision rules to be used at the end of Recon to winnow the range of alternatives to be carried forward to Real Deal

26. Vulnerability Report (4:35-4:45)

See Document Q

Heidi Luckenbach reviews the Water Department's *Vulnerability Report*.

Desired outcome:

- Agreement on whether to address vulnerability in greater detail in a future meeting

27. Growth (4:45-4:55)

See Document L

The Committee will review the Water Department's report "*Historic Water Demand Related to Growth*." It will also review the agreement reached at the July meeting regarding growth and the General Plan, and refine parameters for a further discussion of this in October.

Desired outcome:

- Understanding of the historic record of the relationship between water demand and growth
- Agreement on the parameters that the Committee will follow when considering growth so that we are better prepared for further discussions of this in the October meeting

28. Technical Consultant for Real Deal (4:55-5:15)

Heidi will lead a discussion about the use of Stratus for technical support during Real Deal.

Desired outcome:

- Agreement on a recommendation as to whether or not to use Stratus for technical support during Real Deal

29. Agenda for September and October (5:15-5:40)

The Committee discusses the agenda outlines for the Committee's September and October meetings.

Desired outcomes:

- Understanding of the tasks anticipated for September and October
- Agreement on direction to the co-facilitators regarding the plans for Committee meetings in September and October

30. Oral communication (5:40-5:50)

We invite public comments about items relevant to the Committee's work but not necessarily on the meeting's agenda

31. Evaluation and wrap up (5:50-6:00)

Review the session and consider items to be carried forward to the next meeting.

32. Adjourn (6:00)

TO: WATER SUPPLY ADVISORY COMMITTEE (WSAC)
FROM: HEIDI LUCKENBACH
SUBJECT: UPDATE ON SOQUEL CREEK WATER DISTRICT ACTIVITIES
DATE: AUGUST 20, 2014

Similar to last month's meeting of the Water Supply Advisory Committee, the attached is provided as information about completed, new and ongoing activities of the Soquel Creek Water District. The attached is excerpted from their August 12, 2014 meeting packet and includes the Table of Contents as well as pages 143 – 154 of that packet.

Particular areas of interest to the WSAC may include topics covered on page 143 on Demand Management and pages 143-146 on Groundwater Management.



Board of Directors
Dr. Thomas R. LaHue, *President*
Bruce Daniels, *Vice President*
Dr. Don Hoernschemeyer
Dr. Bruce Jaffe
Richard Meyer

Kim Adamson, *General Manager*

**BOARD OF DIRECTORS
REGULAR MEETING – 7:00 P.M.
TUESDAY, AUGUST 12, 2014
LOCATION: New Brighton Middle School
Performing Arts Center
250 Washburn Avenue, Capitola, California**

AGENDA

- 1. ROLL CALL**
- 2. PUBLIC HEARING**
 - 2.1 Public Hearing to Receive Comments on the Proposed CONSERVATIONplus Program Ordinance No. 14-02: First Reading
- 3. CONSENT AGENDA**
 - 3.1 Approve Previous Minutes
 - 3.1.1 July 15, 2014 Regular Meeting
 - 3.2 Conditional Will Serve Letters
 - 3.2.1 Bob & Jean McElroy, 12 Colina Drive, La Selva Beach, APN 045-193-10
 - 3.3 Report of Expenditures over \$25,000
 - 3.4 July Warrants
 - 3.5 Income & Investment Report for June
 - 3.6 McGregor Pump Station CWO 08-004, Adopt Plans & Specifications and Call for Bids
 - 3.7 Approve Revision to District's Records Retention Schedule and Blanket Resolution Authorizing Destruction of Records Under the Provisions of the Records Retention Schedule
 - 3.8 Main Street Well Rehabilitation Project, CWO 14-014: Ratify Zim Industries Change Orders 1 and 2; Accept Project as Complete, and File the Notice of Completion; Authorize Additional Fees for HydroMetrics WRI; and Approve Transfer of Funds from Operating Contingency Reserve
 - 3.9 Headquarters Parking Lot Expansion and Interior Office Remodels, Approve Preliminary Environmental Assessment & Categorical Exemption
 - 3.10 Production Graphs
 - 3.11 Accept Final Report for Monitoring Well Replacements & Installations, CWO 12-024
- 4. ORAL COMMUNICATIONS (*items not on the Agenda*)**
- 5. INFORMATION ITEMS**
 - 5.1 Work Plan Status Report

6. **ADMINISTRATIVE BUSINESS**

- 6.1 Unconditional Will Serve Letter for Ashvin Desai, 420 Sand Dollar Dr., La Selva Beach, APN 046-061-77
- 6.2 Review and Provide Direction on Hexavalent Chromium Treatment Implementation Study
- 6.3 Item pulled
- 6.4 Direction to Staff Regarding 2014 Grand Jury report, *Desalination and Alternatives – Water for a Thirsty County*
- 6.5 Renewal of Emergency Service Agreement for Trout Gulch Mutual Water Company
- 6.6 Renewal of Emergency Service Agreement for PureSource Water, Inc.
- 6.7 Approval of Integrated Regional Water Management Plan Update 2014 for Northern Santa Cruz County

7. **STATUS REPORTS**

- 7.1 Conservation Customer Service Field - Oral
- 7.2 Engineering - Oral
- 7.3 Operations & Maintenance
- 7.4 Finance – Oral
- 7.5 Human Resources
- 7.6 District Counsel - Oral
- 7.7 General Manager - Oral

8. **WRITTEN COMMUNICATIONS AND CORRESPONDENCE**

- 8.1 Letter from Heidi Morgan regarding rates
- 8.2 Email from Stephen Wyckoff regarding moratorium

9. **CLOSED SESSION** - None

10. **ADJOURNMENT**

All information furnished to the Board of Directors with this agenda is provided under ***Who We Are - Board Meetings*** on the District's website www.soquelcreekwater.org. Any additional information provided to the Board prior to the meeting will be made available to the public at the District office. Please observe the following procedures for addressing the Board on agenda items. All those wishing to speak on an item should raise a hand and be recognized by the Board President during the portion of the proceedings set aside for public comment. Each speaker will be limited to a single presentation of up to three minutes per agenda item (time limits may be increased or decreased at the Board President's discretion). After all speakers have addressed the Board, the Board will deliberate and take action. Additional public comment will not be allowed during the Board's deliberation unless the President specifically calls on someone in the audience. Organized groups wishing to make a presentation are asked to contact the Board Clerk prior to the Board Meeting. Disability Access – the meeting room is wheelchair accessible. Please contact Karen Reese, Board Clerk, at (831) 475-8500 ext. 126 if you need assistance in order to participate in a public meeting or if you need the agenda and public documents modified as required by Section 202 of the Americans with Disabilities Act.

Work Plan and Special Assignments Status Report
Updated as of August 12, 2014

ACTIVITIES RELATED TO WORK PLAN ITEMS

Key –

Regular Font = No Change

Red Italic or underlined = New Assignment or Activity

~~Blue Strikethrough~~ = Completion; Completed items are deleted the following month

INTEGRATED WATER RESOURCES PROGRAM (IRP)

The District's adopted multi-faceted program includes demand management, groundwater management, and supplemental supply (conjunctive use or local). Below includes a status or current activities of these components *(This section has been re-arranged (from how it organized in previous work plan updates to mirror the order as outlined in the IRP):*

1. Demand Management :

a. Conservation~~ONSERVATION–Plus Program.~~ ~~Using focus group results, the board made changes to the details of the Conservation Plus program on June 17, 2014. and Board adoption by resolution at a public hearing is anticipated for August 12, 2014~~ *The first reading of Ordinance 14-02 and the public hearing will be on August 12; with the second reading and consideration of adoption on September 2. Water Budget Allocation Forms and Commercial Enrollment forms are tentatively scheduled to be sent out on in mid-September. The Prop 218 letters for penalties related to excess use and non-compliance with BMPs are scheduled for mid August with a public hearing at the October 7 meeting. Staff is now focusing on preparing the District to successfully implement the program including hiring additional staff and preparing billing software, forms and materials. Staff and consultants have named, branded, created key messages and drafted an outreach plan for the program which is being finalized and initial communications have begun.*

Water Waste Ordinance. Staff has made modifications to the water waste ordinance as adopted by the board on June 17 and are working to update internal materials to reflect the changes. ~~The interview process for a~~ *Tera Curren has been hired as our —full-time, temporary Conservation Compliance Assistant to educate our community/customers on our water waste policy. has been completed and this person will come on board and begin patrolling for water waste shortly. Tera was recently featured in KSBW's coverage on the City of SC and SqCWD related to drought and water waste.*

2. Groundwater Management

a. Cooperative Agreement with City of Santa Cruz (City) (Admin)
 – Status: Negotiations have resumed and agreement now includes City

participating in cutting back groundwater pumping if District enforces Mandatory Rationing. The City provided a revised agreement for Staff to consider on April. City Staff was provided pumping distribution plans for total pumping and demand outlined in 2012 Integrated Resources Plan from HydroMetrics, WRI. The technical memorandum was presented to the Board on 4/16 and accepted. The draft agreement was presented by Cameron Tana of HydroMetrics to the Board on July 9, 2013. The Board suggested modifications that were presented to the city. A revised version containing most of the requested changes is being presented for the Boards consideration on September 3, 2013. Currently the agreement is on hold pending findings on protective elevations to come from our pending Peer Review. The Peer Review Report is complete ~~is scheduled to be~~ was brought to the Board at the July 15th for acceptance. The Board requested that Hydrometrics and Todd Engineering put together a document listing the differences and issues of disagreement and which assumptions led to those disagreements. It should identify which items would be resolved by a groundwater model and which would require separate studies. The Board will consider the report recommendations and formation of a TAC after they receive this information. We plan to bring this information back for the September 16, 2014 meeting.

- b. **Groundwater Emergency Declaration (Admin.)** On June 3, 2014 after conducting a public hearing and being presented with the peer review's concurrence that the groundwater basin is in a state of overdraft, the District directed staff to prepare a resolution declaring a groundwater emergency. The Board adopted Resolution 14-22 declaring a groundwater emergency. A letter to neighboring water agencies seeking aid and assistance in response to this declaration ~~will be brought to the Board on 7/15~~ was approved by the Board and sent to neighboring agencies in July. Currently only the County has responded and a meeting has been scheduled with Supervisors Friend and Leopold on August 26th.
- c. **Groundwater Replenishment Powers and Zone of Benefit –**
Status: The Basin Implementation Group discussed this item on May 24, 2011. As the next step in the evaluation, Staff will update information on non-District well locations and pumping within the SqCWD service area using metering information and water use factors and consider various zone of benefit scenarios based on pumping impacts. At the Strategic Planning Workshop on July 30, 2013, the Board decided to look further at this option and we discussed replenishment powers under AB3030 at the March 4, 2014. The zone of benefit can be determined through a groundwater model determination of which wells influence seawater intrusion. This is not

legally required, but is important if we hope to have cooperation on this issue. The Board ~~will consider moving forward with a groundwater model at the July 15, 2014 meeting.~~ recommended that the proposal for the groundwater model be recommended to the Basin Implementation Group (BIG). The BIG will consider the proposal at their August 14, 2014 meeting.

- d. **Basin Implementation and Advisory Groups** - most recent BIG meeting was held on June 24, 2014 with the BAG meeting preceding it on June 4, 2014. Letters of invitation have been sent to both the City and the County. They will be considered by their Council and Board in September and August respectively. Per the June 24th BIG meeting, PVWMA was also considered to be invited to the BIG and this will be brought to both boards of Central Water District and SqCWD to approve. The SqCWD board ~~will consider~~ approved this on 7/15 and, if upon CWD approved approval, a letter of invitation will be sent out to PVWMA. If any of the entities governing bodies accept the invitation, the next step is to write an amendment to the existing partnership agreement. The BIG also discussed the notion of changing its name and this will be further considered. We are currently working on scheduling a staff level meeting to discuss organizational models to bring to the Board of the BIG.
- e. **Groundwater Stakeholder Committee:** The District is working with Central Water District and the County of Santa Cruz to form a stakeholder advisory committee to broaden the engagement with all groundwater basin users (including private pumpers) to promote open and effective communication and explore issues related to groundwater rights, seawater intrusion, etc. The Board approved a budget for the facilitation of the group at the March 4, 2014 meeting. The first meeting was on May 13, 2014 at Seacliff Inn. The next meeting was held on July 8 at Soquel Congregational Church from 7-9 PM and included a presentation by Cameron Tana, hydrologist for Soquel Creek Water District and Central Water District as well as a pilot groundwater monitoring and conservation project being conducted by Resource Conservation District. The next meeting will be on August 27, 2014 where we will focus on taking questions and fact checking the multiple historic reports related to private well pumping. This will be followed by a meeting on September 9, 2014 and which will focus on CA groundwater law –past, present, and future featuring Russ McGlothlin as the speaker.
- f. **CA State Legislation on Groundwater** – While surface water rights have been regulated since 1913, CA does not apply statewide

regulations. This may soon change. District staff is the two bills AB 1739 (Dickenson) and SB1168 (Pavley) that have been written and focus on better groundwater management in the State. Currently the authors of the bills are co-authors on one another's bill and it's anticipated the two bills will be further reconciled. ACWA and the California Water Foundation have both been actively working with the bill authors. Both bills authorize a groundwater management agency to require registration of wells and reporting of pumping, impose regulatory fees to fund management and replenishment, and where necessary – establish quantified pumping allocations that could be transferred among groundwater users. The proposals also establish a 'backstop' of state intervention if local management fails to enact sustainable groundwater plans. ~~Staff will continue to track these and provide the Board with updates.~~ Revised copies of the bills are expected to be in print shortly and additional amendments are coming out shortly. One major change is the addition of a definition for de minimus pumpers, identified as residential pumpers who pump less than two acre feet per year. De minimus pumpers are excluded from metering and use reporting activities identified in the proposed legislation. Fees can still be imposed on de minimus pumpers.

3. Supplemental Supply: District's Exploratory Discussions and Evaluation of Back-Up Options

- a. Meetings: Since fall 2013, the District has been holding topical meeting discussion on back-up options for a supplemental water supply. Staff plans on ~~returning to the Board on July 15~~ staff presented with a status update and selection grid for the Board to use. The Board was asked to return their completed scoring by August 20, 2014 so staff can compile the info for the ~~and August 26 to begin conducting an~~ alternatives analysis workshop.
- b. Follow up and Evaluation: Projects, thus far, to include in a qualitative summary for the Board to consider at a future meeting include: District-only Desalination, Deep Water Desalination, Water Exchange, Recycled Water for seawater barrier, groundwater replenishment, and irrigation. Staff presented conceptual level information on the District-only desal project to the same level of detail as the recycled water options at the March 18 meeting.

Staff attended a meeting for potential JPA members for the Deep Water desal project on February 20, 2014. It was focused most on the formation of a JPA and the legalities involved. Some concerns raised specific to the project were the ownership of the intake/outflow, the bond rating if there are public private partners and concern over

public agencies contracting with Deep Water desal for the management-construction of the plant rather than going through a design-bid-build or design build selection process.

Monterey Peninsula Water Management District would like to cost share with us for Kennedy/Jenks' financial review of the project. Todd Reynolds met with Deep Water Desal on April 23rd to go over their projections.

Staff also provided information on previous very preliminary ideas for pipeline routing that Deep Water Desal could roll into their Proponent's Environmental Assessment and application for the State Lands Commission.

District Board approved preparing a grant application for a study of regional recycled water projects at its May 20, 2014 meeting which will look at regional options that could possibly meet our recharge needs. The City of Santa Cruz approved to split the cost and prepare the grant application jointly at its June 17th meeting.

c.To access the dedicated webpage on these back up evaluations, visit: <http://www.soquelcreekwater.org/exploratory-discussions> . This page includes meeting materials (presentation, minutes) and Community TV video footage.

4. Supplemental Supply: Regional Desalination Project with the City of Santa Cruz (Admin)

- a. CEQA Oral and written comments will be posted on the project website in September. Approximately 400 comments were submitted by roughly 300 commenters and URS has grouped comments by topics and is developing a budget and scope for a phased approach to address EIR comments. This has been put on hold.
- b. Permitting/Regulatory: No new information at this time.
- c. Public Outreach: With the close of the EIR comment period, scwd² outreach will primarily be supporting the District and City outreach and education efforts. No new information at this time.
- d. Grants: No new information at this time.
- e. Public Vote: The District has committed to a vote but details have not yet been brought back to the Board. On August 20, the City released a press release from their Mayor and City Manager that they recommend a public vote not occur in 2014.

- f. Task Force Meeting: Meetings have been suspended.
- g. Other: The Santa Cruz County Grand Jury released a report on June 17, 2014 titled "Desalination and Alternatives, Water for a Thirsty County" that examined the shortage issues facing the City of Santa Cruz and the District. The District received a commendation in the report for holding board meetings at the Capitola City hall to address supplemental water supply and mandatory rationing which allowed for greater public participation and awareness on the discussion via local access TV and the internet. Responses on the report need to be submitted by 9/15/2014

5. Supplemental Supply: Water Exchange from Santa Cruz

- a. Status: A letter stating the Board's position on this project as developed on March 20 was approved on April 3, 2012 and sent out to the Santa Cruz City Council. An oral status update by John Ricker was provided on February 19th. The technical working group met on February 11th to discuss the next steps towards applying for individual water rights. A proposal for legal services has been requested from Best, Best & Krieger LLP. Once received, the proposal will be presented to the Board for consideration. Board discussions suggested Staff also contact Peter Kiel with Ellison, Schneider & Harris. This has been put on hold due to staff workloads. At the April 16 board meeting, Director Jaffe requested a future item be agendaized to discuss timing for consulting with a water rights attorney. Staff met with City Staff and County Water Resources Division Director on Monday July 8 to discuss draft report from the County's water right's attorney related to the subject of water exchange. That draft is under review by city legal counsel. FY 13/14 Budget includes \$50,000 to investigate a water right application. Peter Kiel attended the November 5, 2013 Board meeting via teleconference. Through discussions about water rights applications it became clear that we do not have enough budgeted for a successful water rights application. We will need to discuss how to move forward if/when we identify a specific water right for which we would like to submit an application. We have received a scope and work plan from Peter Kiel for a water rights application. It contains sensitive information so Peter Kiel is revising it for presentation to the Board.

We received a letter of agreement from the city. It was sent to us, Scotts Valley and San Lorenzo Water Districts. It is intended to facilitate cooperation for water transfers and basically acknowledges that the city has senior water rights and states that we will not take any adverse action towards the city if they have to use the full amount

of their water right rather than diverting some of it to partner agencies. Staff had a second phone call with legal counsel and Scott's Valley to discuss changes to the agreement. Those changes were submitted to the city on June 11. Follow up discussions between the two agencies water rights attorneys did not go well. On July 11, 2014 the SqCWD General Manager met with the City's Water Manager and worked out some compromises. The agreement will be narrowed to address only water rights related to the conjunctive use study currently under discussion. In addition an agreement for the use of the City's treatment plant will be prepared and considered simultaneously. This item is still pending.

MISCELLANEOUS WORK PLAN ITEMS

1. Energy Work Plan

Status: Staff has developed an RFQ to hire a consultant to assist in creating an RFP for a solar installation at the District facility. The concept is to use a Power Purchase Agreement (PPA), which allow the District not to invest in capital costs, but still retain the offset credits power and the power at a reasonable cost. Effort on this item is on hold until after the June 5 Workshop, after which it will resume. In May 2013, staff is aiming to start this process back up again. An informational item on Community Choice Aggregation was presented at the April 2nd meeting. The CCSF department has transferred this project to the Engineering department. Assessment by ACWA's preferred provider, Solar City, is pending site information and historical power records. *Status-on hold due to higher priorities.*

2. Water Quality

- a. Hexavalent Chromium (O&M) – **Status:** The Water Research Foundation (WRF) Agreement for the chromium 6 pilot testing was approved by the Board on January 15th and the District has processed payment in the amount of \$150,000 to the WRF. The strong base anion exchange water treatment bench- and pilot-tests and the brine treatment studies have been completed. The draft final report has been submitted to the WRF for review.
- b. The District approved a proposal by Ionex SG to rent a containerized strong-base anion exchange chromium 6 treatment system for a period of 2 years beginning in July 2014. The system is being installed at San Andreas Well. Raw water line and on-site piping is complete and delivery of equipment was completed on 6/18. State Water Resources Control Board Division of Drinking Water will inspect the facility in late July or early August to finalize amending the District's water supply permit.

3. District Public Outreach

- a. **Website Redesign:** Status: Ryan Forest Hayes is currently working on the wireframe and web structure with staff. It is anticipated that the website re-launch will be completed in July 2014. With the amount of items to cover at our board meetings lately and with the board meeting only once a month during the summer, staff would like to see if the Board is interested in setting up a one-on-one meeting with staff to go through the beta website. Staff conducted beta testing and input from management, key staff, and several members of the Board and refined the site pre-launch in early July. A soft launch of the site was done the week of July 7. Public outreach will be done to promote the new site the week of August 18.~~when we fully launch in mid-July.~~
- b. **Social Media:** Status: The District's Facebook page was soft launched on March 5, 2014 with minimal promotion. We are currently posting about 3 times a week on current activities (such as the Board Meetings, Groundwater Awareness Week, etc.) A broader outreach will be tied to the website launch ~~in July~~ and CONSERVATIONplus.
- c. **E-Blasts:** Staff launched its monthly District e-blast on March 5. Currently our subscribers total 4,651 which reflects new additions through our Springbrook customers, those who sign up at events/meetings and reductions through some email cleanup we conducted and those who've asked to unsubscribe. As we launch the Water Smart Program to all residential customers and launch our new website requesting interested individuals to sign up for e-blasts, we hope our subscriber list will grow. Our % opening is higher than the average 25% typically seen by businesses and we will be working with MIG to review these performance measurements in September. The intent of these emails are to be concise and include current information of events, news, etc.

Month	Subscribers	% Opened
March	4,218	51.8%
April	4,009	48.5%
May	3,987	48.4%
June	4,735	46.5%
July	4,657	40.0%
<u>August</u>	<u>4,651</u>	<u>36.6%</u>

- d. The August E-blast is attached.
- ~~e. **Newsletter and Bill Inserts:** The board approved at its 2/18 board meeting to revise the format and frequency of the "What's On Tap" Newsletter to be quarterly and a four-page spread. The first 4-page spread was sent to customers beginning in April. We also generated an Annual Water Quality Report that is available on-line and to customers who~~

~~requested a hard copy be mailed. A double sided bill insert was also generated that featured conservation (promoting rebates) and the release of the annual water quality report. A double sided bill insert was included with the June billing statements to alert customers that emergency rates would begin July 1. The newsletter for July September 2014 is attached. The August bill insert is attached.~~

~~f.e.~~

~~g.f.~~ **Advertisements:** ~~The District has been running a series of advertisements in the Sentinel, Good Times, and Capitola/Sequel Times to promote water conservation/outbacks/rebates and the Do More to Use Less message. Last ads featured a young surfer (promoting taking shorter showers) and Boots and Carm McGhee (turf replacement). Advertisements ran in the Sentinel and the Capitola/Sequel and Aptos Times to promote the Groundwater Stakeholder Advisory Committee Meeting on July 8. A copy of the ads attached. As part of the CONSERVATIONplus program outreach plan, staff have~~ **are** ~~developing~~ **ed** ~~an updated media advertising plan and will be~~ **are** ~~negotiating new advertising contracts with local media outlets.~~

~~h.g.~~ **Public Notices/Press Releases:** ~~The District issued a press release on June 17 addressing the release of the Grand Jury Report~~ **August 5 addressing the upcoming public hearing on CONSERVATIONplus and the related August 12 Public Hearing was publically noticed.**

~~i.h.~~ **Events and Presentations:** ~~A current list of our events and presentations is included at the bottom of this work plan.~~

~~j.~~ **Banner:** **As part of the CONSERVATIONplus program staff are creating a new plan for b** ~~Banners focusing on water conservation in order to keep the signage fresh and relevant. (Do More to Use Less) and Groundwater (Our Water is Groundwater) are currently hung in Capitola and at the Little League and Pony Fields of Capitola-Sequel, Aptos, and Polo Grounds. Our banner "Thank You for Conserving Water" is hung near our District headquarters.~~

~~k.i.~~

~~l.i.~~ **"Doing Our Part to Use Less" Yard Signs** – We are working with the City of Santa Cruz, PVWMA, Scotts Valley WD, and San Lorenzo Valley WD on a regional campaign to promote using less water outside during this drought period. We are seeing great interest in these signs as a way for community members to encourage their neighbors to use less.

~~m.k.~~ **Community Survey:** ~~MIG completed a community survey of over 300 residents within our District in March 2014. A presentation and summary of the results were provided to the Board at the April 29 meeting. The survey has helped guide our 2014/15 work plan.~~

~~n.l.~~ **Key Messages:** Staff and MIG are working on developing Key Messages and FAQs for Chromium 6 and Conservation*Plus*.

~~e.~~ **Featured Column in Aptos and Capitola Soquel Times:** Kim's Column in the local weekly papers in ~~July~~ August focused ~~this month~~ on " CONSERVATION*plus* Shared Groundwater Resources". ~~Kim also contributed to the Time's 4th of July Handbook.~~

~~p.m.~~

~~q.n.~~ **Outreach Summary Report:** Staff is continuing to migrate and consolidate our outreach reporting into this work plan report from the conservation report that is related to outreach efforts.

4. Board Requests of District Staff:

~~a.~~ **Recommend a common unit for water supply (e.g. gallons instead of acre-feet); develop a cost comparison of water supply from various sources.**

Staff has met and discussed this item in depth. If units are changed to gallons within the billing software it will result in an increase of unaccounted for, unpaid for water in the amount of 2-4 acre feet per year. Currently we bill in rounded hundred cubic feet of use (units). We are checking with Springbrook on our ability to use decimals resulting in non-rounded units. The bills will still say "units". Since all of our water budget outreach is in gallons which are more understandable to customers, we will make sure that all bills always contain an explanation of the relationship between gallons and units.

We are also looking at our current bill layout. Our current bill is very busy and text intensive. This usually results in a lot of text we are trying to convey, which doesn't get read. We are looking at options to clean up our bill layout and make sure we include the most important information we want to convey. Since we are rolling out the Home Water Reports giving us two vehicles for communicating information, we should be able to clean up the current billing statements so they are more likely to be read.

~~a.b.~~ **Investigate GASB 60 and how it would relate to City/District public-public partnership. (12-18-12)**

~~b.c.~~ **Agendize future use of rail trail right-of-way. (12-18-12)**

~~e.d.~~ **Agendize discussion about timing for a surface water rights application required for surface water exchanges with the City of Santa Cruz Water Department (5-21-13)**

~~d.e.~~ **Agendize a discussion on creative financing for Mandatory Rationing.**

- e.f. Investigate options for identifying location of saltwater interface. Staff contacted Randy Hanson of USGS and received the following: USGS can provide geophysics onshore, offshore and in wellbores to assess the saltwater interface as well as provide isotope, age-dating and halogen geochemical samples to determine if the saltwater is current or remnant. We were referred to David O'Leary in San Diego to determine if this is feasible for the District. Director Jaffe recommended we contact Pete Swarzenski since he is most familiar with the Monterey Bay area. This info was sent to Hydrometrics so they can follow up. We hope to schedule a presentation for the September 16, 2014 meeting.
- f.g. Agendize a follow-up discussion on water models. We planned to present a proposal from Hydrometrics at the July 15, 2014 meeting.
- g.h. Staff was asked to prepare a Gantt Chart type report showing the items staff is working on. It was recognized that the work plan reflects a very high staff work load. A Gantt Chart may help the Board to prioritize staff efforts.
- h.i. Initiate a Board Training session and hold a workshop to develop a governance policy prior to the training session.
- i.j. Agendize a conversation about a District name change – on hold due to higher priorities

SPECIAL ASSIGNMENTS

FINANCE

- a. Agendize leak adjustment policy per direction on (2-19-13). Staff will review leak adjustment policy in light of the Water Usage Reduction Program and plans to present recommendations in ~~July~~ September.

CONSERVATION

- a. Focused on components on the CONSERVATIONplus program, WDO program, and working with developers to adhere to our process and regulations. Have been discussing the Conservation Plus program with many interested customers and how they will comply.
- b. Expanding CCSF office to accommodate new staff. Engineering and CCSF staff working with architect to start the process.
- b.c. Staff continues to adapt and operate the Water Demand Program to accommodate modifications to the program.

ENGINEERING – None

OPERATIONS & MAINTENANCE

- a. Reducing Water Loss During Well Start-up/Shut-down – Staff received delivery of the Tannery well VFD. Installation will be completed by staff after the rehabilitation of Main Street Well. Purchase and installation of a VFD at San Andreas Well is underway. The operation of Seascape Well has been scaled back to reduce the number of start-ups and shut-downs.

RECENT AND UPCOMING COMMUNITY OUTREACH

This list includes the current month and upcoming events only. The District's new website will include a calendar of events. Events marked with an asterisk are part of the regional outreach support provided by Ecology Action.

July 18 – staff co-presented at a Desal Alternative forum regarding innovation conservation approaches.

*July 20 and August 10 – Free WaterWise Gardening talk at Capitola Home Depot

*July 26 – Aptos Farmers Market outreach table

*July 27 – Wharf to Wharf after party at Capitola Whole Foods outreach table

August 31 – met with the GM and Board president of large commercial outfit regarding CONSERVATIONplus.

*August 10 – Twin Lakes Church Art Show outreach table

*August 10 – California Beer Festival in Aptos Village Park outreach table (surveys have shown we need to make more of an effort to outreach to young men)

August 12 – staff meeting with an HOA regarding CONSERVATIONplus.

*August 24 – Twin Lakes Church Family Picnic outreach table

TO: Water Supply Advisory Committee

FROM: City Staff

DATE: August 20, 2014

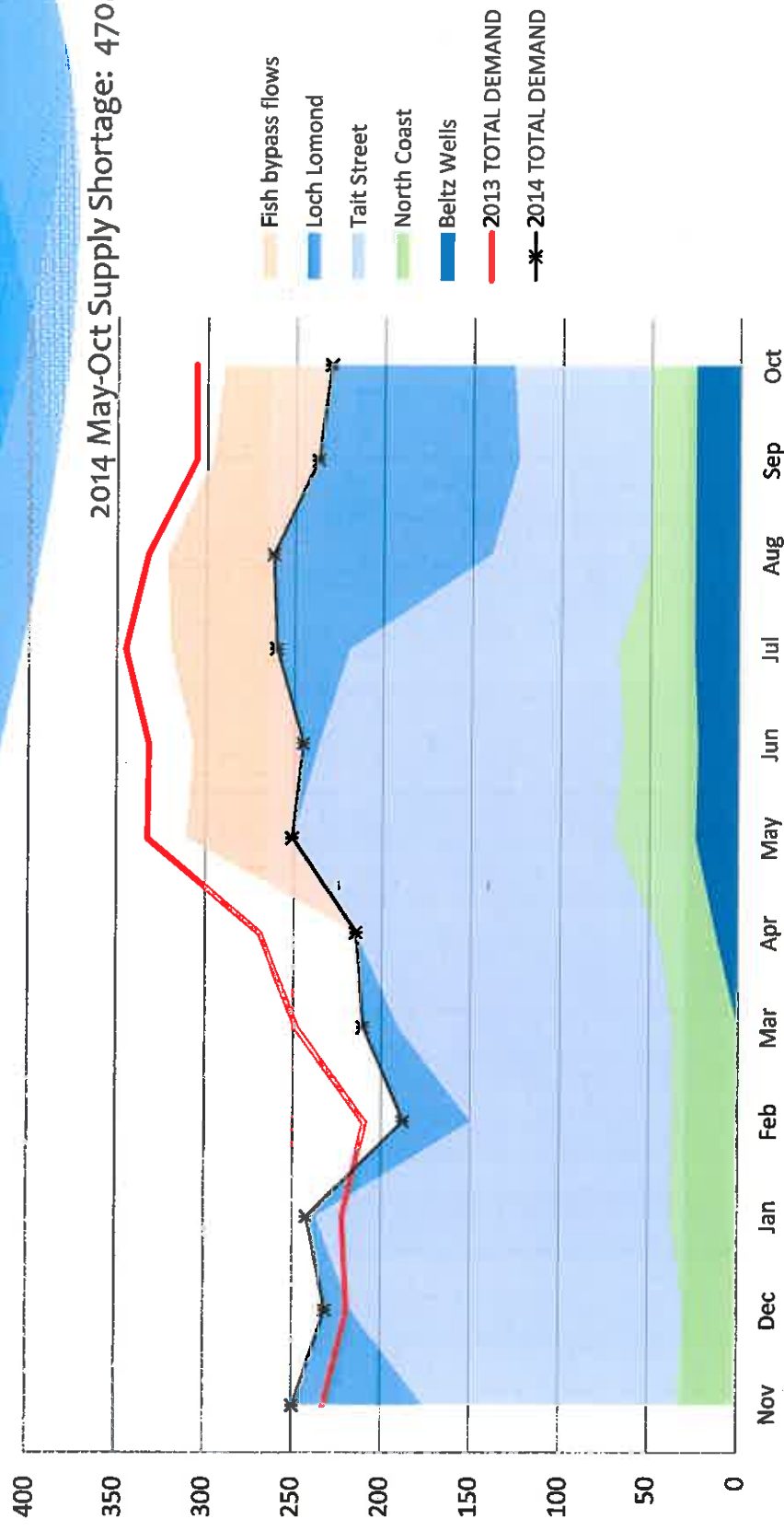
SUBJECT: Additional Supply/Demand Charts

Added to the slide deck presented to the Water Supply Advisory Committee at their June meeting are two slides to further inform the Committee on the water supply issues faced by the City. These two slides are described below.

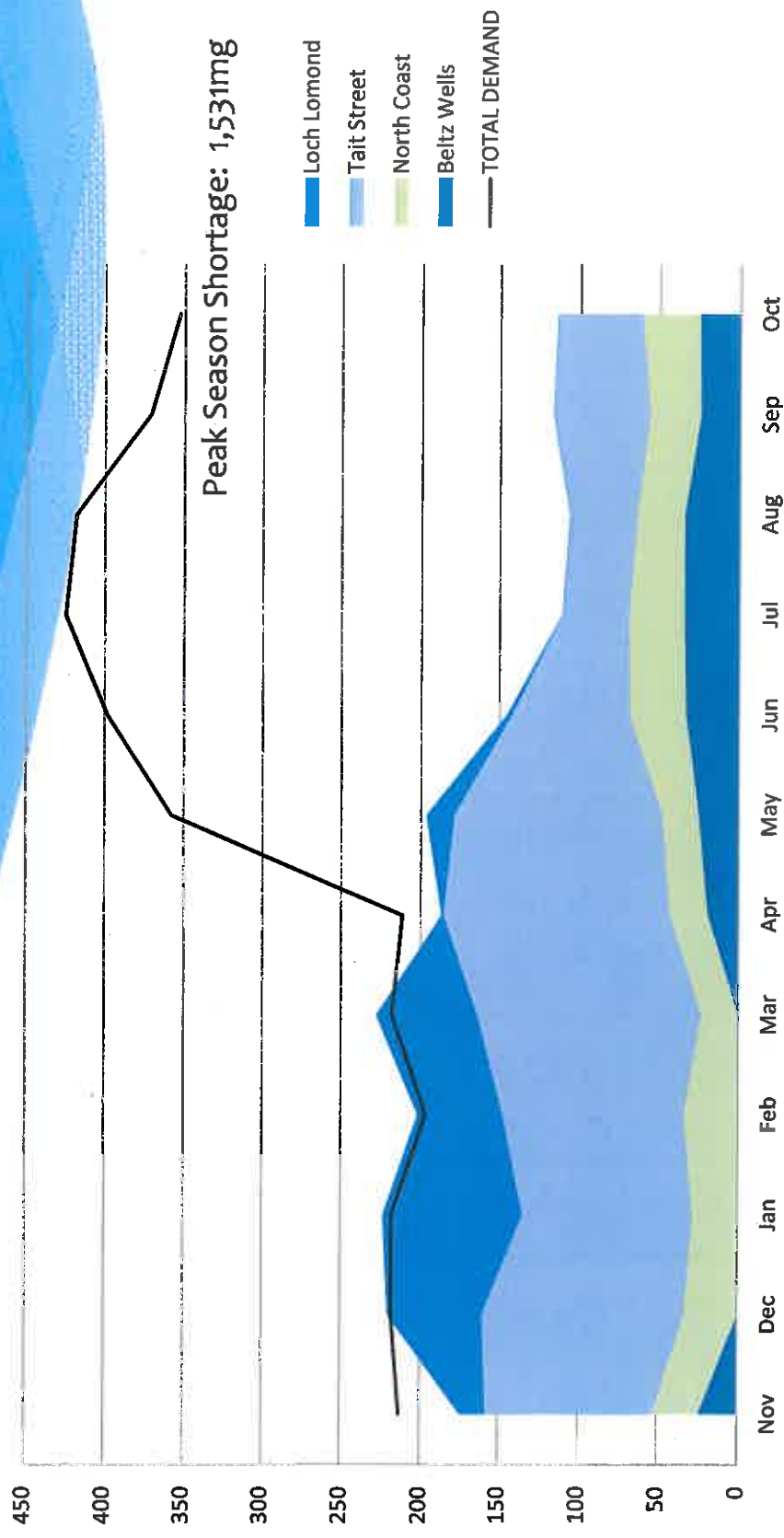
Slide 54a is a companion to **Slide 54**. **Slide 54** represents results of the Confluence model for the 1977 hydrologic year with current demand projections and no fish release flows and shows a 297million gallon peak season shortage. **Slide 54a** is a best approximation of data for the current year, November 2013 to October 2014, with supply and demanded projected to the end October to complete the water year. The goal of the slide is to show the impact of the current drought on City sources of supply, lost supply to support fish releases, and result of Stage 3 curtailment on customer demand. Source production is taken from actual metered data and fish releases are approximated from review of provisional stream flow data.

Slide 55a is meant as a companion to **Slides 55 and 56**. While **Slides 55 and 56** communicate impacts due to Tier 3/2 and Tier 3 flows respectively, **Slide 55a** communicates the impacts of DFG5 flows.

Monthly Source Production Nov 2013 to Oct 2014 (millions of gallons per month)



Monthly Source Production Under 1977 Hydrologic Conditions – DFG5 Flows, Base Infrastructure (millions of gallons per month)



TO: Water Supply Advisory Committee

FROM: Stratus Consulting & City Staff

DATE: August 20, 2014

SUBJECT: Technical Expertise

At a previous meeting, the Water Supply Advisory Committee agreed that the hiring of experts would have four collaborative components: input on the hiring of consultants, input on the hiring of subconsultants, input on the description of consultant and subconsultant tasks and, perhaps most importantly, an ongoing dialog as tasks evolve. This system is designed so that the Committee and the technical team are working together constructively, effectively and with integrity.

As the Committee has worked through Recon, another aspect has become clear: that the need for technical work naturally arises from the discussion about scenarios, criteria and ratings scales. As you develop your understanding of these decision model elements, you are shaping the consultant tasks.

Our job is to make sure that as these tasks become clear, the expertise is available to the Committee in a timely manner. Some subcontracts happen through Stratus and some will be hired through the City. Some of these are quick and easy to do and some, even the Stratus subcontracts, take time. Therefore, to the extent possible, it would be beneficial to go ahead and start the hiring process as soon as is appropriate so that we have access to the technical expertise we can reasonably anticipate we will need. But, of course, once a subconsultant is hired for the process, a discussion with the Committee will occur before proceeding with tasks.

At the WSAC August meeting there are two parallel efforts: in the discussion about scenarios and the decision model, Stratus will elicit information about the specific tasks the Committee may be interested in; this item is to ascertain the subconsultant hiring the Committee is comfortable with now.

Below and attached (Document F) are the outline and table from the July item which is provided again here to facilitate WSAC consideration of this topic; it is not necessarily exhaustive, and may in fact be too far-reaching.

1. Resource Management
 - a. Land Use
 - b. Fisheries
2. Water Management
 - a. Water Conservation
 - b. Demand Management
 - c. Drought Planning
 - d. Demand Analysis
3. Hydrogeology

- a. Groundwater management
 - b. Aquifer Storage and Recovery
- 4. Regulations
 - a. Water Rights: State Water Resources Control Board
 - b. Planning Issues: California Coastal Commission/State Lands Commission/Fish & Game/Fish & Wildlife
 - c. Construction Issues: Regional Water Quality Control Board, Regional Transportation District
- 5. Water Quality
 - a. Water & Wastewater Treatment
 - b. Indirect Potable Reuse
 - c. Direct Potable Reuse
- 6. Energy
 - a. Renewable Energy
 - b. Compliance
- 7. Economy
 - a. Benefit Cost analysis
 - b. Regional Economic Impact Assessment
 - c. Rate Setting
 - d. Resource Valuations
- 8. Civil Engineering
 - a. Infrastructure: Pipelines, pump stations, dams, treatment plants
 - b. Costs, feasibility analyses, conceptual design(s)

Water Supply Advisory Committee

Meeting July 31 – August 1, 2014

Fellowship Hall, Peace United Church of Christ

Meeting Summary

Use and Meaning of the Meeting Summary:

The Summaries of the Water Supply Advisory Committee are intended to be general summaries of key issues raised and discussed by participants at meetings. The presentation of issues or items discussed is not designed to be totally comprehensive, or reflect the breadth or depth of discussions. However, it is intended to capture the gist of conversations and conclusions.

Where a consensus or other agreement was reached, it will be so noted. Where ideas or comments are from only one or several participants, or where a brainstormed list is presented the content of which was not agreed to by all Committee members, the co-facilitators will to the best of their abilities note these qualifiers. Where the co-facilitators believe that the insertion of additional information would be useful to the group they insert it in this summary and indicate that the insertion comes from them, rather than from the Committee.

An early draft of this summary is sent to Committee Members so that they may provide comments to the co-facilitators and permit the preparation of a more reliable Presentation Draft for review at the Committee's next meeting. If the Members' comments conflict with each other the co-facilitators do their best to resolve the conflict in the Presentation Draft. When Members raise comments about the meeting Summaries, or make other suggestions or comments following meetings that propose changes that are more than "corrections" to the Summaries, the facilitators add these in a section at the end of the meeting Summary captioned "Post Script".

This meeting consisted of two consecutive daily sessions. The first lasted 4½ hours, the second last 3½ hours. Here is a list of the members of the Committee. All members attended both sessions except as specified.

Water Supply Advisory Committee

David Green Baskin, Dana Jacobson, Charlie Keutmann, Sue Holt, Rick Longinotti, Sarah Mansergh, Rosemary Menard, Mark Mesiti-Miller, Mike Rotkin, Sid Slatter, Erica Stanojevic, Doug Engfer, Peter Beckmann (attended the first session, absent from the second), Greg Pepping (Absent from both sessions), David Stearns (Absent from both sessions).

First Session, Thursday July 31

Public comment

There was no public comment

Committee Member updates

Mark Mesiti-Miller and Sid Slatter reported that the Chamber of Commerce and the County Business Council meet regularly to confer about the progress of the Committee and that they look forward with excitement to the SIAC event. Rick Longinotti reported that Desal Alts hopes that the Committee will find ways to use water rates to encourage conservation.

Agenda review

Co-Facilitator Nicholas Dewar reviewed the meeting's agenda with the Committee. This included a brief review of the Gantt chart to see where the July meeting fits in the work plan. All agreed on the agenda.

Supply and demand update and Recon Report

Rosemary Menard reported on updates to the Supply and Demand slide-deck. The Committee members discussed the policies concerning the reasonable level of water conservation that is appropriate in wet years and the use of wet-year water to create a substantial buffer. Some pointed out how such wet-year conservation could allow Loch Lomond to be used to provide more supply during peak demand seasons and thereby reduce curtailments. Some noted how climate-appropriate landscapes create greater resilience. Discussing the Master Conservation Plan it was noted that the MCP contains pro-conservation landscaping but that the expected savings produced by this are low.

Rosemary discussed the update to slide 55. Members discussed the importance of using this slide to define a baseline. Bob Raucher has been tasked with defining the baseline as represented on this slide. See Appendix 1 for more information from Bob about this.

Previous Alternatives

Bob, with help from Terry Tompkins and John Ricker, led a discussion about the alternatives that have previously been considered by Santa Cruz.

Members asked about the possibility of getting back the water rights that were given up when the Zayante Dam project was abandoned. Although there seems to be a possibility of obtaining the rights again, none of the presenters was able to give a certain answer.

Members discussed the Felton Diversion and noted how turbid the water there becomes in heavy rains. It was pointed out that the Diversion was originally intended to pump water to the Loch and to Zayante dam. Although there is more storage space available in Loch Lomond, without the second dam it is questionable whether Santa Cruz would be able to perfect its permit amount of 3,000 acre feet/year. Sending water to storage in Loch Lomond is further complicated because there is only a single pipe to the Loch.

Carie Fox led an exploration of the multi-criteria decision support (MCDS) process using software to show how a comparison of five of the previous alternatives would appear when viewed through the MCDS process. The selected five were:

- Zayante Creek
- North Coast brackish groundwater
- Water reclamation for agricultural exchange for groundwater
- Seawater desalination
- Demand management strategies

The presenters emphasized that this was a demonstration exercise only and that no alternatives would be harmed by this process.

In the ensuing discussion Members wondered how to use MCDS to show differences between the feasibility of each project, felt that it needed to be calibrated to show demand at a level reduced by half, and asked for the sequence of alternatives displayed on various bar charts to be kept in the same sequence to facilitate comparison.

Soquel updates

Heidi Luckenbach described recent activities at the Soquel Water District to update the Members.

Strategies and Ideas Convention

Doug reported to the Committee the progress of the Subcommittee. He described the issues about which the Subcommittee needed the Committee's direction. The Committee reached consensus on the following directives to the Subcommittee:

- The Committee will host an event at which the proponents of alternatives will display posters of their proposals arrayed around a room so that Committee Members and participating members of the public can easily see them and ask each proponent questions about them.
- This poster session will be immediately preceded by a plenary session lasting about one hour in which proponents will each have one minute to make a very brief presentation – like an elevator speech – intended to attract the attention of participants and encourage them to visit their poster exhibit.
- The event will take place at the Civic Auditorium on Thursday, September 25. The poster exhibit will last into the early evening to permit participation by proponents and members of the public who are only able to participate after the end of the normal workday.
- The response to the proponents will:
 - encourage collaboration among proponents with similar proposals
 - ask them to describe how their proposal meets more comprehensive criteria. The Subcommittee should develop these

Water Supply Advisory Committee

criteria based on the “Simplified Criteria for the Exercise with Rosemary’s Rather Sophisticated Ratings Scales” that were used by the Committee in the exercise during the consideration of Previous Alternatives

- include a check-list to facilitate the preparation of complete responses by proponents
- explain that the Water Department has offered to provide support to proponents for the production of large-format printed materials
- The proponents will be instructed to respond no later than Friday, September 12 so that the Subcommittee will have an opportunity to review the proposals, identify any that are non-responsive and do what they can to assist the proponents to make complete proposals. Proponents who have not yet contacted WSAC will be allowed to submit proposals up until the September 12 deadline even without submittal of an initial “overview”.
- The Subcommittee will draft the response to the proponents and will send it to all Committee members for any comments. The Subcommittee will resolve any comments received from members of the Committee and will send the response to proponents on Monday, August 11.
- The Subcommittee will oversee the development of an application that permits easy evaluation of each proposal using the specified criteria.
- The Subcommittee will oversee the development of a public feedback mechanism to provide the Committee and the City with information about the reaction of community members to the alternatives as a whole.
- The Subcommittee need not attend to any outreach effort. The Recon Outreach Subcommittee will do that.

Postscript:

Following a request for Committee Members’ comments on an early draft of this section of the Summary some members submitted the following comments and suggestions that were not mentioned during the Committee meeting:

- *The Green House Gas (GHG) criterion needs to have a rating scale that accounts for the fact that some projects may consume lots of energy (and thus deserve to be given a poorer GHG rating) but be designed to produce their energy supply from carbon-neutral sources (and thus deserve a favorable GHG rating).*
- *Proponents should be asked to use a relatively coarse set of criteria so that they are not encouraged to prepare a proposal that is more detailed and fleshed-out than is needed for this exercise.*
- *Perhaps two of the criteria are so similar that they should be merged. One member felt that “Aligns supply and demand” is so similar to “Reliable” that they should either be combined or described in ways that make them clearly distinguishable. Another member suggested changing “Reliable” to “Resilient” in order to better distinguish between them.*
- *Another Member recommended that the Committee make a first pass of the proposals at an early stage to eliminate those that are evidently inapplicable, already addressed elsewhere (i.e. in the Conservation Master Plan) or dependent on unproven technology*

Research for Scenarios

Bob described how two key uncertainties – fish-flow requirements and climate change – might interact with plausible future scenarios. Members formed small groups to reflect on the information about these key uncertainties and to imagine how a future Santa Cruz would look if the City takes no action to adapt. Then, as a second step, the Members imagined the future Santa Cruz that they hope for and discussed how this would affect the imagined future without adaptation.

Each of the four groups reported to the Committee as follows:

- If climate change follows general trends the City will have a higher proportion of drought years, curtailment will become a way of life, business will be affected and there will be heavy economic impacts. If the City adapts and organizes a reliable water supply this will reduce the stress on the community that results from continuing imbalance, will be good for fish

and for business. It will create jobs so fewer people go over the hill to work. Applying this vision to the scenarios neutralizes most of the negatives in the scenario.

- If climate change follows general trends and fish flow requirements demand lots of water the big difference in a no-adaptation scenario will be the inability to obtain water for storage. There will be tight water controls to support fisheries, intense rationing during periods of shortage and economic stress on local businesses. The group had reached clear agreement on a vision of high-density housing, permeable roads and driveways, fewer lawns, artificial turf, and elaborate green building codes that would increase conservation and provide more water for storage. In particular we need to enable fish to thrive. Water shortage puts stress on fish and also on us.
- If climate change follows general trends and is accompanied by extreme events the Boardwalk will become a dystopian Coney Island with gang fights, a silted-in river, severe erosion in the upper watershed, trees dying, Loch Lomond silted up; neighbors fighting each other; businesses failing; tourists disappearing. Attention to proper adaptation would be to increase storage capacity and better infiltration of rainwater into aquifers. This provides a better environment for everything: less run-off and silting so more clearer water in the river. Pathways run along both river banks engage the community in the health of the river; better shade trees; green building codes; collaborative businesses; surf at the river mouth and better availability and management of water resources. Features such as rain gardens in the upper watershed improve water storage. Businesses adopt a sustainability ethic. Local employment grows so commuting over the hill becomes unnecessary.
- If climate change follows general trends and is accompanied by extreme events curtailment will become frequent and more dramatic, there will be strong incentives for conservation, coastal wells will be lost to salt water intrusion, community resentment about living through droughts year after year will grow. Water rates will continue to increase and service will diminish. We will see Santa Cruz lose its quality of a lush garden community: there will be no redwoods, tomatoes or corn growing in our yards. Existing businesses will suffer and the City will be less attractive to

new businesses. If accompanied by a more significant allocation of water to support fish, the results would be more dramatic. Businesses will close, outdoor water parks will disappear, public open spaces will dry up, there will be severe impacts on wildlife, significantly increased impacts on plumbing and significant community and political unrest. A reliable supply of water gives us back our utopian community with our gardens thriving – not just surviving. Reliable supply means not living in fear each season, and a reliable habitat for fish and other wildlife.

In further discussion Members emphasized the importance of establishing reliable baseline data, repeated the importance of protecting fish habitat and noted that much of the shortfall this year is being provided on the backs of the fish. Rick Longinotti explained to the Committee his understanding that the scenario that envisioned Tier 3 flows for fish habitat was unrealistic, given that state and federal fisheries agencies are not considering Tier 3 flows, but rather advocating for a flow scenario, DFG-5. Rick added that fisheries agencies argue that the City can accommodate DFG-5 without a new water supply.

Facilitators' note: the concerns raised by Rick were questioned by others and have been referred to a Fact-finding process that the co-facilitators are currently conducting. Any results from this process will be provided to the Committee as soon as possible.

Copies of the notes provided by the small groups that performed the Scenarios exercise are collected at Appendix 2.

Wrap up, plan for second session and evaluation of this session

The remaining items on the agenda for this session were postponed to the second session.

Second Session, Friday August 1

Public comment

A member of the public gave the Committee a satirical adaptation of “American Gothic” with the caption “What! Meter our wells?”

Correspondence received from the Community

Mike Rotkin reported on correspondence received from the community. All of this has been forwarded to Committee members and will in future be posted to the Committee’s website.

Reflections on yesterday’s session

Carie drew attention to the discussion on Thursday evening of slide 55 and described the facilitator’s task to enable Committee members to report and receive information and feel assured that it is accepted and acceptable. This task also includes ensuring that implicit questions and doubts about information presented as facts are made explicit and answered appropriately. She requested the agreement of the Committee to the use of a fact-finding process to resolve any questions that remain about slide 55. The Committee agreed by consensus.

Members asked if it would be possible for consultants to give Members a periodic product review as they prepare their materials for the Committee. They agreed by consensus that, as an experiment, Bob should provide early drafts of his material so that they can review it and submit questions. It was pointed out that there will only be twelve working days between the end of this meeting and the date for delivering the August meeting’s packet to Members, so it may be difficult to assess the utility of this process in August.

Members agreed by consensus that the entire meeting packet will be delivered before the weekend preceding each Committee meeting.

Research for Scenarios

The Committee resumed its work to provide Stratus Consulting with instructions regarding the development of scenarios.

Water Supply Advisory Committee

Members discussed the importance of providing fish flows to enable fish to thrive. Some wondered if our support for the fish would continue if we knew it would mean shutting down the City. Members noted that fish habitat is not only a question of in-stream flows, but concerns the whole habitat including, for example, the condition of riverside vegetation, the shading of the river, the condition of the stream bed etc. They noted that the Water Department has programs for watershed restoration that include the whole habitat so consideration of this whole habitat can be included within the scope of the Committee's work. They remarked on the close relationship between a healthy habitat for fish and the health of the human habitat. In general, what is healthy for the fish is healthy for the people. They also noted the importance of an outdoor lifestyle to the people of Santa Cruz: a healthy habitat is what the community wants.

Members asked for the scenarios to reflect uncertainties with respect to the economy and the scarcity of resources as well as considering jobs created by water policies. They asked how to make a connection between the economic resources of the region and the situation of the local water resource.

They noticed that the volume of greenhouse gases (GHGs) emitted by vehicles may increase if workers are obliged to commute over the hill to find work.

Members noted the importance of accounting for the costs of conservation: costs are born by the City and costs are born by individual households. The total cost needs to be consolidated and its impact considered not only in total but also in terms of price per gallon as water use falls and costs increase.

The Committee agreed by consensus to ask Bob to develop four or five scenarios based on the exercise conducted in the first session and these discussions. See Bob's description of this in Appendix 1.

Members noted the importance of considering the vulnerability of the water system and asked for an assessment of its vulnerability to climatic, seismic and other natural but hazardous events. Rosemary said that the Water Department will provide a synopsis of what has already been assessed in this regard and then ask Stratus to fill any gaps that it finds. See Bob's description of this at Appendix 1.

Members discussed sea level rise (SLR) and asked how and how soon this might affect the Beltz wells, the Tait Street facility and the sewage treatment plant. The Committee agreed by consensus to ask Bob to survey existing information to see if it reveals any risk to those facilities as a result of SLR. See Bob's description of this at Appendix 1.

Facilitator's note: in Recon, the Committee's task is to list desirable research topics. In November, at the end of Recon, their task is to use analytic tools in combination with their own experience and perspectives to prioritize these research topics.

“Real” Criteria

Members reviewed the Dialog Map depicting the Criteria gleaned from the Co-Facilitators' interviews during the Assessment Phase. They felt that “Resilience” is a “first-order” criterion that deserves its own “light bulb” on the Dialog-Map.

Members discussed the significance of growth to the work of the Committee. They recognized that growth can mean many different things. They asked whether water policy is deliberately used as a growth-regulating tool or if water policy should accommodate the growth that is expected to occur in the General Plan. They recognized that population growth and economic growth are not necessarily the same.

The Committee agreed by consensus that using water scarcity to change the GP growth levels is *not* part of the Ctte's decision space. However, there are several growth issues that are still part of the Ctte's discussion:

- Impacts to growth beyond the GP's planning horizon
- The relationship between GP growth and increased water needs
 - The effect of additional water-neutral policies
 - Analysis of existing policies which might be water-neutral

Members asked whether the General Plan specifies anything about the water supply. Rosemary and Mark Mesiti-Miller agreed to review the GP and documents associated therewith and report back their findings.

Members proposed to add “Adaptive capacity” to the list of criteria.

Independent Review Panel

Rosemary reported that a ratings sheet for the IRP selection will be provided to the IRC Subcommittee next week. Sue Holt volunteered to join the Subcommittee and was enthusiastically added to it.

Recon Outreach Subcommittee

Charlie Keutmann reported that the Subcommittee has decided to work as a reporter of the Committee’s work and a recruiter of interested members of the public, but to avoid getting involved directly in debate. He provided the following information:

- To develop outreach, the subcommittee will work in partnership with the City. The City will provide much of the staff work and the subcommittee members and City will provide oversight.
- Sarah Mansergh continues to manage website details, although the responsibilities of the Website Subcommittee have been assumed by the Recon Outreach Subcommittee.
- The staff will initiate the outreach sections of the Recon Report and the subcommittee will provide comment.
- Charlie is delivering a monthly radio spot to describe the activities of the Committee. The next one is Monday August 18 at 7:15 a.m. KSCO AM 1080.
- Erica is leading the Subcommittees efforts to schoolchildren and homeschoolers
- Tina Shull is developing a proposal for a survey to discover “What is the vision for the City?”

Water Supply Advisory Committee

Facilitator's note: there is confusion about various proposals to conduct different types of activity to discover the opinions and visions of the community. We expect that there will be a concerted effort to resolve this confusion.

- The subcommittee is reaching out to other organizations, especially neighborhood organizations, to develop a useful interface with them. City staff will research this.
- The subcommittee will use a small version of the 100 slide slide-deck for it's outreach work. This smaller slide deck will be developed with the help of a graphics person.
- The subcommittee is discussing with Civinomics ways to conduct a public evaluation of the SIAC/Alts Fair.
- The subcommittee intends to reach out beyond the City limits to include all customers of the Water Department.

Charlie invited Members to send the Subcommittee ideas about information to be sent out in the outreach effort.

Carie asked if the Committee whether it wanted Rosemary and Tina to prepare a paper about a survey related to public perceptions of quality of life visions. Doug volunteered to collaborate with them.

Carie asked whether the Committee would like to appoint spokespersons in the event that, for instance, Keith Sterling is contacted by a reporter who asks to speak to a Committee member. The spokesperson would be bound by the charter rules about representation. The Committee agreed by consensus that the three Subcommittee members (Charlie, Erica and Peter) as well as Mike Rotkin would be those spokespersons.

WSAC Website

Sarah reported that the Committee website is now live and can be visited at www.SantaCruzWaterSupply.com

Agendas for August and September

Nicholas facilitated a discussion about the agenda for August. The agenda for September was not discussed in any detail.

Facilitator's note: Here is the latest draft of the August agenda. This is going to change a lot before we meet again, the sequence will change and we may even have to remove items if we decide that we will have insufficient time.

Session 1

Roll Call

Welcome to the public and public comment

Committee member updates

Soquel updates

Agenda review

SIAC

- *Update from Scctee. Initial consideration of questions to be given to Stratus at September meeting.*

Growth

- *Follow-up July's decisions re growth. Clarification about how water issues are handled in the GP*

Survey

- *Request to Council for authorization to conduct a survey*

Presentation of report to Council

- *Reports from Outreach and SIAC Subcommittees. Decision on recommendations to Council. Consider and agree on content of presentation to Council, and who will do it.*

Supply/demand update

- Rosemary updates re changes to the slide deck. Stratus reports on changes to slide 55. Will include discussion of Fiske's role and the preparation of baseline information by Stratus

Scenarios

- Stratus reports on progress with development of scenarios. Explanation of TBL: how it supports Cttee and how it works w/ MCDS. Exercise to develop scenarios and nexus with criteria.

Criteria

- Take results from Scenario exercise and conduct exercise to add criteria

Online Decision Model

- Demonstrate the online decision model. Determine how it needs to be updated.

Materials resulting from the previous meeting

- Review and approve Action Agenda, Summary, etc.

Wrap up, plan for next session and evaluate session

Adjourn

Session 2

Roll call

Public comment

Correspondence received from the community

Reflections on Wednesday's session

Review online decision model (updated) and consider Rating Scales

- *Review the updates entered into the decision model since Wednesday and consider Ratings Scales. Consider the interactions between uncertainty and Ratings Scales. Consider what technical support needs are indicated by the ratings scales. Instruct Stratus regarding subcontractors.*

Resiliency

- *Bob describes significance of resiliency, how to regard it and how to represent it in the decision model. [Should this be folded into the Scenario/Criteria/Ratings work?]*

Decision Rules for Recon Alts

- *Although Cttee will probably use MCDS to winnow the range of alts that will be carried forward from Recon to Real Deal, this need not be the the only way to reach decisions. Agree on other rules to apply during the decision making process.*

Consultant for Real Deal

- *Agree on whether or not to use Stratus for technical support during Real Deal. Make recommendations to City accordingly.*

Agenda for Sep/Oct

Recon Outreach Scttee update

Oral communication

Evaluation and wrap up

Adjourn

Subconsultants in November

Rosemary led a discussion about the technical resources that the Committee and Bob need immediately. Heidi provided a list of likely candidates to fill various roles. The Committee Members felt that they needed more opportunity to

consider this list and instead focused on who Bob really needed now. The Committee agreed by consensus to recommend that Stratus should, as soon as possible, retain David Mitchell of M.Cubed. The Committee also agreed by consensus to authorize the IRP Subcommittee to approve the subcontracting of additional consultants in cases where delays in starting the work of such a consultant would have serious consequences.

Materials resulting from previous meetings

Nicholas facilitated a review of the Summary and the Action Agenda of the June meeting. The Committee approved both by consensus.

Written evaluation and wrap up

Carie encouraged Committee Members and members of the public to go to the Committee's SurveyMonkey site at <https://www.surveymonkey.com/s/SZQ6BSB> to give feedback about the meeting.

Members made the following comments about the meeting:

- We revisited tools that we can use in the future
- We're slowly getting going: it's like climbing – we're on track and we're starting to see when the substantive discussion will start and how the process will play out.
- I'm loving the progress we're making as our mutual understanding grows. The scenarios exercise broadened our scope and showed our shared values.
- We appreciate having Bob and Karen on the team
- We're starting to take ownership of the process

Adjourn

APPENDIX 1

Dear Water Supply Advisory Committee (WSAC) members:

It was great to have the opportunity to meet you and to begin the process of working together. It is quite evident (and exciting) that the Committee consists of smart, hard-working individuals committed to working collaboratively to address a series of very tough questions facing your community. We look forward to providing objective and timely technical support for the important work you are tackling.

This short note is intended to concisely capture the key work items and administrative issues that were discussed with WSAC during the course of the July 31/Aug 1 meeting. Our intention is to make sure we have identified all of the important items and are clear on our next steps. It is not intended to provide complete details. Please let us know if we have missed or incorrectly characterized any of the information below. Thanks.

I. Work Topics/Items requested by WSAC:

Several items were requested by WSAC – some of which we are clearly tasked to do, and some were deferred to the Water Department or to a later time. Here is an overview of our understanding:

1. Define the Baseline

This was raised in concert with Rick's request to "update slide 55" from Rosemary's Supply and Demand PowerPoint deck, and expanded upon during the scenario discussion. Rosemary will be updating the slide, and this provides an appropriate starting point for defining the baseline.

The baseline establishes *what the Santa Cruz water situation is likely to look like in the future, if no additional actions are taken (beyond current policies and actions to which the Dept is already committed)*. Our experience is that "defining the baseline" can be both the most challenging and most important component of a sound and informative technical analysis. We commend you for recognizing the importance of establishing a baseline that can be broadly accepted. This will greatly increase your ability to communicate your choice and evaluation of Alts.

We recommend the following elements be considered as we work together to define the baseline:

Time frame: As we look out into the future to characterize the baseline, we need to select a timeframe (e.g., a year such as 2030? 2040? Other?) that will serve as our benchmark for defining scenarios and comparing alternatives. That is, we want to pick some logical point(s) in time to use for the analysis (rather than a vague notion of "the future").

Climate change: Climate change is happening, therefore we recommend including a plausible but conservative (least impactful) estimate of the impact on water issues as part of developing a long-term baseline. (Later, a separate climate change scenario can be used as a vision of what happens if the community faces a more adversely impactful suite of climate change impacts; i.e., drawing from the more severe end of the climate change uncertainty spectrum). This will help ensure the baseline used to compare scenarios includes at least a minimal consideration of climate impacts – while allowing each additional scenario to support your understanding of what happens for a given future uncertainty.

APPENDIX 1

Economic Implications: In addition, we suggest providing insights into the implications of the baseline water supply on the economic loss/impacts associated with projected long-term curtailments. This would entail a fairly significant, longer-term work effort – but one we believe is worth starting to frame up in the near term.

Fishery Flows: The baseline needs to accommodate an assumption of fish flow requirements and associated HCP implications. This is an aspect that will require some consideration and deliberation (e.g., do we insert DFG 5 as part of the baseline?).

In sum, we believe developing a baseline that includes a range of plausible social (e.g. community and regional economic implications), financial (e.g. Water Department implementation and operational costs), and environmental (e.g. carbon footprint, impact on fisheries) implications will serve the WSAC well as they engage in developing alternative scenarios and identifying and evaluating alternatives.

Action Items for Baseline:

Timeframe - We will work with the Water Department to identify timeframes that make sense with their and the City's planning processes. We will make specific suggestions for WSAC review once this information has been gathered.

Climate Change: We will investigate how to characterize a low-end suite of climate change impacts that we will suggest be included in the baseline, and may have some input for your review as part of the next package.

Updates on both of the above items, and other aspects, will be shared no later than the Friday before the next WSAC meeting.

2. Develop Draft Scenarios

In addition to the baseline, we will develop 4 (possibly 5?) alternative future scenarios. We will use the scenarios outlined during the Friday (Aug 1) WSAC session; which were based on the Thursday discussion.

We propose establishing a simple framework that can be used to describe each draft scenario, including:

- a vision statement,
- a metric that can be used to objectively measure if the vision has been achieved (or at least identify how close an alternative may come to meeting the vision),
- a list of questions that need to be addressed. The question section will include an overview of the "what factors need to be considered?" to help ensure we collectively look at the issues most pressing to the Committee. We may define these as "elements" (e.g., carbon footprints) and these in turn may lead into and reinforce what is embedded in the "criteria" that may ultimately be used in the Multi-Criteria Decision Support process.

APPENDIX 1

- suggestions for analysis that can be conducted to increase your understanding of the water supply and demand associated with each vision.

Scenario Development Action Items:

We will provide the WSAC with draft scenarios using the framework described above, no later than the Friday before the next WSAC meeting.

3. Sea Level Rise (SLR) and Coastal Wells/Infrastructure.

WSAC asked for a quick and superficial look by Stratus at whether there is existing information that reveals a risk to the Beltz wells and Tait facilities, from SLR and storm surge, seawater intrusion, etc. The idea is to quickly glean if there is available information about a probable timeframe with which to gauge whether there is a vulnerability in the mid- to long-term. We will conduct a cursory review of available information (including input as may be available from the Water Dept.), and report back on what we discern. There could be future, more in-depth investigation if this turns out to be a potential risk – and such potential future work probably require adding hydrologic expertise.

SLR Action Item:

A brief update of this item will be provided to WSAC no later than the Friday before the next meeting.

4. Resiliency, Reliability, and Redundancy of the Water System. No work assigned here for Stratus. The Water Dept will provide a synopsis of what has already been assessed in terms of the vulnerability and resiliency of the system to climatic, seismic, and other natural hazards/events.

II. Administrative/Process/Contractual Issues

- Approved Subcontractors. WSAC approved adding David Mitchell (M.Cubed) to the contract. Gary Fiske is already approved.
- Process for adding other subs. We anticipate needing to add other subs over time, as technical needs become better defined. Engineers, hydro-geologists, fisheries are among the foreseen needs in the near future. We need to work within and manage the WSAC approval process by providing (1) a clear justification of need for any tech expertise sought, and (2) a rationale for our recommended subcontractor (or short list).
- Timeline for providing materials to WSAC. Time is of the essence for the WSAC process, and we will strive to provide the Committee with written work products no later than the Friday preceding the next WSAC meetings. This will enable Committee members time to review the materials and raise questions prior to the Committee meetings.
- Process for Interacting with the Committee. We need to be mindful of the Brown Act and other concerns in terms of how we interact and communicate with the Committee, outside of official meetings. We will rely on Carie and Nicholas, as well as Rosemary and Heidi, to help facilitate open

APPENDIX 1

communication while also adhering to the applicable rules and the need to manage the work load and information flow.

I think that covers it. Please let us know what we may have missed or mis-interpreted.

Thanks,

Bob and Karen

Question #1

- ③ - More frequent curtailment & more dramatic
- Greater reliance/incentives for conservation
 - Loss of coastal wells due to sea level rise
 - Community resentment re. increased rates/less service
 - Inability to realize "garden community"
 - Adverse impacts to existing business
 - Less attractive to new business

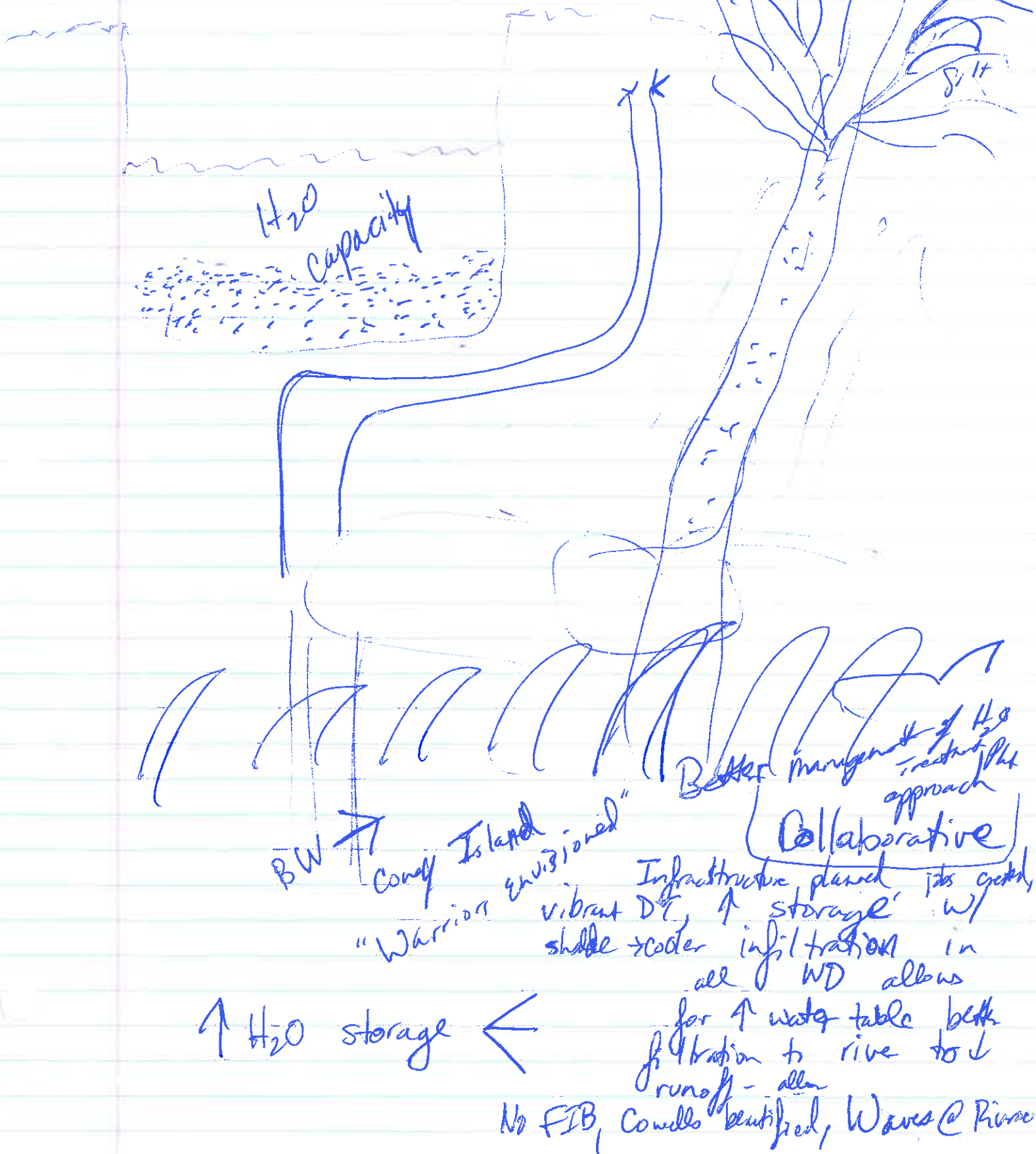
2nd Reflection - involved conservation/limited curtailment

- ability to garden/enjoy outdoor spaces
- vibrant, attractive economic/business environment
- reliable water supply & natural habitat

- ④ - Lost Businesses - increased unemployment - ^{severe economic impact}
- Reduced property values - residential/commercial
 - Loss of outdoor enjoyment
 - Prohibition of outdoor water use
 - Brown parks & public
 - Severe wildlife impacts fish - birds -
 - Domestic & municipal plumbing impacts
 - Community/political unrest

Do current containment ~~is~~
achieve our goal?

Cell 3



DO NOTHING

VISION

1.

rationing
tight controls on flows
business stress

more storage
treated water gets
~~more~~ recycled water
few personal lawns
more native landscape
artificial turf for
golf courses

2.

minimum flow ^{enough} needed to meet
rationing
business stress

permeable surfaces
ultimate ~~for~~ green bldg codes
~~water retention~~
growth controls that
increase density
→ universal capture
of graywater & rainwater
→ paved roads

Peace United Church of Christ
Fellowship Hall
900 High St.
Santa Cruz, California 95060



WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA

Regular Meeting

July 31 - August 1, 2014

ACTION Agenda prepared August 8, 2014 with action taken in bold type.

5:00 P.M. REGULAR MEETING - SESSION ONE (JULY 31): FELLOWSHIP HALL

2:00 P.M. REGULAR MEETING - SESSION TWO (AUGUST 1): FELLOWSHIP HALL

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.

General Business: Any document related to an agenda item for the General Business of this meeting distributed to the WSAC 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 WSAC meeting with the display copy at the rear of the Council Chambers.

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, the basis upon which the action is considered to be in error, and addressed to the City Council in care of the City Clerk Administrator.

Other - Appeals must be received by the City Clerk Administrator 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.

City Councilmember Attendance: Four or more members of the City Council may be in attendance at this meeting.

July 31, 2014 - 5:00 PM

SESSION ONE

Intern Applicant Assignment Display

Prior to calling the session of July 31, 2014 to order, Committee Members and the public were invited to view assignments completed by the Infographics Design Intern applicants.

Call to Order - Co-Facilitator Nicholas Dewar called the meeting to order at 5:04 p.m.

Roll Call - Committee Members Present: Menard, Beckmann, Engfer, Baskin, Holt, Jacobson, Keutmann, Longinotti, Mansergh, Mesiti-Miller, Rotkin, Slatter and Stenojavic. Absent: Stearns and Pepping.

Welcome to the Public and Public Comment

Co-Facilitators Fox and Dewar welcomed the public. No members of the public commented on matters relating to items on the agenda.

Committee Member Updates

Three Committee Members discussed matters related to the agenda, conservation and community impressions.

Agenda Review

Co-Facilitator Dewar led the Committee Members in a review of the agenda for the WSAC's fourth meeting. This review included a quick discussion of the Committee's Gantt Chart.

Presentations

1. Supply and Demand Update

Water Director Rosemary Menard led Committee Members in an update about the current status of the Supply and Demand information presented during the June meeting.

2. Previous Alternatives

WSAC Consultant Bob Raucher led the Committee Members in a discussion on alternatives previously addressed by the City and its community members.

Exercise

Co-Facilitator Carie Fox led the Committee Members in an exercise using the MCDS discussed last meeting.

Soquel Updates

The Water Department Deputy Director/Engineering Manager Heidi Luckenbach updated the Committee Members on significant events and news within the Soquel Creek Water District.

Public Comment

Three members of the public spoke on matters relating to the MCDS.

Strategies and Ideas Convention

Water Director Rosemary Menard and Strategies and Alternatives Convention Subcommittee member Sarah Mansergh led Committee Members in an overview of the status of the Strategies, Ideas and Alternatives Convention (SIAC). **By consensus, the Committee agreed that the convention event will be held on Thursday September 25 in the Civic Auditorium and will be scheduled to ensure that people will be able to attend after the end of the normal working day. It further agreed that the event will combine plenary sessions lasting about one hour and will dedicate the rest of the time to a poster exhibition. The Committee directed the SIAC Subcommittee to send a response to all proponents no later than August 11 describing the criteria that the proponents' proposals should aim to meet and requiring the proponents' responses no later than September 12. It agreed that proponents who had not yet contacted the Committee will be allowed to submit proposals up until the same deadline without submitting an initial "overview."** It further agreed that the Subcommittee should prepare an application that will allow easy evaluation of the proposals and also consider the use of a survey to gauge the perspectives of members of the public. The Committee directed the Subcommittee to encourage collaboration among proponents with similar proposals, include a check-list to facilitate the preparation of complete responses and explain that the Water Department has offered to provide assistance to those who cannot print the necessary materials. It also agreed that outreach for the event will be considered by the Recon Outreach Subcommittee.

Presentation - Scenarios

WSAC Consultant Bob Raucher led the Committee Members in a discussion on the data that is needed to model climate change and other variables.

Exercise

WSAC Consultant Bob Raucher and Co-Facilitator Carie Fox led the Committee Members in a scenarios exercise. Each group presented their experiences after the exercise. **By consensus, the Committee agreed to direct WSAC Consultant Bob Raucher revise and clarify the data on slide 55 of the Supply/Demand slide pack in order to provide a sound baseline establishing what the Santa Cruz water situation is likely to look like in the future if no additional actions are taken. It further agreed to direct Bob Raucher to review existing information to assess any need for further study of risks to Beltz wells and the Tait Street facilities resulting from foreseen sea-level rise.**

Written Review and Wrap Up

Co-Facilitator Nicholas Dewar requested that participants complete written reviews of the meeting.

Adjournment - At 9:39 p.m. the Water Supply Advisory Committee adjourned from its first session on July 31, 2014 of the fourth regular meeting to its second session on August 1, 2014 at 2:00 p.m. in the Fellowship Hall, at the Peace United Church of Christ.

Water Supply Advisory Committee

August 1, 2014 - 2:00 PM

SESSION TWO

Call to Order - Co-facilitator Nicholas Dewar called the meeting to order at 2:22 p.m.

Roll Call - Committee Members Present: Menard, Engfer, Baskin, Holt, Keutmann, Longinotti, Mansergh, Mesiti-Miller, Rotkin, Slatter and Stanojevic. Committee Members Absent: Beckmann, Pepping and Stearns. Committee Members tardy: Dana Jacobson.

Public Comment

One member of the public spoke on matters relating to a humorous water-related graphic.

Correspondence received from the community

Corresponding Secretary Mike Rotkin reported on correspondence received from the community and reported that all correspondence will be posted at the Committee's website.

Review of Previous Session

Co-Facilitator Carie Fox led the Committee Members in a review of the

previous session and a discussion on the current session. The Committee agreed by consensus that the entire meeting packet will be delivered before the weekend preceding each meeting. The Committee agreed by consensus that, on an experimental basis, Raucher will provide early drafts of documents to the Committee so that Committee members may send questions to him, or telephone him with questions about his drafts. It also agreed that the co-facilitators may use the discussions about slide 55 as a topic for a fact-finding process.

Scenarios

WSAC Consultant Bob Raucher and Co-Facilitator Carie Fox led the Committee Members in a discussion of the first draft of scenarios. The Committee agreed by consensus to ask the consultant to develop four or five scenarios based on the Committee's discussions. It further agreed by consensus to ask Raucher to survey existing information to see if it reveals any risk to the Beltz Wells and the Tait Street facility as a result of sea level rise.

Presentation - "Real Criteria"

Co-Facilitator Carie Fox led the Committee Members in a discussion about the draft criteria for the decision model. By consensus, the Committee agreed that it will accept that Santa Cruz needs sufficient water to satisfy the needs of growth called for in the General Plan and in the years beyond the General Plan.

Independent Review Panel Progress

Water Director Rosemary Menard led the Committee Members in an update on the IRP. Sue Holt was added to the IRP Subcommittee.

Presentations

1. Outreach Subcommittee Update

Outreach Subcommittee Member Charlie Keutmann led the Committee Members in a discussion on the Outreach Subcommittee's progress regarding its interactions within the WSAC and community, the infographics intern position, and outreach.

2. WSAC Website

Website Subcommittee member Sarah Mansergh led the Committee

Members in an overview of the WSAC's website.

Agendas for August and September

Co-Facilitator Nicholas Dewar led the Committee Members in a discussion of the agenda outlines for August and September

Ratings Scales

WSAC Consultants Bob and Karen Raucher led the Committee Members in a discussion of ratings scales to be developed for each subcriterion. **The Committee discussed its immediate technical support needs and by consensus agreed that Stratus should as soon as possible retain David Mitchell of M.Cubed. The Committee further agreed by consensus to authorize the IRP Subcommittee to approve the subcontracting of additional consultants by Stratus in cases where delays in starting the work of such a consultant would have serious consequences**

Materials Resulting from Previous Meeting

1. Approval of Meeting 3 Action Agenda

Co-Facilitator Nicholas Dewar led the review and approval of the Action Agenda for the WSAC's third meeting. **By consensus, the Committee approved the Action Agenda for the WSAC meeting June 26-27, 2014.**

2. Approval of Meeting 3 Summary

Co-Facilitator Nicholas Dewar led the review and approval of the Summary for the WSAC's third meeting. **By consensus, the Committee approved the Summary for the WSAC meeting June 26-27, 2014.**

Written Review and Wrap Up

Co-Facilitator Carie Fox guided the Committee Members in identifying any incomplete issues that need to be carried to the next session as well as what was completed during this meeting.

Adjournment - At 5:30 p.m., the Water Supply Advisory Committee adjourned from the regular meeting of July 31 - August 1, 2014 to its next meeting on August 27 and 29, 2014 in the Fellowship Hall, at the Peace United Church of Christ.

DRAFT

CITY COUNCIL
AGENDA REPORT

DATE: August 27, 2014

AGENDA OF: September 9, 2014

DEPARTMENT: Water Supply Advisory Committee (CN)

SUBJECT: Water Supply Advisory Committee Second Status Report and Community Survey Proposal

RECOMMENDATION: Motion to accept the progress report from the Water Supply Advisory Committee on its work to date and outreach and community engagement plans, authorize the proposed plan for conducting a community attitudinal survey, and provide feedback to the WSAC and staff, as appropriate.

BACKGROUND: In February 2014 the Santa Cruz City Council appointed representatives to a new advisory body whose role is to provide the City Council with recommendations on issues related to improving the reliability of the current water supply serving the Santa Cruz water service area. This new advisory committee, the Water Supply Advisory Committee (WSAC or Committee) has specifically been asked to “explore, through an iterative, fact-based process, the City’s water profile, including supply, demand and future threats; analyze potential solutions to deliver a safe, adequate, reliable and environmentally sustainable water supply, and develop strategy recommendations for City Council consideration.”

In establishing the WSAC, the Council asked to receive periodic reports from the Committee. The purposes of these reports are to give the Council updates, to ask for Council action on key steps on the process, for example, the WSAC Charter or the problem statement, and to provide opportunities for the Council to give the WSAC its feedback about issues or topics such as the work plan.

As the Council may recall, the Committee divided its work into two distinct phases: the initial reconnaissance or “recon” and the “real deal.” The recon phase allows for a broad survey of the challenges, issues and options around Santa Cruz’s water supply and development of methodology to winnow the options and issues to a manageable subset for in-depth exploration in the real deal phase. The recon phase will conclude in approximately December and the Committee will shift to the real deal for the balance of its time (until May 2015). Recommendations for the City Council will be formulated toward the conclusion of the real deal phase.

The Committee has convened four times with its fifth meeting slated for August 27 (5 p.m.) and August 29 (2 p.m.) at the Peace United Church of Christ Fellowship Hall. All agendas and meeting materials can be found on the Committee’s website: www.santacruzwatersupply.com.

DRAFT

DISCUSSION: This agenda item provides the City Council with the second of several planned WSAC status reports and reports on major milestones. Included in this agenda item is a request for Council action on conducting a community attitudinal survey to support the WSAC's evaluation of alternative approaches to improving the reliability of Santa Cruz's water supply.

The following sections provide synopses of the distinct issues examined by the Committee since the last progress report to the City Council:

Evaluation Criteria

Since the WSAC's June report to the City Council, the Committee received a comprehensive report on Santa Cruz's water supply and demand profile and an overview of the many water supply studies, project development and evaluation work conducted by the City since the early 1980s. It also began to develop and apply a multi-criteria decision tool to aid in the weighting and evaluation of water supply alternatives for use in the recon and possibly real deal phases of the work.

A key facet of the evaluation process for water supply options and alternatives is the selection of the criteria that will fuel the evaluation process. Before it could start rating and comparing possible alternatives, the Committee needed to decide *what* to include as the evaluation rubric.

Attachment A is a concept paper on potential criteria for evaluating alternatives during the reconnaissance phase of the Committee's work. These criteria were derived from the assessment process conducted by facilitators Nicholas Dewar and Carie Fox at the beginning of the WSAC process. The expectation is that these criteria will evolve and develop as the Committee begins to use them, including adding new criteria, combining criteria and eliminating criteria. In addition to work on criteria, the Committee began work on the rating scales that will be used to evaluate options for improving the reliability of Santa Cruz's water supply.

Scenario Development Exercise

Section to be drafted . . .

Community Outreach and Engagement Efforts

The WSAC and City staff have taken very seriously the Council's direction and desire to work throughout the process to engage the broader community. Since the Committee's June report to the Council, through the collaborative efforts of WSAC members and City staff, a lot of really creative work is underway. Examples are highlighted below.

1. Santa Cruz Water Supply Convention – Our Water, Our Future

Following the work of a WSAC subcommittee made up of Doug Engfer, Sarah Mansergh, and Sid Slatter, in early July the public was invited to submit brief write-ups of strategies, ideas and alternatives for improving the reliability of Santa Cruz's water supply. By July 28th, more than 80 submissions had been received.

Submissions covered a wide range of topics ranging from:

DRAFT

- enhancing conservation efforts
- landscaping improvements
- expanding rainwater catchments and grey water systems
- incentivizing conservation through pricing structures
- revisiting old strategies such as exchanging highly treated wastewater for irrigation water used for north coast agriculture
- developing recycled water facilities and systems
- more groundwater development
- aquifer storage and recovery
- on-stream and off-stream storage projects
- desalination using a variety of existing and new approaches and technologies for both the desalination process and the energy issues related to desalination.

In August those submitting ideas in the first round were invited to sharpen their pencils and further develop their proposals for submission to the WSAC and for public review in a Santa Cruz Water Supply Convention to be held from 11 a.m. to 9 p.m. on (date to be determined) at the (location to be determined). The Santa Cruz Water Supply Convention will include very brief presentations by the submitters at noon and at 5:30 p.m. and poster presentations of strategies, ideas, and alternatives so that those visiting the event can view the ideas and interact with the submitters. The public is highly encouraged to attend and the event will be correspondingly publicized by the City.

WSAC members will attend the Convention and rate and rank the proposals using four criteria: effectiveness, environmental impact, community impact, and practicability. At the WSAC's meeting on Friday, September 27th, the Committee will discuss its reviews and ask their consultant team to develop follow up information and analysis for those strategies, ideas and alternatives considered most relevant to include in the last stages of the reconnaissance phase of the Committee's work and carry into the real deal.

2. www.santacruzwatersupply.com Website

As of mid-July, the Water Supply Advisory Committee's new website is up and running. Committee members Sarah Mansergh and David Sterns worked with City staff Malissa Kaping, Keith Sterling, and Eileen Cross to create and launch a website dedicated to the Committee and its exploration process. This website serves as a key information portal for Committee members and the public alike. Meeting agendas and materials are posted, an extensive document library is being developed, and local, state, national and international news and analysis articles that are being directed to the Committee's attention by a wide range of interests will be posted. Interested members of the public can find out about the backgrounds and interests of WSAC members and work the Committee and sign up to receive regular updates, meeting highlights, invitations to events and more. The site will continue to evolve into an extremely rich data resource for the entire community.

3. Community Outreach Subcommittee

The Committee established a subcommittee to work on community outreach during the reconnaissance phase of the project. Its members are Erica Stanojevic, Peter Beckmann, and

DRAFT

Charlie Keutmann who are supported by City staff. This subcommittee has begun working and is developing and pursuing the following activities:

- Now that the website is up and running, there is an opportunity to provide regular email updates to interested members of the public. The subcommittee is working on creating an email distribution list for this purpose and will be integrating email lists developed by the Water Department for other purposes as well as providing opportunities for citizens to sign up for email updates on the website.
Monthly highlights of the WSAC meetings are being developed and will be regularly distributed to those on the email notification list.
- The outreach subcommittee is considering a speaker's bureau consisting of Committee members and staff with the core goals to educate and engage. The speaker's bureau will offer presentations to community organizations such as service clubs, neighborhood and other interested groups (environment, business, technology, industry) . The first presentation would focus on helping the community understand the nature of the issues with which the WSAC is dealing. Later in the process, additional presentations would be developed and offered to give interested groups an update on progress and invite their participation and input.
- KSCO has offered Charlie Keutmann a 10 minute radio segment on the third Monday of every month to talk about the WSAC and its work. Charlie's first program in July focused on the request for the public to provide strategies, ideas and alternatives for improving the reliability of Santa Cruz's water supply. His August program will include WSAC member Sue Holt. Sue represents outside city customers on the WSAC and will use this opportunity to reach out to that constituency.
- WSAC member Erica Stanojevic is researching opportunities to engage school children (and their parents) and is working on ideas such as a video contest that would focus on water conservation ideas kids have and are using. She is also thinking about opportunities later in the process to engage home schooled children.

Independent Review Panel

In June, the Council authorized the Committee to obtain the services of an Independent Review Panel to critically review the work products of Committee's technical consultant team. Attachment B is a copy of the request for qualifications issued for the Independent Review Panel. A subcommittee consisting of David Baskin, Rick Longinotti, Sarah Mansergh and Sue Holt are reviewing the statements of qualifications from the prospective panelists for recommendation for appointment in September.

Community Attitudinal Survey

Section to be drafted . . .

Summary

As this second status report indicates, the Committee has been productively and industriously working on several fronts to complete the mission set forth by the City Council in a timely manner.

DRAFT

To date, this work has been largely framework setting and high-level exploratory to prime for the intense, substantive work to come.

The Committee is pleased to submit this report and welcomes comments and feedback from the Council.

FISCAL IMPACT: Should the City Council authorize the City and Committee to conduct a community attitudinal survey, there will be a cost to the Water Fund ranging from \$15,000 to \$23,000. There is adequate balance in the XXXX fund to cover the expenditure.

Submitted by:

Mike Rotkin
Member, Water Supply Advisory Committee

DRAFT

Attachment A

DATE: July 28, 2014

TO: Water Supply Advisory Committee

FROM: Nicholas Dewar and Carie Fox

SUBJECT: Concept Paper on Potential Criteria for Evaluating Alternatives during Recon

The purpose of this concept paper is to give the Committee the beginnings of a potential list of criteria for use in evaluating water supply or demand management alternatives or other strategies during the Recon phase of its work. The criteria included on this list (and in the graphic on the first page) were gleaned from the assessment process that involved interviews of WSAC members and others by the process facilitators Nicholas Dewar and Carie Fox. Nicholas and Carie started with over 100 nodes and reduced them to the 31 you see in the attached graphic. As you hammer away on these, the number likely will (and definitely should) go down dramatically again.

There is one thing missing from this graphic and in the narrative below: the option of using water scarcity as a lever to reduce growth. This is a tricky thing to use in a shared decision model because you don't have shared values about that objective. And it is also a deeply controversial issue because it is not certain that growth is part of your Committee's decision space. Luckily, Recon is a highly iterative process, so it made sense to flag this issue for you and ask your guidance about whether, where and how you want to represent this issue.

Again, luckily, the decision about growth doesn't need to be made this month. It is important to get a good start on the criteria now, however. Why? Because ratings scales drive the research, and in turn ratings scales hang on the criteria. If you as a Committee want influence over the research, getting the criteria going is a very good strategy.

To assist the Committee in getting its head around the criteria, Rosemary Menard created a preliminary definition for each and included a brief discussion of relevant sub-criteria. The same rules apply as for all the other Concept Papers. Dig in and make changes!

Promotes Good Governance – Actions or ideas that achieve or support achievement of this criterion are transparent, fiscally responsible, aligned with community values and priorities, and provide long---term community benefits. Examples of sub---criteria would include:

- Complies with relevant federal, state, and local law and policy
- Garners and maintains public support

DRAFT

- Obtains and sustains political support
- Supports decision-making approaches that attempt to optimize the value added from the action taken for the investments (time, money, community energy) being made

Mitigates Direct Impacts – Almost any action or plan can have impacts. Impacts can be general or localized. An example of a direct sub-criterion would be:

- Minimizes and equitably distributes rate impacts, and maintains affordability of water service
- Makes investments in a manner that protects and supports the viability and vitality of the local economy as well as the financial health and well-being of the City

An example of a localized sub-criterion would be:

- Reduces noise and odors from the project during both construction and ongoing operations

Promotes Environmental Well Being – Our long history of federal and state environmental laws such as NEPA and CEQA make this criterion a familiar one. These laws require that a wide range of potential environmental impacts be analyzed and evaluated prior to the authorization of any project. Impacts associated with a project that can't be avoided are mitigated. A common example is wetland impacts that are mitigated through constructing or improving wetlands elsewhere. Examples of sub-criteria for this criterion would include:

- Minimizes effects of greenhouse gas emissions related to water supply
- Provides instream flows to support aquatic ecosystems

Provides Comfort and Social--Well--Being – This criterion encompasses a range of social and community value issues that are important in establishing and maintaining a strong and socially viable community. Included in this criteria are basic human needs and values, as shown, for example, in lower three levels of Maslow's hierarchy of need:



Sub-criteria for this criterion include:

- Provides for and sustains individual and community health, safety and physical and psychological comfort
- Establishes and maintains social fairness and equity
- Supports comfort

DRAFT

and Recreation

Supports Economic Well--Being – A strong and resilient economy is the needed foundation on which to build and sustain any community. Such an economy plays an important role in supporting a community

in establishing and maintaining the social conditions that are necessary for a quality community as described in the criteria above. Examples of sub---criteria for this criteria include:

- Supports a vibrant and diverse regional and local business community that provides a solid and resilient tax base
- Establishes and maintains a diverse housing stock
- Supports retention of property values and allows for maintaining or improving curb appeal
- Supports financial ratings for the City that provides for access to capital markets on favorable terms
- Directs growth in a manner that minimizes negative impacts to the community and its values and character

Manages Risk – Effectively managing risk to support its ability to consistently deliver water that meets both quality and quantity standards and expectations is one of the Water Department's major functions. Sub---criteria relevant to this criterion would include:

- Provides necessary and expected quantity of water annually
- Provides necessary and expected quality of water annually
- Manages the water system to effectively limit unplanned interruptions in service
- Manages the water utility to efficiently and cost---effectively deliver water service to its customers
- Manages the water utility's finance to support financial ratings for the Water Department that provide for access to capital markets on favorable terms

Aligns decisions with community identity – Each community has its own character and value system. Decisions made by community elected or appointed decision---makers should reasonably align with the community's identity. Sub---criteria related to this criterion would include:

- Supports the community's commitment to environmental sustainability
- Supports the community's commitment to embracing and applying creative appropriate technologies to address community challenges
- Supports maintaining stable community characteristics, particularly related to the community's look, feel, economy and value system

Qualifications Due: 3:00 PM, Thursday August 14, 2014

4

Attachment B



Request for Qualifications for an
Independent Review Panel

Water Supply Advisory Committee

City of Santa Cruz Water Department



Qualifications Due: 3:00 PM, Thursday August 14, 2014

I. Request for Qualifications

The City of Santa Cruz Water Department is soliciting Statements of Qualifications (SOQs) from individuals with expertise in assisting citizen advisory bodies in effectively interacting with a technical consultant support team.

II. Water Supply Advisory Committee Overview

A. Project Description

The City of Santa Cruz Water Department (SCWD) is a municipal utility that provides water service to a geographic area that includes the entire City of Santa Cruz, adjoining unincorporated areas, a small part of the City of Capitola, and coast agricultural lands north of the City limits. The current population served is approximately 94,000.

The SCWD's water supply comes entirely from local sources. Surface water accounts for over 95% of the SCWD's total water supply. Groundwater pumped from wells comprises the remaining 5% of SCWD's water sources. Due to this, the region's water supply is extremely vulnerable to fluctuations in seasonal rainfall. Frequent water shortages and restrictions exemplify the region's vulnerability.

In response to the region's water supply reliability issues, the City has spent decades observing, researching, and reporting on new water supply opportunities and conservation methods. In 2010, after multiple studies, evaluations and reports, SCWD (partnered with Soquel Creek Water District) proposed a sea water reverse osmosis desalination plant (desal) as a potential solution to the region's water shortages.

The public responded to the proposed desalination plant by requesting that it be put to a vote, and gathered enough signatures to qualify a measuring requiring a public vote before funding for construction or acquisition of a desal project could commence. This measure, known as Measure P, was placed on the November 2012 ballot and passed with 72% of the vote.

In the fall of 2013, following continuing expressions of concern about a possible desal project by community interests, the City stepped back from the path it had been on and decided to create a citizens committee to consider the water supply issues, alternative strategies and solutions, and the public policy implications for Santa Cruz and provide recommendations to the Santa Cruz City Council. The Water Supply Advisory Committee (WSAC or Committee) was formed in early 2014 and began meeting in late April. It is made up of 14 citizens with diverse backgrounds and professions and the Santa Cruz Water Department Director is an ex officio member of the committee.

The Committee will have the support of a team of technical consultants throughout its process and the role of the proposed Independent Review Panel (IRP or Panel) is to support the committee by providing critical review of the work products produced by the technical support team and to provide suggestions to the Committee lines of technical inquiry that would be helpful in completing their work.

IRP Role Description

The role of the IRP would be to assist the WSAC in effectively interacting with its consultant support team. To achieve this goal, the Panel would:

- Provide critical review, on an as assigned or as needed basis, of products created by the WSAC technical support team. The goal of the Panel's work is to offer feedback to the Committee on work provided by its technical support team. Specifically, review of the work produced by the technical support team would focus on:
 - The accuracy and appropriateness of analytical, scientific, and technical methods;
 - The clarity and accuracy of statements of assumptions; and
 - The appropriate characterization of the strengths and weaknesses of the analyses, especially with respect to uncertainty, data quality, or other factors that, if different, could affect the results in a significant manner.
- Offer advice or suggestions to the WSAC regarding lines of inquiry or technical questions that should be evaluated by the technical team.

The Panel would work together as a team, or be individually assigned, to review products prepared or created by the technical team and report their findings to the Committee.

For more information on the WSAC please see the following website:

<http://www.cityofsantacruz.com/index.aspx?page=2018>

B. Panel Characteristic:

Panel characteristics would include the following:

- The Panel would include 3 to 5 members;
 - Panel members would have scientific or technical training and substantial practical experience in scientific or technical disciplines relevant to the work of the WSAC.
 - Panel member experience and expertise would be diverse with the experience and expertise of each panel member complementing and supplementing the experience and expertise of the other. An example of an effective Panel would be made up of:
 - An environmental engineer/scientist, especially with experience related to climate change, watersheds, fisheries, hydrology, hydrogeology, permitting or related issues;
 - A civil engineer with experience related to municipal water systems and resource planning, management, treatment technology, facilities design and operations; and
 - A public policy expert, especially related to environmental and community sustainability issues and decision-making by local governments in light of significant uncertainty.
- Other combinations of expertise will be evaluated by the Panel selection team.
- Panel members would be expected to bring their broad knowledge and experience to the process and apply this expertise to the topics the WSAC will be dealing with.

- Panel members would have reasonable availability to work with the WSAC during the coming year, including being willing to at least occasionally attend WSAC monthly meetings, being willing to commit the time needed to review documents, and being willing to prepare and personally present to the WSAC summaries of their review efforts.
- Panel members would have demonstrated ability to explain complicated topics in terms non-technical people can understand as well as the ability to present facts without concealing values and with clear articulation of assumptions.

Additional Panel characteristics that would be desirable include:

- Panel members would have demonstrated skills as technical and/or scientific reviewers through experiences such as providing peer review for articles or other publications on scientific and technical topics; and
- Panel members would have some previous experience supporting, advising, and engaging with citizen groups on topics with public policy implications.

C. Panel Compensation

Compensation would be provided in the form of an honorarium only. The honorarium amount would be limited to \$5,000 per panel member. Direct expenses (mileage, other transportation, per diem, if and as needed) would be reimbursed.

D. Schedule

The WSAC meets at least monthly and is scheduled to complete its work by spring of 2015 unless the work is extended by the City Council.

III. RFQ Process

A. Process

Parties interested in being considered to provide these services are requested to submit their SOQs on or before 3:00 pm, Thursday, August 14, 2014. SOQs will be evaluated by a Panel selection team made up of City of Santa Cruz staff and WSAC members using the criteria established in Section V. The panel selection team may make its selection entirely based on the SOQs or top rated candidates may be asked for supplemental information or may be invited to interview with the panel selection team. During the interview phase, if it is used,, semi-finalists may be asked to:

- Make an oral presentation, and/or
- Respond to pre-established questions.

All responsive teams 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. Timeline

The tentative timeline for the selection process is as follows.

3:00 pm, Thursday, August 14, 2014 ----- SOQs Due
Week of August 25, 2014 ----- Interviews, if applicable
Friday, September 19, 2014 ----- Contracts with Panel in
place

C. Information Disclosure to Third Parties

SOQs are a matter of public record and are open to inspection under the California Public Records Act. If any respondent claims any part of its SOQ is exempt from disclosure and copying, they shall so indicate in the transmittal letter. By responding to this RFQ, respondents waive any challenge to the City's decision in this regard.

If any SOQ contains confidential information, the respondent shall clearly label and stamp the specific portions that are to be kept confidential. The respondent is urged to identify the truly confidential portions of the SOQ and not simply mark all or substantially all response as confidential. Notwithstanding the foregoing, respondents recognize that the City will not be responsible or liable in any way for losses that the respondents may suffer from the disclosure of information or materials to third parties.

D. 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 and/or schedule interviews as part of the selection process;
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.
9. City reserves the right to determine the extent, duration and limit of Panel member service

E. Questions/Clarification Request

For the City, the primary contact is:

Rosemary Menard Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C, Santa Cruz CA
95060 Email:
RMenard@cityofsantacruz.com
Phone: (831)420-5205

During the SOQ process, interested parties shall direct all questions via email to the City's primary contact listed above.

IV. Submittal of SOQs

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

- Cover letter describing:
 - How they fit the Panel Characteristics
 - Their willingness to accept the offered compensation
 - Their availability to work with the WSAC over the coming year
- Resume or curriculum vitae.

V. Evaluation Criteria and Selection

The City will evaluate each respondent's experience and expertise in relation to the panel characteristics described in section II B above. Candidates will be evaluated on the information presented in the SOQ. Final selection may be based on the SOQ as well as any supplemental information or interviews conducted. Evaluation factors used to select the semi-finalists shall include the following:

1. Experience and qualifications as they relate to this project (100%).
 - a. The match of individual qualifications and experience to the Panel characteristics described in this RFQ, and
 - b. An individual's availability to participate.

If a clear choice is not evident, interviews will be scheduled with those semi-finalists of exceptional rating.

VI. Response Format

One copy of the Statement of Qualifications shall be submitted and are to be no longer than 20 individual sheets in length (proposal may be printed on both sides of sheet), including resumes and attachments. Submitters are encouraged to use a double-sided format and recycled paper when possible.

Parties interested in being considered for this project are requested to submit their Statements of Qualifications **by 3:00 pm, Thursday, August 14, 2014**

to: City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060
Attention: Rosemary Menard



WATER DEPARTMENT MEMORANDUM

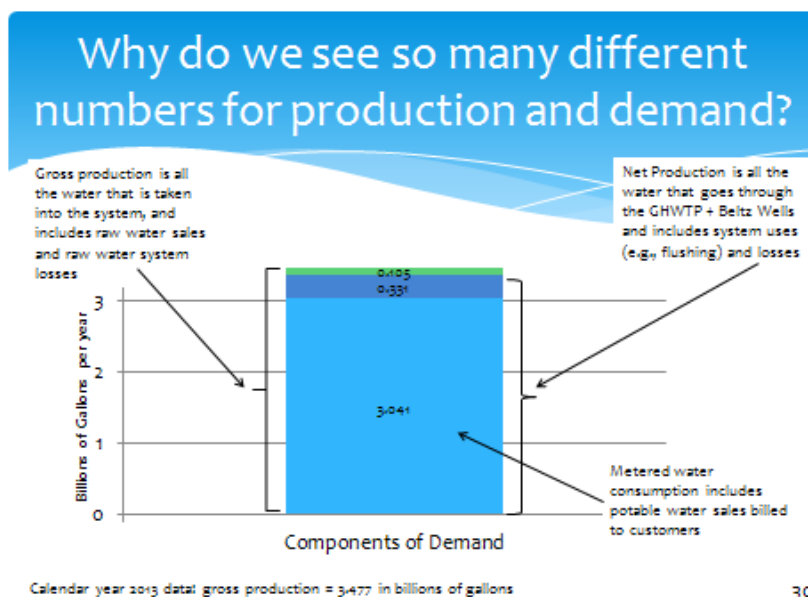
DATE: August 20, 2014

TO: Water Supply Advisory Committee

FROM: Toby Goddard

SUBJECT: System Water Losses and Water Loss Control

BACKGROUND: On June 26, 2014, The Water Supply Advisory Committee received a presentation providing an overview of water supply and demand characteristics in Santa Cruz. One of the topics introduced in the process of explaining the different terms and figures relative to annual water production and water demand was system water losses.



30

Shortly thereafter, the New York Times published an article entitled “The Art of Water Recovery” examining the subject of water losses in public water systems and the potential to reduce leakage (Attachment 1). The article highlighted two important issues:

- According to the U.S. Environmental Protection Agency, public water systems lose, on average, one-sixth of their water – mainly from leaks in pipes; and

- The volume of leakage in the nation's 55,000 drinking water systems is unknown, because few conduct water audits using standards established by the International Water Association (IWA) and the American Water Works Association (AWWA).

This paper provides current information about system water losses in Santa Cruz, and measures the City is taking to minimize system losses.

DISCUSSION: Total system water demand includes not only metered water sales but also authorized, unmetered uses from fire hydrants such as main flushing, fire fighting, street sweeping, and sewer flushing, as well as losses due to underground leaks. The difference between the amount of water produced at the City's two water treatment plants entering the distribution system and the amount of water consumed, including both metered and unmetered uses, is referred to as system water losses.

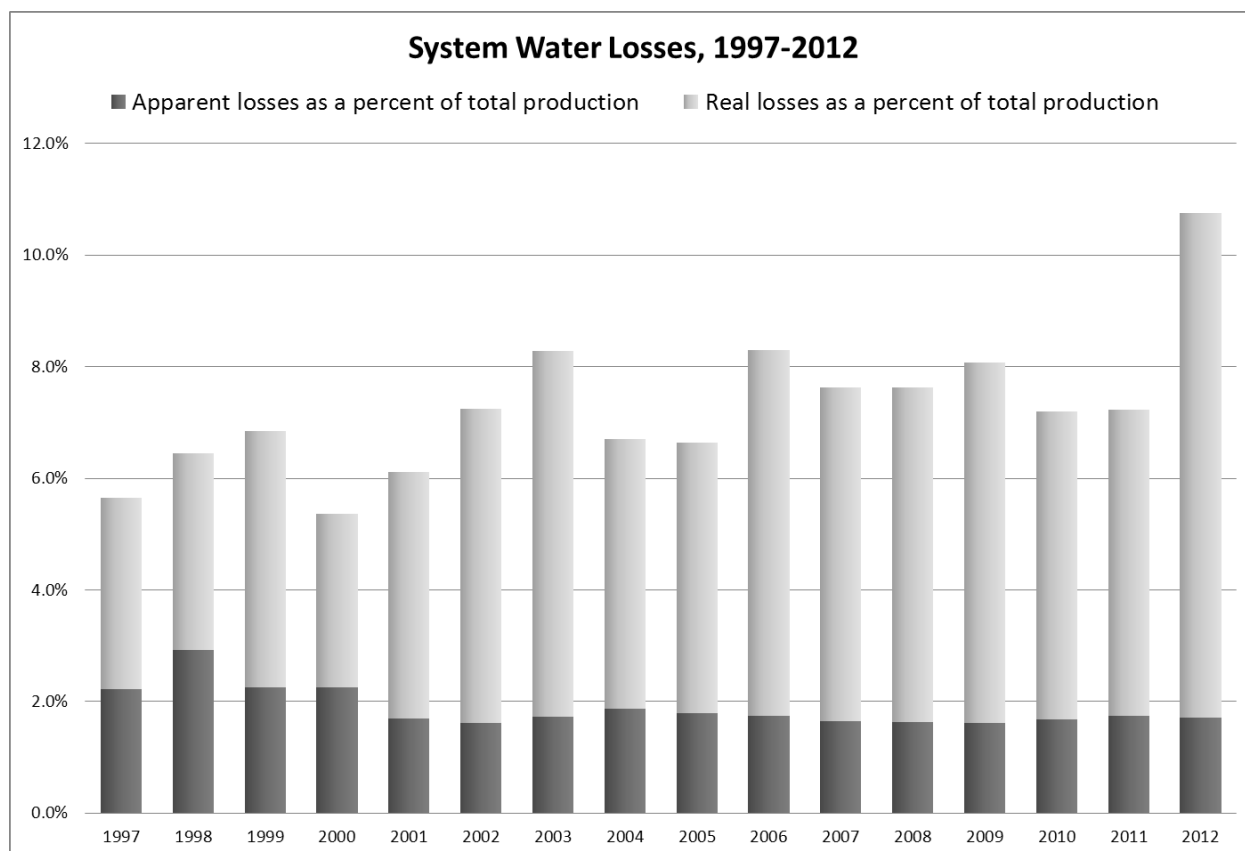
System losses have two components: 1) physical losses from leaking service lines, valves, and water mains, also referred to as "real" losses and 2) "apparent" losses in which potable water is consumed but goes underreported due to sales meter inaccuracies, billing and accounting errors, and other factors.

The Water Department first began conducting annual water audits of distribution system in 1997. The purpose of a water audit is to quantify how much water and revenue are lost through both physical leaks and apparent losses and to identify steps to minimize system losses and improve the operational efficiency of the water system. Until 2006, the Department followed the approach described in the AWWA M36 Manual of Water Supply Practices – Water Audits and Leak Detection. Starting in 2006, the City began to use the new, standardized water balance approach developed through the IWA and AWWA referenced in the New York Times article.

Under the California Urban Water Conservation Council's MOU, Water Loss Control is listed as a Best Management Practice. Since 2009, agencies have been expected to use the new IWA/AWWA software to complete their annual water audits and to meet increasingly stringent requirements to support water loss control activities and identify areas for improved efficiency and cost recovery.

Annual Water Losses

Water audit results indicate system water losses vary from year to year but have averaged about 7.3 percent of total production over the last 15 years, or about 264 million gallons per year (mgy).



As seen in the chart above real water losses; i.e. distribution system leakage, is the larger of the two components that make up total system losses. Estimates of physical losses from underground leakage in service lines, water mains, valves, and distribution system controls average 5.4 percent of total production, or just under 200 mgd. Apparent losses are estimated at about 70 mgd or about 1.9 percent of all treated water entering the distribution system. There is considerable uncertainty, however, about the true magnitude between real and apparent water losses due to the fact that no formal, systematic meter testing program has been carried out by the Water Department for many years.

It can also be seen that in 2012, the City experienced a sudden jump in lost water to a level not previously seen. This occurred after a long period where the annual water loss rate had been relatively consistent. The cause of this sudden jump is yet to be understood.

Cost of Water Losses

The estimated cost to the City from system water losses is shown below using data from 2011 and 2012.

Item	2011	2012	Difference
Total treated water production entering distribution system	3,000 mg	3,273 mg	+273 mg
Metered water consumption	2,760 mg	2,896 mg	+136 mg
Authorized un-metered water uses	24 mg	25 mg	+1 mg
Total consumption	2,874 mg	2,921 mg	+47 mg
Water losses	216 mg	352 mg	+136 mg
Water losses (as percent of total production)	7.2%	10.8%	+3.6%
Apparent losses (metering inaccuracies)	52 mg	56 mg	+4 mg
Real losses (leakage in mains and service connections)	164 mg	296 mg	+132 mg
Leakage (as a percent of total production)	5.5%	9.0%	+3.5%
\$ Value of apparent losses ¹	\$275,964	\$300,944	+\$24,980
\$ Value of real losses ²	\$66,420	\$132,608	+\$66,188
Total \$ value of losses	\$342,384	\$433,552	+\$91,168

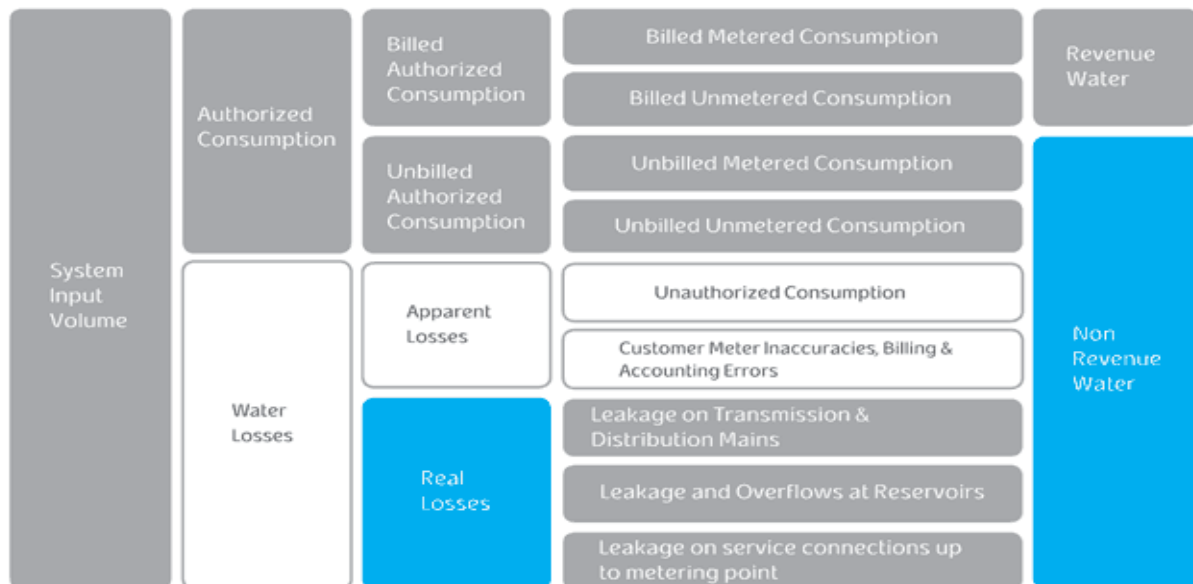
¹ Apparent losses was valued at \$4.02/CCF (volumetric revenues for the calendar year/sales in CCF = Average \$/CCF sold) or \$5,374 per mg in 2012.

² Real water losses valued at variable production cost of current water supplies was \$448 per million gallons in 2012.

Even though real losses are thought to be much larger by volume than are apparent losses, the lost revenue associated with inaccurate water meters represents a much greater cost to the utility than does underground leakage. This is because apparent losses are valued at the retail rate of about \$4.00/CCF or \$5,374/million gallons, whereas real losses are valued at the City's variable cost of producing water based on the cost of electric power for pumping and chemicals for treatment, currently estimated at \$448/million gallons. This latter value does not, however, take into account costs of labor, repair, or property damage that results from certain water system breaks, disruptions, and ruptures, which can be significant, as vividly dramatized by the recent major water main break near the UC Los Angeles campus.

Water Balance Model

The new IWA/AWWA water balance approach is based on the following diagram and associated terms and definitions. It is a tool to help utilities better understand and quantify water uses and losses relative to annual system input volumes. No longer is there any reference to the outdated term "unaccounted for water". The water balance reflects that all drinking water managed by the utility is accounted for in the various categories of consumption and loss.



One of the most powerful features of the software is the numerical grading system where a specific rating is assigned to each of the analytical inputs when compiling and entering data to describe the confidence and accuracy of the data. These grades are helpful to assess priority areas for attention and to identify measures to improve water loss control.

The audit software also provides a variety of financial and operational performance indicators. These include the following:

- Nonrevenue water as percent by volume of water supplied,
- Nonrevenue water as percent by cost of operating system,
- Infrastructure leakage index – a ratio of a utility's current annual real losses to its unavoidable annual real losses (a theoretical reference value that represents the technically low limit of leakage given the length of mains, average pressure, and number of service connections).

The City's completed audit and associated worksheets for calendar year 2012 are included as Attachment 2.

Approaches to Reduce Real Water Losses

Maintenance and improvement of the treated water distribution system is a major activity of the Water Department, and central to the Department's mission of providing a clean, adequate, and reliable supply of water. The Water Distribution section consists of 23 certified personnel, and a group of 6 technicians, specialists, and a supervisor in the Meter Shop, all dedicated to maintaining and repairing the system 24/7. It is organized into several crews that focus on the following activities:

- Main replacement
- Service line renewal
- Leak repair
- Valve maintenance
- Utility location and leak detection

Annual water main replacement projects are coordinated by the Department's Engineering section. Main replacement is guided by several factors. These include considerations for system reliability, water quality, fire flow, circulation, maintenance, as well as coordination with street paving and other public projects. The Distribution section also performs smaller main replacement projects, replacing about one mile of main per year.

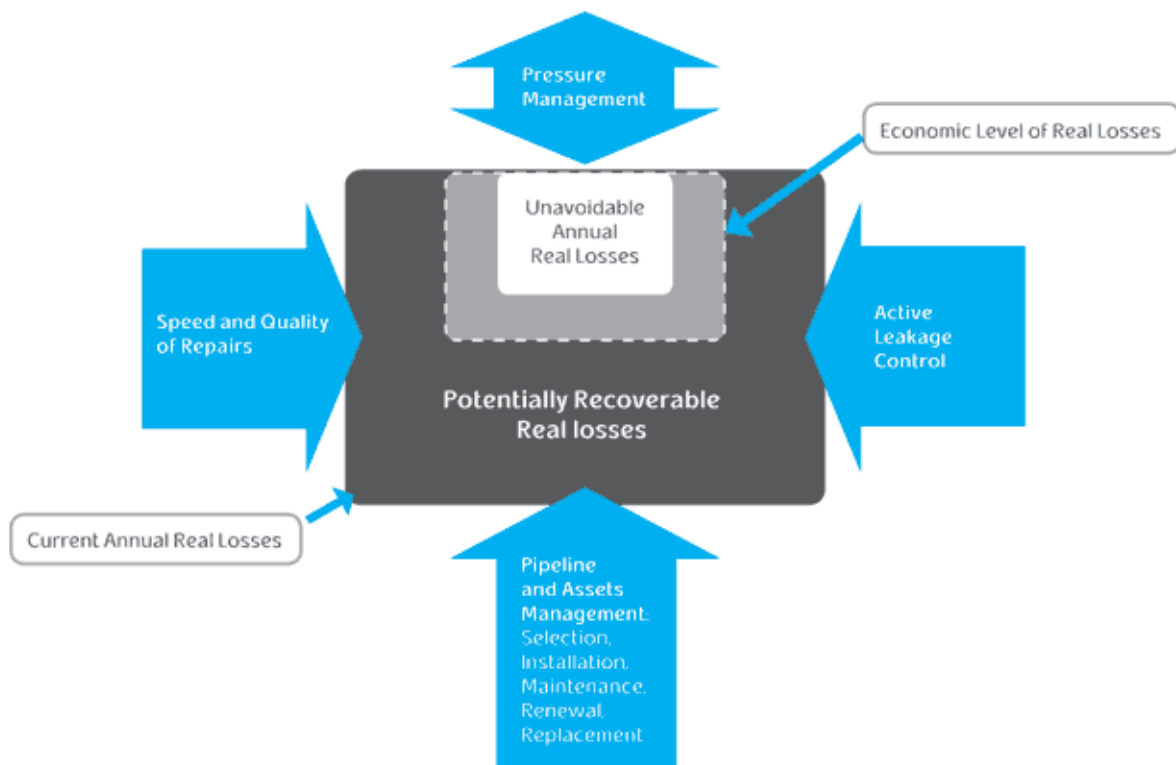
Several years ago, the Department considered the idea to operate an active, acoustic leak detection program. It was decided, based on analysis of leak types and volumes, to undertake a different approach, though, which was to establish a crew to proactively replace polybutylene service lines with copper service lines. Polybutylene service lines were being found, both locally and elsewhere throughout the industry, to fail prematurely, and represented a significant source of leakage. Over 5,000 plastic service lines have been replaced over the last decade to help prevent future leaks from occurring.

A sheared fire hydrant is a one example of a real water loss



The following illustration shows the four potential areas where additional actions are possible to further reduce leakage to a level that is economically achievable. These

actions include actively performing sonic leak detection surveys to find unreported leaks, optimizing leak repair activities, managing pressure, and increasing the level of water main and service line replacement. Of these four approaches, active leak detection and asset management are the two areas thought to be where the most potential exists on the City's distribution system. The Department already has a good record of responding quickly to leaks. The potential for leak reduction through pressure management is uncertain, but probably relatively low, given the large area served by the City's gravity zone, and the lack of discrete areas where pressure could be managed.

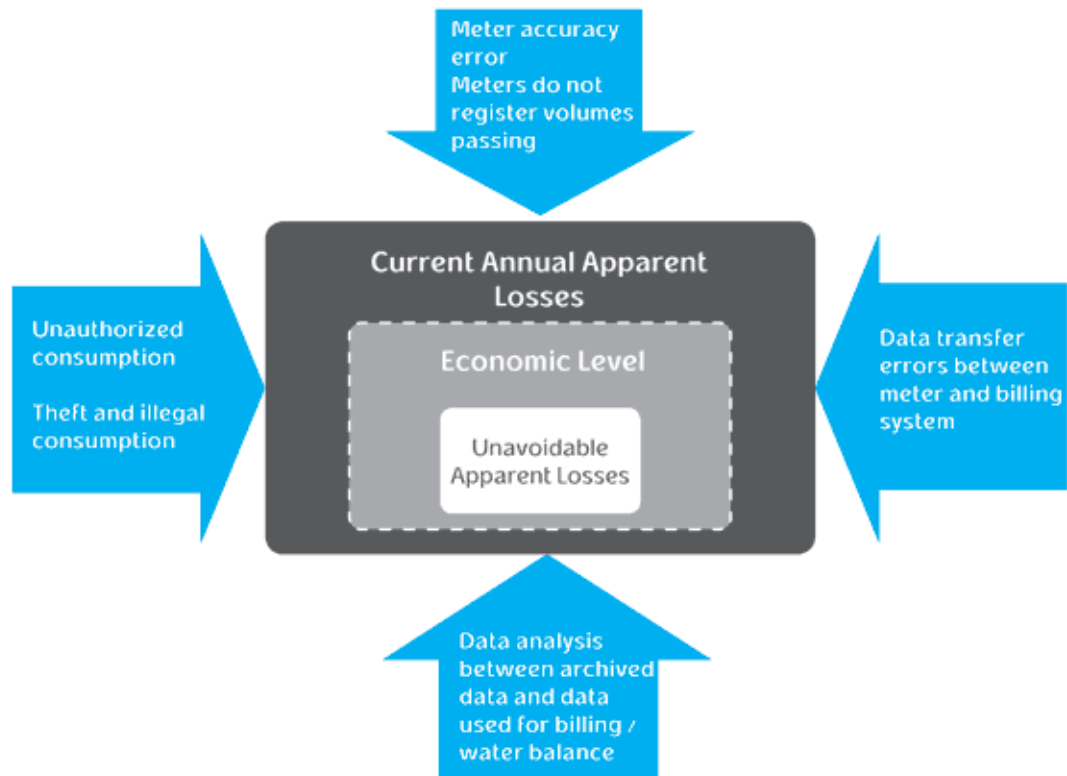


The idea with the illustration is there is a hierarchy of real losses that includes: 1) the utility's current level of losses, 2) some potentially lower level that is economical to achieve, and 3) some even lower level that represents the unavoidable minimum level of loss. Under this model, eliminating all physical water losses is not practical to achieve.

Approaches to Reduce Apparent Water Losses

Apparent losses occur as a result of inefficiencies in the measurement, recording, archiving, or accounting operations used to track water volumes in a water utility. Unlike real losses, reducing apparent losses does not create new or more water, but it does improve revenue recovery and other benefits.

As with real water losses, there are four basic approaches to reducing apparent water losses, illustrated in the following diagram:



Inevitably, some water is used but not captured on a billing system due to all these different sources, and the City does not have good information at the present time to quantify their relative contribution. The Department knows of individual examples of situations where water is used but not recorded. For instance, movement on a fire service check meter is a type of water loss that goes unrecorded on the billing system, as does unauthorized usage on a closed account. While rare, a mis-programmed meter register or a meter that was not loaded up on the utility inventory system are examples of data transfer errors can also result in “missing water”. The Customer Service section and Meter Shop regularly run billing system reports known as the Meter Read Edit List and other controls to help identify and resolve such problems.

When it comes to apparent losses, though, the bigger unknown is the overall accuracy of the City’s 25,000+ meters. As meters age, the components inside meter registers wear down, causing under-registration of water volume, and, in some cases, reporting zero consumption. Beginning in the late 1990’s, the Water Department began a multi-

year project converting from a manual to an automated meter reading (AMR) system to enable monthly billing, reduce risk of employee injury and accidents, and improve operational efficiency. This capital improvement project involved completing over 20,000 radio read meter installations that involved replacing, either completely or partially, the majority of the water meters on the water system, primarily in the smaller 5/8 and 1 inch size class. This project was completed in 2008. The last time a major meter replacement project was undertaken before then was in the late 1970's.

With the priority having been devoted primarily to the AMR conversion project for much of the last decade, no regular, formal meter testing program has been carried out by the City for many years. Some testing has been conducted on selected large meters on an intermittent basis. As mentioned above, it is currently estimated that about 2 percent of all treated water that enters the distribution system goes unrecorded due to meter inaccuracies. However, little current testing data exists either for the newly replaced small meter population or the current stock of large meters to understand the functional status or accurately gauge the level of meter error or sales revenue lost systemwide due to meter under-registration.

Water Loss Control in the Water Conservation Master Plan

One of the recommended measures in the City's proposed Water Conservation Master Plan is to contract with a firm specializing in water loss control to examine the City's water system and practices to better validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce lost water. The FY 2015 operating budget includes \$150,000 to undertake this initial contract work.

Attachments

1. "The Art of Water Recovery", New York Times, July 10, 2014
2. 2012 AWWA Water Audit

The New York Times**The Opinion Pages**

Fixes

The Art of Water Recovery

By DAVID BORNSTEIN

July 10, 2014 8:00 pm

Fixes looks at solutions to social problems and why they work.

Imagine that you run a company that sells bottled water. You spend lots of money, and use lots of energy, pumping the water out of the ground, purifying it and transporting it for sale. Then, one day, you discover that a large number of bottles never make it to the stores. They are falling through holes in the trucks.

Wouldn't you want to know what could be done about it? Wouldn't you be crazy to allow the situation to continue?

Well, that's what's happening with many water utilities in the United States. The Environmental Protection Agency estimates (pdf) that public water systems lose, on average, one-sixth of their water — mainly from leaks in pipes. The E.P.A. asserts that 75 percent of that water is recoverable. (In truth, the volume of leakage in the nation's 55,000 drinking-water systems is unknown, because few conduct water audits using the standards established by the International Water Association and the American Water Works Association.)

It's been widely reported that California is experiencing its worst drought in history. But take a look at the United States Drought Monitor: much of the country is abnormally dry or in drought. Internationally, the problem is even more serious. The World Bank reports that, over the next decade and a half, water availability may fall 40 percent short of global need (pdf).

Meanwhile, utilities in the developing world are hemorrhaging water. The World Bank estimates that water systems have real losses (leakages) of 8.6 trillion gallons per year, about half in developing countries (pdf, 11MB, p.6). That's enough to serve 150 million Americans (and we use a lot of water!)

Why don't utilities do more to recover it?

The results can be substantial. Consider Manila. From 2009 to 2013, with project management from an innovative young company called Miya, the utility that provides water to the western zone of Manila, Maynilad, reduced its so-called non-revenue water from 1.5 billion to 750 million liters per day, mainly by stemming leakages (pdf).

During that period, according to Irineo L. Dimaano, who directs Maynilad's non-revenue water work, the company reduced the volume of water it supplied into the system by 400 million liters per day, while simultaneously serving an additional 1.3 million people, increasing the proportion of customers who receive 24-hour service to 97 percent from 65 percent, improving water pressure, and doubling annual revenues.

This is an extreme case of the potential gains that can be made by tightening up a water system. But water leakage is widely overlooked — largely because it is technical and dull and politically unattractive. “Water loss is unsexy,” said Mary Ann Dickinson, president of the Alliance for Water Efficiency. “There’s no ribbon cutting for new plants. If you announce that you’ve recovered a million gallons a day, it looks like you weren’t managing your system right in the first place.”

Today's budding water loss industry grew out of the efforts of a bunch of brilliant, obsessive, far-thinking engineers in Britain who started something called the National Leakage Initiative in the early 1990s. Led by a man named Allan Lambert, they developed a methodology for categorizing and quantifying water leakage, and predicting losses, so they could rigorously determine how to reduce them.* This was vital in Britain, which had some of the world's oldest water systems.

Their efforts were famously successful. Lambert later led a task force for the International Water Association, which established new standards for water accounting (pdf). In recent years some states, notably, California, Georgia, Tennessee and Texas, have begun requiring that utilities conduct water audits, but they have not mandated targets for water loss reduction. In fact, no state mandates targets for water loss reduction using the new standards.

Today, the emergence of companies that specialize in reducing water losses, like Miya, represents an important step forward, much like the emergence of energy service companies in the 1970s and 1980s to reduce energy use.

Miya was founded in 2006 by Shari Arison, an American-Israeli businesswoman and billionaire. Over the past eight years, the company has assembled a team of water loss experts and deployed them in a dozen countries. What distinguishes its work is its whole system approach: it looks at a water system the way a doctor looks at the body's circulatory system.

Water systems are counterintuitive. It's commonly thought that water leakage can be solved simply by replacing the worst pipes, but that's usually just a short-term fix. The real key is understanding and managing pressure.

"When you have a pressurized system, what you do in one place affects all other places," said Meir Wietchner, Miya's chairman. Replace a leaky pipe segment and the pressure will increase in other segments and more leaks will sprout. "It's simple physics," he added. "And the larger the pressure the larger the leakage. If a hole that's receiving one unit of pressure will leak X gallons per day, with 2 units of pressure it will leak 4X, and with 3 units pressure it will leak 9X. It's a square function."

One of Allan Lambert's insights was to separate leaks into "bursts" and "background" losses (pdf). "It isn't the main leaks that cause the most loss of water," he said. "It's the long-running leaks that go on for months or years that aren't detected. One leaking toilet will lose as much water in two years as a burst in a four-inch main for a full day."

So how do you fix and manage a system that's leaking in tens or hundreds of thousands of places — and how do you do it cost effectively?

That was the problem that Glen Laville, the general manager for the Bahamas Water and Sewerage Corporation (W.S.C.), was facing. Before 2012, to serve the water needs of New Providence, the largest island in the Bahamas, each day the W.S.C. was supplying some 12 million imperial gallons to the system — and each day it was losing 6.5 to 7 million gallons. Over the years, piecemeal solutions had been tried — mainly replacing big pipes — but the leakage always returned.

In 2012, Miya won an \$83 million 10-year contract to advance a more sustainable solution. “The other companies wanted to come in and change 20 to 30 miles of pipeline,” said Laville. “We weren’t looking for someone to come in and just give us a new infrastructure. We wanted a holistic approach.”

One selling point was that 30 percent of the company’s fees would be based on performance. To earn those payments, Miya would have to bring the leakage down to 2.5 million gallons per day by year five, and to 2 million gallons per day by year seven — and the levels would have to be maintained for the duration of the contract. (Reductions below that level become cost prohibitive.)

Work started in 2012. The company spent most of the year studying the problem, examining every component of the system, explained Sofia Kanellopoulou, the project manager for the Bahamas, who was formerly a deputy director of the Athens water utility. The system had 44,000 service connections — pipes from water mains to customers — and, in line with Lambert’s findings from Britain, that’s where 90 percent of the leaks were occurring.

There were many reasons for the leaks: Service connections hadn’t been installed with proper pipes and fittings; water from the desalination plant contained substances that were damaging pipes; the water table was high, with saline intrusion from the sea, which was also corrosive.

Then there was a secondary problem exacerbated by the leakage itself. With so much water lost, the system sometimes ran short of supply, and water had to be rationed. (Not for tourists, though. The big hotels typically supply their own

water.) Water rationing is common in the developing world — but the consequences are poorly understood. When pressure drops to zero in pipes, contaminants in the surrounding ground — including salt water or waste from nearby sewage lines — can get sucked into the water lines, which is terrible for public health. And when you empty a system and then re-pressurize it, the resultant “surge wave” further damages pipes. A steady, moderately low level of pressure is best — just as in the human body.

Finding leaks is painstaking work. It starts by dividing a large system into smaller “district metered areas” where pressure can be independently monitored and controlled. You analyze tons of data with computer programs. You stay up late. Most of the water moving through a system in the middle of the night is leakage. Because it’s too costly to replace every leaky pipe or connection, the key is to figure out how to save the greatest volume of water with the least possible effort.

To do this, leak detectors with sophisticated sound equipment fan out around cities in the wee hours, listening closely to gauge the size of leaks below ground. (In the Bahamas that didn’t work, however, because of electrical interference from power lines.) Fortunately, the water pipes are only a few feet under the ground, so access was relatively easy.

To date, the system has been partitioned into 30 pressure zones, and will be further subdivided. More than 2,500 leaks have been repaired, using materials that are suitable for local conditions. Meters have been installed and the system pressure is being carefully managed. Water losses are already down to 4.5 million gallons per day, reports Laville. This past May, the W.S.C. needed to supply only 10 million gallons per day to meet customers’ needs, two million less than in 2012.

“Last year, with two desalination facilities running at full capacity, we had to ration water,” said Laville. “Within nine months of starting this project, we got to a point where we no longer had to ration the water. And we’re now at a point where we can tell the desalination plant to cut back on their supply.”

Over the 10 years, Laville estimates that the project will save 10 billion gallons of water, 7 million gallons of diesel, and 33 gigawatts of electricity. “In the 10 years, the project will pay for itself,” he added. “It’s almost a no-brainer.”

It's a major improvement. But Paul Fanner, Miya's project director in the Bahamas, comments: "We're not doing anything that special. We just have to get all the things right. If you do one or two things, it doesn't work. It's all interrelated. It's not rocket science, but to do it well is very rare."

What Laville likes most is that Miya has just four people from outside the Bahamas working on the project. "That is an amazing thing for a project of this size and complexity," he said. "They come in, they train locals, they transfer that technology, and then they let them loose. At the end of 10 years, we'll have a trained work force to continue the work."

Efforts to reduce water leakage are spreading around the world, albeit slowly (pdf). There have been big water recovery gains in Cambodia, Brazil, South Africa and Malaysia, among other places. But despite the fact that it's good for business, good for customers, and good for the environment, bankers and politicians still favor expanding production when there are shortfalls (even if the expanded production will have to flow through the old leaky pipes!)

"In many areas of the world, there's no need to produce more water if we just cut waste," said Wietchner. "But a lot of people are not willing to admit the level of loss they have."

Back to California. There are currently 17 desalination plants in the planning or construction stages in the state. The \$1 billion Carlsbad Desalination Project — the largest desalination facility in the Western Hemisphere — will produce 50 million gallons of potable water daily for San Diego county.

But how much water could be saved by reducing leakages in California?

One study (pdf) conducted for the California Public Utilities Commission examined audits done by 17 water utilities and found that losses were 1.6 to 6.6 times higher than optimum levels. (See footnote, for a brief explanation of these numbers, known as Infrastructure Leakage Indices.) Assuming that 40 percent of the losses could be recovered economically, the study's lead author, Reinhard Sturm, estimated potential savings at 113 billion gallons per year — equivalent to the annual production of six Carlsbad projects.

It's vital to consider the impact on energy use and the environment. Water is often lost between the main pipe and the customer, which means it has already been extracted, treated and transported a very long way. That's expensive. All that energy is lost — and more has to be used — and that, of course, increases carbon emissions. California's water system is already the state's largest single energy user. At the same time, desalination plants are energy intensive. Electricity accounts for roughly half the cost of their water.

As noted, some states are requiring utilities to report water audits. And around the country, individuals like George Kunkel of the Philadelphia Water Department and Chris Leauber of the Water & Wastewater Authority of Wilson County, Tenn., and companies like Water Systems Optimization and Cavanaugh, are leading the way.

But given the scope of the problem — and the fact that utilities are asking their own customers to conserve water — far more attention is warranted. With properly conducted water audits and loss reduction targets, officials would be in a position to determine if shortfalls could be better met by reducing leakage than by increasing production. Right now, many have no way to know.

Part of the problem is good old-fashioned complaisance. "U.S. folks have the impression that they are already system tight and they don't need to do much more," said Mary Ann Dickinson, of the Alliance for Water Efficiency. "I believe they are mistaken and they need to run their numbers to verify where they are."

What's missing most is serious focus from governments, particularly at the state level. "Government policy makers are not paying attention to leakage," added Dickinson. "We want to see every state requiring their water utilities to look at this. That's what they did in the U.K., and the huge turnaround that occurred there is what we need to see in the U.S."

* Note for wonks: Most people refer to water leakage in terms of percentage losses. However, Allan Lambert, the godfather of water-leakage reduction, argues against using percentages because they fail to provide a meaningful or consistent measure of the quality of a water system (and are easily manipulated). For

instance, if you add a few large customers to a leaky water system and make no repairs, percentage leakage will drop. (It will appear that you have improved things when you have only increased the denominator.)

Lambert favors a measure called Infrastructure Leakage Index (I.L.I.), which compares real losses to the lowest level that is technically achievable for a particular system. An I.L.I. of 4 means you're losing four times as much water as you would be losing if your system was optimally managed. I.L.I.s can be used to compare different systems, and also to estimate how difficult, and therefore costly, marginal gains will be to achieve.

Join Fixes on Facebook and follow updates on twitter.com/nytimesfixes. To receive email alerts for Fixes columns, sign up [here](#).

David Bornstein is the author of "How to Change the World," which has been published in 20 languages, and "The Price of a Dream: The Story of the Grameen Bank," and is co-author of "Social Entrepreneurship: What Everyone Needs to Know." He is a co-founder of the Solutions Journalism Network, which supports rigorous reporting about responses to social problems.

AWWA WLCC Free Water Audit Software: Reporting Worksheet

Copyright © 2010, American Water Works Association. All Rights Reserved.

WAS v4.2

[Back to Instructions](#)

[?](#) Click to access definition

Water Audit Report for: **City of Santa Cruz**

Reporting Year: **2012** 1/2012 - 12/2012

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR**

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	?	7	3,249.900	Million gallons (US)/yr (MG/Yr)
Master meter error adjustment (enter positive value):	?	9	23.080	under-registered MG/Yr
Water imported:	?		0.000	MG/Yr
Water exported:	?		0.000	MG/Yr
WATER SUPPLIED:			3,272.980	MG/Yr

AUTHORIZED CONSUMPTION

Billed metered:	?	7	2,893.200	MG/Yr
Billed unmetered:	?	5	0.940	MG/Yr
Unbilled metered:	?	9	2.500	MG/Yr
Unbilled unmetered:	?	8	24.360	MG/Yr

Click here: [?](#)
for help using option
buttons below

Pcnt: ☐ Value: ☐ 24.360

Use buttons to select
percentage of water supplied
OR
value

AUTHORIZED CONSUMPTION: [?](#) 2,921.000 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

351.980 MG/Yr

Apparent Losses

Unauthorized consumption: [?](#) 8 0.001 MG/Yr

Customer metering inaccuracies: [?](#) 1 56.350 MG/Yr
Systematic data handling errors: [?](#) 4 0.001 MG/Yr

Apparent Losses: [?](#) 56.352

Pcnt: ☐ Value: ☐ 0.001

☐ ☐ 56.350

Choose this option to
enter a percentage of
billed metered
consumption. This is
NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?](#) 295.628 MG/Yr

WATER LOSSES: 351.980 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: [?](#) 378.840 MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	?	5	263.9	miles
Number of active AND inactive service connections:	?	6	24,575	
Connection density:			93	conn./mile main
Average length of customer service line:	?	7	0.0	ft (pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	?	10	89.0	psi

COST DATA

Total annual cost of operating water system:	?	8	\$21,523,528	\$/Year
Customer retail unit cost (applied to Apparent Losses):	?	7	\$4.02	\$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	?	7	\$448.00	\$/Million gallons

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	11.6%
Non-revenue water as percent by cost of operating system:	2.1%
Annual cost of Apparent Losses:	\$302,833
Annual cost of Real Losses:	\$132,441

Operational Efficiency Indicators

Apparent Losses per service connection per day:	6.28	gallons/connection/day
Real Losses per service connection per day*:	32.96	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.37	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	166.13	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	295.63	million gallons/year
? Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.78	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 68 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Customer metering inaccuracies

3: Billed unmetered

[For more information, click here to see the Grading Matrix worksheet](#)

AWWA WLCC Free Water Audit Software: <u>Water Balance</u>					Water Audit Report For:		Report Yr:	
Copyright © 2010, American Water Works Association. All Rights Reserved.					City of Santa Cruz		2012	
Own Sources (Adjusted for known errors) 3,272.980	Water Exported	Billed Water Exported						
	0.000				Billed Metered Consumption (inc. water exported)	Revenue Water		
			Billed Authorized Consumption		2,893.200			
		Authorized Consumption	2,894.140		Billed Unmetered Consumption	2,894.140		
		2,921.000			0.940			
			Unbilled Authorized Consumption		Unbilled Metered Consumption	Non-Revenue Water (NRW)		
			26.860		2.500			
					Unbilled Unmetered Consumption			
					24.360			
		Water Supplied		Unauthorized Consumption	378.840			
		3,272.980		Apparent Losses				
			56.352	Customer Metering Inaccuracies				
				56.350				
				Systematic Data Handling Errors				
				0.001				
		Water Losses						
		351.980						
			Real Losses					
			295.628	Leakage on Transmission and/or Distribution Mains				
				Not broken down				
				Leakage and Overflows at Utility's Storage Tanks				
				Not broken down				
				Leakage on Service Connections				
				Not broken down				

AWWA WLCC Free Water Audit Software: Grading Matrix

Copyright © 2010, American Water Works Association. All Rights Reserved.

WASv 4.2

[Back to Instructions](#)

In the Reporting Worksheet, grades were assigned to each component of the audit to describe the confidence and accuracy of the input data. The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize efforts to begin to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all source meters. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing on all meters. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Master meter error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply, either its own source, and/or imported (purchased) water sources	Inventory information on meters and paper records of measured volumes in crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records. Tank/storage elevation changes are not employed in calculating "Volume from own sources" component. Data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data adjusted to correct gross error from equipment malfunction and error confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component.	Conditions between 6 and 8	Continuous production meter data logged automatically & reviewed daily. Data adjusted to correct gross error from equipment malfunction & results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results reviewed daily. Mass balance technique compares production meter data to raw (untreated) water and treatment volumes to detect anomalies. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter error adjustment" component:		to qualify for 2: Develop plan to restructure recordkeeping system to capture all flow data; set procedure to review data daily to detect input errors	to qualify for 4: Install automatic datalogging equipment on production meters. Identify tanks/storage facilities and include estimated daily volume of water added to, or subtracted from, "Water Supplied" volume based upon changes in storage		to qualify for 6: Review hourly production meter data for gross error on, at least, a weekly basis. Begin to install instrumentation on tanks/storage facilities to record elevation changes. Use daily net storage change to balance flows in calculating "Water Supplied" volume.		to qualify for 8: Complete installation of elevation instrumentation on all tanks/storage facilities. Continue to use daily net storage change in calculating balanced "Volume from own sources" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component:		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component:		<u>to qualify for 2:</u> Review bulk water sales agreements with partner suppliers; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	<u>To qualify for 4:</u> Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all imported water meters. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billed for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billed for others. Manual meter reading, under 50% read success rate, remainder estimated. Limited meter records; no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based billing from meter reads; flat or fixed rate billed for remainder. Manual meter reading used, at least 50% meter read success rate, failed reads are estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters replaced only upon complete failure. Computerized billing records, but only periodic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; remaining accounts are estimated. Manual customer meter reading gives at least 80% customer meter reading success rate, failed reads are estimated. Good customer meter records, limited meter accuracy testing, regular replacement of oldest meters. Computerized billing records with routine auditing of global statistics.	Conditions between 6 and 8	At least 97% of customers with volume-based billing from meter reads. At least 90% customer meter read success rate; or minimum 80% read success rate with planning and budgeting for trials of Automatic Metering Reading (AMR) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics, verified periodically by third party.	Conditions between 8 and 10	At least 99% of customers with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) trials underway. Statistically significant customer meter testing and replacement program in place. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts. Annual audit verification by third party.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<u>to qualify for 2:</u> Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	<u>to qualify for 4:</u> Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		<u>to qualify for 6:</u> Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Conduct routine audit of global statistics.		<u>to qualify for 8:</u> Purchase and install meters on unmetered accounts. Assess cost-effectiveness of Automatic Meter Reading (AMR) system for portion or entire system; or achieve ongoing improvements in manual meter reading success rate. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Refine routine auditing procedures based upon third party guidance.		<u>to qualify for 10:</u> Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) system trials if manual meter reading success rate of at least 95% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue routine auditing and require annual third party review.		<u>to maintain 10:</u> Regular internal and third party auditing, and meter accuracy testing ensures that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billed. No data collected on customer consumption. Only estimates available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption recorded on portable dataloggers. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing but lacks written procedures and employs casual oversight, resulting in up to 20% of billed accounts believed to be unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but exemption exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy requires metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because because installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy requires metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading										
	n/a	1	2	3	4	5	6	7	8	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Investigate a new water utility policy to require metering of the customer population, and a reduction of unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and datalogging the water consumption.	to qualify for 4: Implement a new water utility policy requiring customer metering. Expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes.		to qualify for 6: Budget for staff resources to review billing records to identify unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Implement procedures to obtain reliable consumption estimate for unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties to devise means to install water meters or otherwise measure water consumption.	to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10
Improvements to attain higher data grading for "Unbilled metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.	to maintain 10: Reassess philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running x typical flowrate x number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: unmetered fire connections registering consumption), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time x typical flow) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures to ensure that fire hydrant permits are issued for use by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.	to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES										

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running x typical flowrate x number of events).	Default value of 0.25% of system input volume is employed	Coherent policies exist for some forms of unauthorized consumption but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records. Unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for certain events (ex: tampering with water meters); other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is quantified via formulae (time x typical flow) or similar methods.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of system input volume. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for use and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program. Workflow is driven chaotically by customer complaints with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters. Limited number of oldest meters replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. Population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters at varying lifespans to determine optimum replacement time for various types of meters.	Conditions between 8 and 10	Good records of number, type and size of customer meters; ongoing meter replacement occurs. Regular meter accuracy testing gives reliable measure of composite inaccuracy volume for the system. New metering technology is embraced to keep overall accuracy improving.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize procedures for meter recordkeeping with the electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.		to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new technology in Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering and customer consumption data.
Systematic Data Handling Error:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Vague policy for permitting (creating new customer accounts) and billing. Billing data maintained on paper records which are in disarray. No audits conducted to confirm billing data handling efficiency. Unknown number of customers escape routine billing due to lack of billing process oversight.	Policy for permitting and billing exists but needs refinement. Billing data maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work conducted to confirm billing data handling efficiency. Volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for permitting and billing exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy for permitting and billing is adequate and reviewed periodically. Computerized billing system in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	Permitting and billing policy reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Annual internal checks conducted with periodic third party audit. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound policy exists for permitting of all customer billing accounts. Robust computerized billing system gives high functionality and reporting capabilities. Assessment of policy and data handling errors conducted internally and audited by third party annually, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy for permitting and billing. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy for permitting and billing. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine permitting and billing procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of permitting and billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that internal and third party audits are conducted annually.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound policy and procedures for permitting and documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedure that result in poor documentation.	to qualify for 4: Complete inventory of paper records of water main installations & abandonments for a number of years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation and abandonments.		to qualify for 6: Finalize updates/improvements to policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic databases with backup as justified.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Permitting policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Permitting policy and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Permitting policy and procedures reviewed at least biannually. Well managed computerized information management system and routine, periodic field checks and internal system audits allows counts of connections that is no more than 2% in error.	Conditions between 8 and 10	Sound permitting policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections believed to be in error by less than 1%.
Improvements to attain higher data grading for "Number of Active and Inactive customer service connections" component:		to qualify for 2: Draft new policy and procedures for permitting and billing. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for permitting and billing. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with permitting policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of permitting policy and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Average length of customer service line:	Note: if customer water meters are located outside of the customer building next to the curbstop or boundary separating utility/customer responsibility, follow the grading description for 10(a). Also see the Service Connection Diagram worksheet.	<p>Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curbstop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)</p> <p>Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curbstops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curbstops.</p> <p>Policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curbstop is the property of the water utility; and the piping from the curbstop to the customer building is owned by the customer. Curbstop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.</p> <p>Good policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curbstops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records.</p> <p>Clear policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.</p> <p>Clearly worded policy standardizes the location of curbstops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curbstops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.</p>									<p>Either of two conditions can be met to obtain a grading of 10:</p> <p>a) The customer water meter is located outside of the customer building adjacent to the curbstop or boundary separating utility/customer responsibility for the service connection piping. In this case enter a value of zero in the Reporting Worksheet with a grading of 10.</p> <p>b). Customer water meters are located inside customer buildings, or the properties are unmetered. In either case the distance is highly reliable since data is drawn from a Geographic Information System (GIS) and confirmed by routine field checks.</p>

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		<u>to qualify for 2:</u> Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curbstops. Obtain the length of this small sample of connections in this manner.	<u>to qualify for 4:</u> Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		<u>to qualify for 6:</u> Establish coherent procedures to ensure that policy for curbstops, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		<u>to qualify for 8:</u> Implement an electronic means of recordkeeping, typically via a customer information system or customer billing system. Standardize the process to conduct field checks of limited number of locations.		<u>to qualify for 10:</u> Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		<u>to maintain 10:</u> Continue with standardization and random field validation to improve knowledge of system.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breach pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breach pressure zones. Well-covered telemetry monitoring of the distribution system logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable SCADA System data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data.
Improvements to attain higher data grading for "Average Operating Pressure" component:		<u>to qualify for 2:</u> Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	<u>to qualify for 4:</u> Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		<u>to qualify for 6:</u> Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		<u>to qualify for 8:</u> Install a Supervisory Control and Data Acquisition (SCADA) System to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		<u>to qualify for 10:</u> Obtain average pressure data from hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		<u>to maintain 10:</u> Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of documentation on many operating functions making calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Gaps in data known to exist, periodic internal reviews conducted but not a structured audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and periodically by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		<u>to qualify for 2:</u> Gather available records, institute new procedures to regularly collect and audit basic cost data of most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		<u>to qualify for 8:</u> Standardize the process to conduct routine financial audit on an annual basis.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):		Antiquated, cumbersome water rate structure is use, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Customer population unmetered. Fixed fee charged; single composite number derived from multiple customer classes.	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, including residential, commercial, industrial and any other customer classes within the water rate structure.	Conditions between 8 and 10	Third party reviewed weighted average composite consumption rate (includes residential, commercial, industrial, etc.)
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		<u>to qualify for 2:</u> Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	<u>to qualify for 4:</u> Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		<u>to qualify for 6:</u> Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	<u>Meter customers and charge rates based upon water volumes</u>	<u>to qualify for 8:</u> Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to qualify for 10:</u> Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to maintain 10:</u> Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate calculation of unit variable production costs based on these two inputs only. All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power and treatment (ex: liability, residuals management, etc.) are included in the unit variable production cost. Data audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent variable production costs tracked. Data audited at least annually by utility personnel, and periodically by third-party.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all primary and secondary cost components on an annual basis. or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		<u>to qualify for 2:</u> Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, etc.) should be included to calculate a more accurate variable production cost.		<u>to qualify for 8:</u> Formalize the accounting process to include primary cost components (power, treatment) as well as secondary components (liability, residuals management, etc.) Conduct periodic third-party audits.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service
For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.					

Once data has been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities in gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

**General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)**

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 - 5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		



WATER DEPARTMENT MEMORANDUM

DATE: August 20, 2014

TO: Water Supply Advisory Committee

FROM: Toby Goddard

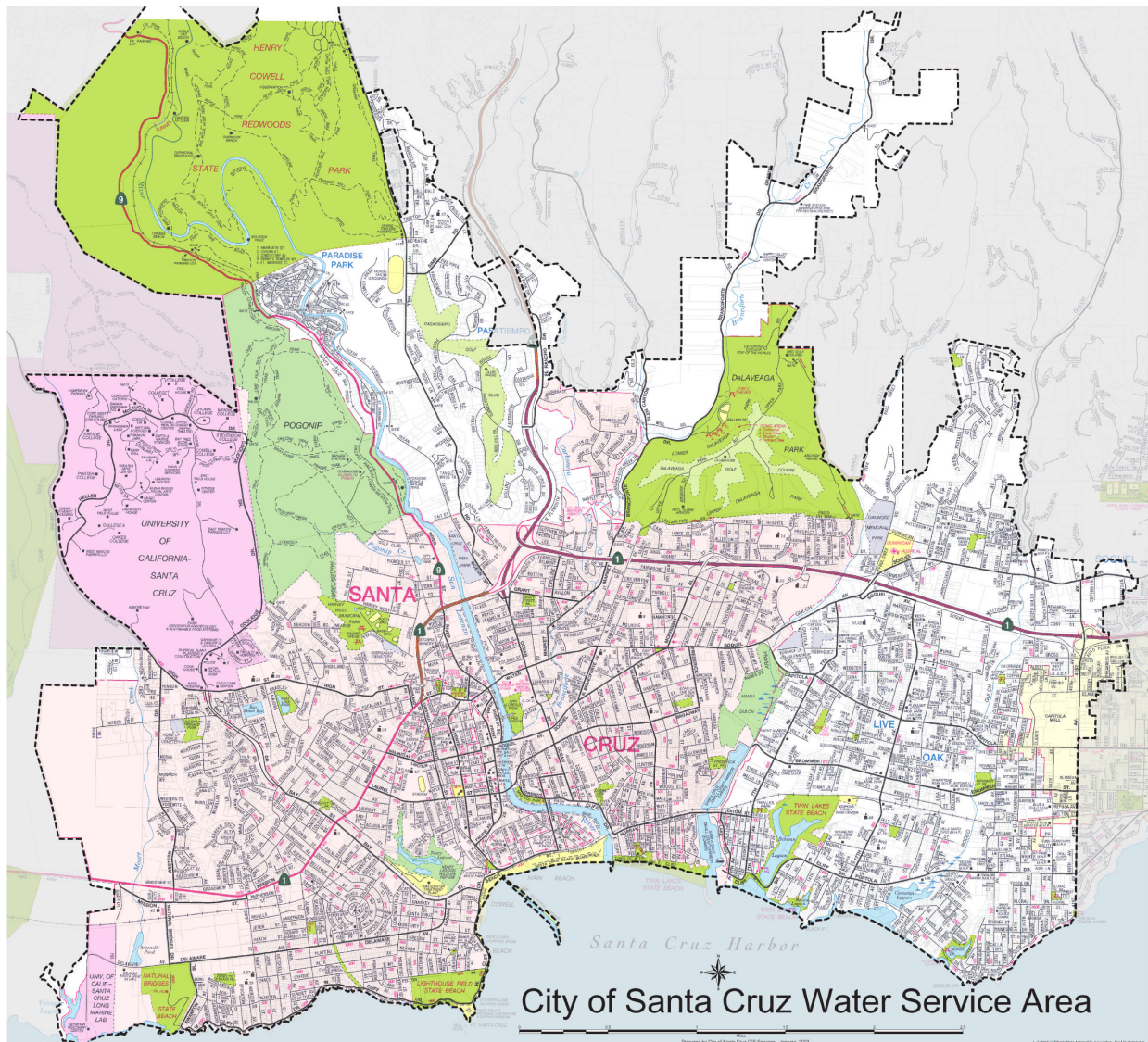
SUBJECT: Historic Water Demand Related to Growth

BACKGROUND: Growth and development in the City of Santa Cruz water service area is guided by a number of local and regional planning documents and policies, including City and County General Plans, housing elements, local coastal zone programs, University long-range development plans, and others. These planning documents not only shape land use and development; they express the values and desires of the community about the area's future physical, social, economic, cultural, and environmental character. By establishing the location, intensity, and type of land use in the region, they also have the potential to influence and shape the demand for water in the community, directly or indirectly.

This staff report is the first two parts exploring community growth and development in Santa Cruz. It provides a brief profile of the service area, describes how the Water Department currently tracks growth, and presents information on recent trends in growth and in water use. It will be followed by a subsequent report describing future growth projections in the service area and the water demand that could potentially be generated by ongoing growth.

Profile of the Service Area

The City provides water service to an area approximately 20 square miles in size, including the entire City of Santa Cruz, adjoining areas of Santa Cruz County, a small part of the City of Capitola and to selected parcels on agricultural lands north of the City. The general geographic area served by the City water system (not including the north coast) is shown in the figure below.



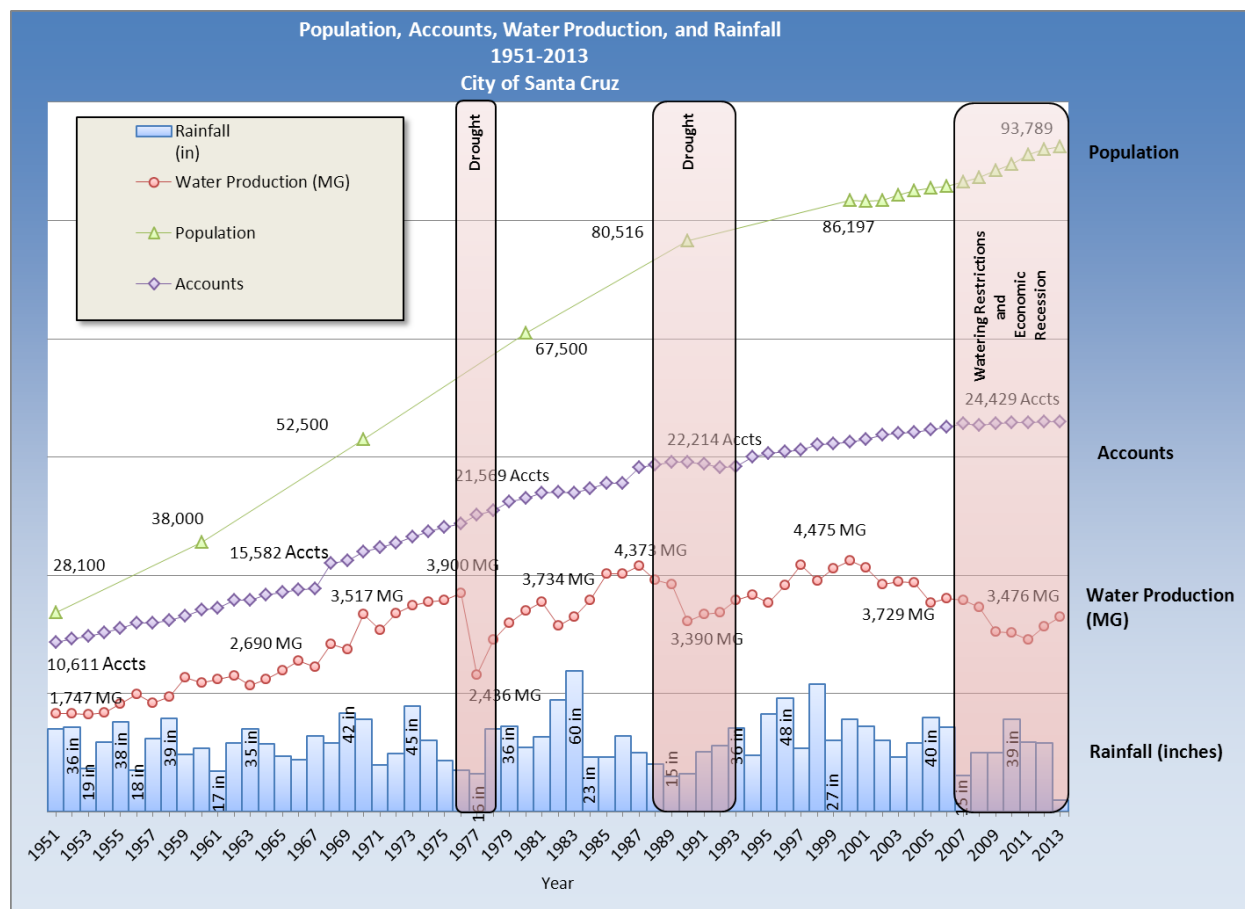
In terms of the service area boundary, the size of the service area has remained relatively fixed over time due to a long-standing prohibition against new water connections along the north coast, the acquisition of open space lands which created a greenbelt around the City, and the County's urban services boundary, all of which have served to inhibit urban sprawl. Within the City's water service area, vacant land is increasingly scarce.

Population: The present population of the service area is estimated to be 94,880, with 63,440 or 67 percent of the total population residing in the City of Santa Cruz (California Department of Finance, 2014).

Housing Units: The 2010 U.S. Census reported a total of 23,316 housing units in the City of Santa Cruz. Outside the City, it was estimated that there are another 14,500 housing units in the unincorporated area, and another 255 in the City of Capitola (City of Santa Cruz, 2010). Accordingly, the total housing units served by the City number about 38,000.

How the Water Department Tracks Growth

Population, account growth, and water production are the primary metrics the Water Department has traditionally used to track service area growth over time. The chart below shows long-term changes in these parameters going back to the early 1950s.



Beginning in 1996, the Department developed new utility billing system reports to better understand the actual water demands associated with new development.

Each year, one report is generated that identifies all new water accounts that were added during the previous year. Because these accounts are activated at different times of the year, it is not until the following year that the full annual demand associated with these accounts is available. Therefore, another, companion report was developed to look back at these same accounts one year later and add up the water they used over the first full year in service.

It is important to clarify what these billing reports represent and what they do not represent. Most major development that occurs in the service area requires a new water account and these new development projects are captured on the report. However the

changes in water use associated with remodels, additions, or tenant improvements on existing properties with an existing water service are not captured, unless the project triggers the need for a new water account. It also does not capture changes in use or occupancy that might require a larger meter to serve the property, but not a separate, new water meter. As a result, while the report gives a reasonably good approximation of how much water is associated with new development, it is acknowledged that it gives a somewhat incomplete picture of all the various types of building improvements and construction projects that are occurring throughout the community. Ultimately, the change in water use associated with these smaller construction projects is captured, whether higher or lower, and reflected in the sales reports for the existing customer base.

Another possible approach to track added water demand from growth would be to use building permit reports. However, the Water Department has found building permits are not an effective mechanism for this purpose. For one, there can be a long time lag between permit issuance, construction, final inspection, and occupancy. Second, it would be a challenging job to separate all the different types of building permits issued in each jurisdiction to assess what constitutes new development, and then try to match it to the Water Department's account classification system.

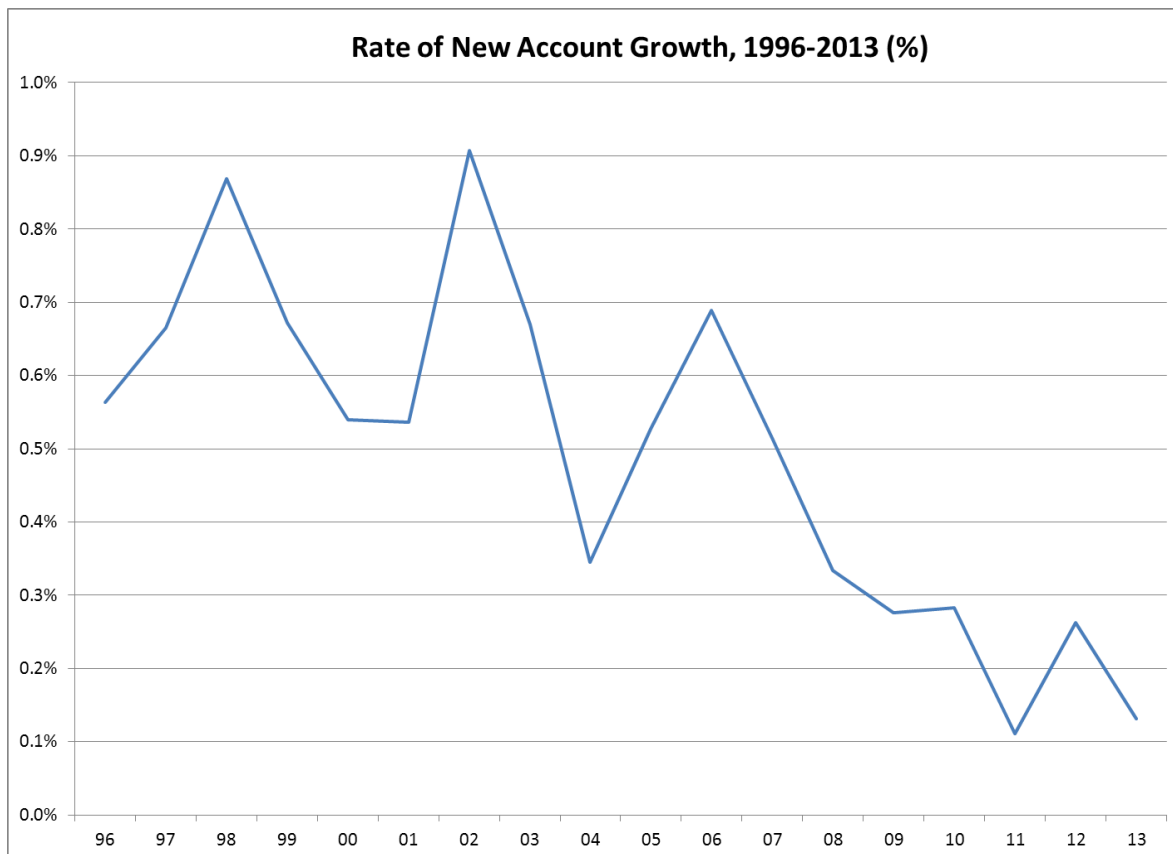
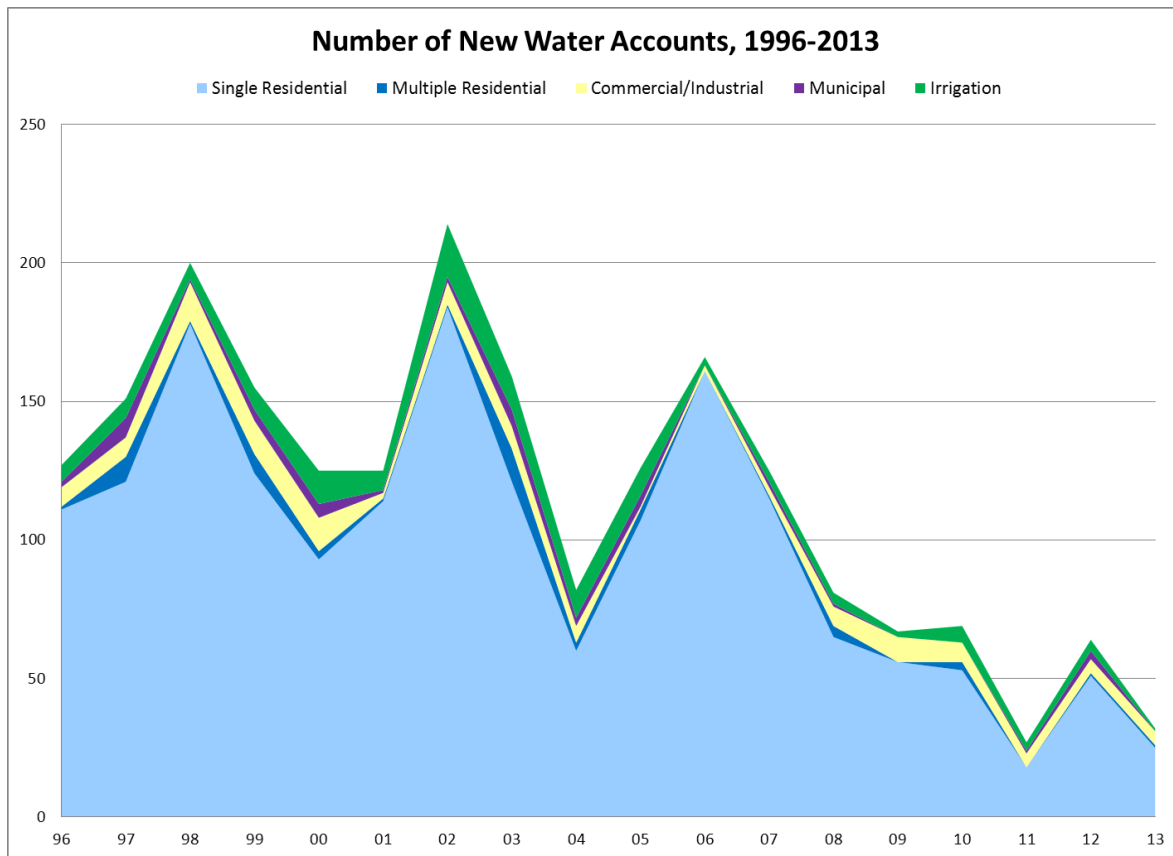
Number of New Accounts And Associated Water Demand

The chart below shows the number of new accounts added annually to the City's water system since 1996, by type of account. It reveals a number of noteworthy trends:

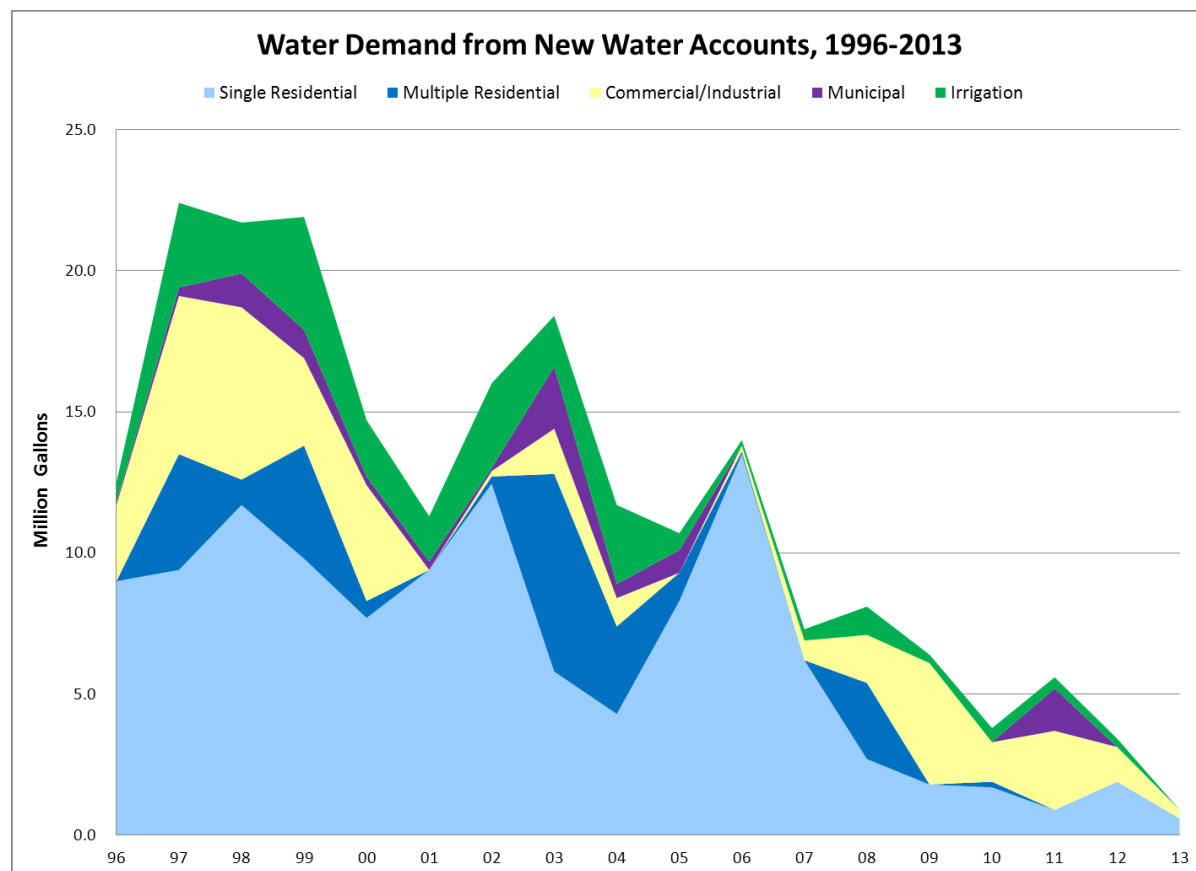
- The overwhelming majority of new accounts being added are single family residential accounts.
- There is substantial variation in the number of accounts added from year to year.
- The number of new accounts dropped significantly in 2008 and has remained low ever since.

Since 1996, a total of 2,095 new accounts have been added to the water system. During this time, the number of new accounts has ranged from as many as 214 in 2002 to as few as 27 in 2011 and averaged 116 new accounts per year. On average, there have been 98 new single residential accounts, 3 multifamily residential accounts, and 16 other (commercial, industrial, municipal, or irrigation) accounts added to the system annually since 1996.

The annual growth rate in new accounts, expressed as a percent of total accounts, has averaged from a high of 0.9 percent per year to a low of 0.1 percent per year, and has averaged 0.5 percent per year over the last 18 years.



The chart below illustrates the corresponding amount of water demand added to the system by new accounts since 1996. Over this time, new accounts have added between 22 million gallons per year in 1997 to 3 mgy in 2012, averaging just under 12 mgy¹. Like the number of new accounts, the amount of water added annually is not uniform but varies widely over time and has decreased substantially in recent years.

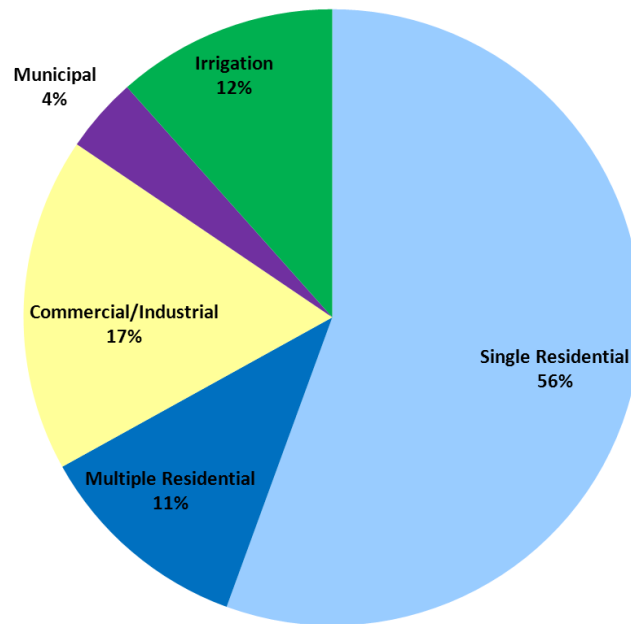


As can be seen above, even though new multifamily residential, commercial, and irrigation accounts are been relatively few in number, they tend to use more water per account than do single family accounts. As a result the distribution of new water use by customer category is different than the distribution of new water accounts. The pie chart below shows the aggregate water demand used by new accounts from 1996 through 2012, by customer category. Overall, the proportion of water used by each major customer category for these new accounts is not altogether unlike that of the service area as a whole. Roughly two-thirds of the new account consumption goes to residential uses, and the remaining one-third going to commercial, irrigation and municipal uses.

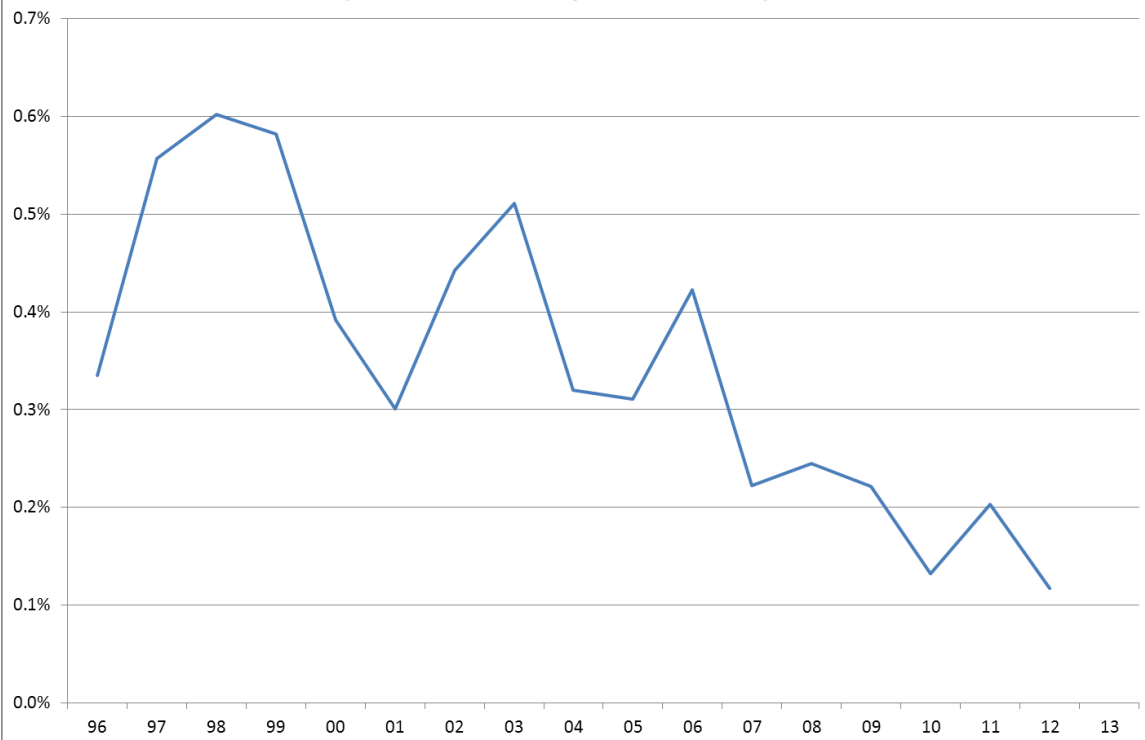
The amount of new water demand, expressed as a percent of total system demand ranges from 0.6 to 0.1 percent and averages 0.3 percent over the last 18 years.

¹ Consumption data for 2013 are incomplete and are included only as a placeholder to be updated later in 2015.

**Percentage of Water Demand in New Accounts, 1996-2013
by Customer Category**

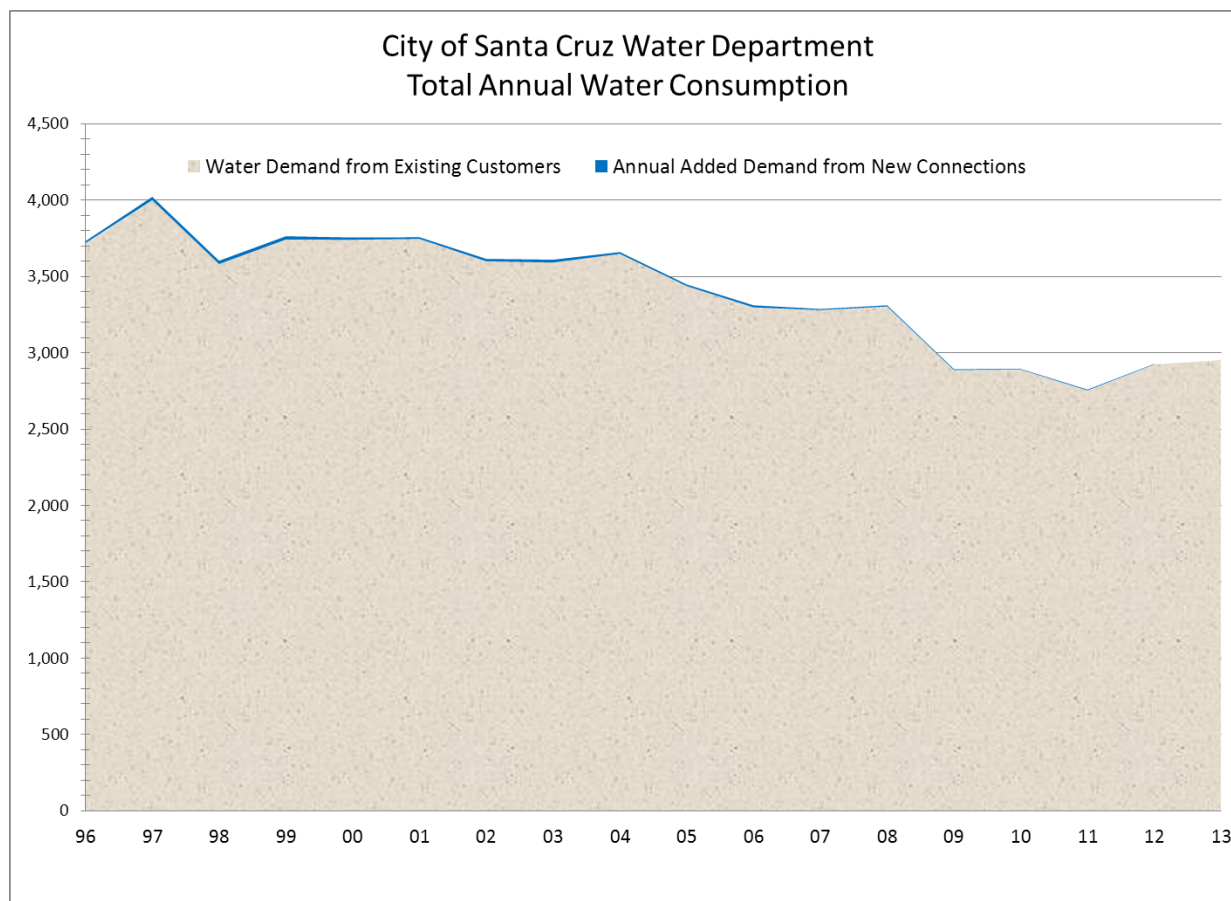


**Water Demand Associated with New Account Growth, 1996-2013
(Percent of Total System Demand)**

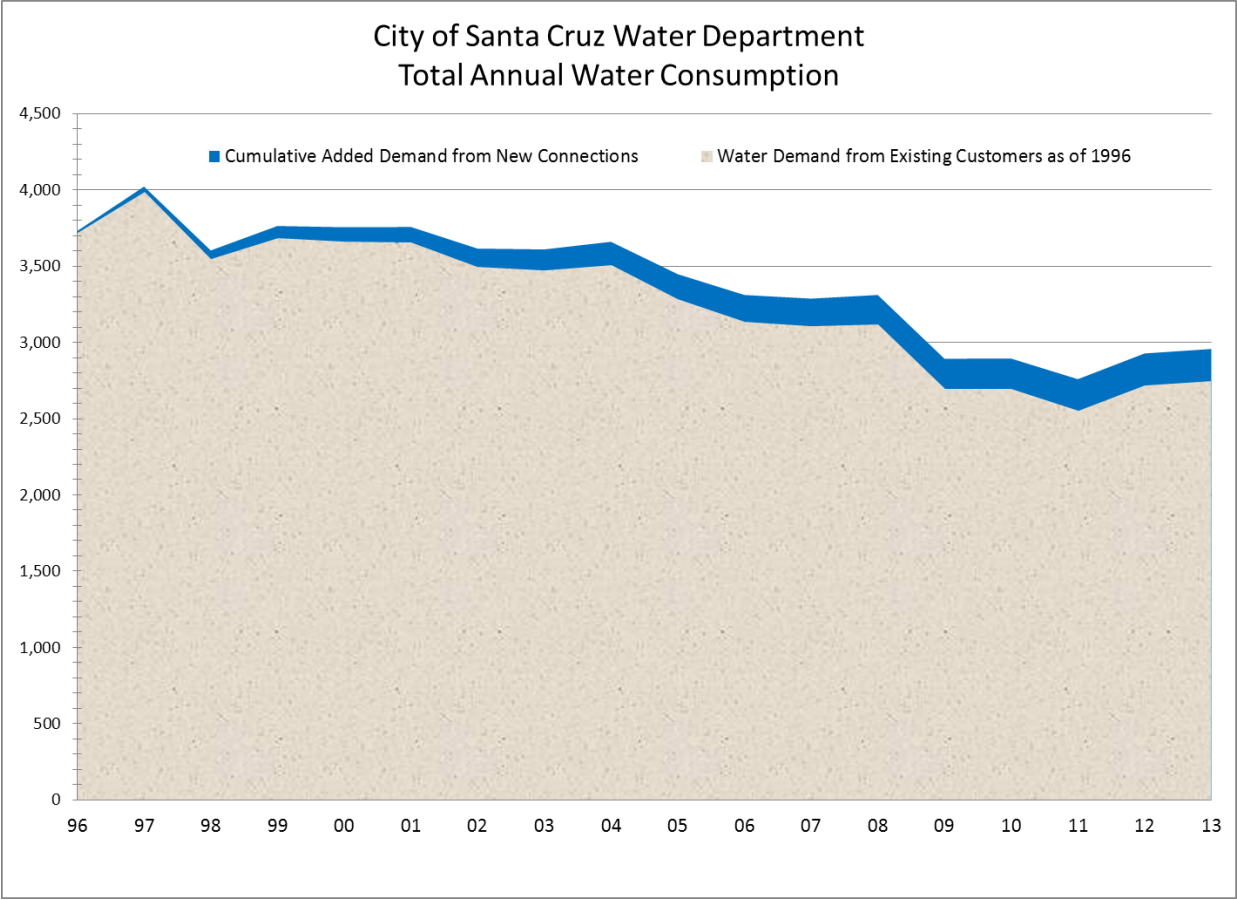


Water Demand from New Accounts Relative to Overall System Demand

Finally, it is of interest to examine how the amount of water demand associated with new accounts compares to the overall level of consumption on the system as a whole. On an annual basis, the amount of water from new connections is negligible relative to the amount of water used by all other customers, especially in recent years.



When viewed on a cumulative basis, however, the amount of water from new connections appears to be more noticeable. During the past 18 years, a total of about 211 million gallons in water demand has been added to the system from 2,095 new water accounts. This does not necessarily imply, however, that overall water demand is higher today than it was in 1996. Over that same time period, overall metered water consumption has declined from 3.7 billion gallons in 1996 to less than 3.0 billion gallons in 2013, even with new water demand. There are a number of reasons that have contributed to this decline, including loss of industry, rate and rate structure changes, water restrictions, economic downturn, plumbing code changes, and long-term conservation effects. But because the influence from new accounts is still relatively small compared the existing customer base, it is larger changes on the base, and not water demand new accounts, that determines the overall direction of water use, which has been generally downward in recent years.



Attachment:

- 1. Data Table

Attachment 1. Data Table for Historic Water Demand Related to Growth

Year	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	Total	Average	Percent
New Service Connections	127	151	200	155	125	125	214	159	82	126	166	125	81	67	69	27	64	32	2,095	116	
New Water Demand (mgd)	12.5	22.4	21.7	21.9	14.7	11.3	16.0	18.4	11.7	10.7	14.0	7.3	8.1	6.4	3.8	5.6	3.4	0.9	210.8	11.7	
New Service Connections																					
Single Residential	111	121	178	124	93	114	184	121	60	107	161	115	65	56	53	18	51	25	1,757	98	83.9%
Multiple Residential	1	9	1	7	3	1	1	12	3	4	0	1	4	0	3	0	1	1	52	3	2.5%
Commercial/Industrial	7	7	14	12	12	2	8	8	6	1	2	3	7	9	7	5	5	5	120	7	5.7%
Municipal	2	7	1	4	5	1	2	6	3	4	0	2	1	0	0	1	3	0	42	2	2.0%
Irrigation	6	7	6	8	12	7	19	12	10	10	3	4	4	2	6	3	4	1	124	7	5.9%
Total	127	151	200	155	125	125	214	159	82	126	166	125	81	67	69	27	64	32	2,095	116	100.0%
New Water Demand (mgd)																					
Single Residential	9.0	9.4	11.7	9.8	7.7	9.4	12.5	5.8	4.3	8.3	13.5	6.2	2.7	1.8	1.7	0.9	1.9	0.6	117.2	6.5	55.6%
Multiple Residential	<0.1	4.1	0.9	4.0	0.6	<0.1	0.3	7.0	3.1	1.0	0.1	0.0	2.7	0.0	0.2	0.0	<0.1	<0.1	24.0	1.3	11.4%
Commercial/Industrial	2.7	5.6	6.1	3.1	4.1	<0.1	0.2	1.6	1.0	0.0	0.2	0.7	1.7	4.3	1.4	2.8	1.2	0.3	37.0	2.1	17.5%
Municipal	0.1	0.3	1.2	1.0	0.3	0.3	0.1	2.2	0.5	0.8	0.0	0.0	<0.1	0.0	0.0	1.5	<0.1	0.0	8.3	0.5	3.9%
Irrigation	0.7	3.0	1.8	4.0	2.0	1.6	3.0	1.8	2.8	0.6	0.2	0.4	1.0	0.3	0.5	0.4	0.3	<0.1	24.4	1.4	11.6%
Total	12.5	22.4	21.7	21.9	14.7	11.3	16.0	18.4	11.7	10.7	14.0	7.3	8.1	6.4	3.8	5.6	3.4	0.9	210.8	11.7	100.0%
Existing water accounts																					
Growth Rate (%)	22,557 0.6%	22,694 0.7%	23,024 0.9%	23,061 0.7%	23,170 0.5%	23,310 0.5%	23,590 0.9%	23,724 0.7%	23,799 0.3%	23,924 0.5%	24,096 0.7%	24,305 0.5%	24,228 0.3%	24,310 0.3%	24,351 0.3%	24,357 0.1%	24,425 0.3%	24,429 0.1%		0.5%	
Annual Water Demand																					
Growth Rate (%)	3,731 0.3%	4,022 0.6%	3,603 0.6%	3,763 0.6%	3,755 0.4%	3,757 0.3%	3,615 0.4%	3,602 0.5%	3,659 0.3%	3,447 0.3%	3,311 0.4%	3,287 0.2%	3,311 0.2%	2,893 0.2%	2,874 0.1%	2,759 0.2%	2,928 0.1%	3,042		0.3%	

TO: Water Supply Advisory Committee
FROM: Doug Engfer, Committee Member
Tina Shull and Rosemary Menard, City of Santa Cruz
RE: Community Attitudinal Survey – Concept Paper
DATE: August 21, 2014

Note: At the July 10 meeting of the WSAC Outreach Subcommittee, the idea of conducting a community attitudinal survey was raised as one way to generate information about community values and concerns that might be useful to the WSAC during its deliberations. Tina Shull was asked to do some preliminary research about such a survey and report back to the Outreach Subcommittee at its July 30th meeting. The Outreach Subcommittee report to the full Committee on July 31st included a brief mention of a potential survey and it was agreed that a concept paper on a potential community attitudinal survey would be prepared for discussion at the August WSAC meeting.

This concept paper describes preliminary thinking about how a community attitudinal survey might be used to capture attitudes, values and beliefs surrounding Santa Cruz's collective quality of life and community characteristics as they relate to water supply reliability issues. The following we trust will set up the Committee for a healthy discussion.

Why Collect Information from the Community?

The Water Supply Advisory Committee is in a position of substantial responsibility, tasked with delivering to the City Council policy recommendations to address the City of Santa Cruz's vulnerable water situation. These recommendations are to be rooted in a variety of criteria and inputs, and the Committee has obtained the services of experts to assist them to sort through the drivers of our water supply challenges and uncertainties, e.g., climate change, water releases for fish habitat, etc.

While the Committee can obtain clarity about the technical and scientific aspects of various options and thereby bracket uncertainties to some degree, what we lack is a lens through which to view the science and data in order to develop politically-feasible policy options. That lens, we submit, is the community's expressed values and desired quality of life and community characteristics, particularly as they relate to water. The Committee would be hard pressed to select viable options without gaining a better understanding of what matters most to the community and how our residents want to live and have our local economy operate. This perspective is important to advancing the Committee's work from Recon to the Real Deal. Moreover, as the City Council ponders the choices presented next year, having broad-based information about the community's values will be critical.

Question to the Committee: Do we agree that collecting such information from the community makes sense?

What would be the Goal of a Formal Community Survey?

The goal of a formal survey would be to gather statistically valid, reliable, and significant data to measure the greater community's attitudes about community character and quality of life, as they relate to water supply and demand. This survey would not serve as a vetting tool for possible strategies or options; rather, it gets to the underlying criterion of community standards that any future strategies or options must at least take into account and, ideally, meet. In addition, survey results would help the Committee better understand and plan for the nature, scope, and content of the conversation it will be having with the community when it presents its recommendations.

Survey data can be used by the Committee as input for consideration during the evaluation of alternatives using MCDS, for example, as well as inform the creation and consideration of management actions and strategies related to scenarios. As the Committee develops and refines criteria for use in these evaluations, knowing that survey data will be available to inform rating and weighting of criteria would mean that Committee members don't have to depend entirely on personal judgment, anecdotal evidence, or other informal sources of information as they rate alternatives and weight criteria.

Question to the Committee: Do we agree that a formal survey of some form is the right way to collect this information?

In developing and deploying a formal survey, there are critical questions to be answered beforehand:

1. **Who** should conduct the survey?
 - a. Committee or its consultants?
 - b. The City?
 - c. An independent 3rd party?

The City has used a polling professional (Gene Bregman) to conduct a number of similar surveys for many years. We would suggest that the Committee engage this firm, with Council approval and funding, to do this work and that the Outreach Sub-committee, our consulting team, and City staff be actively engaged in working with the firm to consider and develop the sampling strategy, the survey questions, and the approach to analyzing the results. In order to avoid survey bias, it's important that the content of the survey remain confidential prior to its administration. Therefore, the Outreach Sub-committee will be responsible for the survey content (acting on behalf of the Committee as a whole). The Committee would review and approve the strategy and analytic plan (but not the actual survey questions).

Questions to the Committee: Do we agree that we should work with the City's incumbent survey firm as described here?

2. **Whom** do we ask and **How**?
 - a. City residents?
 - b. Water service single and multi-family residential customers?
 - c. Registered voters?
 - d. Likely voters?
 - e. Other?

There are several modes of data collection available to the Committee. The classic tool for developing statistically valid polling-type data is a randomized telephone survey. Others tools include web-based surveys, focus groups, “man on the street” or door to door interviews, comment cards, online forums, etc. Each of these tools has its special strengths and limitations. We propose that the formal survey be conducted as a randomized, phone-based survey. However, it is highly likely that a wide variety community based information gathering tools will be developed and applied during the WSAC process.

We asked Gene Bregman to comment and he provided the following guidance.

Sample Size. $n = \sim 400$ for statistical significance, drawn from Santa Cruz Water Service Area.

Survey Options:

1. **Telephone Survey Using Voter registration data.** Administered over a weekend. Voter registration data can be culled to fit the geographic area desired. In this case, the survey administrator would overlay a map on precinct data to create a bank of telephone numbers associated with people registered in that area.
 - a. Cell v. landline. Telephone contact information is provided on the voter registry card. Survey administrators would call the numbers provided (randomly selected from the total bank). This naturally produces a sample with a mix of cell and landlines as voters use both cell and land lines as their contact numbers when registering to vote. Recent surveys conducted by the survey administrator showed between 38% and 53% of numbers called were cell phones (survey administrators ask this question). Nationwide, it is estimated that about 40% of households have cell phones only.
 - b. Cost. For a 400-respondent survey with an average length of about 18 minutes, the costs are approximately \$22,000. Shortening the survey, which is very possible here because a ballot measure is not being tested, reduces the cost.
 - c. Pros. Most efficient method of collecting quantitative data (geographic area is pre-vetted, survey administrators know respondents live in the designated area). Queries the most civically engaged citizens who may be more likely to be involved in future civic issues. Captures local residents who have out of area cell phones.

- d. Cons. Does not capture data from people who are not registered to vote or do not have telephones. Demographics may be viewed as narrow: trend toward longer-term residency, home owners, more aged.
- 2. **Telephone Survey Using Random Digit Dial.** Administered over a weekend (but requires more time than a voter registry based survey). The surveying agency must determine what proportion of land to cell phones it desires. Then, a random dialer is deployed that uses the 831 area code and the most common three-digit prefixes in the desired geographic area. Location still must be screened by the survey administrator (confirming usually by zip code, but we may need to refine further given the sample area spanning parts of several zip codes).
 - a. Cell v. landline. Survey administrators need to ask if cell or land line was called and once the pre-designated quota for either cell or land line is fulfilled, will only administer survey to the other category of phone lines.
 - b. Cost. Add about 50% in cost to a voter registry based survey due to complexity of deriving the sample and reduced efficiency when administering the survey. (~\$33,000).
 - c. Pros. Captures data from residents in an area as opposed to residents registered to vote in an area. Gathers a more general pool of opinions.
 - d. Cons. Costly and much less efficient. Will miss those who live locally but have out of area cell phones.
- 3. **Door-to-Door Field Survey.** A good random sample of addresses and a lot of manpower and time is required to administer this type of survey. Survey administrators receive a list of addresses and are deployed in the field to knock on the designated doors and administer the survey.
 - a. Cost. Will cost a lot more than a telephone survey because of labor costs and low efficiency. For example, during a telephone survey, if the line called is unanswered, the survey administrator moves on and is dialing a new number within five seconds. A field survey requires the administrator to physically travel to the next household on the list.
 - b. Pros. Reaches absolutely everyone in an area.
 - c. Cons. Much less efficient. Costly. Takes a lot more time.

We recommend a randomized phone-based survey that samples registered voters from the entire City's water service area.

Question to the Committee: *Do we agree on this mode of administration?*

Question to the Committee: *What is the target pool for the survey?*

3. **What** questions do we ask?

Drafting the questions for a survey is the most important component of this process. The survey(s) can't be too long, can't be leading or suggestive and must be fine-tuned to ask what you need to know. The Stratus team has indicated that it has experience in drafting survey questions and could therefore assist in the process. As noted above, we recommend that the

Outreach Committee lead this effort, with support from Stratus, City staff, and the professional survey firm. We recommend that input into the questions come from a variety of perspectives. The Committee's role in reviewing the questions would help ensure both balance and breadth.

Preliminary thinking about potential topics to address include:

- Degree of interest in aquatic habitat support (how much water should be provided for fish?)
- How important is it to citizens to maintain water for dry season irrigation for use in public and private landscapes, gardens and open spaces?
- Attitudes toward other outdoor water use (what about pools, hot tubs, car washing and driveway/sidewalk washing?)
- Attitudes toward recreational facilities (grass or artificial turf?)
- Extent of willingness to personally conserve (how long and how much?)
- Extent of willingness to regularly or frequently impose light or stringent conservation measures on community (what should everyone do?)
- Extent of tolerance for uncertainty in water supply and ad hoc water rationing as needed (to what degree does the community desire stability and predictability?)
- Willingness to have negative impacts on local economy (how acceptable are business losses, opportunity costs, and temporary to prolonged economic hardship?)

Question to the Committee: Any other suggested topics for consideration in the survey?

4. **When** should we survey?

We suggest conducting the survey in early fall in order to provide information for the Committee to consider as it finishes the Recon phase and begins transitioning into the Real Deal. This timing also allows us to collect information from the community when its focus on and awareness of water issues is high due to the continuing drought and current water restrictions.

Question to the Committee: Do we agree on this timing?

Developing and Deploying Additional Community and Sector Specific Input Tools for Consideration

In addition to a survey which has the benefit of providing statistically valid information, there are other tools that the Committee might consider to supplement and complement results from a survey of registered voters. For example, the Committee might want to consider the following questions:

- Does the Committee (or the constituencies Committee members represent) want additional specific sector opinions (Business, tourism, agriculture, education)?
- Does the Committee want to deploy online tools in addition to or instead of other tools or strategies (understanding the self-selective aspects of these tools)?

- Does the Committee want to consider other specialized services to gather more general input such as Civinomics' iPad surveys or Peak Democracy's online forum, or focus groups to delve into more details about trends, values, and issues?

As indicated earlier in this concept paper, the WSAC's work will create many opportunities for gathering information from the public and incorporating the information gathered into the Committee's analysis. We recommend that the Committee further task the Outreach Subcommittee (along with its consultant and staff support) to consider, as it develops its outreach strategies, what tools should be developed and deployed to support the various outreach initiatives it will be developing and implementing.

Question to the Committee: *Do we agree that this is the ongoing responsibility of the Outreach subcommittee?*

DATE: August 22, 2014

TO: The Water Supply Advisory Committee

FROM: WSAC Subcommittee on the Santa Cruz Water Supply Convention
(Doug Engfer, Sarah Mansergh, Sid Slatter, and Rosemary Menard)

SUBJECT: Concept Paper on WSAC and participant experience at the Santa Cruz Water Supply Convention, including how the WSAC and other participants will evaluate Convention submissions for improving the reliability of Santa Cruz's water system

In planning for the Santa Cruz Water Supply Convention, the WSAC and the SIAC subcommittee working on this effort have done only some general thinking about what they want to get out of it. We all think that there are a lot of possibilities for what this event can produce in terms of the participants' experiences – for the Committee, those submitting proposals, and those visiting the event to learn more about options for improving the reliability of the Santa Cruz water supply.

This note addresses two topics about the Convention: what we want the various types of participants to experience (learn, practice, and come away with, individually and collectively), and how we might provide participants the means to evaluate the alternatives and communicate their evaluations to the Committee.

The Convention Experience

1. The Convention, in General

By way of context, here, in summary form, is our current working description of the Convention agenda and logistics:

- Final date still TBD, pending venue, Committee, and public scheduling.
- All-day event, with public participation from 11a-9p. Venue would be open for participants to set up starting at 8a and would remain open until 10p to allow for removal of exhibits, etc.
- General format is similar to a science fair or scientific poster session. Each presenter would have a tabletop display and handouts. Presenters would then engage interested visitors in relatively brief, but reasonably detailed discussions of their proposed solutions.
- There would be two "Plenary Sessions", one at 12p and one at 6p. Each of these would consist of (1) brief welcome and context-setting remarks (speaker TBD) and (2) a series of very brief (1-2 minute) "elevator pitches" by each interested presenter, highlighting the salient characteristics of their solution(s).

Santa Cruz Water Supply Convention: The Event and the Experience

- We would provide a handout to each participant, describing the event, their role, the overall context (e.g., approximate scale of the supply-demand mismatch, size of SCWD budget, etc.), and situating the Convention in the overall process (clarifying that we are collecting data right now, not making decisions).
- WSAC members would be free to roam the floor at will; however, each WSAC member will have one or more “assigned” solutions, so that we can ensure 100% coverage of all solutions by the Committee.
- Any member of the public is welcome to attend and/or evaluate the alternatives (that is, participation is not restricted).

Question to the Committee:

- *Any questions or improvements?*

2. The WSAC Experience

For WSAC members, along with the experience of interacting personally with a wide range of submitters and learning about a wide range of approaches to improving water supply reliability, the Convention would provide a key opportunity to practice using the multi-criteria decision support (MCDS) tool that is being developed for the Committee. This tool would be useful at the Convention and when reviewing submissions online outside of the Convention.

The SIAC subcommittee therefore recommends that WSAC members use the MCDS as their primary evaluation tool.

This would require that the Committee will have established and agreed upon those criteria and rating scales to be used in this Convention, and that the MCDS tool will be ready and accessible by the Convention. Those agreed-upon criteria and associated rating scales would be available to WSAC members to use in evaluating the strategies, ideas and alternatives presented both at the event and in the written submittals that will have been provided by those choosing to continue with the SIAC process. The criteria provided to those submitting proposals for the next step continue to focus on Practicability, Effectiveness, Environmental Impact, and Community Impact. Some sub-criteria have been identified for each of the criteria, and a task yet to be completed is the development of rating scales for these sub-criteria as well as any other criteria that the WSAC may want to add to the existing ones.

Results of the composite ratings produced by WSAC members would be compiled and presented to the WSAC during the October meeting. The Committee would be able to specify further analyses of the preliminary results, and those additional results would come back to the Committee at the November meeting.

Santa Cruz Water Supply Convention: The Event and the Experience

Whether additional functionality (for example, weighting of criteria, ranking the proposals, ability to note open questions, comments or concerns as free text, etc.) will be included in the instrument created to gather WSAC's ratings is an open question at this point. Input from the Committee and its facilitators would be valuable in considering this question.

Questions to the Committee:

- *Do you want to use the MCDS solution to evaluate the solutions?*
- *If so, what functionality do you want in the MCDS in order to support your evaluations?*

3. The Participant Experience

a. Submitter Participants

For those submitting strategies, alternatives, or ideas, a successful process and event will make them feel included, respected for their willingness to share their ideas and for the efforts that they have taken to do so, and exhilarated by the experience of being in a big hall with lots of citizens, elected officials, media, school children, college students, educators, business owners, and invited luminaries milling around, reading, talking, sharing, and learning. Whether their ideas rise to the top or ultimately are bypassed for other options, they will have had an opportunity to be heard, to have their input considered and to be a part of finding a solution the community can support.

Should these participants wish to do so, they could also participate in the same way that non-submitter participants will, by reviewing and evaluating some or all of the other presented solutions.

b. Convention-goer Experience

For those attending the Convention, their participation is a fabulous opportunity for them to be exposed to, learn about and consider a wide range of options for improving the reliability of Santa Cruz's water supply. Participants would be asked to circulate through the room and, using a much simplified set of criteria and rating scales, rate the submissions. For example, participants might be asked to score the submissions on a scale of 1 to 5, with 1 being low and 5 being high, on their Practicability, Effectiveness, Environmental Impact, and Community Impact. They might be asked to do forced rankings for these same criteria for categories of options such as demand management, storage, supply etc. (the basic list from the grouping on the website summary of submittals we received). They would be able to log free-text notes, questions, and comments, as well. This could be done using an online or interactive "app" on a smartphone, tablet or laptop.

Composite results from these ratings would be presented to the WSAC during the October meeting. The Committee would be able to specify further analyses of the

Santa Cruz Water Supply Convention: The Event and the Experience

preliminary results, and those results would come back to the Committee at the November meeting.

Another complementary idea would be to create a face-to-face opportunity for some participants to interact and provide more qualitative input as they leave the event. For example, a participant might be asked to take part in an exit interview with an interviewer who would sit down with the person and ask questions such as:

- Did you see an option (or more than one option) that you really liked and think should be implemented? If so, what was it about this option that made you choose it?
- Tell us about one thing you learned from attending this event?
- What surprised you most about what you saw here?
- Anything by way of options you expected to see that you didn't see?

c. Non-Convention Goer Experience

For those not able to attend the Convention, we will provide an opportunity for them to give us the same kind of input as event-goers can provide. Online access to the rating app would seem to make sense. We would need to provide clear expectations about timeliness of feedback. Otherwise, it seems as though the same rating tool could be used for both types of participants. Results from these evaluations would be included in the reports delivered to the Committee in October.

Question to the Committee:

- *Does this approach for community engagement meet the Committee's expectations? Any suggested improvements?*

Skeletal Requirements for “Alts App”: There’s an app for that!

The purpose of this section is to collect the functional requirements for technology-based solutions that will allow WSAC members and the public to record their evaluations of, thoughts about, and reactions to the various Strategies, Ideas, and Alternatives (“Alts” for short) that surface during the Recon period. In particular, the solution should enable folks to record their observations both at and away from the Convention.

Note that we anticipate that the WSAC will use the MCDS solution, rather than this “survey app”. However, the requirements here would help to define the functionality available to the Committee and to the Public, via those separate solutions.

[Functional requirements discuss the “what” (and, to some extent, the “why”) of the solution, without addressing the “how” – implementation is left largely up to the vendor/partner who will develop the solution. However, we may include some ideas or suggestions that read on “how,” just because we can’t help ourselves.]

Why Are We Doing This?

Here we list our goals in deploying this solution.

- Collect accurate, useful, analyzable, and reasonably complete evaluation information from respondents
- Get respondents thinking comprehensively about solutions for Santa Cruz’s water supply/demand imbalance
- Gain insights into the values, vision, and mindset of the broader community as they relate to the City’s water situation
- Generate outputs (reports) that deliver value to respondents (fulfilling the “bargain” for their time and effort in responding)

Users

Here we list the various Users of the solution.

- WSAC members (NB: will use MCDS solution, rather than public app)
- Solution submitters
- General public
- Local officials, office-holders, candidates
- Special guests, such as George T (UCD Emeritus), etc. (may want them to use MCDS solution, rather than public app)

Venues and Modes

Here we list the Venues where Users may use the solution and the technological Modes they may employ.

- At the Convention, based on prezos, handouts, and discussions
 - Portable device (phone, tablet, laptop)
- At home, etc., based on review of online submissions
 - Portable device or desktop

Evaluation Functionality

Here we describe the functionality that will support Users' Evaluations of "Alts". This focuses on "data entry" aspects of the solution.

- Simplicity and ease-of-use of the solution are critical, given that we are expecting untrained members of the Public to use this tool.
- Evaluate and "score" each solution based on previously-established criteria
 - Criteria for WSAC will be more-detailed than those for other groups, but will still fit largely within the framework of Effectiveness, Practicability, Environmental Impact, and Community Impact (some WSAC criteria may go beyond those areas).
 - Scoring v each criterion on a numeric scale (low values = poor; high values = outstanding).
 - Would not be scored relative to other solutions – rather, each solution is scored absolutely and independently.
- Ability to identify and enter open questions, comments or concerns about the solution or criteria (limited in scope)
 - Categorized? E.g., questions, comments, concerns, ...
- Ability to "score" the criteria (in essence, determining the respondent's "weighting" of the various criteria)
- Ability to collect information about the respondent's "water-related vision" for the City
 - [implementation note: this could be as simple as a single item that asks the respondent to choose (say) 5 adjectives that best-characterize their vision from a list of (say) 30.]
- Evaluate the Convention / process
- Ability to access and update one's evaluations from multiple venues and on different days.
 - It may take folks several days to get through all of the submissions. Need to allow them to get into their evaluation repeatedly, and potentially from different venues.
 - At the same time, need for their responses to be reasonably "secure" so that folks are confident that no one can change their responses.
- Do we allow folks to see the results of their evaluations, in a scoring hierarchy?
 - There are psychometric arguments on both sides here.

Santa Cruz Water Supply Convention: The Event and the Experience

- One option is to only allow the “review” mode after the person says that they are done scoring (and then not allowing them to go back and re-score). Alternatively, the scoring hierarchy could be highly interactive, with the solution permitting users to change their scoring at will.
- Collect some (very basic) demographics about the respondent (SCWD customer, City/non-City, etc.)
- Reasonable expectation of anonymity by respondents.

Analytics and Reporting

Here we discuss examples of the types of analyses we may want to conduct on the data we collect using this solution.

- Want to be able to view analytics by “group” (WSAC, Public, Officials, etc.), though not individually.
 - [implementation note: There is a case to be made that we would NOT see these analytics for the WSAC just yet.]
- Want to be able to see how solutions “scored”, by each criterion.
- Both weighted and unweighted scoring
- View the Convention / process evaluations
- [maybe] Correlative analysis of Convention/process evaluations against solution scoring results (may help us understand any weird variances in either dataset)
- Basic demography of respondents: in/out city limits, SCWD customer or not, “group” (as identified above), etc.

Other Considerations and Open Questions

Here are some thoughts that don’t fit into the other categories.

- [DRE] I’m hopeful that one basic solution can be used across the board here.
- [DRE] I’m thinking that something web-based probably makes the most sense.
- [DRE] How do we support folks at the event who do not have access to a portable computing device?
- [DRE] I presume that we can direct folks without computers to the Public Library for access to the system.
- [DRE] How do we prevent folks from submitting more than one set of evaluations (ballot-box stuffing)? Or do we really worry about this? Need advice here from survey folks.

Question to the Committee:

- *Any questions or improvements?*

DATE: August 22, 2014

TO: Water Supply Advisory Committee

FROM: Rosemary Menard, Santa Cruz Water Director

SUBJECT: Recon Report Response to Questions Related to the supply/demand slide deck

On Friday August 1, 2014 email WSAC member Rick Longinotti sent the following email to Bob Raucher (see also the attachment provided and referred to in the last paragraph of the email.

This report provides information in response to this request, including a schematic of how the Confluence model works (inputs, process, outputs), specific responses to the question regarding the starting lake level for Loch Lomond used in developing slides 54, 55, and 56, and an explanation of how the model projects lake levels in all the years of the hydrologic record (e.g., what is the rule curve for the operation of Loch Lomond that is used as an input to the model.)

Dear Bob,

I am putting this in writing in order to spare my colleagues on the WaterSac a long-winded request. At yesterday's meeting, I made a request that the model for the worst-case year (1977) be updated given our experience with this year's runoff conditions. I would like to understand the discrepancy between the model's prediction of a peak season shortfall of 650 million gallons when the water supply forecast given to the Water Commission in April predicts a shortfall of 383 million gallons. The April agenda packet reports, "Staff is forecasting that the river can be expected to run at levels equal to 100% of what occurred in 1977".

I have three additional requests:

1. that all the assumptions and data for the *Confluence* model be made public.
2. that the water supply operations assumptions for the baseline scenario (the do-nothing scenario) include the capital improvements and conservation measures that are already underway or planned by the Water Department.
3. that the all scenarios assume that the City will receive state approval of its water rights applications once the fisheries agencies approve of the City's Habitat Conservation Plan.

Making Confluence Modeling Transparent The *Confluence* model is a very valuable tool for understanding our supply versus demand situation under a variety of scenarios. The California Department of Fish and Wildlife is the only entity outside of the Water Department that became privy to the model's inner workings. To the rest of us it was a black box.

The WaterSAC will probably want to test various assumptions that feed the model. For example, in the past the model assumed that in normal years Loch Lomond would supply an amount of water equivalent to the maximum water rights limit for the reservoir (1 billion gallons/year), when the actual average allocation from the reservoir over a ten year period was about half that amount. Not surprisingly, the model predicted that in a second dry year there would be only 200

million gallons of water available from the reservoir. See the Table 2 from the 2005 *Urban Water Management Plan*.

**Table 5-2. Water Supply Reliability for Average, Single Dry, and Multiple Dry Years
(millions of gallons)**

Source	Average Water Year	Single Dry Water Year	Multiple Dry Water Years	
			Year 1	Year 2
North Coast	1,077	500	400	300
San Lorenzo River	2,008	2,100	2,100	1,800
Live Oak Wells	187	300	300	400
Loch Lomond Reservoir	1,042	900	700	200
Total	4,314	3,800	3,500	2,700
Percent of Average	100%	88%	81%	63%

City Responses to Questions Raised:

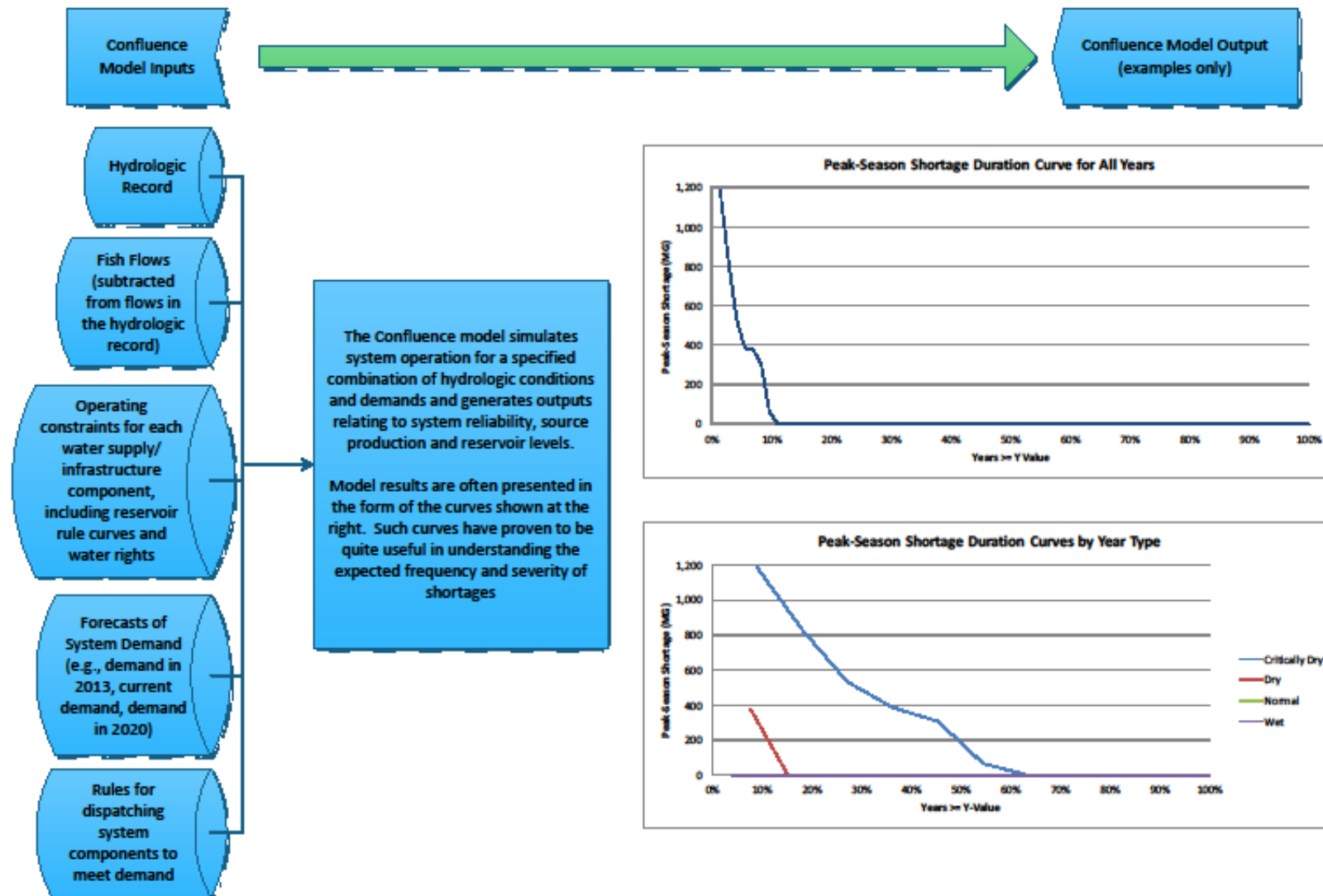
On the next page of this memo, is a simplified schematic of the inputs, processes and key outputs of the Confluence model. This schematic isn't intended to answer every question, but with respect to issues related to how model inputs as they relate to Slides 54, 55 and 56, the schematic helps clarify several issues:

- Demand used in these slides (3500 million gallons/year) was an approximation of current demand. .
- Fish flows release regimes are specified in the graphs – slide 54 has none beyond releases required by current water rights (e.g., 1cfs bypass flow to Newell Creek); slide 55 has Tier 3/2 flows, and slide 56 has Tier 3 flows. A slide in this series created in exactly the same manner as these three slides is now available for the fish flow release regime called DFG-5.
- These slides assume flows from the 1977 hydrologic year which runs from November 1, 1976 to October 31, 1977.
- The basic operating strategy the model uses for dispatching sources is as follows:

Take all available flows from the North Coast streams first (accommodating agreed upon fish flows, of course). Next go to the San Lorenzo River and take any available water that meets water quality criteria and is within the provisions of our water rights and after meeting agreed upon fish flow releases. If it is winter, go to the lake next, if it is summer, go to groundwater sources next and then to the lake.
- The model runs underlying these slides assume base infrastructure, which reflects ongoing improvements to the North Coast pipeline and limited summer production from Beltz well 12.

This page intentionally blank

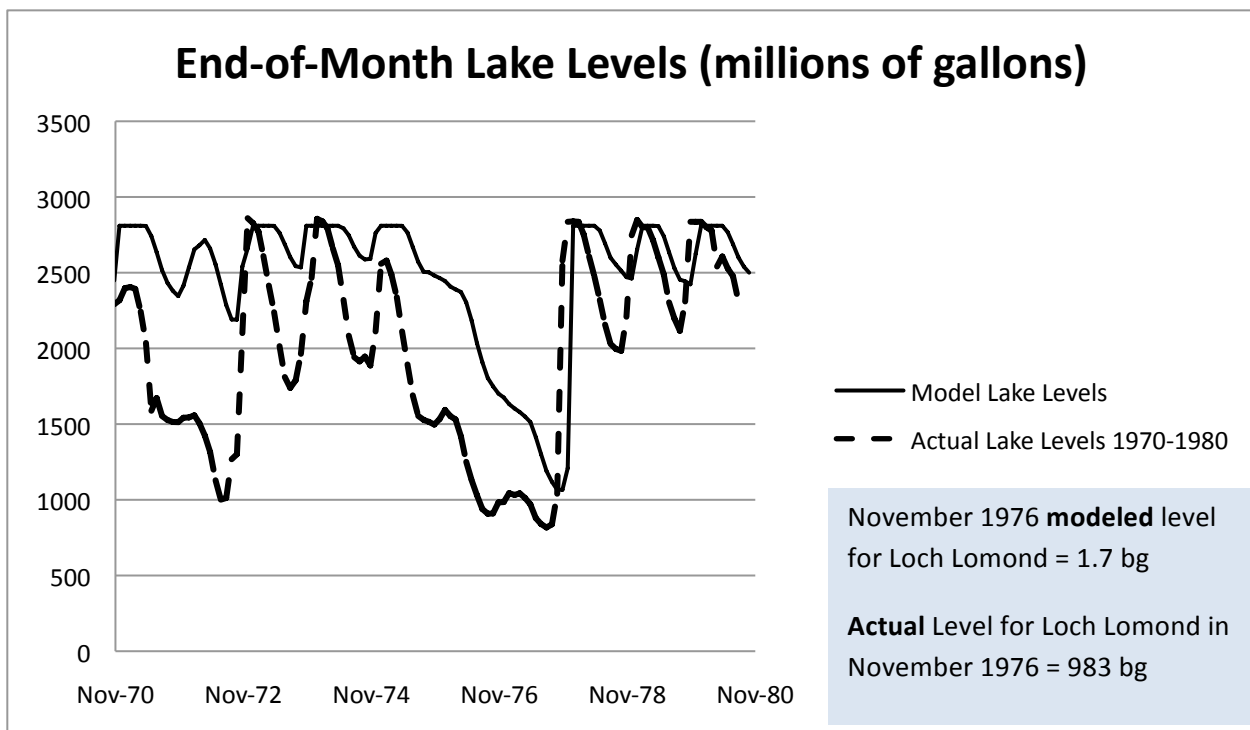
Schematic of How the Confluence Model Works



Question: What was the starting lake level used in preparing the graphs shown in Slides 54, 55, and 56?

Answer: The lake level at any point is not an input to the Confluence model; rather it is a product of the model simulation. Likewise, the model is not “programmed” to release a specified amount of water for any year. Like in real life, the lake is always the last source of water dispatched in the model, and is treated as the source of last resort after all other supplies are fully maximized. The model governs the operation of the lake using something called a rule curve that determines whether the lake level at any point in the peak season is high enough to allow the lake to fully meet remaining demand, or whether lake draw down must be slowed, resulting in a shortage during the dry season. The chart below shows the lake levels that result from a model run that assumes Natural flows, current demand levels, and a 10-year hydrologic sequence running from water year 1971 through 1980. The chart also shows the actual lake levels for that 10-year period (dashed line). The differences between the two are due to a variety of factors, most notably differing demands, and changes since the 1970s in how the system is operated.

Among other things, this chart tells us that in Slide 54, which is also based on a simulation assuming Natural flows, the starting lake level on November 1, 1976 is 1.7 billion gallons. The starting lake levels for slides 55 and 56 will differ because of different flow assumptions.



Question: Does Table 5-2 from the 2005 Urban Water Management Plan in any way reflect or direct water system operations in normal years?

The answer to this question is no. The graph on page 6 shows both the modeled lake levels and the actual lake levels for the period November 1970 to October 2009. Particularly since 1995, lake levels

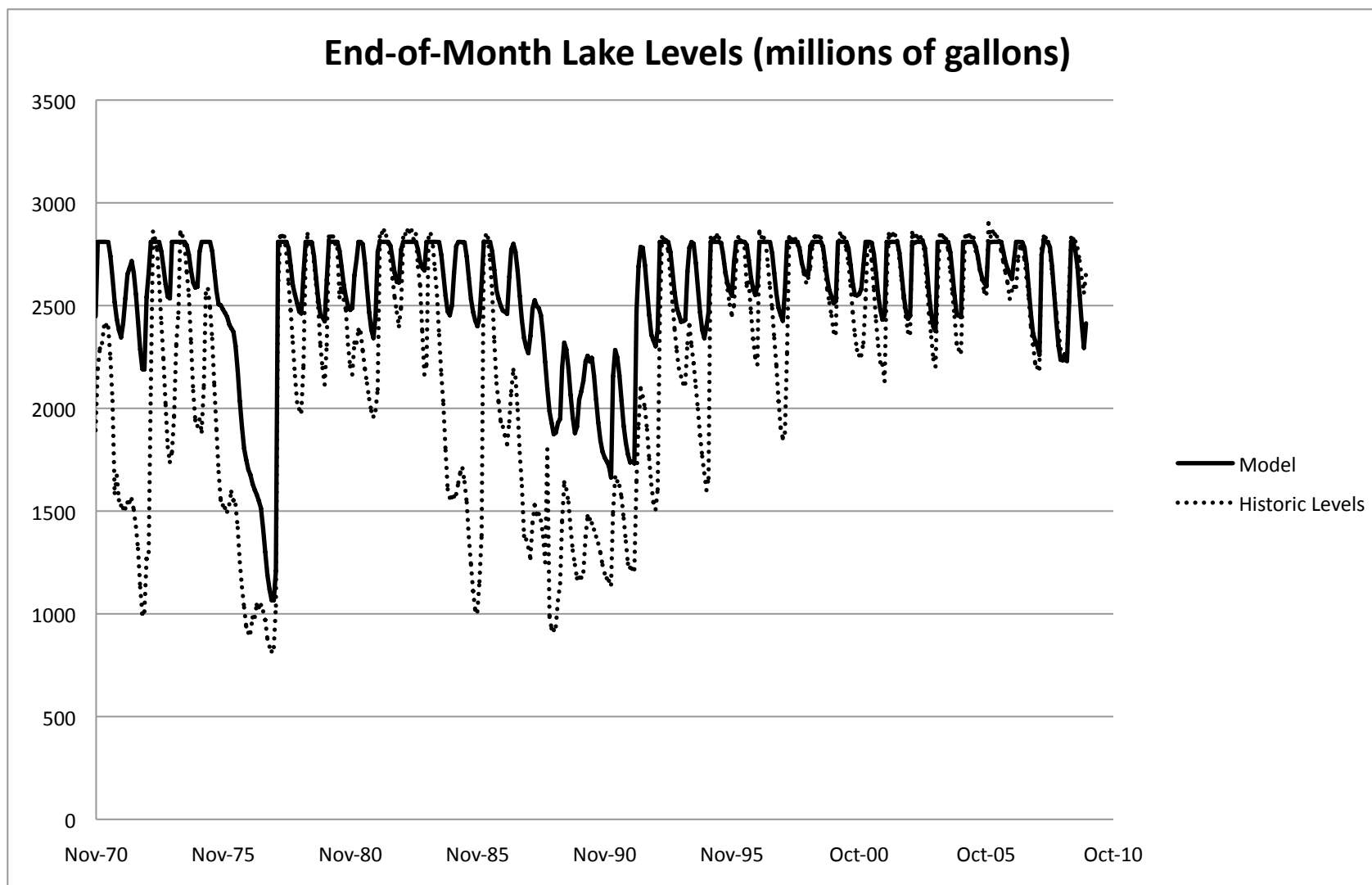
have seldom fallen below 2 billion gallons and in recent years, actual lake usage has typically been in the neighborhood of no more than 600 million gallons per year. It appears that the purpose of Table 5-2 may have been more related to theoretical capacities rather than operational practices, especially those occurring over the last 20 years.

In reviewing the chart on page 6, I want to call reviewers' attention to information that will help them understand and appropriately interpret what they are seeing.

The solid black line is modeled lake levels that are based on actual hydrology and constant demand equal to current demand levels (i.e., 3.5 bgy). The dotted black line is actual lake levels and has been influenced by management decision-making about how to use the lake in responding to the water supply situation in any given year.

It is interesting to note how much closer the modeled and historical lake levels are in recent years than in earlier years. This is to be expected, as modeled and actual demands as well as modeled and actual operating regimes have converged.

This page intentionally blank



TO: Water Supply Advisory Committee

FROM: City Staff

DATE: August 22, 2014

SUBJECT: Vulnerability Report

BACKGROUND: At their July meeting the Water Supply Advisory Committee (Committee) asked for a summary of existing information regarding the vulnerability of the City's water system to natural hazards such as storms, earthquakes, and seawater intrusion. This memo summarizes information known to date highlighting information related to existing facilities including the City's wells, Beltz (Live Oak) and Tait, as well as other infrastructure (water mains, pump stations, treatment plants, etc.).

DISCUSSION: At the July meeting Stratus Consulting summarized several existing studies on climate change, vulnerability, and sea level rise that have been done for the Santa Cruz area. The three main studies are:

- Simulation of Climate Change in San Francisco Bay Basins, California: Case Studies in the Russian River Valley and Santa Cruz Mountains; USGS/Flint and Flint, 2012
- City of Santa Cruz City Climate Change Vulnerability Assessment; Griggs and Haddad, 2011
- The Impacts of Sea-Level Rise on the California Coast; Pacific Institute, 2009.

In general these studies indicate an increase in intensity, duration, and amount of rainfall in winter months that could increase flooding risk on the San Lorenzo River and other coastal streams. The Pacific Institute study also gives a generalized idea of impacts by adding sea level rise to existing 100 year flood elevations; however, it does not factor in location-specific features such as the location of levees and berms, and specific hydrology of the San Lorenzo River, all of which may have mitigating affects.

Other studies of note include:

- City of Santa Cruz Local Hazard Mitigation Plan 2012 – 2017; City of Santa Cruz, 2013
- City of Santa Cruz Climate Adaptation Plan; City of Santa Cruz, 2011
- Water Quality and System Improvement Study TM-2/Appendix A – The Potential for Natural Disasters to Damage the SCWD System; CDM, 2002.

According to the City's Local Hazard Mitigation Plan, and consistent with the Pacific Institute study, the Tait Wells and Coast Pump Station are located in the existing 100-year floodplain and could potentially experience an increased frequency of inundation during storm events in the future; however, site specific hydrology would need to be completed to accurately determine the nature of any increased risk. The City of Santa Cruz Climate Adaptation Plan identifies as an

action item a study of site specific hydrology to determine more accurate risks and potential flood control measures. The Tait Wells are not currently a large component of the water supply during winter storm events; historically, the percentage of total water supply derived from the Tait wells generally represents about 4 percent of the City's annual water supply. The City is currently studying different options for the Tait Wells and Coast Pump Station that could change the way these resources are used in the future during storm events; this study will include vulnerability to various potential hazards.

The abovementioned studies also identify a potential for increased risk of seawater intrusion into low lying wells due to sea level rise. In 1961 there was a period of high salinity in the Tait wells that required they be shut down. This high salinity period coincided with a period of low river flows, in a critically dry year when the Tait wells were fully utilized, and may have occurred due to the highest high tide (possibly a "king tide"). However, similar low flow, pumping rates, and high tide conditions existed in 1972 and no elevated salinity levels were found in the wells. This phenomenon has not occurred since. At this time it is inconclusive as to how or if elevated sea level rise could affect the Tait wells.

Seawater intrusion has been identified as a threat to the City's Live Oak wells. Seawater intrusion is currently not detected in any of the City's production wells. Historically, however, indicators of seawater intrusion (elevated levels of chloride and TDS) have been detected in monitoring wells near the Pleasure Point area. The City, along with the Soquel Creek Water District, have been monitoring and otherwise studying the potential for seawater intrusion in the Soquel-Aptos basin for many years now. Analysis of this data shows that there is a likely threat of seawater intrusion in the Pleasure Point, Soquel Point, and Moran Lake areas.

Sea level rise could potentially raise the seawater/freshwater interface over time and increase the risk of seawater intrusion to the Live Oak wells. Since the exact location of the seawater/freshwater interface is not currently known, it is difficult to determine exactly when and in what time frame seawater could impact one the City's production wells. Soquel Creek Water District, in conjunction with the City of Santa Cruz, Central Water District, Hydrometrics WRI and the USGS (US Geological Survey), are in the process of developing a groundwater model and studying the seawater/freshwater interface. This will allow further study of the potential impacts of sea level rise to seawater intrusion in the City production wells.

Given the threat of seawater intrusion and lowered groundwater levels, actions have been taken to reduce pumping at production wells and move pumping inland so as to eliminate impacts and restore the basin. The City has reduced its pumping over the last several years by almost 50% to respond to lowered groundwater levels and groundwater management planning efforts in the region. And, the City and District are developing new production wells inland from the existing Live Oak wells in an attempt to control groundwater levels, protect the basin, while maintaining water service. The City is in the process of developing Beltz Well No. 12. The purpose of Beltz Well No. 12 is to increase the City's water production during dry years by supplementing the

production of the Live Oak Wells. (Note that the Live Oak wells are used every year during the peak season; Beltz Well 12 would be used to supplement peak season demand during dry years.) The addition of Beltz Well 12 will improve the Live Oak Well system's reliability and flexibility by reducing localized pumping but will not restore groundwater capacity to prior volumes.

It should be noted that for water supply planning purposes, the City has run water supply modeling scenarios with and without the production of the Live Oak wells to be able to consider impacts in the event of seawater intrusion. The water supply information the Committee saw at its June meeting are scenarios that include full production from the Live Oak wells and Beltz Well 12). Scenarios with lost production from the Live Oak wells, while available, was not included at the time for simplicity.

In 2007 the City completed the Water Quality & System Improvement Study; TM2/Appendix A The Potential for Natural Disasters to Damage the SCWD System is part of that study. The purpose of Appendix A was to develop a management plan that would enable the City to continue to provide drinking water that is safe, reliable and meets or exceeds current and anticipated water quality standards and regulatory requirements. CDM conducted a review of available information on potential natural disasters which could impact the system. That study concluded that the hazards of greatest importance to the Santa Cruz area are earthquakes, floods, landslides, and fire. CDM recommended that the City undertake site-specific hazard vulnerability assessments of key facilities including diversions, specific Graham Hill Water Treatment Plant (GHWTP) basins and buildings, and treated water reservoirs.

Prior to and following the CDM study the City has taken on much of the vulnerability assessment work. Several projects/studies were done specifically to address hazard issues while other facilities are evaluated as they come in to turn for capital improvements. The following list broadly summarizes this work.

- During the 1982 floods, the water system had one generator at the GHWTP; today, all essential facilities have either stationary or mobile back up power.
- During the construction of the Bay Street Tanks, a reconnection was made available between the Coast Raw Water System and the tanks. Should the GHWTP be offline for an extended period of time, water, albeit raw, would be available.
- The Newell Creek Dam (NCD) is monitored monthly and following seismic and increased rainfall events. Results are reviewed annually by the Division of Safety of Dams.
- The pipeline from NCD to the GHWTP crosses a landslide (Brackney slide). Infrastructure has been installed on either side of the slide to allow a workaround should a landslide eliminate this critical pipeline.
- The Water Department maintains a larger parts inventory than historically. The manufacturing industry has moved to a schedule of "we build it when you order it" which can create a lag of up to 9 months for some parts. Most recently, the Water Department

ordered a pump for the drought to ensure that the Coast Pump Station can stay functional at very low flows.

- Standby pumps are available at each pump station for redundancy and/or fire protection.
- The Department has started a study of the various concrete tanks in the system to evaluate their structural integrity. Results from the study may recommend upgrades and/or replacement due to vulnerabilities.

One area that continues to receive attention is treatment redundancy. The City operates two treatment plants with over 90% of its water being treated at the GHWTP. While the facility is evaluated and maintained to withstand hazards, a redundant facility would improve reliability and redundancy and meet emergency flows, at a minimum, should the GHWTP be out of service for an extended period of time. A membrane plant was evaluated as part of the Water Quality & System Improvement Study titled Membrane Plant Feasibility Study (CDM, 2007). Issues that reduced the feasibility of this include lack of ample land space in the vicinity of the sources including land already in City ownership; hydraulics; and reduced flows related to fisheries issues. However, redundant treatment facilities remains an important consideration in terms of the City water system's vulnerability assessment.

**Scenarios, Criteria, Alternatives:
What are the WSAC's Technical Support Needs?**

Bob and Karen Raucher
Stratus Consulting Inc

August 21, 2014

This note provides an introduction and some background information on scenarios, alternatives, criteria, ratings, and how they all fit together. One point of focus for this note is to provide context that will help you identify the kinds of information that will support your decision-making process, and identify the technical expertise needed to provide that information.

We believe it is important to continue identifying the key technical questions – and related technical expertise required – during Recon. This is because: (1) it takes time to nominate, gain WSAC approval, and bring additional expertise under the contract, (2) we need to be able to provide experts with some advance notice, so they can plan to schedule this assignment within their workload, and (3) some of the technical issues will require many months (or longer) to complete. Therefore, waiting until the Real Deal to start retaining expertise to address these analyses may cause roadblocks that can be avoided by planning ahead. Basically, we want to tee up the analytic work that everyone agrees needs to be completed, and begin the discussion of what technical support WSAC may want/need in the future.

This memo provides background materials for the discussion on Aug 27. Additional information and details will be provided at that time.

Scenarios

The use of a scenario-based approach has been identified as one of the few proven methods for facilitating informed decision making under large uncertainty. Using scenarios, you can plan for several differing visions of the future and identify what alternatives work for each vision. Scenario-based decision-making can be facilitated using a set of criteria, ratings and weights within an MCDS framework. This allows decision makers to identify the mix of alternatives, the timings of alternatives, etc. that -- based on criteria and ratings applied in a MCDS process -- helps identify the 'best' overall selection of alternatives for Santa Cruz.

Based on the template and rudimentary scenarios developed during the last WSAC meeting, we suggest that each Scenario discussion include the elements outlined in Figure 1. An example is also provided, as a separate document.

We believe that scenarios provide a useful construct for looking into a future that embodies considerable *uncertainty* along several relevant dimensions (e.g., climate change, fishery flow requirements, the future level and patterns of growth). One way to use scenarios in this fashion is to articulate plausible futures of interest or concern (the scenarios). The Committee can then evaluate

alternatives according to how well they perform across the various potential futures (e.g., to determine which alternatives are “robust” in that they perform suitably well across most or all identified future scenarios).

Figure 1: Elements of a Scenario (and Related Analyses)

- A) **Vision Statement:** A vision statement lays out a specific future that WSAC wants to support through their consideration of water supply alternatives.
- B) **Measure of Success (Criteria and Ratings):** How do we measure success for this vision; E.g., how do we define the criteria and which associated ratings metrics will we develop and use to define/evaluate success? Which criteria and ratings will be assessed using *quantitative* measures derived from objective technical analyses, and which may be more subjective and qualitative?
- C) **Alternatives:** Eventually we need to identify the set of alternatives that can be used to help meet this vision as reflected by the measure(s) of success, based on the ratings metrics. As part of evaluating how well each alternative meets the vision, WSAC will want to rate how the alternatives perform against their identified set of criteria. WSAC can then place weights on the different criteria to identify how well the different alternatives perform, overall.
- D) **Questions of Critical Concern about this Vision:** What do I need to understand about this vision in order to ensure that the decision I make supports this vision? In other words, what are the criteria WSAC will establish?. Amongst the likely criteria are those that may be characterized broadly as falling in the following categories:

Financial: What set of *Financial* criteria - to the City and ratepayers - are important to understand and include?

Social: What set of *Societal/Community* values and related criteria – Including a sense of community identity – are important to understand and include?

Environmental: What set of *Environmental* criteria are important to understand and include?

Technical: What set of technical feasibility and performance reliability criteria are important to assess and include?

Other: What additional criteria may be important to WSAC, beyond those criteria identified under the broad categories above?

- E) **Technical Research Needs:** Based on the questions of critical concern – the criteria outlined above, what are the research tasks needed to assess the financial, social, environmental and other criteria (and ratings) established for this Scenario? And do we execute these analyses?
- F) **Technical Support Needs:** Suggestions for kinds of Recon work, and associated individual experts or firms, WSAC may choose to provide answers to the questions of critical concern outlined above.

- Scenarios also provide a way to develop some explicit and shared *visions of the future* for Santa Cruz – visions towards which the Committee may wish to aim (or futures they want to avoid). Such scenarios are used in the same fashion as discussed above.
- Defining the *baseline* is a critical aspect of the process, as it represents a scenario reflecting the future if the City remains on its current path (i.e., the status quo in which the Water Dept. does not make any appreciable changes in its water supply portfolio, related infrastructure, operations, or demand management). The baseline is thus the scenario against which the other scenarios (and related Alts) are compared.

We will work with the Committee on the 27th to develop a few potential scenarios for the Committee’s consideration. The upcoming discussion is intended to assist the Committee in its deliberations for defining the scenarios that it finds most useful and relevant.

Key Questions, and Related Potential Criteria

As the Committee works to define scenarios, several key technical questions begin to emerge. For example, for a scenario that envisions providing generous fish flows that fully ensure vibrant and healthy coho and steelhead populations at all times, one key question that emerges is “what flows does that mean?” Associated questions may include: “Are we looking to go above and beyond DFG-5? If so, by how much? What does this imply for extractable yields for the City? How might the target instream flows (and associated yields) change under climate change?”

To answer these questions, specialized technical expertise is required related to fisheries, stream flow hydrology, and so forth. This defines specific needs that may require adding technical firms or individuals to the consultant team (more on this aspect, below).

In addition, the Committee needs to consider how it may evaluate Alts in the context of fish flows. Providing desired fish flows may well become one likely criterion. Determining how such a criterion will be worded, and establishing rating scales for the criterion (i.e., developing the metric with which an Alternative’s performance will be rated relative to this criterion), are important aspects to consider. Does the criterion include a specified ideal target for fish flow? Will performance relative to this criterion be rated based on specific quantitative measures, or subjective qualitative scoring?

As we help flesh out possible scenarios, one might apply a Triple Bottom Line (TBL) organizational framework as one mechanism to help identify and categorize likely key questions and potential associated criteria – although other factors may also be included. For example:

- For the *financial* bottom line, one key issue for the Committee is likely to be, “How much does it cost to attain the targets associated with a scenario? How will this impact customer water bills, compared to the baseline?” These questions point to cost and affordability as potential criteria and, therefore, indicate a need for analyses relying on engineering and economic expertise to estimate costs and affordability impacts.

- For the *societal* bottom line, key focal points may include the impact on the City’s economic vitality, including opportunities for meaningful local employment for residents across the economic spectrum. Regional economic impacts may also be a factor that the Committee wishes to examine. These issues point to developing analyses relying on regional economic modeling, and so forth. Other possible societal criteria may include “aligns with community identity” as suggested by Carie and Nicholas based on their interview work with the Committee members; and ratings for such a potential criterion might be largely qualitative and developed through a deliberative process (rather than a quantitative technical analysis).
- For the *environmental* bottom line, key focal points are likely to include fish flows and related fishery health issues (as described above), energy use and associated carbon footprint/GHG emissions, and other factors. Assessing some of these factors will require various types of expertise. For example, a technical expert may be needed to assess the energy requirements (and carbon footprint) associated with the various Alts (or combinations of Alts).
- Other criteria may emerge that do not fit neatly within the TBL construct, and these can be identified and included. For example, technical feasibility and reliability are important considerations when evaluating how well an Alt may perform.

A Quick Look at Expertise Needs Related to Alts

While the Committee has yet to dive deeply into the Alts discussion, we can already identify several topics that we expect to emerge and for which additional technical expertise will likely be required. For example, *groundwater-related hydrogeological questions* are likely to emerge related to a range of issues:

- Potential risks of seawater intrusion into wells in near-coastal areas
- The impact of City well operations on City wells, and on Soquel Creek’s wells (and vice versa)
- The feasibility of using local aquifers for storage (i.e., the leakage issue)
- The viability of neighboring water districts to provide the City with groundwater in seasonal exchanges

This indicates that hydrogeological expertise will be needed related to the complex groundwater formations in the region. This is specialized expertise and the associated studies and modeling probably require considerable time to develop and apply.

Likewise, the discussions to date have pointed to other types of anticipated technical needs, including *engineering* (e.g., for examining the feasibility, cost and performance of various Alts, including possible modification of extraction points and related infrastructure that may improve San Lorenzo River yields), *fishery expertise*, *water rights knowledge*, and so forth.

We also expect there will be interest in exploring various potential *water recycling* alternatives, which in turn draws on engineering, public health/regulatory knowledge, and other skills.

To avoid delays later, we would like to help move the process along for expanding the technical team. As we move forward, we will aim to better define specific technical needs, and provide some options and recommendations for who might best fill those needs. We also will try to articulate technical needs relative to:

1. What is useful/necessary for Recon
2. What is likely to be needed/useful for the Real Deal, but requires a relatively long timeline and would thus benefit from initiating the technical analysis during Recon
3. What is likely to be needed once we start the Real Deal, such that having expertise in place will enable expeditious tasking once the Real Deal begins.

Criteria for Selecting and Approving Additions to the Technical Team

To help us focus our suggestions for specific experts or firms, it will help if the Committee can consider and articulate how it wishes to evaluate potential additions to the technical team. While a core factor is the technical qualifications of the potential additions, there are also some additional considerations and tradeoffs that may emerge. For example, does the Committee have any strong preference between:

- Santa Cruz experience, versus a fresh perspective
- Individual experts, versus firms that provide more breadth and depth
- Real field experience versus some more conceptual/academic knowledge

There does not need to be a hard rule one way or the other, but if there is a strong preference across the Committee members for some attributes, then it will be useful to have them articulated.

Conclusions

This document is intended to help draw useful linkages between scenario analysis (as a constructive way to contemplate long-range decisions when there are several sources of considerable uncertainty), and the identification of key technical questions. These technical questions are related to defining the criteria and ratings that may be useful within an MCDS approach to evaluating alternatives. To best support the Committee in its deliberations, our objective is to help articulate the key questions – and associated technical analyses that may help answer or clarify these questions – to facilitate the Committee’s ability to objectively evaluate alternatives. This in turn provides a foundation for working with the Committee to define what additional types of technical expertise to consider adding to the process, so that we can help provide relevant and objective information to support the deliberations.

DATE: August 21, 2014

TO: Water Supply Advisory Committee

FROM: Water Supply Advisory Committee Subcommittee on the Independent Review Panel
(David Green Baskin, Sue Holt, Rick Longinotti, Sarah Mansergh, Rosemary Menard)

SUBJECT: Recommended Independent Review Panel

Thirteen Statements of Qualifications for the WSAC Independent Review Panel (IRP) were received by the August 14, 2014 deadline. An evaluation form using the criteria in the Request for Qualifications was provided to the subcommittee and all subcommittee members rated all the SOQs received. The subcommittee met on Thursday, August 21, 2014 to discuss the results and develop its recommendations.

The subcommittee identified 8 skill areas that would be desirable in an IRP:

- Hydrogeology
- Hydrology
- Environmental Science
- Utility Management
- Engineering
- Development/Evaluation of Supply Options
- Conservation/Demand Management
- Public Policy especially related to Sustainability

The names of the 8 top scoring candidates were placed under the categories where they provided expertise. The table below shows these results.

Hydrogeology <ul style="list-style-type: none">• Griggs• Cloud	Hydrology <ul style="list-style-type: none">• Griggs• Cloud• Lacy	Environmental Science <ul style="list-style-type: none">• Wolfe• Lacy• Griggs• Leonard	Engineering <ul style="list-style-type: none">• Ramaley• Ferraro• DiLoreto• Lacy
Conservation/Demand Management <ul style="list-style-type: none">• Wolfe• Ramaley• DiLoreto• Ferraro	Development/Evaluation of Supply Options <ul style="list-style-type: none">• Ramaley• DeLoreto• Leonard	Utility Management <ul style="list-style-type: none">• Wolfe• Ramaley• DiLoreto• Leonard	Public Policy and Sustainability <ul style="list-style-type: none">• Wolfe• DiLoreto• Cloud• Ramaley• Griggs• Leonard

Document T
Refers to agenda item #5

The subcommittee carefully considered various approaches to creating a well-balanced and diverse Independent Review Panel and is recommending to the WSAC that Mike Cloud, Roy Wolfe, Patrick Ferraro, and Brian Ramaley be contracted with to form the IRP.

Following the WSAC's action on this recommendation, steps would be taken by City staff to contract with the selected individuals and to begin to organize their work plan. For this latter task, City staff recommends that the IRP subcommittee remain involved in preliminary planning and development work associated with the IRP's work plan and the development of the management approach that will be used in managing this group.

Attachments:

- RFQ for IRP
- All SOQs submitted (13)



Request for Qualifications for an Independent Review Panel

Water Supply Advisory Committee
City of Santa Cruz Water Department



Vern Fisher/Herald Archive

Qualifications Due: 3:00 PM, Thursday August 14, 2014

I. Request for Qualifications

The City of Santa Cruz Water Department is soliciting Statements of Qualifications (SOQs) from individuals with expertise in assisting citizen advisory bodies in effectively interacting with a technical consultant support team.

II. Water Supply Advisory Committee Overview

A. Project Description

The City of Santa Cruz Water Department (SCWD) is a municipal utility that provides water service to a geographic area that includes the entire City of Santa Cruz, adjoining unincorporated areas, a small part of the City of Capitola, and coast agricultural lands north of the City limits. The current population served is approximately 94,000.

The SCWD's water supply comes entirely from local sources. Surface water accounts for over 95% of the SCWD's total water supply. Groundwater pumped from wells comprises the remaining 5% of SCWD's water sources. Due to this, the region's water supply is extremely vulnerable to fluctuations in seasonal rainfall. Frequent water shortages and restrictions exemplify the region's vulnerability.

In response to the region's water supply reliability issues, the City has spent decades observing, researching, and reporting on new water supply opportunities and conservation methods. In 2010, after multiple studies, evaluations and reports, SCWD (partnered with Soquel Creek Water District) proposed a sea water reverse osmosis desalination plant (desal) as a potential solution to the region's water shortages.

The public responded to the proposed desalination plant by requesting that it be put to a vote, and gathered enough signatures to qualify a measuring requiring a public vote before funding for construction or acquisition of a desal project could commence. This measure, known as Measure P, was placed on the November 2012 ballot and passed with 72% of the vote.

In the fall of 2013, following continuing expressions of concern about a possible desal project by community interests, the City stepped back from the path it had been on and decided to create a citizens committee to consider the water supply issues, alternative strategies and solutions, and the public policy implications for Santa Cruz and provide recommendations to the Santa Cruz City Council. The Water Supply Advisory Committee (WSAC or Committee) was formed in early 2014 and began meeting in late April. It is made up of 14 citizens with diverse backgrounds and professions and the Santa Cruz Water Department Director is an ex officio member of the committee.

The Committee will have the support of a team of technical consultants throughout its process and the role of the proposed Independent Review Panel (IRP or Panel) is to support the committee by providing critical review of the work products produced by the technical support team and to provide suggestions to the Committee lines of technical inquiry that would be helpful in completing their work.

IRP Role Description

The role of the IRP would be to assist the WSAC in effectively interacting with its consultant support team. To achieve this goal, the Panel would:

- Provide critical review, on an as assigned or as needed basis, of products created by the WSAC technical support team. The goal of the Panel's work is to offer feedback to the Committee on work provided by its technical support team. Specifically, review of the work produced by the technical support team would focus on:
 - The accuracy and appropriateness of analytical, scientific, and technical methods;
 - The clarity and accuracy of statements of assumptions; and
 - The appropriate characterization of the strengths and weaknesses of the analyses, especially with respect to uncertainty, data quality, or other factors that, if different, could affect the results in a significant manner.

- Offer advice or suggestions to the WSAC regarding lines of inquiry or technical questions that should be evaluated by the technical team.

The Panel would work together as a team, or be individually assigned, to review products prepared or created by the technical team and report their findings to the Committee.

For more information on the WSAC please see the following website:

<http://www.cityofsantacruz.com/index.aspx?page=2018>

B. Panel Characteristic:

Panel characteristics would include the following:

- The Panel would include 3 to 5 members;
- Panel members would have scientific or technical training and substantial practical experience in scientific or technical disciplines relevant to the work of the WSAC.
- Panel member experience and expertise would be diverse with the experience and expertise of each panel member complementing and supplementing the experience and expertise of the other. An example of an effective Panel would be made up of:
 - An environmental engineer/scientist, especially with experience related to climate change, watersheds, fisheries, hydrology, hydrogeology, permitting or related issues;
 - A civil engineer with experience related to municipal water systems and resource planning, management, treatment technology, facilities design and operations; and
 - A public policy expert, especially related to environmental and community sustainability issues and decision-making by local governments in light of significant uncertainty.
 Other combinations of expertise will be evaluated by the Panel selection team.
- Panel members would be expected to bring their broad knowledge and experience to the process and apply this expertise to the topics the WSAC will be dealing with.
- Panel members would have reasonable availability to work with the WSAC during the coming year, including being willing to at least occasionally attend WSAC monthly meetings, being willing to commit the time needed to review documents, and being willing to prepare and personally present to the WSAC summaries of their review efforts.
- Panel members would have demonstrated ability to explain complicated topics in terms non-technical people can understand as well as the ability to present facts without concealing values and with clear articulation of assumptions.

Additional Panel characteristics that would be desirable include:

- Panel members would have demonstrated skills as technical and/or scientific reviewers through experiences such as providing peer review for articles or other publications on scientific and technical topics; and
- Panel members would have some previous experience supporting, advising, and engaging with citizen groups on topics with public policy implications.

C. Panel Compensation

Compensation would be provided in the form of an honorarium only. The honorarium amount would be limited to \$5,000 per panel member. Direct expenses (mileage, other transportation, per diem, if and as needed) would be reimbursed.

D. Schedule

The WSAC meets at least monthly and is scheduled to complete its work by spring of 2015 unless the work

is extended by the City Council.

III. RFQ Process

A. Process

Parties interested in being considered to provide these services are requested to submit their SOQs on or before 3:00 pm, Thursday, August 14, 2014. SOQs will be evaluated by a Panel selection team made up of City of Santa Cruz staff and WSAC members using the criteria established in Section V. The panel selection team may make its selection entirely based on the SOQs or top rated candidates may be asked for supplemental information or may be invited to interview with the panel selection team. During the interview phase, if it is used,, semi-finalists may be asked to:

- Make an oral presentation, and/or
- Respond to pre-established questions.

All responsive teams 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. Timeline

The tentative timeline for the selection process is as follows.

3:00 pm, Thursday, August 14, 2014 ----- SOQs Due
Week of August 25, 2014 ----- Interviews, if applicable
Friday, September 19, 2014 ----- Contracts with Panel in place

C. Information Disclosure to Third Parties

SOQs are a matter of public record and are open to inspection under the California Public Records Act. If any respondent claims any part of its SOQ is exempt from disclosure and copying, they shall so indicate in the transmittal letter. By responding to this RFQ, respondents waive any challenge to the City's decision in this regard.

If any SOQ contains confidential information, the respondent shall clearly label and stamp the specific portions that are to be kept confidential. The respondent is urged to identify the truly confidential portions of the SOQ and not simply mark all or substantially all response as confidential. Notwithstanding the foregoing, respondents recognize that the City will not be responsible or liable in any way for losses that the respondents may suffer from the disclosure of information or materials to third parties.

D. 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 and/or schedule interviews as part of the selection process;
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.
9. City reserves the right to determine the extent, duration and limit of Panel member service

E. Questions/Clarification Request

For the City, the primary contact is:

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C, Santa Cruz CA 95060
Email: RMenard@cityofsantacruz.com
Phone: (831)420-5205

During the SOQ process, interested parties shall direct all questions via email to the City's primary contact listed above.

IV. Submittal of SOQs

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

- Cover letter describing:
 - How they fit the Panel Characteristics
 - Their willingness to accept the offered compensation
 - Their availability to work with the WSAC over the coming year
- Resume or curriculum vitae.

V. Evaluation Criteria and Selection

The City will evaluate each respondent's experience and expertise in relation to the panel characteristics described in section II B above. Candidates will be evaluated on the information presented in the SOQ. Final selection may be based on the SOQ as well as any supplemental information or interviews conducted. Evaluation factors used to select the semi-finalists shall include the following:

1. Experience and qualifications as they relate to this project (100%).
 - a. The match of individual qualifications and experience to the Panel characteristics described in this RFQ, and
 - b. An individual's availability to participate.

If a clear choice is not evident, interviews will be scheduled with those semi-finalists of exceptional rating.

VI. Response Format

One copy of the Statement of Qualifications shall be submitted and are to be no longer than 20 individual sheets in length (proposal may be printed on both sides of sheet), including resumes and attachments. Submitters are encouraged to use a double-sided format and recycled paper when possible.

Parties interested in being considered for this project are requested to submit their Statements of Qualifications **by 3:00 pm, Thursday, August 14, 2014**

to: City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060
Attention: Rosemary Menard

City of Santa Cruz Water Department

August 13, 2014

212 Locust Street, Suite C

Santa Cruz, CA 95060

Attn: Rosemary Menard

RE: Statement of Qualifications (SOQ) for Independent Review Panel

Dear Ms. Menard,

Introduction

My name is Mike Cloud and I am interested in assisting the City Water Supply Advisory Committee (WSAC) as a member of an Independent Review Panel (IRP). I recently retired from Santa Cruz County Environmental Health Services (EHS) where I held the position of Registered Geologist. At EHS, I worked in the Water Resources group under the supervision of John Ricker, the County Water Resources Division Director.

I have lived in this region most of my life and am intimately aware of our regional water resource issues. I was born in San Jose, raised in Santa Clara, and graduated from San Jose State University in 1982. Most of my professional working career was based out of the San Francisco Bay Area. I moved to Aptos in January 1991 and continued working as a geologic consultant until late 1997. In November of that year I was hired as Resource Planner with the Santa Cruz County Planning Department. I spent 16-years working with Santa Cruz County including service with Planning, Public Works and EHS (Department of Health Services). I retired from the County at the end of December 2013.

Panel Qualifications

I believe my extensive technical expertise makes me well suited for a position on the IRP. Specifically:

- I have over 14-years of consulting experience dealing with geologic site characterization and groundwater protection in which I conducted technical analyses and reviewed and wrote numerous technical reports.
- I worked as a resource planner with Santa Cruz County Planning Department where I became familiar with County policies, the County General Plan and County Code.
- As a hydrologist and geologist with Santa Cruz County my primary function was to provide technical review and comment on water agency consultant reports, including the City Water Department reports. As part of this work I conducted independent analyses of county groundwater basins.

- I was the administrative staff to the County Water Advisory Commission for 14-years. In addition to organizing meetings, I supplied water-related articles and studies and explained technical water-related concepts to the commission members.
- For many years I was a key staff on the county-wide flood monitoring system (ALERT). My work with ALERT allowed me to gain understanding of timing and volume of stream flow through the major watersheds in the county. This information is critical to the understanding of surface and groundwater interactions as well as the timing availability of surface flows for municipal use.
- I served as a member of numerous technical advisory committees for various county water agencies
- I developed and oversaw several components of the Northern Santa Cruz County Prop 50 Integrated Regional Water Management Plan dealing with maintaining sustainable water supply for the County water agencies.
- In addition to developing a mid-county groundwater management program, I coordinated with the majority of our county water agencies, including the City Water Department, to develop a county-wide groundwater monitoring program for the State (CASGEM).
- I was lead staff on the County Water Conservation program for many years where I had significant public contact.
- I conducted a detailed quantitative analysis of water usage in Santa Cruz County that included variables such as sources, timing, and users.
- I conducted the initial quantitative analysis of a potential water sharing arrangement between the City of Santa Cruz, Scotts Valley and Soquel Creek water districts. To conduct this analysis I had to become familiar with the City water infrastructure and water rights.
- I have made several public presentations regarding water resource management in this county including presentations to Engineers for Water Alternatives, the Santa Cruz County Board of Realtors, the San Lorenzo Valley Rotary Club, and the Docents of Henry Cowell State Park; tailoring the technical aspects of the messages to the audiences.
- And finally, I have working relationships with staff of the U.S. Geological Survey, California Department of Water Resources, California Regional Water Quality Control Board, and numerous technical consultants. Additionally I established working relationships with all the local water agencies, County Planning, Public Works, and Environmental Health staff and management.

Position Compensation

It is my understanding that as compensation, a \$5,000 honorarium will be paid to those individuals who the City Water Department hires for these positions. Plus, direct expenses incurred for this job will also be reimbursed by the City. I am agreeable to these terms.

Work Availability

I understand that the position will require approximately 15- to 20-hours per month and will continue until at least spring of 2015. The time required to complete the IRP work will consist of attending monthly WSCA meetings, reviewing and commenting on technical documents identified by the WSAC, and personally presenting the findings to the WSAC.

As I previously indicated, I am retired and therefore have a very flexible schedule. I feel confident that I can be available as needed to complete these duties.

Closing

Although I am retired, I maintain a great interest in the vitality of my community/county and the sustainability of our water resources. I have gained a great deal of knowledge about those resources over the past 16-years and would like to continue helping the local water agencies find ways to manage them sustainably. It would be my pleasure to help the City of Santa Cruz Water Department and WSAC develop water supply recommendations for the City Council.

Sincerely,



Michael Cloud

Professional Geologist

CA 4660

(831) 684-2412

Michael A. Cloud

RESUME

554 Ranchitos del Sol, Aptos, CA 95003

(831) 685-1543
mike-cloud@sbcglobal.net

EDUCATION

B.A. Geology, Chemistry Minor, California State University, San Jose (1982)

PROFESSIONAL LICENCE

Registered (Professional) Geologist, State of California, R.G. 4660

SUMMARY OF EXPERIENCE

I have 30 years of professional experience, and I have developed a broad background of technical expertise in hydrology, geology, hydrogeology, and engineering geology, especially as these disciplines apply to environmental issues. I have been a Professional Geologist in the State of California since 1989.

To work within the community in which I lived, I accepted a position as a Resource Planner for the County of Santa Cruz in 1997. My work consisted of reviewing building and land development applications for conformance with the County General Plan and specific environmental ordinances as they relate to geologic/geotechnical hazards, and grading, erosion control, watershed, riparian, and sensitive habitat issues.

Most recently I was the Hydrologist and later a Registered Geologist for Santa Cruz County. In these positions I served in the Planning, Public Works, and the Health Services Departments. As the Hydrologist/Geologist with Santa Cruz County, my main function was to provide technical peer review of hydrogeologic studies conducted in the county by water agencies and their consultants. I regularly served on technical review committees for the various agencies. By providing technical review I was able to completed geologic structural and stratigraphic analyses of two of the main aquifer systems in the county.

Prior to joining the County I worked for various consulting firms in the state. This work primarily involved geologic site characterizations for landfills, industrial sites and gas stations so that groundwater monitoring systems could be developed and, if necessary remedial action programs could be designed. During this phase of my career I became adept at geologic field techniques, including drilling, mapping, and contractor supervision. In the office I developed skills in data analysis, cost estimating, scheduling and report writing.

As a self employed consulting geologist, I operated and maintained a computer aided design (CAD) system in which site, operational, and geologic graphic information was maintained. For my clients I prepared maps for inclusion into my technical reports and large scale graphics for public presentations. I stored the site data in a database management program from which I produced graphs and charts.

I spent a year performing the investigation and interim cleanup of four petroleum contaminated sites for the California North Coast Water Quality Control Board, using State Clean-up and Abatement Account Funds. While working for the Regional Board, I completed a State training course on Contract Management, prepared a scope of work, put it out to bid, hired a contractor, oversaw their work, analyzed the collected data, prepared a report and presented my findings to the Board members.

I spent a short time working for the California Department of Conservation. As an Associate Engineering Geologist, I performed field reviews of proposed timber harvest plans (THPs) with a multidisciplinary team.

My role was to determine if the plans would have negative impacts on slope stability and watersheds. This job included reviewing THPs in Santa Cruz County.

REFERENCES:

John Ricker, Santa Cruz County Environmental Health Services, (831) 454-2750

Chris Coburn, Resource Conservation District of Santa Cruz County (831) 464-2950 x17

Bruce Laclergue, Santa Cruz County Public Works, (831) 454-2807

Stephen Janes, The Janes Network, (831) 454-9757

DETAILED DESCRIPTION OF WORK EXPERIENCE

2008-2013 **Registered Geologist, County of Santa Cruz** (Duties the same as the Hydrologist position)

1999-2008 **Hydrologist, County of Santa Cruz**

Most recently I was the Hydrologist and later, Registered Geologist for Santa Cruz County in Environmental Health Services. As the Hydrologist/Geologist with Santa Cruz County, I was responsible for the review, analysis, and reporting on issues related to water policy including groundwater and surface water quantity and quality, water supply analysis, and flooding.

My main function with the County was to provide technical peer review of hydrogeologic reports prepared for the various projects within the County and participate on various county technical advisory committees. In my capacity as Hydrologist/Geologist I acquired an extensive technical knowledge of the main aquifer units within the county. My structural analyses of the Purisima and Santa Margarita groundwater basins were integral to developing groundwater model for the Scotts Valley area. A formal model of the Purisima has yet to be developed, but when it is, my analyses will be incorporated into that model.

For several years I oversaw the County flood monitoring network (ALERT). Experience with the ALERT allowed me to gain understanding of timing and volume of stream flow through the major watersheds in the county. This information is critical to the understanding of surface and groundwater interactions as well as the timing availability of surface flows for municipal use. I was also responsible for updating the County ALERT manual and training junior staff on the system.

Since 1999 I served as administrative staff to the County Water Advisory Commission. In this position I was responsible for preparing agenda packets, coordinating meetings, taking minutes of the proceedings and preparing annual reports to the County Board of Supervisors. As staff it was my responsibility to explain the technical issues of our water resources to the Commission members, who typically did not come from technical backgrounds.

I was responsible for updating the County Primary Groundwater Recharge map, application procedure and review criteria. Work on this map made me more knowledgeable about the various county aquifers, their interactions with streams, and their recharge capabilities.

I was responsible for administering the County Water Conservation/Plumbing Retrofit program. In addition to tracking home plumbing retrofit documents, I was responsible for public communication to explain the program to home owners and the real estate professionals.

I developed and oversaw three components of a Prop 50 grant to promote Integrated Regional Water Management Planning in Northern Santa Cruz County. These components included 1) a feasibility analysis for conjunctive use of water resources in the Lower San Lorenzo Valley, 2) the design and construction of storm water recharge facilities, and 3) the protection and enhancement of groundwater recharge.

In 2010 I began a detailed analysis of the Santa Cruz City Water supply system to determine the feasibility of 'water sharing' with neighboring water districts. This analysis was critical because the City at that time was jointly pursuing the construction of a seawater desalination plant with the Soquel Creek Water District. However, there was significant community opposition to that project and there was a demand for alternative sources of water supply.

I conducted a detailed quantitative analysis of water usage for the entire Santa Cruz County. This analysis identified all the sources of available water, the timing of each sources usage, and which group was using the water sources. Because the type and volume of water usage changes annually, this analysis can be periodically updated to reflect current trends.

1997-1999 Resource Planner, County of Santa Cruz

Reviewed building and land development applications for conformance with the County General Plan and specific Environmental Ordinances as they relate to geologic/geotechnical hazards, and grading, erosion control, watershed, riparian, and sensitive habitat issues. Interacted with the public, performed site inspections, wrote site evaluations, assisted code compliance officers with environmental code violation, and independently scheduled work assignments.

1994-1997 Independent Geologic Consultant

Conducted research on historic landfill operations for the purpose of developing site-wide model of waste fill thickness, modeling fluid occurrence and movement through refuse, and identifying potential contaminant source areas.

Designed and directed extraction test program to evaluate feasibility of long term leachate extraction from refuse and optimum well design and placement within a landfill. Prepared analysis of test results and developed model of waste fluid movement within refuse.

Participated in detailed geologic mapping using trenches to define site stratigraphy and structure. This geologic characterization was used to define groundwater and contaminant flow constraints.

Designed and directed a waste fluid sampling program to establish a waste constituent database and identify potential contaminant source areas. Program specifically evaluated occurrence of LNAPLs and DNAPLs.

Participated in the collection of geologic data for an Environmental Impact Report of a proposed major Southern California landfill site. Work included field mapping, fault trenching and logging, and development of the overall site geologic stratigraphic/structural model and hydrogeologic model.

Operated a CAD system. Generated maps and graphics for inclusion into technical reports and/or for display at public presentations.

1991-1994 Senior Hydrogeologist, MEREDITH/BOLI & ASSOCIATES, INC.

Responsible for the oversight of project technical issues as they pertain to geology and/or hydrogeology. This oversight included the design, implementation, and management of field investigations as well as the review and analysis of geologic and hydrogeologic data.

Provided technical overview for a deep soil investigation at a large solvent processing facility. Conducted a study of the complex hydrogeologic setting and designed a site groundwater monitoring system. From the results of the groundwater monitoring, developed a model of contaminant migration in the vicinity of the site.

Finalized an on-going study to assess the nature and occurrence of leachate at a Southern California landfill to determine if remediation was necessary. Based on his analysis and presentation of the data, the local regulatory agency, and their consultant, concluded that the phenomena was sufficiently characterized and that no additional characterization or remediation would be required.

Participated in the geologic characterization of a proposed landfill for the EIR/ES process. Characterization included aerial photographic analysis, field mapping, stratigraphic analysis, structural analysis, and fault age-dating.

Performed peer review of other consultant's geologic/hydrogeologic work including site characterizations and environmental impact reports for proposed landfills.

Participated in the development of several site feasibility studies regarding the practicality of soil gas and groundwater remediation.

1990-1991 Associate Engineering Geologist, California Department of Conservation.

Accompanied interdisciplinary teams on pre-harvest inspections of proposed timber harvesting areas. Identified and evaluated potential effects of logging practices on watersheds and in unstable geologic environments. Prepared maps and reports for each Timber Harvest Plan.

1989-1990 Associate Engineering Geologist, California State Regional Water Quality Control Board.

Prepared and managed a State contract to perform underground leaking tank site cleanups and site hydrogeologic characterizations using State Cleanup and Abatement Account Funds. Responsibilities included: preparation of site investigation workplans per LUFT guidelines and Regional Board recommendations; direction of contractor and subcontractor activities for leaking underground fuel tank and gasoline contaminated soil removal and drilling and well installation activities; analysis of field data and prepared recommendations for additional required field work; presentations to the North Coast Regional Board on the progress and results of field work and investigations; and preparation of a final report on work performed, results of investigations, and recommendations for additional work.

1983-1989 Senior Project Geologist, EMCON Associates.

Typical responsibilities included: performed geologic and hydrogeologic site assessments; prepared work proposals and cost estimates; scheduled staff and subcontractor work and maintained project budget and objectives; supervised office and field work of staff; designed site groundwater monitoring systems per CAC, Title 23, Subchapter 15 requirements; prepared project reports including site specific groundwater monitoring plans and Solid Waste Assessment Test (SWAT) reports; and oversaw scheduling and field operations for leaking underground fuel tank (LUFT) group of Geology Division.

Selected projects include: analysis of surface geophysical survey for landfill saturation investigation; geologic mapping of major hazardous waste disposal facility in California; design of groundwater monitoring systems for sites underlain by anisotropic dipping aquifers; and analysis of the effect of faulting on groundwater flow in confined aquifers.

SELECTED PUBLICATIONS AND REPORTS

I have been the principal or a primary contributing author on numerous environmental assessment documents while working as a consultant. Examples of these efforts include:

The Janes Network. Interim Remedial Measures Study Progress Reports 1 through 3, West Covina Landfill, West Covina, CA, 1994, 1995, and 1996.

MB&A. Property Assessment and Supplemental Investigation Workplan, Kahr Bearing Facility, Burbank, California. April 1993.

MB&A. Landfill Fluids Evaluation Study, Simi Valley Landfill, Ventura County, California. October 1992.

MB&A. Engineering Feasibility Study for the Bradley Landfill and Recycling Center, Sun Valley California. December 1991.

MB&A. RCRA Facility Investigation (Phase IIB), Deep Soil Sampling Program, Oil & Solvent Process Company. Azusa, California. November 1991.

EMCON. Verification Monitoring Report for the Lancaster Landfill, Los Angeles County, California, 1989.

EMCON. Solid Waste Assessment Test Report for the Buena Vista Landfill, Santa Cruz County, California, 1989.

EMCON. Groundwater Monitoring Plan for the Lancaster Landfill, Los Angeles County, California, 1988.

EMCON. Verification Monitoring Program for the Ben Lomond Landfill, Santa Cruz County, California, 1988.

EMCON. Solid Waste Assessment Test Report for the San Ardo Landfill, Monterey County, California, 1988.

EMCON. Solid Waste Assessment Test Report for the Luis Road Landfill, Monterey County, California, 1988.

EMCON. Hydrology and Ground-Water Monitoring, Simi Valley Sanitary Landfill, Ventura County California. February 1988.

EMCON. Evaluation of Hazardous Waste Disposal Grid Area. Simi Valley Landfill Expansion, Ventura County California. November 1986.

MB&A and EMCON. Groundwater Monitoring Program for the Simi Valley Landfill. July 1986.

EMCON. RCRA Part B Permit Application, Hydrogeology, Chemical Waste Management, Kettleman Hills Facility, Kings County, California. 1986.

1900 Sunburst Terrace
West Linn, OR 97068
503-650-0770, (c) 503-320-5284
gdiloreto@hotmail.com

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

Dear Ms. Menard:

I am pleased to respond to your Request For Qualifications for an Independent Review Panel for the City of Santa Cruz regarding water supply issues, alternative strategies and solutions. Below is my response to the three areas requested in the RFQ.

How I fit the Panel Characteristics

As you can see from my attached resume I am a licensed civil and environmental engineer in Oregon. I recently retired after serving 14 years as the Chief Executive Officer for the Tualatin Valley Water District located in metropolitan Portland Oregon. TVWD serves over 200,000 customers and is Oregon's second largest water utility. We received many awards for our work including being one of the first utilities to receive the Association of Metropolitan Water Agencies Platinum Award for Effective Utility Management. I have an additional 17 years as a public works director and city engineer for three Oregon communities ranging in population from 3,500 to 90,000 people where the water system was one of the divisions under my direction. Additionally, last year I served as the President of the 145,000 member American Society of Civil Engineers, where I worked to form increased relationships between ASCE and the American Water Works Association.

I have served in a similar capacity related to your RFQ on three different occasions. From 1997 to 1999 I served on the City of West Linn's Utility Advisory Board. Our purpose was to advise the city council on matters relating to West Linn's water and sewerage systems. In 2002 I served on the City of Portland Oregon's Bull Run Treatment Citizens Panel where I represented west side Portland wholesale water purchase customers in recommending to the city council the method of water treatment for the City's water system that would place them in compliance with the EPA Long Term 2 Surface Water Treatment Rule. In 2006 I served on the review panel for a Water Research Foundation Project: Decision Process and Trade-off Analysis Model for Supply Rotation and Planning for Tampa Bay Water. My role was to participate with the researchers in reviewing their research on this project.

I also believe that I meet your criteria for a public policy expert, especially related to environmental and community sustainability. I hold a master's degree in Public Administration from Portland State University. Additionally TVWD received many awards for our environmental and sustainability programs, including a silver award for Leadership in Environment and Energy Design for the District Headquarters Building in 2003. The District was one of the first to rate its' capital improvement plan based on the triple bottom line. During my term as ASCE President I traveled around the world promoting the Institute of Sustainable Infrastructure, of which ASCE is one of the three founding members, and its' rating tool EnvisionTM as a means for rating the sustainability of our infrastructure projects. Beginning this fall I will become one of the nine Board members of ISI. As a public works

director and CEO for the past 37 years it has been my responsibility to develop and provide recommendations on public policy to the city councils and boards that I served.

Willingness to Accept the Offered Compensation

I accept the proposed honorarium amount and reimbursement of direct expenses for efforts I undertake in my work on this Panel.

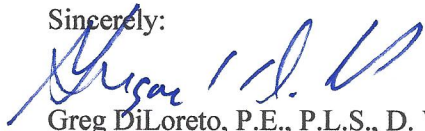
Availability to Work With the WSAC Over the Coming Year

I am available during the week of August 25th 2014 should interviews be required and I would have no problem meeting the contract deadline of September 19th. I am available during the period fall through spring of 2015 for this work although I will be out of the country the first three weeks of October. However, I will be available by phone and email during that time.

Conclusion

I am excited about the opportunity to participate with you and the City in this effort. It fits with my past experiences as well as my interest in public policy. I am available should you have further questions or need additional information.

Sincerely:

A handwritten signature in blue ink, appearing to read "Greg DiLoreto", with a stylized flourish at the end.

Greg DiLoreto, P.E., P.L.S., D. WRE

Resume

Name: Greg DiLoreto, P.E., P.L.S., D. WRE

1900 Sunburst Terrace
West Linn, OR 97068
503-320-5284
gdiloreto@hotmail.com

Employment:

2013 President of the American Society of Civil Engineers. In this volunteer position I served as President for the 145,000 member ASCE global organization. As President I represented ASCE to the members, other professional organizations and before Congress. I also served as the principle liaison between the Board and the executive director. During my term, ASCE released the 2013 Report Card on America's Infrastructure and I served as chief spokesperson for that effort, including testifying before congress on the importance of infrastructure in America. Additionally I have worked in the promotion of our sustainability program through the Institute for Sustainable Infrastructure. Based on the triple bottom line this organization has developed an infrastructure rating tool, Envision, for infrastructure projects.

1999 to 2013 Tualatin Valley Water District Oregon, population 205,000. General Manager and Chief Executive Officer, Retired. As CEO I am responsible for the overall management of the second largest water utility in Oregon. I report to a 5 member elected Board of Commissioners for the development and administration of policy and strategic long range planning for the District. The District organization consists of six Departments, which include: Administration; Customer and Support Services; Engineering; Field Operations; Finance and Information Technology; Office of Community and Intergovernmental Relations. The District has 120 employees and a 2011-13 budget of \$175 million. The capital improvement budget for 2011-13 is \$34 million.

1986 to 1999, City of Gresham Oregon, population 85,000. Director, Dept. of Environmental Services 1991 – 1999; City Engineer from 1986 to 1991. As Director I had overall responsibility for the water system; sanitary sewer and 15 million gallon per day wastewater treatment plant, expanded to 20 mgd in 1999; 200 mile transportation system; storm and surface water management; parks and recreation; solid waste and recycling; and building and property management. The Department consisted of 150 employees, an operating budget of \$25 million, and a capital budget for 1998-99 of \$27 million.

1983 - 86, City of Newberg Oregon, Director of Public Works, 1985-86 and City Engineer from 1983-85. As Public Works Director, I had overall responsibility for the water system and water treatment, sanitary sewer and wastewater treatment,

streets, and storm water system. The Department consisted of 25 employees and an operating budget of \$3.5 million.

1982- 83, City of Sandy Oregon, Director of Public Works. As Public Works Director I had overall responsibility for the water system and water treatment, sanitary sewers, streets, storm water system, and park maintenance.

1977 - 82, Whiteley-Jacobson and Associates. I served as a consulting municipal engineer for the cities of St. Helens, Rainier, and Clatskanie Oregon. Performed general civil engineering master planning, design and construction and administration of water, sewer, storm water and street projects.

1976 - 77, Haner, Ross, and Sporseen. I served as an entry level civil engineer.

Schools and Universities attended/ Degrees held:

- Bachelor of Science Civil Engineering, Oregon State University, Dec. 1975
- Masters of Public Administration, Portland State University, Jun. 1985 (graduated with honors)
- Rocky Mountain Program, Center for the Improvement of Public Management, University of Colorado at Denver, 1992
- Program on Negotiation for Senior Executives, Harvard University 2003

Professional Licenses Held:

Registered Professional Engineer, Civil and Environmental, Oregon
Registered Professional Land Surveyor, Oregon

Organizations

Fellow, American Society of Civil Engineers
Life Member, American Public Works Association
City Club of Portland

Related Accomplishments:

American Society of Civil Engineers

- President, Oregon Section 1986-87
- Chair, Pacific Northwest District Council 1989-90
- Historian/Treasurer Pacific Northwest District Council 1996 – 2003
- Director District 12, National ASCE Board 2003-2006
- Have served on sixteen ASCE national professional activities committees, since 1987
- ASCE Society President 2013
- AWARDS
 - Outstanding Younger Member Oregon Section 1985
 - ASCE Edmund Friedman Young Engineer Award, 1986
 - Outstanding Civil Engineer, Oregon Section 1995

- Government Engineer of the Year Oregon Section 2004
- ASCE Government Civil Engineer of the Year 2005

League of Oregon Cities

- Water/Wastewater Legislative Committee, 1992 – 1999
- Transportation Legislative Committee, 1983 – 1999

City of West Linn

- Library Board 1989-1997, 2008 – 2011
- West Linn Library Foundation 2009-2011
- Chair, Library Building Expansion, 1999 to 2001
- Member, Water Utility Advisory Board (1997 - 1999)
- 10th Street Task Force 2007

Special Districts Association of Oregon

- President of the Board 2008 – 2011
- Board member 2003 – Present

Association of Metropolitan Water Agencies

- Chair Management Committee 2008-09

Miscellaneous

- Appointed by Oregon Gov. Victor Atiyeh to Governor's Public Works Task Force, 1985
- Appointed by Oregon Gov. John Kitzhaber to Community Right to Know Task Force, 1997
- 2002, Chair of the Regional Water Providers Consortium Technical Committee
- 2003 Awarded membership to the Oregon State University Academy of Distinguished Engineers
- 2003 – 2007, Metro's Transportation Policy Alternatives Committee – citizen representative

PUBLICATIONS

- "Regional Detention Basins to Control Storm Water" Public Works Magazine, April 1982
- "Local Conditions and Needs, City Street Systems in Oregon" League of Oregon Cities 1984
- "Gaining Contracts for Operating, Managing and Providing Water Services to Other Public Agencies" Association of Metropolitan Water Agencies, Making Waves, Vol. 4 Spring 2002
- "Career Development from an Employer's Perspective" Journal of Engineering Management, American Society of Civil Engineers, Vol. 2, Issue 2, April 2002
- "Providing Water Service to Other Public Agencies" Journal of the American Water Works Association, September 2003

- “Water Supply, Water Treatment, Water Storage and Distribution, Water Conservation chapters of the Planning and Urban Design Standards”, American Planning Association, John Wiley and Sons, 2006

Patrick T. Ferraro
351 Brookwood Ave.
San Jose, CA 95116-2742
Ptferraro5@gmail.com

August 4, 2014

Water Director Rosemary Menard
212 Locust St., Suite A
Santa Cruz, CA 95060

Subject: Statement of Qualifications submitted in response to RFQ re. Independent Review Panel for City of Santa Cruz Water Supply Advisory Committee

Dear Ms. Menard:

I am honored to have received your RFQ for service to the City of Santa Cruz as a member of an Independent Review Panel for the Water Supply Advisory Committee. I hope the following gives you adequate information to decide that I possess the qualifications you are seeking in a panelist to achieve all the elements listed in the RFQ,

My education and experience in water resource management has accrued over forty-five years, beginning with a classic engineering curriculum augmented with over a dozen courses in philosophy and ethics. After completion of my graduate work at San Jose State University in Environmental Engineering, my work and spiritual path merged and has since guided my professional work, my involvement in water politics and my lifestyle, which I hope leads by example.

My engineering career began in 1966 doing earthwork and drainage systems construction for Caltrans in Southern California. My first employer after graduate school was with the firm of Consoer-Townsend Consulting Engineers. During my employment with this firm, I performed design, surveying and construction management for numerous wastewater treatment plants throughout California (San Jose, EBMUD, Hunter's Point Naval Facility, Madera)

In 1970, I was also assigned as key project engineer for a comprehensive analysis of the disposition of all wastewater discharges into South San Francisco Bay projected to the year 2000. This assignment, which also included an in-depth evaluation of the potential for wastewater recycling in Santa Clara County, lead directly to my leaving the employ of the Consoer-Bechtel Consortium managing this study and began my long-term involvement in local water politics.

In early 1972, our study team gave a presentation to the Santa Clara Valley Water District Board of Directors on the technical and financial feasibility for a 100 mgd wastewater recycling system to augment the local groundwater yield with a safe, reliable and drought-proof supply of water, financed with 87.5% State and Federal grants under the newly passed Clean Water Act. The response by the District was fear that such an alternative would be a serious threat to future funding of the San Felipe Division of the Central Valley Project, authorized to deliver CVP supplies to four out-of-basin counties: Santa Clara, San Benito, Santa Cruz and Monterey.

The SCVWD staff then hired the consortium to prepare an addendum study on the recycling component of the plan. The staff directed me, as the project engineer, to

size a smaller recycling system with very high unit costs, which the Board could then cite as an infeasible alternative to the San Felipe Project. Believing this to be a serious breach of ethics, I chose to seek election to the SCVWD Board, gain access to the local media and promote a closed-loop water management system over the linear model that had dominated most water systems in Bay Area, California and the nation.

Once elected to the SCVWD Board, I formed my own environmental consulting company and prepared EIR's for various types of projects throughout California, including several in Santa Cruz County. In addition to preparing EIR's on several large mountain subdivisions and a 200 ft. sediment containment dam for Granite Rock Co. in Aromas, I was hired by the County of Santa Cruz in 1975 to prepare an EIR for the County Master Wastewater Plan.

This plan proposed to build force mains to transport most of the coastal communities' wastewater to the City of Santa Cruz wastewater treatment plants and discharge the treated effluent into Monterey Bay through an extended outfall pipeline. It was common knowledge that the majority of the County Supervisors at the time (and today) realized the cost of conveying CVP water to the coast was too expensive (and, as we've learned, also too unreliable), the EIR demonstrated that an alternative plan for major water recycling for agricultural use and groundwater protection was preferable to the proposed project plan.

After twenty-three years (nearly six terms) I resigned from the SCVWD Board in 1995 to be appointed as Executive Director of the newly formed Silicon Valley Pollution Prevention Center (SVP2C). This NGO was created as part of a consent

decree settling a Clean Water Act lawsuit filed by a coalition of environmental groups calling themselves Clean South Bay. The Board of Directors consisted of equal numbers of executives from government, business and officers of the coalition members and served as a *de facto* ongoing mediation process to identify sources of water pollution and pursue actions to reduce or eliminate practices causing these pollution discharges. In addition, The SVP2C also held periodic conferences and training seminars for elected officials and public agency staff on various water management and land use strategies, which reduced the impacts on water quality and water demand.

The Center operated successfully for eight years, but the industrial members chose to terminate the organization in 2004 rather than address serious pollution discharge issues connected to land use, extended product stewardship and maximizing non-potable water reuse in the South Bay communities.

Since 2009, I have served as an adjunct faculty member at San Jose State University and, in 2013 I was hired at Santa Clara University, lecturing to both engineering and environmental science students in courses in Water Law & Policy and Water Resources Management. Teaching these courses requires I remain current on developments in the field of water policy and management, reading daily news reports and newly released studies from government agencies and NGO's.

I believe my experience is broad enough to qualify for all three categories of expertise listed in the RFQ:

- I am an environmental engineer with experience related to climate change, watersheds, fisheries, hydrology, hydrogeology, permitting or related issues;

- I have worked many years as a civil engineer with experience related to municipal water systems and resource planning, management, treatment technology, facilities design and operations; and
- I have extensive public policy experience, especially related to environmental and community sustainability issues and decision-making by local governments in light of significant uncertainty.

My current teaching load is limited to one course per semester or quarter and I currently have no other consulting contracts in place, so I am available to work with the WSAC as needed during the next year and to attend the WSAC monthly meetings and make presentations of the review efforts as requested.

As an elected representative of 20% of the population of Santa Clara County, I gained years of practice in the art of explaining engineering and other scientific concepts to my constituents and many of my colleagues with less training and experience in the field of water resources management. One of my goals in teaching environmental science students is to familiarize them with engineering jargon to enable them to fully participate in discussion of water management issues in the communities in which they will reside.

I have decades of experience interfacing with citizen advisory committees as a Board member of the Santa Clara Valley Water District. The agency connects with its customers by maintaining many specialized advisory committees for sectors such as agriculture, landscape irrigation, watershed management, oversight of expenditure of flood protection parcel tax revenues, and a County Water Commission comprised of elected officials to review water rates and supply/demand forecasts.

While I have not been called upon to do peer review of technical journals, I read and

comment continuously on water issue reports prepared by both government agencies and NGO's. As the news media reports on many of these reports, I often post comments in social media (LinkedIn Focus Groups, Facebook, Google+) along with the links to the report and/or news article, encouraging others to read the report and engage in further dialogue.

I attended part of most recent WSAC meeting on July 31 and found the format most admirable. The commitment of the committee members is extraordinary and the facilitators and the consultant presentations were of the highest caliber. I especially was impressed with the presentations concerning uncertainty, climate change, sea level rise and adaptive management, which I have found seriously inadequate in other water supply planning efforts.

Attached, please find my Curriculum Vitae for a list of professional history and academic assignment during my career. Please contact me and request any additional information you may need for your evaluation of my qualifications.

I can be reached by phone at 408.293.1852 or by email at ptferraro5@gmail.com

Sincerely yours,

Patrick T. Ferraro

Curriculum Vitae of Patrick T. Ferraro

Contact Information:

Mailing Address: 351 Brookwood Avenue, San Jose, CA 95116-2942

Telephone: 408.293.1852

E-Mail: ptferraro5@gmail.com

Career Objective:

Teaching positions that can allow me to share my accumulated expertise and motivate others to more fully participate in the field of ecosystem protection, water management and water policy development and related fields such as low impact urban development and sustainable agriculture.

Education:

Master of Science, Civil Engineering (Environmental Engineering), San Jose State University, 1970. Focus on pollution prevention and water resource recovery systems.

Bachelor of Science, Civil Engineering, Loyola University of Los Angeles, 1968. Four-and-a-half year curriculum of classic engineering disciplines.

Professional History:

1995-2004: Executive Director, The Silicon Valley Pollution Prevention Center. The primary mission was to educate all community sectors in the South San Francisco Bay watersheds about the sources of pollution in the southern end of the estuary, to identify methods of preventing pollution from identified sources, and to promote the use of methods, which reduce or eliminate pollutants.

1973-1995: Director on the Board of the Santa Clara Valley Water District. Directed the water resources management for the San Jose (Silicon Valley) Metropolitan area's 1.5 million people, with a staff of 600 and an annual operating budget of \$180 million; District representative on EPA's Integrated Environmental Management Project; six years as District representative on Intergovernmental Council; District representative on Tanner Committee, which evolved into the County Pollution Prevention Committee; leading board advocate for water recycling and watershed management.

1972-present: Owner and Project Coordinator, Water Brothers Environmental Consultants. Prepare EIRs and provide water and sewage expertise for state, county and local government agencies and private industry.

1970-1972: Project Engineer, Consoer, Townsend & Associates. Design and construct inspection of various wastewater treatment projects. In joint venture with Bechtel Inc., studied effects of all discharges to South San Francisco Bay and the reuse potential in Santa Clara County.

1967-1969: Caltrans, Engineering Student Trainee, Junior Civil Engineer, Construction surveys and inspection

Academic Contracts:

1974-1977: Instructor, Santa Clara University. Graduate and undergraduate courses in water resources management.

Curriculum Vitae of Patrick T. Ferraro (Page 2)

1977-1981: Instructor, San Jose Community College District. Environmental science course taught in conjunction with related curriculum.

1987-1988: Instructor, San Jose State University, Department of Environmental Studies. Course in groundwater restoration techniques, *vis a vis* current politics and legal requirements.

2009- 2013: Lecturer, San Jose State University, Department of Environmental Studies. Courses in Water Policy in the Western United States (EnvS 129) and Water Resources Management (EnvS 128)

2013-2014: Lecturer, Santa Clara University, Departments of Civil Engineering and Environmental Sciences. Course title: Water Law and Policy (CENG 124, CENG 258 & ENVS 124)

Professional Affiliations:

1969-2004: Water Environment Federation and California Water Pollution Control Association.

1979-1993: Director and Executive Committee, Association of California Water Agencies; Chairman, Special Agencies Section; 1993-1995: Secretary, Region 5 (Central Coast agencies)

1991-1995: Director, California WateReuse Association: Co-Chair of Education Committee and Video Project Coordinator in charge of fund raising, production house selection process and contract negotiations, and script reviews.

Honors:

Fellowship, Federal Water Quality Administration, San Jose State Foundation, 1969-1970

Water Recycling Leader of the Year, 1992, California WateReuse Association

Personal Profile:

Age: 66 (d.o.b. 9/4/47)

Place of birth: Niagara Falls, N.Y.

United States of American citizen

Married 32 years to Cari Lynn Ferraro, two children, Nicholas (SCU '12) ages 24 and Chrysalis Rose, 29

Valid California Driver's License

Professional References:

Terry Christensen, Retired SJSU Political Science professor t.chris@comcast.net

Mr. Ted Smith, former Executive Director, Silicon Valley Toxics Coalition and past vice president, Silicon Valley Pollution Prevention Center tsmith@igc.org

Eric Rosenblum, Former Project Manager, South Bay Water Recycling and President of Envirospectives
Cell: 408 656-6666 rewater@aol.com

Ken Mackay, retired SJSU Meteorology professor mackaykp@hotmail.com

Stephanie Hughes, Engineering consultant and SCU Lecturer steifehughes@yahoo.com

Terry Trumbull, Environmental Lawyer and University lecturer terryt1011@aol.com

July 22, 2014

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C, Santa Cruz, CA 95060

RE: Statement of Qualifications for Water Supply Advisory Committee Independent Review Panel

Ms. Menard,

I am responding to your email message soliciting applicants to be considered for the Independent Review Panel. The following letter summarizes my qualifications. I have tried to address each of the three elements separately and have also attached a resume.

1] Fit to panel characteristics

My experience and expertise may be a bit different than others who may apply in that I have some overlap into all three of the areas listed, but believe I am strongest in the Environmental Scientist role. Because I have lived and worked in the county for the past 45 years and much of my work, both through University teaching and research, as well as consulting, speaking and public service has been related to the geology and hydrology of the region, much of the following experience overlaps. I feel it is probably more direct to list my relevant experience in bullet form as it relates to the Review Panel rather than trying to describe each of these in a letter format.

- My undergraduate degree is in Earth Sciences and my Ph.D. is in Oceanography, which includes a minor in Civil Engineering. The minor included courses in hydrology, sanitary engineering and soil mechanics among other courses.
- I have been on the faculty in the Earth Sciences Department at UCSC for 45 years and taught Hydrology for about 25 of those years. The course covered all of the basics of surface and groundwater hydrology (weather, precipitation, runoff, flooding, dams and reservoirs, erosion and sedimentation, groundwater and wells, water quality, and water supply and treatment) and was focused on Santa Cruz County. Part of this teaching involved laboratory and field exercises throughout the county, including stream gaging, flood frequency analysis, dams and water storage (proposed dams on both Soquel Creek and Zayante Creek), as well as the Santa Cruz city water supply sources and treatment plant and wastewater treatment facilities.
- I taught Environmental Geology for about 30 years, which also covered runoff, flooding and water quality. As a result of teaching his course for a number of years I wrote a commonly used textbook: *The Earth and Land-Use Planning* and several years

later, revised this book with a new title: *Geologic Hazards, Resources and Environmental Planning*. Part of teaching both courses and writing these two books was spending a lot of time explaining fundamental hydrologic principles and processes to undergraduate students in understandable terms. My co-author on both books, John Gilchrist, was the Santa Cruz County Environmental Planner at the time. Many of the examples used in the book were local and all involved environmental planning and policy.

- For about 18 years I served as a geological consultant to the Santa Cruz County Planning Department as part of an interdisciplinary panel, reviewing proposed land use change and geologic consulting reports and rendering opinions of sites and their limitations or hazards. From 1982 to 1991, I served in a similar role for the Department of Environmental Health Services, reviewing a regular set of consulting reports and proposals for water and septic systems.
- Over the 45 years of both teaching and living in Santa Cruz County I have been involved firsthand with a number of water supply projects and issues, some of which include: participation in the operation of two different small rural water systems (in Bonny Doon, including streams, wells, storage, distribution and metering use); member of a consulting team that investigated potential groundwater supplies on Wilder Ranch (for city of Santa Cruz); drilling for groundwater on the UCSC campus and monitoring off site springs and streams for responses to well pumping tests; combined with living in Bonny Doon and teaching hydrology, I have become familiar with the North Coast water streams/springs and water supplies (Liddell, Majors and Laguna creeks); following the Loma Prieta earthquake I was part of small team investigating the hazard posed by a large landslide that was initiated above the Loch Lomond reservoir; I also was involved in the early 1970s supervising a Ph.D. thesis on the risks posed by the Zayante Fault, which passes through the original proposed Zayante reservoir site; I supervised and worked closely with a research project involving a complete inventory of all ground water wells throughout the entire Bonny Doon and San Lorenzo Valley areas (depths, rocks types, yield and drawdown, quality and quantity issues).
- I am a Registered Geologist and Certified Engineering Geologist in California and have consulted on numerous sites, developments, hazards assessment and related issues over the past 45 years throughout Santa Cruz County. Several of these projects involved investigations advising property owners or small water companies of potential groundwater drilling sites, and then working with drillers in the actual well drilling.
- For several years I was on the San Lorenzo River Task Force (one of several such Task Forces over the years), working with Joe Hall of the Redevelopment Agency, with consultants and city officials on the issues of flooding, flood control, and river front development and plans for redevelopment.
- Prior to and following the 1982 storms and flooding throughout Santa Cruz County I was involved investigating flood hazards throughout the San Lorenzo Valley, the

downtown stretch of the river, and Soquel Creek, assessing flood frequency analysis and risk; following the flooding I directed a team which mapped the high water marks, completed flood frequency analysis and evaluated impacts of the flooding throughout the county.

- I was funded by a state agency to look carefully at coastal hazard policies and practices along California's 1100 mile coastline, which involved reviewing each coastal city and county policies as they related to coastal hazards, interviewing planning department staff in each city and county, comparing how Coastal Commission land use practices compared with written policies, and then preparing a final report: *California Coastal Hazards: A Critical Look at Existing Policies and Practices*.

- More recently (2010-2011) I was one of two consultants hired by the Santa Cruz City Redevelopment Agency to carry out a Climate Change Vulnerability Assessment for the city of Santa Cruz, which included: sea-level rise, coastal storm damage and erosion; changes in precipitation, flood potential and water availability; changing temperatures; wild fires; natural resource impacts; risk assessment; impediments to climate change adaptation; principles for adaptation and adaptive capacity; and climate change adaptation strategies for Santa Cruz. This project involved meeting with various city agency staff, reviewing reports and data involving climate change impacts and history in Santa Cruz, preparing a comprehensive final report and then making presentations to the City Council as well as the County Planning Commission and County Environmental Commission.

- Following the Climate Change Vulnerability Assessment for Santa Cruz, I was asked by the California Energy Commission Public Interest Environmental Research program to submit a proposal to develop a Sea-Level Rise Vulnerability Assessment and Adaptation Guide for California's coastal communities. This led to the preparation, printing and distribution of a manual for local governments, as well as a specific Sea-Level Rise Vulnerability Assessment for the City of Santa Barbara.

Throughout virtually all of my professional career at the University of California Santa Cruz, my research, teaching, writing, public presentations and consulting have involved both science and policy. I have also given hundreds of public lectures over the past 45 years, ranging from k-12 schools, life-long learners, other colleges and universities, service clubs, realtor groups, public entities (e.g. California Coastal Commission, California Ocean Protection Council, planning commissions and other similar groups), conservation organizations and others, so that explaining science in understandable terms has been core to my work. Over the past 6 years I have also been writing a bi-weekly column for the Santa Cruz Sentinel focused on the coastal ocean and which requires regular writing and explaining science in an understandable format.

An important part of my professional work over the past 45 years has involved a significant amount of technical review of manuscripts for professional journals, of

chapters for proposed textbooks, of proposals for research funding from state and federal agencies, of consulting reports, of institutional/departmental/research organizations.

As described above, I have also worked over the period I have served as a professor at UCSC in a wide range of roles involving advising and engaging with citizen's groups, local government staff, as well conservation or environmental groups on issues involving policy.

2] Willingness to accept the compensation

I am quite willing to accept the compensation as listed in the Statement of Qualifications

3] Availability to work with the WSAC over the coming year

While I have several business/professional trips that will require my being out of town for several days to as much as 10 days, I am otherwise available throughout the next year to work with the WSAC.

Sincerely,

A handwritten signature in black ink, appearing to read "Gary Griggs". The signature is stylized with a cursive-like flow.

Gary Griggs

GARY B. GRIGGS

Distinguished Professor of Earth and Planetary Sciences
Director- Institute of Marine Sciences
University of California, Santa Cruz, California 95064
(831) 459-5006; cell (831) 432-9318; fax (831) 459-4882; email: griggs@ucsc.edu

EDUCATION

1965 B.A. Geological Sciences, University of California, Santa Barbara
1968 Ph.D. Oceanography, Oregon State University, Corvallis; Minors:
Civil Engineering and Geology

PROFESSIONAL REGISTRATIONS

Registered Geologist in California (No. 3277)
Certified Engineering Geologist in California (No. 1282)

PROFESSIONAL AFFILIATIONS

American Shore and Beach Preservation Association
American Geophysical Union
Coastal Research Foundation

PROFESSIONAL EXPERIENCE

1965-66: Graduate Research Assistant in Oceanography, Oregon State University
1966-68: National Science Foundation Graduate Fellow in Oceanography, Oregon State University
1969-present: Assistant to Full Professor of Earth Sciences, University of California, Santa Cruz
1981-84: Chairman of Department of Earth Sciences, University of California, Santa Cruz
1975: Participant and advisor to Gulf of Naples Ecological Program, Naples Biological Station, Naples, Italy
1980: Participant in United States-New Zealand Joint Oceanographic Research Program, New Zealand Oceanographic Institute, Wellington, New Zealand
1973-1991: Geological Consultant to Santa Cruz County Planning Department
1982-1991: Hydrological Consultant to Santa Cruz County Department of Environmental Health Services
1984 & 1996: Visiting Professor, Semester at Sea Program, University of Pittsburgh
1987: Guest Lecturer, World Explorer Cruises
1990-present: Editorial Board- *Journal of Coastal Research*
1991-2000: Board of Directors: American Shore and Beach Preservation Association
1991-1999: Editorial Board-*Shore and Beach*
1991-present: Director-Institute of Marine Sciences, University of California, Santa Cruz

1991-1994: Associate Dean-Division of Natural Sciences, University of California, Santa Cruz
 1995-1997: Editorial Board-Geology
 1995-2006: Consortium for Oceanographic Research and Education: Member of Executive Committee and Governor, Central California Consortium.
 1997-98: National Academy of Sciences-National Research Council Committee on Coastal Engineering Research & Education Needs
 1998: Chair-California Sea Grant Program Review Committee
 1999-2009: Chair-University of California Marine Council
 2002-07: Chair of Steering Committee and Principal Investigator-Center for Integrated Marine Technologies
 2003-2004: Board of Directors- Island Conservation
 2003-2004: Chair- Strategic Futures Committee, University of California, Santa Cruz
 2003-2010: Advisory Board-California Center for Ocean Science Education Excellence, Lawrence Hall of Science
 2003-2010; 2014: Advisory Board-California Sea Grant
 2002-07: Executive Committee Central and Northern California Ocean Observing System
 2007- present: Save-Our-Shores Science Advisory Council
 2007-09: Consortium for Ocean Leadership-Board of Trustees and Executive Committee
 2007-08: Planning Committee: California Current Ecosystem-Based Management Initiative
 2008-present: Scientific Advisory Team to the California Ocean Protection Council; (2009-2013 Co-Chair of Team and Executive Committee member)
 2010-2011: Cooperation Across the Atlantic for Marine Governance Integration (CALAMAR). American Co-Chair for Working Group on Oceans and Climate Change.
 2010-2012: Member of National Academy of Sciences-National Research Council Committee on Sea-Level Rise for Coasts of California, Oregon and Washington.
 2012: Chair, Geological Society of America Panel on Developing Position Paper: The Role of Geology in Managing U.S. Coastal Hazard Risk.
 2104: Visiting Professor-Semester at Sea, University of Virginia

AWARDS

1974-75: Fulbright Fellow- Institute of Oceanographic Research, Athens, Greece
 1998: University of California, Santa Cruz, Division of Natural Sciences- Outstanding Faculty Award (for combined teaching, research and service)
 2001: Distinguished Alumnus Award- Geological Sciences Department, University of California Santa Barbara
 2003: American Shore and Beach Preservation Association: Joe Johnson Coastal Research Award
 2006: University of California Santa Cruz Alumni Distinguished Teaching Award
 2006: University of California Santa Cruz Pioneer Faculty Award
 2007: Ed Ricketts Award for Sustained Research in Marine Science- Monterey Bay National Marine Sanctuary
 2009: California Coastal Commission/Sunset Magazine California Coastal Hero award

2010: Elected to California Academy of Science

RESEARCH AREAS

- Geologic and hydrologic hazards, processes and policies
- Coastal Processes: Littoral drift, sand budgets and littoral cells; evaluation of long-term shoreline changes and geomorphic evolution of coastlines.
- Coastal Erosion and Protection: sea cliff and beach erosion; coastal engineering; coastal protection structures and their effectiveness and impacts; coastal hazard analysis and planning; Impacts of sea-level rise on coastlines and adapting to sea-level rise.

COURSES TAUGHT

Oceanography
Geologic Hazards
Hydrology
Coastal Geology
Geologic Principles
Tectonic Geomorphology
Frontiers in Earth Sciences
Coastal Processes

SELECTED PUBLICATIONS (175 total but only local or more relevant publications included)

10. Griggs, G.B. and other, 1970. SANTA CRUZ AND THE ENVIRONMENT, Big Trees Press, Felton, 28 p.
15. Griggs, G.B., 1973. THE EFFECT OF COASTAL CURRENTS ON OCEAN OUTFALLS, Effluent and Water Treatment Jour. 14:29-32.
19. Griggs, G.B., 1974. NEARSHORE CURRENT PATTERNS ALONG THE CENTRAL CALIFORNIA COAST, Estuarine and Coastal Marine Science, 2: 395-405.
20. Griggs, G.B. and McCrory, P., 1974. COMPARITIVE FRESH AND WASTE WATER DICHARGES ALONG THE CALIFORNIA COAST, Environ. Geology 1: 89-95.
24. Griggs, G.B. and Johnson, R.E., 1976. THE EFFECTS OF THE SANTA CRUZ SMALL CRAFT HARBOR ON COASTAL PROCESSES IN NORTHERN MONTEREY BAY, CALIFORNIA, Environ. Geology 1: 229-312.
26. Griggs, G.B., and Gilchrist, J.A., 1976. THE EARTH AND LAND USE PLANNING (book), Duxbury Press, North Scituate, Mass., 492 p.

31. Coppersmith, K.J. and Griggs, G.B., 1978. MULTI-FACTOR FAULT ACTIVITY ANALYSIS OF THE SAN GREGORIO FAULT, In: Special Pub. California Div. Mines & Geology, No. 147:33-44.
32. Griggs, G.B. and Johnson, R.E., 1979. EROSIONAL PROCESSES AND CLIFF RETREAT ALONG THE NORTHERN SANTA CRUZ COUNTY COASTLINE, Calif. Geology 32: 67-76.
33. Weber, G.E., Lajoie, K.R., and Griggs, G.B., 1979. FIELD TRIP GUIDE: COASTAL TECTONICS AND COASTAL GEOLOGIC HAZARDS IN SANTA CRUZ COUNTY AND SAN MATEO COUNTIES, CALIFORNIA, Cordilleran Sect. Geol. Soc. America 75th Ann. Mtg. 189 p.
34. Griggs, G.B., and Walsh, B.L., 1979. THE HYDROLOGY OF HUNGRY VALLEY, CALIFORNIA, Final Rpt. to State Dept. of Parks and Recreation, 118p.
35. Griggs, G.B. and Hein, J.R., 1980. SOURCES, DISPERSAL, AND CLAY MINERALOGY OF FINE-GRAINED SEDIMENT OFF CENTRAL AND NORTHERN CALIFORNIA, Jour. Geology 88:541-566.
36. Griggs, G.B. and Walsh, B.L., 1981. THE IMPACT, CONTROL AND MITIGATION OF OFF-ROAD VEHICLE ACTIVITY IN HUNGRY VALLEY, CALIFORNIA, Environ. Geology 3:229-243.
37. Griggs, G.B. and Paris, L., 1982. THE FAILURE OF FLOOD CONTROL ON THE SAN LORENZO RIVER, SANTA CRUZ COUNTY, CALIFORNIA, Environ. Manage. 6: 407-419.
39. Griggs, G.B., 1982. FLOODING AND SLOPE FAILURE DURING THE JANUARY 1982 STORMS, SANTA CRUZ COUNTY, CALIFORNIA, Calif. Geology 35: 158-163.
41. Griggs, G.B. and Gilchrist, J.A., 1983. GEOLOGIC HAZARDS, RESOURCES, AND ENVIRONMENTAL PLANNING, (book) Wadsworth Pub. Co., Belmont, 502p.
43. Griggs, G.B., and Johnson, R.E., 1983. THE IMPACT OF THE 1983 STORMS ON THE COASTLINE OF NORTHERN MONTEREY BAY, Calif. Geology 36: 163-174.
45. Griggs, G.B., 1984. FLOOD CONTROL AND RIPARIAN HABITAT DESTRUCTION ALONG THE LOWER SAN LORENZO RIVER, CALIFORNIA, In: California Riparian Systems. Werner, R.E. and Hendrik, K.M. (eds.), University of Calif. Press, p. 142-149.
46. Griggs, G.B., 1984. HIGHWAY PROTECTION AND MAINTENANCE AT WADDELL BLUFFS, SANTA CRUZ COUNTY: PROBLEMS IN AN ACTIVE GEOLOGICAL SETTING: Proc. 35th Ann. Highway Geology Symposium. San Jose, Calif., p. 144-169.
47. Griggs, G.B. and Savoy, L.E., 1985. LIVING WITH THE CALIFORNIA COAST (book), Duke University Press, Durham, N.C., 393 p.

50. Tuttle, M. and Griggs, G.B., 1985. ACCELERATED SOIL EROSION AT THREE STATE VEHICULAR RECREATION AREAS: CENTRAL AND SOUTHERN CALIFORNIA, In: Erosion Control: A Challenge in Our Time, 16th An. International Erosion Control Assoc., San Francisco, Ca. p. 105-115.
58. Griggs, G.B., 1987. MONTEREY BAY: ITS GEOLOGIC AND HYDROLOGIC SETTING, Proc. "Managing Inflows to California's Bays and Estuaries", Monterey, Calif.
60. Griggs, G.B., 1987. THE PRODUCTION, TRANSPORT AND DELIVERY OF COARSE-GRAINED SEDIMENT BY CALIFORNIA'S COASTAL STREAMS, Proc. Coastal Sediments '87, Amer. Soc. Civil Engin., New Orleans, La., p. 1825-1838.
61. Tuttle, M. and Griggs, G.B., 1987. SOIL EROSION AND MANAGEMENT RECOMMENDATIONS AT THREE STATE VEHICULAR RECREATION AREAS, CALIFORNIA, Envir. Geology and Water Sci. 10: 111-123.
66. Griggs, G.B., 1988. THE IMPACT OF THE JANUARY 3-4, 1982 FLOODS ON SANTA CRUZ COUNTY, CALIFORNIA, U.S. Geological Survey Prof. Paper 1434: Landslides, Floods, and Marine Effects of the Storm of January 3-5, 1982, in the San Francisco Bay Region, California, pp. 205-227.
75. Griggs, G.B., Rosenbloom, N.A., and Marshall, J. S. 1990. INVESTIGATION AND MONITORING OF GROUND CRACKING AND LANDSLIDES INITIATED BY THE OCTOBER 17, 1989 LOMA PRIETA EARTHQUAKE. Final Report to United States Army Corps of Engineers, 220pp.
76. Plant, N., and Griggs, G.B. 1990. COASTAL LANDSLIDES AND THE LOMA PRIETA EARTHQUAKE. Earth Sciences 43: 12-17.
78. Griggs, G.B., Pepper, J., and Jordan, M.E., 1991. CALIFORNIA'S COASTAL HAZARDS: A CRITICAL LOOK AT EXISTING LAND USE POLICIES AND PRACTICES. Proc. Coastal Zone '91. Special Volume on The California Coastal Zone Experience: 89-107.
80. Best, T., and Griggs, G.B., 1991. THE SANTA CRUZ LITTORAL CELL: DIFFICULTIES IN QUANTIFYING A COASTAL SEDIMENT BUDGET. Proc. Coastal Sediments '91:2262-2276.
81. Best, T. and Griggs, G.B., 1991. A SEDIMENT BUDGET FOR THE SANTA CRUZ LITTORAL CELL, Soc. Econ. Paleon. & Mineral. Spec. Pub. No. 46: 35-50.
82. Keefer, D.K., Rakstins, A.A., Griggs, G.B., Harp, E.L., Levine, P., McAneny, C.C., Spittler, G.E., and Weber, G.E., 1991. GEOLOGIC HAZARDS IN THE SUMMIT RIDGE AREA OF THE SANTA CRUZ MOUNTAINS, SANTA CRUZ COUNTY, CALIFORNIA, EVALUATED IN RESPONSE TO THE OCTOBER 17, 1989, LOMA PRIETA EARTHQUAKE: REPORT OF THE TECHNICAL ADVISORY GROUP. Prepared for Federal Emergency Management Agency, U.S. Geological Survey Open File Report 91-618:427 pp.

86. Griggs, G.B., Pepper, J.E., Jordan, M.E., 1992. CALIFORNIA'S COASTAL HAZARDS: A CRITICAL ASSESSMENT OF EXISTING LAND-USE POLICIES AND PRACTICES. Special Publication of California Policy Seminar Program, 224 p.
89. Griggs, G.B., Pepper, J.E., and Jordan, M.E., 1993. CALIFORNIA'S COASTAL HAZARDS POLICIES: A CRITIQUE. In: Coastal Natural Hazards: Science, Engineering and Public Policy, Ed. by J.W. Good and S.S. Ridlington. Oregon Sea Grant, pp. 127-138.
99. Keefer, D.K., Griggs, G.B., and Harp, R.L., 1998. LARGE LANDSLIDES NEAR THE SAN ANDREAS FAULT, IN THE SUMMIT RIDGE AREA, SANTA CRUZ MOUNTAINS, CALIFORNIA, In: Keefer, D.K., ed. United States Geological Survey Professional Paper 1551-C, The Loma Prieta, California, Earthquake of October 17, 1989: Strong Ground Motion and Ground Failure: p. A71-A128.
104. Storlazzi, C.D. and Griggs, G.B., 1998. THE 1997-98 EL NIÑO AND EROSION PROCESSES ALONG THE CENTRAL COAST OF CALIFORNIA. Shore and Beach 66:3: 12-17.
106. Griggs, G.B. and UCSC/USGS Coop., 1998. A COLLABORATIVE PROGRAM TO INVESTIGATE THE IMPACTS OF THE 1997-98 EL NIÑO WINTER ALONG THE CALIFORNIA COAST. Shore and Beach 66:3: 24-32.
108. Griggs, G.B., 1998. CALIFORNIA NEEDS A COASTAL HAZARDS POLICY. California Coast and Ocean. 14:3:30-33.
109. Moore, L.J., Benumof, B.T. and Griggs, G.B., 1999. COASTAL EROSION HAZARDS IN SANTA CRUZ AND SAN DIEGO COUNTIES, CALIFORNIA. Journal of Coastal Research, Special Issue 28:121-139.
110. Benumof, B.T., Moore, L.J., and Griggs, G.B., 1999. FEMA AND STATE-OF-THE-ART COASTAL EROSION MAPPING ALONG THE SAN DIEGO COUNTY, CALIFORNIA, COASTLINE. In: Proceedings of California's Coastal Natural Hazards: pp86-97. Ed. By Lesley Ewing and Douglas Sherman. USC Sea Grant Program
111. Griggs, G.B. 1999. THE PROTECTION OF CALIFORNIA'S COAST: PAST, PRESENT AND FUTURE. Shore and Beach v. 67:1: 18-28.
112. Griggs, G.B., 1999. CALIFORNIA'S COASTLINE: EL NIÑO, EROSION AND PROTECTION. California's Coastal Natural Hazards, CSBPA Conference: pp36-55. Ed. By Lesley Ewing and Douglas Sherman. USC Sea Grant Program
115. Griggs, G.B. and others, 1999. MEETING RESEARCH AND EDUCATION NEEDS IN COASTAL ENGINEERING. National Academy Press, Wash. D.C. 62p.

117. Storlazzi, C.D. and Griggs, G.B. 2000. THE INFLUENCE OF EL NIÑO-SOUTHERN OSCILLATION (ENSO) EVENTS ON THE EVOLUTION OF CENTRAL CALIFORNIA'S SHORELINE. Geological Society of America Bull. 112:2:236-249.
118. Griggs, G.B. 2000. SAVING THE COASTLINE- AT WHAT COST? WetSand-Surf Report, Surfing Directory and Resource Guide for Surfers. February 2000. <http://wetsand.com>
119. Griggs, G.B. 2000. BRINGING BACK THE BEACHES- A RETURN TO BASICS. Proc. ASBPA conference: Sand Rights '99: Bringing Back the Beaches, ed. By L. Ewing, O.T. Magoon and S. Robertson, ASCE, pp. 276-285.
120. Storlazzi, C.D., Willis, C.M, and Griggs, G.B. 2000. COMPARATIVE IMPACTS OF THE 1982-83 AND 1997-98 EL NIÑO WINTERS ON THE CENTRAL CALIFORNIA COAST. Journal of Coastal Research v.16:4:1022-1036.
123. Moore, L.J. and Griggs, G.B., 2002. LONG-TERM CLIFF RETREAT AND EROSION HOT SPOTS ALONG THE CENTRAL SHORES OF THE MONTEREY BAY NATIONAL MARINE SANCTUARY. Marine Geology 181:265-283.
125. Willis, C.M. and Griggs, G.B. 2003. REDUCTIONS IN FLUVIAL SEDIMENT DISCHARGE BY CALIFORNIA COASTAL DAMS AND IMPLICATIONS FOR BEACH SUSTAINABILITY. Journal of Geology 111: 167-182.
126. Runyan, K.B. and Griggs, G.B. 2003. THE EFFECTS OF ARMORING SEA CLIFFS ON THE NATURAL SAND SUPPLY TO THE BEACHES OF CALIFORNIA. Journal of Coastal Research v.19:2:336-347.
128. Hampton, M.A. and Griggs, G.B. , 2004. FORMATION, EVOLUTION, AND STABILITY OF COASTAL CLIFFS-STATUS AND TRENDS. United States Geological Survey Professional Paper 1693: 123p.
134. Runyan, K.B. and Griggs, G.B., 2005. IMPLICATIONS OF HARBOR DREDGING FOR THE SANTA BARBARA LITTORAL CELL SEDIMENT BUDGET. Proceedings, California and the World Ocean Conf., October 2002, Santa Barbara, California, Pub. American Society of Civil Engineers, pp. 121-135.
137. Griggs, G.B., Patsch, K.B. and Savoy, L.E., 2005. LIVING WITH THE CHANGING CALIFORNIA COAST (book). University of California Press: 540pp.
140. Griggs, G.B. and Ross, D.S., 2006. Santa Cruz Coast- Then and Now. (book) Arcadia Publishing Co., Charlotte, S.C. 95pp.
141. Revell, D.L. and Griggs, G.B., 2006. Beach Width and Climate Oscillations along Isla Vista, Santa Barbara, California. Shore and Beach v. 74: 3: 8-16.

142. Patsch, K. and Griggs, G., 2006. Littoral Cells, Sand Budgets and Beaches: Understanding California's Shoreline. Institute of Marine Sciences, University of California Santa Cruz and California Department of Boating and Waterways. 39p.
143. Patsch, K. and Griggs, G., 2006. Development of Sand Budgets for California's Major Littoral Cells: Eureka, Santa Cruz, Southern Monterey Bay, Santa Barbara, Santa Monica (including Zuma), San Pedro, Laguna, Oceanside, Mission Bay, and Silver Strand Littoral Cells. Report for California Coastal Sediment Management Workgroup, 111 pages.
148. Revell, D.L, Marra, J.J. and Griggs, G.B. 2007. Sandshed Management. Journal of Coastal Research Special Issue 50: 93-98.
149. Griggs, G.B. and Slagel, M.J. 2007. A Regional Approach to Coastal Protection. Shore and Beach 75:3-20.
152. Slagel, M.J. and Griggs, G. 2008. Cumulative Losses of Sand to the Major Littoral Cells of California by Impoundment behind Coastal Dams. Journal of Coastal Research 252:50-61.
153. Patsch, K.B. and Griggs, G.B. 2008. A sand budget for the Santa Barbara Littoral Cell, California. Marine Geology 252:50-61.
155. Grandy, C.C. and Griggs, G.B. 2009. Natural and anthropogenic changes to beach sand supply in the Oceanside Littoral Cell, San Diego, California. Shore and Beach 77:30-38.
156. Griggs, G.B. 2010. Introduction to California's Beaches and Coast. (book). University of California Press, 311pp.
159. Griggs, G.B. (Co-Chair), N. Wijnost, T. Agardy, B. Cicin-Sain, M. Davidson, M. D Dickey-Collas, R. Gagosian, E. Lee, T. MacDonald, S. O'Neill, H. Psaraftis, A. Ruiz and V. Schoenmakers. 2011. Oceans and Climate Change: In: Transatlantic Options for Improved Integrated Maritime Governance, Cooperation Across the Atlantic for Marine Governance Integration. Ecologic Institute. 18pp.
161. Orme, A.R., Griggs, G.B., Revell, D.L., Zoulas, J.G., Grandy, C.C., and Koo, J. 2011. Beach changes along the Southern California coast during the twentieth century: A comparison of natural and human forcing factors. Shore and Beach 79:4:38-50.
162. Griggs, G.B. and Haddad, B., 2011. City of Santa Cruz Climate Change Vulnerability Study, City of Santa Cruz Redevelopment Agency, 73pp.
163. Russell, N.L. and Griggs, G.B. 2012. Adapting to Sea Level Rise- A Guide for California's Coastal Communities. California Energy Commission-Public Interest Environmental Research Program and California Ocean Sciences Trust: 52p.

165. Griggs, G.B. and Russell, N.L., 2012. City of Santa Barbara: Sea-Level Rise Vulnerability Study. California Energy Commission Public Interest Energy Research Program, 87pp.
166. National Research Council, 2012. Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present and Future. The National Academies Press, Washington, D.C. 274pp.
168. Russell, N.L. and Griggs, G.B. 2013. California sea-level rise vulnerability and adaptation guidance document: A summary report. *Shore and Beach* V. 81:1: 1-7.
169. Caldwell, M. R., Hartge, E. H., Ewing, L. C., Griggs, G., Kelly, R. P., Moser, S. C., Newkirk, S. G., Smyth, R. A., & Woodson, C. B. (2013). Coastal Issues. In: Garfin, G., Jardine, A., Merideth, R., Black, M., & LeRoy, S. (Eds.), *Assessment of Climate Change in the Southwest United States: a Report Prepared for the National Climate Assessment*. A report by the Southwest Climate Alliance. Washington, DC: Island Press: Chapter 9: 168-196.
170. Russell, N.L. and Griggs, G.B., 2013. City of Santa Barbara sea-level rise vulnerability assessment: A summary report. *Shore and Beach* V. 81:4: 38-51.
171. Anderson, J., Griggs, G., & Nichols, R.J. and Uhlenbrock, K. 2013. Adapting to Shifting Tides: Science and the Policy Implications of Coastal Change. *EOS*: 94:47: 435.
172. Griggs, G.B. and Ross, D.S., 2014. The California Coast from the Air- Images of a Changing Landscape. Mountain Press, Missoula, Mt. 176pp.
173. Griggs, G. B. (In Press) Lost Neighborhoods of the California Coast, *Journal of Coastal Research*.

August 13, 2014

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C
Santa Cruz, CA 95060

Re: Statement of Qualifications for Water Supply Advisory Committee Independent Review Panel

Dear Ms. Menard:

I am responding to the City of Santa Cruz Water Department's Request for Qualifications for Independent Review Panel Members to support its Water Supply Advisory Committee. I have attached my resume for your consideration. I retired at the end of May from Seattle Public Utilities, closing out my career there as the Drinking Water Director.

Here are my responses to the three topic areas in the SOQ Submittal:

I. How do I fit the Panel Characteristics?

First, I believe my general qualifications and experience fit the second type of panelist described B. Panel Characteristic. I am an engineer by training (BSCE in Civil Engineering and MSCE in Environmental Engineering, with a focus on drinking water treatment). I have over 30 years of water utility experience in Seattle, which provides drinking water to over 1.3 million people primarily from surface water (~99%) supplemented by groundwater (~1%). Since about 1996, I was at a director level within Seattle Public Utilities (SPU) with responsibility for drinking water quality, including regulatory compliance, for water resource management (including the conservation program), for 24/7 water supply operations and, more recently, for oversight of drinking water system planning and water capital improvement programs. I have had leadership roles in the development of most of SPU's major drinking water projects over the last 20 years, including 2 water treatment plants, a reservoir covering program, a new WQ Laboratory and a major Supervisory Control and Data Acquisition (SCADA) Upgrade. SPU has one of the first Habitat Conservation Programs in the country. That program was managed from my division.

Second, I see some similarities between the Seattle and Santa Cruz. Both are primarily surface water (local sources), supplemented by groundwater. Both have had or are having surface water supply challenges. In 1992, Seattle experienced a drought that changed the way the utility and city viewed water supply. Major choices at that time for Seattle were to either develop a major new source of supply and/or to implement conservation measures. For Seattle, the focus since that time has been on conservation efforts, on water supply flexibility (optimizing existing supplies) and on maintaining new source options.

Finally, I have had recent experience with a citizen panel. In my final year with SPU, the utility was developing a 6 year strategic plan for all 3 lines of business (drinking water, drainage & wastewater and solid waste). A nine member citizen review committee was recruited to assist the utility in developing this 6 year plan. As the Drinking Water Director, I attended most of the committee meetings and was regularly involved in educating the committee about the drinking water system and on the options for O&M and capital projects and programs for the next 6 years.

II. My willingness to accept the offered compensation.

I would have no concern with the compensation.

III. My availability to work with the WSAC over the coming year.

Since I am retired, I have fairly good availability with the exception of planned vacations and AWWA conferences: September 10-29, 2014; AWWA Water Infrastructure Conference (Oct 27-28); AWWA Water Quality Technology Conference (November 14-20); February 18-27, 2015; May 20-29; AWWA ACE (June 5-10); June 22-30.

I trust that this cover letter and resume are responsive to the RFQ. Please feel free to contact me for additional information, if needed.

Sincerely,

David J. Hilmoie, P.E. BCEE
Cell Phone: (206) 713 0690
Email: watervet@q.com

DAVID J. HILMOE, P.E. BCEE

11723 Corliss Avenue N, Seattle, Washington 98133

watervet@q.com

(206) 713-0690

Education and Certifications:

B.S.C.E. South Dakota State University

M.S.C.E in Environmental Engineering. Iowa State University

Washington Registered Professional Engineer (#21656)

American Academy of Environmental Engineers – BCEE (#98-20058)

Washington DOH Certified WDM IV & Cross-connection Control Specialist

ICS 100, 200, 300, 400, 700, 800 and Planning Section Chief Training

Organizational Involvement

AWWA, including current Trustee of Water Quality & Technology Division (2011-17)

American Academy of Environmental Engineers

Seattle Management Association

Engineers Without Borders

Water for People, Seattle area Chapter

PROFESSIONAL EXPERIENCE

2005 – May, 2014 Seattle Public Utilities. Drinking Water Director. I was responsible for the Drinking Water Line of Business (LOB) Division which is responsible for drinking water system and asset management planning, CIP development and water resource and drinking water quality O&M management for 1.3 million retail and wholesale customers. This division is the primary point of contact for Washington State Departments of Health and Ecology regulators as well as management of the 2 source water treatment operations contracts (about \$5M/year). The water capital program is about \$60 million/year. This Division of about 50 staff has 5 sections – Water Planning; Major Watersheds; Water Resources; Transmission and Distribution and Water Quality & Treatment.

1997 - 2005 Seattle Public Utilities. Water Quality and Supply Director. I was responsible for drinking water regulatory compliance; the largest state certified drinking water laboratory, water resource management and 24/7 water supply and water treatment operations. The Water Management Section had responsibilities for managing SPU's sources of supply and for managing anadromous fisheries on the S. Fork Tolt and Cedar Rivers. I was the water quality and operational lead for the 120 MGD Tolt and 180 MGD Cedar Water Treatment Facilities Design Build Operate (DBO) project teams. My division completed a \$17M Supervisory Control and Data Acquisition (SCADA) strategic planning and implementation project. In 1999, a new 24,000 SFT Water Quality Laboratory was completed. The Division had about 80 people with an annual operating budget of about \$7 million.

1983-1997 Seattle Water Department. Three positions: Water Treatment Supervisor, Water Quality Manager and then Water Quality Director.

1977-81. Buell Winter Mousel. Project Engineer. BWM, Associates is a general municipal consulting firm in Sioux City Iowa.

Significant roles within Seattle Public Utilities and the Water Industry:

- Drinking water quality lead for the utility between 1995 and 2013, responsible for the water quality program in general (regulatory compliance, relationships to state and local health, water quality operational strategies) and as lead for major water quality emergencies. My primary focus in this role was on public health protection, regulatory compliance and customer confidence in its drinking water quality.
- Managing the water quality and supply operations relationship. I think I was relatively unique in larger utilities in the country in having had responsibility for both water quality and water supply operations, managing the project and O&M interfaces between these two critical functions.
- Transition management. I was responsible for establishing transition plans for several major capital projects, ensuring that customer service impacts would be minimized as new facilities were constructed and brought on line. This includes a program to cover 8 large drinking water reservoirs, new Tolt and Cedar Water Treatment Plants, a new Water Quality Lab and a major SCADA upgrade.
- Capital Program Management, including prioritization, downsizing and refocusing efforts. From 2010 to May 2014, the Water CIP has been transitioning from major projects to a focus on the distribution and transmission infrastructure. It was my division's responsibility to manage this transition.
- System Planning & Strategic Planning. Two Water System Plans (2007 and 2013) were led out of my division. Additionally, I was involved in Transmission and Distribution System strategic planning, strategic asset management plan (SAMP) development and the 2013-14 SPU effort to develop a 2015-2020 department strategic business plan (I was the line of

business lead for this effort), which involved support to a 9 member citizen advisory committee.

- Emergency Preparedness and Response. I have over 30 years of experience in planning for and responding to drinking water emergencies. I have multiple ICS certifications, including Planning Section Chief certification (taken early in 2013). I have been the water quality lead for multiple emergencies, including water treatment plant failures, watermain breaks and e-coli positive samples. I was a water utility lead for the response to the 1990 Goodwill Games, Y2K, continuity of operations planning (COOP) in response to bird flu and the development of several incident action plans (IAPs) in support of the highest consequence or most likely water utility emergencies.
- Management of a division with multi-million dollar budgets. For almost 20 years, I have been a division director with a range in staff of 30 to 80 people, operating budgets from \$2 to \$7 million. I have experienced multiple reorganizations, dealing with impacts on programs and on staff transitions.
- AWWA. I have been a member of AWWA for over 30 years and I am in my second 3 year term (2014-17) as a Trustee of the Water Quality and Technology Division. I am currently on the planning committee for AWWA's first Water Infrastructure Conference in Atlanta, Georgia.

Jessica Lacy
U.S. Geological Survey
400 Natural Bridges Drive
Santa Cruz, CA 95060
jlacy@usgs.gov

August 12, 2014

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060

Dear Ms. Menard:

I would like to be considered for the Independent Review Panel for the Water Supply Advisory Committee. I am a physical oceanographer at the U.S. Geological Survey's Pacific Coastal and Marine Science Center in Santa Cruz. I conduct research in hydrodynamics and sediment transport in estuaries and coastal waters, including San Francisco Bay, Puget Sound, and Monterey Bay. I have always been interested in the interface between science and environmental policy. I've served on numerous scientific advisory panels for wetlands restoration projects and estuarine resource management. Before earning a Ph.D. in Civil and Environmental Engineering at Stanford University, I worked in water quality regulation for the State of California for eight years as a professional engineer.

As a government scientist, one of my responsibilities is to explain technical concepts to local agencies, journalists, and the public. I served as the technical consultant to nonprofit environmental groups participating in the Total Maximum Daily Load (TMDL) process for regulating copper discharge to South San Francisco Bay, explaining technical issues to environmental group members and representing their concerns to engineers and policy makers. As an engineer at the State and Regional Water Quality Control Boards I frequently interacted with citizen groups and other stakeholders interested in water quality, and presented at public hearings.

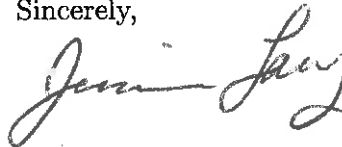
I regularly review research proposals for the National Science Foundation and other granting organizations, and scientific articles for journals as well as for colleagues and coauthors. As a member of the Science Panel for the Elkhorn Slough Tidal Wetland Plan and as consultant on the TMDL process I reviewed consultant proposals and reports.

I live and work in Santa Cruz and my work schedule is somewhat flexible, so I can attend WSAC meetings when needed. I'm interested in reviewing documents and am willing to prepare and present summaries of my reviews.

If I participate in the Review Panel it would be as a citizen of Santa Cruz, not as a representative of USGS. Because of federal guidelines governing outside work by civil servants I would not accept compensation other than reimbursement for direct expenses.

As a resident of Santa Cruz for more than ten years I am very interested in the ongoing planning process for water supply. My C.V. is attached. If I can provide any other information, let me know.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jessica Lacy".

Jessica Lacy

Jessica R. Lacy

U.S. Geological Survey
Pacific Coastal and Marine Science Center
400 Natural Bridges Drive
Santa Cruz, CA 95060
jlacy@usgs.gov
<http://walrus.wr.usgs.gov/staff/jlacy/>
831.460.7520

Registered Professional Engineer in Civil Engineering in the State of California

EDUCATION

Ph.D. in Civil and Environmental Engineering, Stanford University Environmental Fluid Mechanics and Hydrology Program	2000
M.S. in Water Science, University of California, Davis Emphasis in aquatic ecology	1987
B.S. in Environmental Engineering, California State University, Humboldt	1983

FELLOWSHIPS

John K. Vennard Civil Engineering Fellowship, Stanford University	1994–95
Distinguished Scholar Fellowship, University of California, Davis	1985–86

RESEARCH TOPICS

- Hydrodynamics of the coastal ocean, estuaries, and lakes
- Lateral dynamics in estuaries with complex topography, and their influence on mixing
- Sediment dynamics of estuarine shallows
- Estimation of bottom roughness, bottom shear stress, and sediment resuspension in wave-dominated environments
- Interaction between aquatic vegetation and hydrodynamics

RESEARCH APPOINTMENTS

Research Oceanographer, Pacific Coastal and Marine Science Center, U.S. Geological Survey	2003 – present
Research Associate, Institute of Marine Sciences, Univ. of California, Santa Cruz	2005 – present
Visiting Scientist, Terrestrial Environment Research Center, University of Tsukuba, Ibaraki, Japan	January 2005
Postdoctoral Researcher, Coastal and Marine Geology, U.S. Geological Survey	2001–02
Postdoctoral Researcher, Environmental Fluid Mechanics Laboratory, Stanford University	2000

Research Assistant, Environmental Fluid Mechanics Laboratory, Stanford University 1995–2000
Hydrologist, U.S. Geological Survey, California District Office, Sacramento, CA Summer 1995
Research Assistant, Department of Land Air and Water Resources, Univ. of California, Davis 1986–87

TEACHING EXPERIENCE

Lecturer, Department of Civil and Environmental Engineering, Stanford University Winter 2000
Transport and Mixing in Surface Water Flows: Graduate class in hydrodynamics
Teaching Assistant, Department of Civil and Environmental Engineering, Stanford University 1994–98
Introductory Fluid Mechanics, Open Channel Flow, Transport and Mixing in Surface Water Flows

PROFESSIONAL EXPERIENCE

Technical Consultant, South Bay TMDL Workgroup 1998–2000
Associate Water Resource Control Engineer, California Regional Water Quality Control Board, San Francisco Bay Region, Planning Division, Oakland, CA 1990–95
Water Resource Control Engineer, State Water Resources Control Board, Division of Water Quality, Sacramento, CA 1987–90
Sanitary Engineer, Massachusetts Department of Environmental Quality Engineering, Wetlands Division, Worcester, MA 1984–85

PROFESSIONAL ACTIVITIES AND ASSOCIATIONS

Facilitator of the Science Advisory Panel on Sand Mining in San Francisco Bay convened by the San Francisco Bay Conservation and Development Commission January 2014
Member of the Science Panel for the Pescadero Lagoon 2012 – present
Member of the Science Panel for the Elkhorn Slough Tidal Wetland Plan 2004 – present
Participant in the Climate Ready Estuaries Workshop convened by U.S. EPA and BCDC, San Francisco, CA March 2010
Participant in the Envisioning the Future of the Gulf Coast Symposium, New Orleans LA April 2006
Participant in the National Research Council Workshop on Mitigating Shore Erosion along Sheltered Coasts, Seattle, WA October 2005
Member of the Science Team convened by the California Coastal Conservancy for the South San Francisco Bay Salt Pond Restoration Project 2003–05
Participant in the Dissertations Initiative for the Advancement of Coastal and Estuarine Science Symposium, Guanica, Puerto Rico October 2002
Member of American Geophysical Union, Estuarine Research Federation, and American Society of Limnology and Oceanography

PUBLICATIONS

- A. Brand, J.R. Lacy, S. Gladding, R. Holleman, and M.T. Stacey. Model-based interpretation of sediment concentration and vertical flux measurements in the shoals of South San Francisco Bay. In review, *Limnology and Oceanography: Fluids and Environments*.
- D. Buscombe, D.M. Rubin, J.R. Lacy, C.D. Storlazzi, G.Hatcher, H. Chezar, R. Wyland, and C.R. Sherwood. 2014. Autonomous bed-sediment imaging systems for revealing temporal variability of grain size. *Limnology and Oceanography – Methods* 12: 390–406. doi:10.4319/lom.2014.12.390.
- L. MacVean and J.R. Lacy. 2014. Interactions between waves, sediment, and turbulence on a shallow estuarine mudflat. *Journal of Geophysical Research – Oceans* 119, 1534–1553. doi:10.1002/2013JC009477.
- J.R. Lacy, S. Gladding, A. Brand, A. Collignon, and M.T. Stacey. 2014. Lateral baroclinic forcing enhances transport of sediment from shallows to channel in an estuary. *Estuaries and Coasts* 37 (5): 1058–1077. doi:10.1007/s12237-013-9748-3.
- J.R. Lacy, D.M. Rubin, and D. Buscombe. 2012. Currents, drag, and sediment transport induced by a tsunami. *Journal of Geophysical Research* 117 (C09028). doi:10.1029/2012JC007954.
- A.W. Stevens and J.R. Lacy. 2012. The influence of wave energy and sediment transport on seagrass distribution. *Estuaries and Coasts* 35: 92–108. doi:10.1007/s12237-011-9435-1.
- J.R. Lacy and R.S. Dinicola. 2011. Aquatic environment: Circulation, water quality, and phytoplankton concentration. Chap. 2 in R.K. Takesue, ed., *Hydrography of and biogeochemical inputs to Liberty Bay, a small urban embayment in Puget Sound, Washington*. U.S. Geological Survey Scientific Investigations Report 2011-5152. <http://pubs.usgs.gov/sir/2011/5152/>.
- J. Figurski, D. Malone, J.R. Lacy, and M. Denny. 2011. An inexpensive instrument for measuring wave exposure and water velocity. *Limnology and Oceanography: Methods* 9: 204–214. doi:10.4319/lom.2011.9.204.
- J.R. Lacy and D.J. Hoover. 2011. Wave exposure of Corte Madera Marsh, Marin County, California: A field investigation. U.S. Geological Survey Open-File Report 2011-1183. <http://pubs.usgs.gov/of/2011/1183/>.
- J.R. Lacy and S. Wyllie-Echeverria. 2011. The influence of current speed and vegetation density on flow structure in two macrotidal eelgrass canopies. *L & O: Fluids and Environments* 1: 38–55. doi:10.1215/21573698-1152489.
- A. Brand, J.R. Lacy, K. Hsu, D. Hoover, S. Gladding, and M.T. Stacey. 2010. Wind-enhanced resuspension in the shallow waters of South San Francisco Bay: Mechanisms and potential implications for cohesive sediment transport. *Journal of Geophysical Research* 115 (C11024). doi:10.1029/2010JC006172.
- A.W. Stevens, J.R. Lacy, D.P. Finlayson, and G. Gelfenbaum. 2008. Evaluation of a single-beam sonar system to map seagrass at two sites in northern Puget Sound, Washington: U.S. Geological Survey Scientific Investigations Report 2008-5009. <http://pubs.usgs.gov/sir/2008/5009/>
- J.R. Lacy, D.M. Rubin, H. Ikeda, K. Mokodai, and D.M. Hanes. 2007. Bedforms created by simulated waves and currents in a large flume. *Journal of Geophysical Research* 112 (C10018). doi:10.1029/2006JC003942.
- C.R. Sherwood, J.R. Lacy, and G. Voulgaris. 2006. Shear velocity estimates on the inner shelf off Grays Harbor, Washington, U.S.A. *Continental Shelf Research* 26:1995–2018. doi:10.1016/j.csr.2006.07.025.
- J.R. Lacy, C.R. Sherwood, D. Wilson, T. Chisholm, and G. Gelfenbaum. 2005. Estimating hydrodynamic roughness in a wave-dominated environment with a high resolution acoustic Doppler profiler. *Journal of Geophysical Research* 110 (C06014). doi:10.1029/2003JC001814.

- M. Martini, F.L. Lightsom, C.R. Sherwood, J. Xu, J.R. Lacy, A. Ramsey, and R. Horwitz. 2005. Hydratools, a Matlab based data processing package for Sontek Hydra data. *IEEE/OES/CMTC 8th Current Measurement Technology Conference Proceedings*.
- M. Martini, C.R. Sherwood, R. Horwitz, A. Ramsey, F. Lightsom, J. Lacy and J. Xu. 2005. Hydratools Manual Version 1.0, Documentation for a MATLAB-based Post-processing Package for the Sontek Hydra. U.S. Geological Survey Open-File Report 2005-1026. <http://pubs.usgs.gov/of/2005/1026/>
- J.R. Lacy and C.R. Sherwood. 2004. Accuracy of a pulse-coherent acoustic Doppler profiler in a wave-dominated flow. *Journal of Atmospheric and Oceanic Technology* 21 (9): 1448–1461.
- L.A. Landerman, C.R. Sherwood, G. Gelfenbaum, J.R. Lacy, P. Ruggiero, D. Wilson, T. Chisholm, and K. Kurrus. 2004. Grays Harbor Sediment Transport Experiment Spring 2001 Data Report. USGS Data Series Report 98.
- P. Ruggiero, G. Gelfenbaum, C.R. Sherwood, J.R. Lacy, and M.C. Buijsman. 2003. Linking nearshore processes and morphology measurements to understand large scale coastal change. In *Proceedings of the International Conference on Coastal Sediments 2003*. CD-ROM. Corpus Christi, Texas: World Scientific Publishing Corp. ISBN 981-238-422-7.
- J.R. Lacy, M.T. Stacey, J.R. Burau, and S.G. Monismith. 2003. The interaction of lateral baroclinic forcing and turbulence in an estuary. *Journal of Geophysical Research* 108 (C3), 3089. doi 10.1029/2002JC001392.
- J.R. Lacy and S.G. Monismith. 2001. Secondary currents in a curved, stratified, estuarine channel. *Journal of Geophysical Research* 106 (C12): 31283–31302.
- M.T. Stacey, J.R. Burau, M.L. Brennan, J.R. Lacy, S.G. Monismith, and C.C. Tobin. 2000. Spring-neap variations in stratification and turbulent mixing in a partially stratified estuary. In G.A. Lawrence, R. Pieters, and N. Yonemitsu, eds., *Fifth International Symposium on Stratified Flows*, 939–944. Vancouver: Department of Civil Engineering, University of British Columbia.
- J.R. Lacy. 2000. Circulation and transport in a semi-enclosed estuarine subembayment. Ph.D. thesis, Department of Civil and Environmental Engineering, Stanford University.
- J.R. Lacy, M.T. Stacey, S.G. Monismith, and J.R. Burau. 1997. Stratification and turbulence over a tidal cycle in northern San Francisco Bay. In S.S.Y. Wang and T. Carstes, eds., *Proceedings of the 27th IAHR Biennial Congress*, vol. 1, 1108–1113. New York: American Society of Civil Engineers.
- J.R. Lacy, D.H. Schoellhamer, and J.R. Burau. 1996. Suspended-solids flux at a shallow-water site in South San Francisco Bay, California. In C.T. Bathala, ed., *Proceedings of the North American Water and Environment Congress*, June 23–28, 1996. New York: American Society of Civil Engineers.

CONFERENCE PRESENTATIONS

- J.R. Lacy, D.M. Rubin, and A. O'Neill. Influence of combined waves and currents on bedform orientation and evolution. Submitted to AGU Fall Meeting, San Francisco CA, December 2014.
- J.R. Lacy, L.M. Schile, J.C. Callaway, and M.C. Ferner. Sediment flux between San Francisco Bay shallows and marshes. Accepted oral presentation at Bay Delta Science Conference, Sacramento CA, October 2014.
- J.R. Lacy. Wave attenuation by the eelgrass *Zostera marina*: dependence on wave energy. Coastal and Estuarine Research Federation Conference, San Diego CA, November 2013.
- L. MacVean and J.R. Lacy. Interactions between waves, sediment, and turbulence on a shallow estuarine mudflat. Coastal and Estuarine Research Federation Conference, San Diego CA, November 2013.

- J.R. Lacy, D.M. Rubin, and D. Buscombe. Currents, drag, and sediment transport induced by a tsunami. AGU Fall Meeting, San Francisco CA, December 2012.
- J.R. Lacy. Sediment dynamics in the shallows of San Francisco Bay. Bay Delta Science Conference, Sacramento CA, October 2012.
- J.R. Lacy and L. MacVean. Wave-height evolution in the shallows of San Francisco Bay. Physics of Estuaries and Coastal Seas Symposium, New York City NY, August 2012.
- L. MacVean and J.R. Lacy. Sediment dynamics in the shallowest regions of an estuary. Physics of Estuaries and Coastal Seas Symposium, New York City NY, August 2012.
- J.R. Lacy, S. Gladding, A. Brand, A.G. Collignon, and M.T. Stacey. Suspended sediment transport from shallows to channel in an estuary. AGU Ocean Sciences Meeting, Salt Lake City UT, February 2012.
- L. MacVean and J.R. Lacy. Estuarine sediment dynamics in intertidal and subtidal environments: Similarities in forcing and response. Poster. AGU Ocean Sciences Meeting, Salt Lake City UT, February 2012.
- S. Buckley, J.R. Lacy, and E. McPhee-Shaw. The effect of wave variability on bedform dimensions. Poster. AGU Fall Meeting, San Francisco CA, December 2011.
- L. MacVean and J.R. Lacy. Controls on transport of suspended sediment into and out of the estuarine intertidal zone. Coastal and Estuarine Research Federation Conference, Daytona Beach FL, November 2011.
- M.T. Stacey, A.G. Collignon, A. Brand, and J.R. Lacy. Anisotropy of mixing in stratified estuarine flows. Seventh International Symposium on Stratified Flows, Rome Italy, August 2011.
- J.R. Lacy and A.W. Stevens. A field study of the influence of the eelgrass *Zostera marina* on wave velocities. 15th International Workshop on Physical Processes in Natural Water, Burlington Ontario, Canada, July 2011.
- J.R. Lacy and A.W. Stevens. Interactions between eelgrass, currents, and waves in Puget Sound. 9th USGS Conference on Science in the Pacific Northwest, Vancouver WA, March 2011.
- A.G. Collignon, C.D. Holleman, A. Brand, J.R. Lacy, and M.T. Stacey. Development of a transverse circulation in a shoal-channel system under partially stratified conditions. Bay Delta Science Conference, Sacramento CA, September 2010.
- A. Brand, J.R. Lacy, K. Hsu, D. Hoover, S. Gladding, and M.T. Stacey. Seasonal variation of mechanisms governing sediment dynamics in South San Francisco Bay. Physical Processes in Natural Waters 14, Reykjavik Iceland, June 2010.
- J.R. Lacy, A. Brand, A.G. Collignon, and M.T. Stacey. Suspended-sediment flux in the shallows of South San Francisco Bay. Bay Delta Science Conference, Sacramento CA, September 2010.
- A. Brand, S. Gladding, J.R. Lacy, and M.T. Stacey. Model-based interpretation of sediment concentration and vertical flux measurements in the shoals of South San Francisco Bay. Bay Delta Science Conference, Sacramento CA, September 2010.
- S. Gladding, A. Brand, J.R. Lacy, J. Hunt, and M.T. Stacey. Measurements of water column and sediment bed interactions in the South San Francisco Bay Estuary. Bay Delta Science Conference, Sacramento CA, September 2010.
- J.R. Lacy. Waves and resuspension on the shoals of San Francisco Bay. San Francisco Bay Sediment Science Workshop: State of the Sediment, sponsored by BCDC and USGS, Menlo Park CA, April 2010.

- J.R. Lacy, D. Buscombe, and D.M. Rubin. Tsunami-enhanced sediment resuspension on the inner shelf in northern Monterey Bay. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- D. Buscombe, J.R. Lacy, and D.M. Rubin. Fractional resuspension and sediment flux on a wave-dominated, non-cohesive, inner continental shelf. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- D.M. Rubin, D. Buscombe, and J.R. Lacy. Seafloor sediment observatory on a cable and a shoestring. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- A. Brand, S. Gladding, J.R. Lacy, K. Hsu, D. Hoover, and M.T. Stacey. Wind-induced formation of turbidity gradients along the shoal channel transition in south San Francisco Bay and potential implications for sediment transport. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- A. Collignon, C. Holleman, A. Brand, J.R. Lacy, and M.T. Stacey. Development of a transverse circulation in a shoal-channel system under stratified conditions. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- S.M. Gladding, A. Brand, K. Hsu, J.R. Hunt, J.R. Lacy, and M.T. Stacey. Particle flocculation during tidal cycles on the shoals of the San Francisco Bay Estuary. Poster. AGU Ocean Sciences Meeting, Portland OR, February 2010.
- J.R. Lacy and A.W. Stevens. Relating wave-induced sediment mobility to seagrass distribution. Poster. Coastal and Estuarine Research Federation Conference, Portland OR, November 2009.
- A.W. Stevens and J.R. Lacy. Hydrodynamic controls on seagrass distribution along a high energy Puget Sound shoreline. Poster. Coastal and Estuarine Research Federation Conference, Portland OR, November 2009.
- A.W. Stevens, J.R. Lacy, D.P. Finlayson, and G. Gelfenbaum. Evaluation of a single-beam echosounder to map seagrass at two sites in northern Puget Sound, Washington. Puget Sound Georgia Basin Ecosystem Conference, Seattle WA, February 2009.
- R.K. Takesue, J.R. Lacy, E. Carrington, and S. Wyllie-Echeverria. Eelgrass *Zostera marina* and light availability in Puget Sound: Adaptation or limitation? Puget Sound Georgia Basin Ecosystem Conference, Seattle WA, February 2009.
- P. Dowty, J.R. Lacy, and A. Schanz. Causes of reduced underwater light availability and their role in limiting eelgrass distribution in Westcott Bay, San Juan Island, WA. Puget Sound Georgia Basin Ecosystem Conference, Seattle WA, February 2009.
- T.L. Liedtke, C.D. Smith, D.W. Rondorf, R.S. Dinicola, J.R. Lacy, R.K. Takesue, and R.D. Watts. Forage fish spawning habitat selection: First steps toward a predictive model in an urbanized Puget Sound embayment. Puget Sound Georgia Basin Ecosystem Conference, Seattle WA, February 2009.
- J.R. Lacy and D.M. Rubin. Influence of current on suspended-sand concentration profiles in combined flows. Poster. AGU Fall Meeting, San Francisco CA, December 2008.
- Y.J. Chou, O.B. Fringer, and J.R. Lacy. Numerical study of sediment suspension over bedforms in combined flows. Poster. AGU Fall Meeting, San Francisco CA, December 2008.
- J.R. Lacy and D.M. Rubin. Evolution of suspended-sand concentration profiles produced by simulated waves and currents in a large flume. International Conference on Coastal Engineering 2008, Hamburg Germany, September 2008.

- R.T. Takesue, J.R. Lacy, S. Talbot, and S. Wyllie-Echeverria. Small eelgrass (*Zostera marina*) plants along a high-boat traffic shoreline: Light limitation due to sediment resuspension, or genetics? Poster. ASLO Summer Meeting, Newfoundland Canada, June 2008.
- J.R. Lacy and S. Wyllie-Echeverria. Field measurements of current attenuation and vertical mixing in eelgrass meadows. Poster. AGU Ocean Sciences Meeting, Orlando FL, March 2008.
- J.R. Lacy, S. Wyllie-Echeverria, and G. Gelfenbaum. Interaction of eelgrass with nearshore tidal currents. Georgia Basin-Puget Sound Research Conference, Vancouver B.C., March 2007.
- J.R. Lacy, D.M. Rubin, H. Ikeda, and D.M. Hanes. Predicting ripple wavelength in wave-current flows. AGU Fall Meeting, San Francisco CA, December 2006.
- J.R. Lacy, D. Finlayson, A. Stevens, and G. Gelfenbaum. Nearshore processes at Posession Point. USGS Multidisciplinary Coastal Habitats in Puget Sound Project Meeting, Port Townsend WA, November 2006.
- J.R. Lacy, D.M. Rubin, H. Ikeda, and D.M. Hanes. Bedforms produced in the laboratory by varying combinations of waves and currents. AGU Ocean Sciences Meeting, Honolulu HI, February 2006.
- J.R. Lacy, J.N. Harney, S. Wyllie-Echeverria, and G. Gelfenbaum. A field study of the influence of eelgrass on currents and waves in Puget Sound. Estuarine Research Federation Conference, Norfolk VA, October 2005.
- J.R. Lacy, D.M. Rubin, H. Ikeda, and D.M. Hanes. Bedforms produced in the laboratory by waves and currents at varying angles. ONR Ripples DRI Project Meeting, La Jolla CA, September 2005.
- J.R. Lacy, J.N. Harney, S. Wyllie-Echeverria, G. Gelfenbaum, and T. Mumford. The influence of eelgrass on currents and waves in the nearshore region. Puget Sound-Georgia Basin Conference, Seattle WA, March 2005.
- J.R. Lacy, D.R. Rubin, and D.M. Hanes. Bedforms produced in the laboratory by waves and currents at varying angles. ONR Progress Review Southwest Region, MBARI, Moss Landing CA, March 2005.
- J.R. Lacy, J.N. Harney, and G. Gelfenbaum. Temporal variability in the influence of eelgrass on currents in the bottom boundary layer. Poster. ASLO Aquatic Sciences Meeting, Salt Lake City UT, February 2005.
- J.R. Lacy, C.R. Sherwood, and G. Gelfenbaum. Estimating hydrodynamic roughness in a wave-dominated environment with a high resolution acoustic Doppler profiler. AGU Ocean Sciences Meeting, Portland OR, January 2004.
- J.R. Lacy, J.A. Warrick, J. Xu, and M. Noble. Internal tidal bores at the Santa Monica Bay shelf break. Poster. Eastern Pacific Ocean Conference, Catalina Island CA, September 2003.
- J.R. Lacy, M.T. Stacey, J.R. Burau, and S.G. Monismith. The interaction of lateral baroclinic forcing and turbulence in an estuarine channel. Estuarine Research Federation Biennial Conference, Seattle WA, September 2003.
- J.R. Lacy. Circulation in Honker Bay, a natural shallow water habitat. Invited talk. CalFed Science Conference, Sacramento CA, January 2003.
- J.R. Lacy, C.R. Sherwood, D. Wilson, T. Chisholm, and G. Gelfenbaum. Estimates of hydrodynamic roughness and bedform heights in a wave-dominated flow. Poster. AGU Fall Meeting, San Francisco CA, December 2002.
- J.N. Harney, J.R. Lacy, and D.M. Rubin. Time-varying record of sediment resuspension under waves on the inner shelf of Santa Cruz, California. Poster. AGU Fall Meeting, San Francisco CA, December 2002.

C.R. Sherwood and J.R. Lacy. Comparison of three independent estimates of bottom stress on the inner shelf. Poster. AGU Fall Meeting, San Francisco CA, December 2002.

J.R. Lacy, M.T. Stacey, J.R. Burau, and S.G. Monismith. The interaction of lateral baroclinic forcing and turbulence in an estuarine channel. AGU Ocean Sciences Meeting, Honolulu HI, February 2002.

J.R. Lacy and C.R. Sherwood. Estimates of bottom shear stress on a high-energy, wave-dominated ebb-tidal delta using three methods. AGU Fall Meeting, San Francisco CA, December 2001.

J.R. Lacy, C.R. Sherwood, P. Ruggiero, and G. Gelfenbaum. Seasonal changes in near-shore flow and sediment transport near Grays Harbor, Washington. Eastern Pacific Ocean Conference, Stanford Sierra Camp, September 2001.

J.R. Lacy. How do circulation and transport in shallows and channels differ? Presentation to CalFed Expert Review Panel on Hydrodynamics and Salinity Response to Levee Breaches in Suisun Marsh, Sacramento CA, June 2001.

J.R. Lacy, J.R. Burau, M.T. Stacey, and S.G. Monismith. Lateral variability and secondary currents in Suisun Cutoff, San Francisco Bay. Poster. AGU Fall Meeting, San Francisco CA, December 2000.

J.R. Lacy and S.G. Monismith. Lateral variability in two channels in Suisun Bay. CalFed Science Conference, Sacramento CA, October 2000.

J.R. Lacy and S.G. Monismith. Wind, sea level, and a sudden increase in salinity in northern San Francisco Bay. AGU Ocean Sciences Meeting, San Antonio TX, January 2000.

J.R. Lacy and S.G. Monismith. Lateral variability and secondary currents in an estuarine channel. Estuarine Research Federation Biennial Conference, New Orleans LA, September 1999.

J.R. Lacy and S.G. Monismith. Secondary currents in a tidal flow around a bend. Poster. AGU Fall Meeting, San Francisco CA, December 1998.

J.R. Lacy, J.R. Burau, and S.G. Monismith. The influence of complex bathymetry on circulation and mixing in Northern San Francisco Bay. AGU Ocean Sciences Meeting, San Diego CA, February 1998.

J.R. Lacy, S.G. Monismith, and J.R. Burau. The physical environment of estuarine shallows. Interagency Ecological Program Annual Meeting, Asilomar CA, February 1998.

INVITED SEMINARS

Sediment dynamics in the shallows of San Francisco Bay. Environmental Fluid Mechanics and Hydrology Seminar Series, Stanford University, January 2013.

Sediment dynamics in the shallows of San Francisco Bay. Mary and Louise Riley Seminar Series, UC Davis Bodega Marine Laboratory, September 2012.

Interactions among eelgrass, currents, and waves in Puget Sound. Peninsula Geological Survey, Stanford University, December 2011.

Field measurements of current attenuation and vertical mixing in eelgrass meadows. Environmental Fluid Mechanics and Hydrology Seminar, Stanford University, March 2008.

Bedforms produced in the laboratory by varying combinations of waves and currents. Environmental Fluid Mechanics and Hydrology Seminar, Stanford University, February 2006.

Interactions of waves, currents, and bedforms in coastal bottom boundary layers. Ocean Sciences Seminar, University of California, Santa Cruz, April 2005.

Influence of lateral variability on hydrodynamics in San Francisco Bay. University of Tsukuba, Ibaraki, Japan, January 2005.

The influence of complex bathymetry on estuarine hydrodynamics. Department of Marine Sciences, Moss Landing Marine Laboratories, Moss Landing CA, May 2004.

Estimating hydrodynamic roughness for sediment transport models of wave-dominated environments. Department of Civil and Environmental Engineering, University of Delaware, April 2004.

Complex bathymetry and estuarine hydrodynamics. Department of Marine Sciences, University of Connecticut, Avery Point, February 2004.

The influence of complex bathymetry on estuarine hydrodynamics in San Francisco Bay. Ocean Sciences Seminar, University of California, Santa Cruz, October 2003.

Estimating hydrodynamic roughness in a wave-dominated environment using a pulse-coherent acoustic Doppler profiler. Fluid Mechanics and Hydrology Seminar, Department of Civil and Environmental Engineering, Stanford University, June 2003.

Complex bathymetry and estuarine hydrodynamics. Department of Civil and Environmental Engineering, University of Washington, May 2003.

Complex bathymetry and estuarine hydrodynamics. SMAST Seminar, University of Massachusetts, Dartmouth, November 2002.

Estimates of shear stress and bottom roughness on a wave-dominated ebb-tidal delta. Physical Oceanography Seminar, Oregon State University, June 2002.

The physical environment of estuarine shallows. Department of Environmental Engineering, California State University, Humboldt, March 1999.

Steven Leonard

38 Woodhill Drive • Redwood City, CA 94061 • Phone: 650-868-3453
E-Mail: eausimc@gmail.com

RECEIVED

AUG 13 2014

CITY OF SANTA CRUZ
WATER DEPT.

August 10, 2014

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C
Santa Cruz, CA 95060

Re: Independent Review Panel--Statement of Qualifications

Dear Ms. Menard,

I am pleased to submit my Statement of Qualifications for the Independent Review Panel announced in your recent RFQ. Having reviewed the RFQ, I believe I meet the qualifications to be a panel member and appreciate the opportunity to be considered.

I have worked in the water utility industry for over forty years. During this time, I have gained significant expertise in most facets of the industry, including operations and maintenance; water quality, engineering and other technical aspects of the business; utility administration; utility policy development at the state, federal and local levels; and the public involvement in drinking water systems. I have worked in large, medium, and small utilities. I have directed public systems as well as privately owned water systems. I have operated water, wastewater, and combined systems that included recycled water. I have participated extensively in the national and state water utility associations on an array of capacities on a variety technical, policy, and utility communication issues. My experience is from the ground up, and my approach is both practical and effectiveness oriented.

As detailed further in the attached resume most of my career was with the City of San Francisco Public Utilities Commission (SFPUC) working in both water and wastewater. I began my career as a Microbiologist, monitoring the water supply reservoirs, watersheds and water distribution systems; progressed through a series of increasingly responsible technical, supervisory, and managerial positions.

While serving concurrently as Manager of the Water Quality Division and interim Manager of the Suburban Operations Division, in response to an order from the California Department of Public Health (CDPH), I undertook the challenge of bringing San Francisco into compliance with the Surface Water Treatment Regulations. Over the next ten years I led a planning and regulatory compliance unit that worked with the CDPH and the US Environmental Protection Agency to develop regulations that protected public health while ensuring an appropriate level of treatment for San Francisco's main water supply, Hetch Hetchy. Building on that success, I turned my attention to other strategic water supply and environmental issues confronting the SFPUC, several of which were highly contentious and required extensive public processes to resolve.

In 2001, I was asked by the Commission to act as the SFPUC General Manager. In that role, I steered the utility through the 9/11 terror and its aftermath and readied a \$4.2B capital infrastructure initiative for the ballot.

I began working as the Manager of California American's Coastal Division in Monterey in 2002, a privately owned water system that is regulated by the California Public Utilities Commission. The Monterey District is approximately the same size as the Santa Cruz Water District and shares many of the same characteristics, including a small coastal watershed, inconsistent water supplies, endangered fish issues, and an informed and concerned consumer base. Monterey has other issues that compound the marginal supply: the threat of saltwater intrusion in key well fields, diminishing water rights to the primary Carmel River supply, and significantly impaired supply dams. In addition, the Monterey District is in a permanent state of water conservation (current per capita use is 80% of 1978 levels), has high water rates, and extensively integrates the use of recycled water. Monterey also has a very complex political landscape, including nine local public entities. The Monterey District shares water supply jurisdiction with a public agency, the Monterey Peninsula Water Management District (MPWMD), and serves six cities and parts of Monterey County. To successfully meet these challenges, I regularly met with public boards, public interest groups, regulators, the media, and the interested public. During my tenure, we initiated a multipronged water supply development plan to address the diminishing ground water levels and to comply with the increasing SWRCB restrictions. The water supply review looked at the development of additional recycled water, importation of water, purchase of water rights, the seasonal storage of rainwater in Aquifer Storage and Recovery systems (ASR), and an exploration of desalination.

After leaving Cal-Am, I worked a short time for the consulting firm Black & Veatch, where I collaborated with a wide array of clients and project teams in the San Francisco and Monterey Bay areas. The projects we reviewed and proposed on were generally water treatment facilities upgrades, development of Advanced Water Treatment (AWT), and development of supplemental drinking water from ultra-treated wastewater. Among other responsibilities, I monitored the water supply development activities of the Monterey, Santa Cruz and Soquel water utilities.

As the Manager of the Sewer Authority Mid-Coastside, a joint powers agency sewer utility, I was tasked with developing new water supply in conjunction with the two local water agencies. In many ways, the Half Moon Bay Area is a microcosm of other coastal regions where the water supply is inconsistent, and urban interests and agriculture compete for water. While we were not successful developing additional water, we managed to help the sewer board and interested parties better understand the issues and hurdles to the development of the needed infrastructure and to the establishment of financial viability to develop the water reuse project.

Throughout my career I have been able to effectively communicate water issues. I have served on many industry technical committees and expert panels, many of which were specifically focused on communicating issues that were difficult to understand and, from the consumer's standpoint, often difficult to accept. I have extensive experience presenting technical, operational, and financial issues to elected and appointed boards. More importantly, I have participated in more than a hundred public meetings to discuss the difficult issues of high rates, public health threats, water conservation, and new water supply development. I have been able to work with a wide array of interest groups to reach understanding, if not agreement.

In my attached resume I have outlined my utility experience, education, and other water utility qualifications. I have listed my technical, policy, and communication contributions to the water industry, my participation in expert water panels, and links to my online profile and data.

In conclusion, I have the technical background, the utility experience, and the communication skills necessary to be an effective member of the Independent Review Panel in support of the work of the Water Supply Advisory Committee. I am willing to accept the honorarium as proposed and I live within fifty miles of Santa Cruz and have availability to attend the committee's meetings. If you have further questions or need more information, please do not hesitate to contact me.

Thank you for your consideration.

Sincerely,



Steven Leonard

STEVEN D. LEONARD

Water Utility Management

*Water Quality
Water Utility O&M
Water Supply Planning and
Development
Water Conservation
Water Reuse
Utility Communication
Watershed Management
Policy Development*

Water Utility Experience

42 years

Education

M.A., Biology, Humboldt State University

B.A., Zoology, (with honors) University of
California, Santa Barbara

Water Wastewater Leadership Certificate,
University of North Carolina

Professional Certifications

Grade 5, Water Treatment Operator,
California Department of Public Health

Grade 4 Wastewater Treatment Operator,
California State Water Resources
Control Board

California Community College Instructor
Credential, Water Treatment and
Related Technologies

LinkedIn Profile

[www.linkedin.com/pub/steven-
leonard/9/706/86a/](http://www.linkedin.com/pub/steven-leonard/9/706/86a/)

Located in

Redwood City, California

SUMMARY OF QUALIFICATIONS

Experienced utility manager with long career in water operations, administration, and stakeholder communications with the City of San Francisco, supplemented with experience as the Manager of two smaller regional utilities, an investor-owned water system in Monterey and a joint powers wastewater agency in Half Moon Bay. Has successfully and sustainably operated these utilities through normal and extraordinary times. Has been successful working with unionized staff, diverse agency boards of directors, regional utility partners, water consumer and constituent groups. Has demonstrated skills as a utility spokesperson, with a proven record of success connecting with a broad variety of stakeholders on a wide range of challenging water resource issues.

WORK HISTORY

Sewer Authority Mid-Coastside, Half Moon Bay, California

Manager 2010-2013

Directed the regional Joint Power Authority wastewater agency serving 28,000 customers in the communities of the Half Moon Bay region. SAM provides wastewater treatment and contract collection systems O&M for the member agencies. Worked with local water districts on the feasibility of regional recycled water development.

Black & Veatch Corporation, Walnut Creek, California

Client Services Manager 2008-2010

Provided client communication, project support, and utility expertise to project teams working for water and wastewater utilities in the San Francisco and Monterey Bay Areas. Black & Veatch is an engineering firm specializing in engineering and management services for water and wastewater utilities.

California American Water Company, Monterey, California

Manager 2002-2007

Managed the operation and maintenance of the private water utility serving the 110,000 water users in six cities on the Monterey Peninsula. CAW produces water from two highly impacted water sources, the Carmel River and the Seaside Groundwater Basin. Worked with local, state, and federal agencies to address environmental issues affecting water supply, including diminished water rights, endangered species, and a seismically unstable dam. Developed regional options for water supply augmentation, utilizing recycled wastewater from the Carmel Area Wastewater District in Pebble Beach, by collaborating with the MPWMD to develop and operate the first Aquifer Storage and Recovery (ASR) project and by leading the initial evaluation of a desalination plant for the region. Led the local effort to adjudicate the Seaside Groundwater Basin and was a founding Director of the Seaside Basin Water Master.

STEVEN D. LEONARD

San Francisco Public Utilities Commission

Manager, Strategic Programs

1999-2002

Responsible for development and management of strategic initiatives and programs including a variety of operational, regulatory, capital planning, and management issues that faced the SFPUC. No direct reports and no specific budget. Accepted the position of Acting SFPUC General Manager for a period in 2001.

Project Manager, Treatment Improvement Program

1992-1999

Managed capital planning program to bring the Hetch Hetchy water treatment systems into compliance with state and federal drinking water regulations. Managed the SFPUC's negotiations with federal and state agencies on water quality regulations. Secured favorable regulatory changes to state and USEPA regulations that saved the SFPUC over a billion dollars. Appointed "Operations Manager" to direct all SFPUC water system operations following two treatment plant failures.

Manager, Water Quality Division

1986-1992

Manager, Suburban Operations Division

1988-1989

Managed two SFPUC divisions, located on the SF Peninsula, responsible for the operations and maintenance of major (>100 MGD) water treatment and transmission facilities serving the City and the water districts on the Peninsula, in Silicon Valley, and in Southern Alameda County. Managed watersheds, water quality and environmental engineering, and compliance monitoring. Combined staff of the two divisions averaged about 250 personnel.

Manager, Water Quality Laboratory

1985-1986

Supervised all activities within a water quality laboratory that conducted watershed, regulatory compliance, monitoring, and research studies.

Supervisor of Laboratories, Water Pollution Control

1982-1985

Managed three wastewater laboratories supporting the wastewater treatment functions of one 50 MGD primary, a 40 MGD secondary, and a 100 MGD wet weather plant serving San Francisco.

Senior Microbiologist

1972-1982

Conducted water quality, watershed, and environmental monitoring of SFPUC water supply reservoirs.

STEVEN D. LEONARD

PROFESSIONAL

ASSOCIATION

ACTIVITIES

American Water Works Association (AWWA) Life Member

Stage 2 M/DBP USEPA Federal Advisory Committee Act (FACA),
Unfiltered Utilities, Alternate Negotiator

AWWA Disinfection By-Product Technical Advisory Workgroup (TAW)

Moderator on AWWA M/DBP & ESWTR Website

CA/NV AWWA/ Ad Hoc Committee: Surface Water Treatment Rule

CA/NV AWWA Water Quality Analysis Committee

CA/NV AWWA Certification of Water Quality Analysts Committee.

AWWA Reservoirs Committee

AWWA Source Water Committee

AWWA Member "Standard Methods Committee"-Chloride Analysis

Water Research Foundation (WRF)

Panel Member, "Using Watershed Stakeholder Alliances in the Context
of *Cryptosporidium*: Melding Research and National Perspectives with
Local Watershed Realities"

PAC Member, "Protocol for *Cryptosporidium* Risk Communication for
Drinking Water Utilities"

Panel Member, "*Cryptosporidium* Research Issues Workshop"

Chair, Workshop, "Role of Drinking Water in Cryptosporidiosis and the
Immuno-compromised"

Las Vegas, Nevada, *Cryptosporidium* Outbreak Peer Review

PAC Member, "Lead Control Strategies" Manual

Association of Metropolitan Water Agencies (AMWA)

Chair, Resolutions Committee

Regulatory Oversight Committee Liaison

Committee on M/DBPs

Committee on Source Water Protection

AMWA representative to National Drinking Water Advisory Committee
on "Health Care Providers Outreach and Education Working Group"

AMWA alternate to National Water Quality Monitoring Council

Association of California Water Agencies (ACWA)

Water Quality Committee

Safe Drinking Water Act Subcommittee

Water Quality Communications Subcommittee

STEVEN D. LEONARD

EXPERT PANELS

Shanghai Water/Wastewater Master Plan Review: Member of a month long technical exchange between the cities of San Francisco and Shanghai to consult on Shanghai's water and wastewater master plans.

Peer review of suspected *Cryptosporidium* outbreak in Las Vegas, Nevada: Participated in a WRF group that investigated the source of a suspected waterborne outbreak of disease in the Las Vegas.

"Waterborne Cryptosporidiosis and the Immuno-Compromised." Co-Chaired WRF panel of medical professionals and water treatment experts developing strategies to evaluate the risks of *Cryptosporidium* to immune-compromised water consumers.

Group Chair for WRF Workshop at George Washington University that produced **"Water-Related Health Risk Communication: Lessons Learned and Emerging Issues."**

San Francisco Board of Supervisors Task Force on Waterborne *Cryptosporidium*: Member of a multidisciplinary panel tasked to publicly review the SFPUC's treatment plan for Hetch Hetchy water and the potential impact of waterborne *Cryptosporidium* on the City's HIV/AIDS and immuno-compromised community.

Member of WRF Project Advisory Committee (PAC): **"Critical Evaluation of *Cryptosporidium* Research and Research Needs."**

Chaired SFPUC Blue Ribbon Panel of water industry experts investigating two complex water treatment failures of the Sunol Valley Filter Plant.

Member of AWWA task force to develop **strategies for utilities' release of Information Collection Rule (ICR) data to the public and public interest groups.**

Project Advisory Committee member on WRF project to develop the **"Lead Guidance Manual,"** aimed at improving monitoring and data analysis for a toxic plumbing material.

Member of WRF Project Advisory Committee (PAC): **"Protocol for *Cryptosporidium* Risk Communication."**

WRF Project Advisory Committee (PAC): **"Guidance to Utilities on Building Alliances with Watershed Stakeholders."**

Member of the Joint CDPH/AWWA **Ad Hoc Surface Water Treatment Committee** charged with implementing the USEPA Surface Water Treatment Regulations in California.

Disinfection By-Product Technical Advisory Workgroup (TAW): Reviewed proposed regulatory language, EPA guidance manuals, and regulatory data for the AWWA as a part of the M/DBP regulation development.

Utility representative on local talk radio and news programs: Participated in shows that discussed water rates, conservation, public health matters, water supply development, and general issues relating to home water use.

STEVEN D. LEONARD

PROFESSIONAL

PRESENTATIONS &

PUBLICATIONS

"The Truth About Water: Communicating with 'At Risk' Drinking Water Consumers," AWWA Conference. Presentation provided a detailed history of the SFPUC's successful and unsuccessful efforts to communicate with politically sensitive and active stakeholders.

"Public Outreach Programs to Utility Stakeholder Groups," USEPA National Drinking Water Advisory Council. Discussed the SFPUC's approach to public outreach with "at risk" and other stakeholder groups.

"Steer Wars": San Francisco's Watershed Stakeholders Process," AWWRF Workshop. Discussed the SFPUC's groundbreaking effort to balance the effect of cattle grazing with the quality of local water supplies. SFPUC staff worked with a broad group of stakeholders, including ranchers, academics, and ACT UP activists to evaluate the pros and cons of grazing cattle in the local watersheds, ultimately reaching agreement among all parties.

"Successful Watershed Strategies," AWWA Pathogens and Source Water Protection Symposium. Moderated panel discussing successful utility efforts to protect watersheds from parasites.

"Public Information about *Cryptosporidium* in San Francisco," CA/NV AWWA Conference. Review of the public information and communication strategies used by the SFPUC to discuss *Cryptosporidium*. Strategies included a focused Water Quality Report, development of Internet materials, and the posting of ICR data on the Internet.

"The Politics of *Cryptosporidium* in San Francisco," AMWA Legislative Conference. Discussed the failures of early efforts to enlist the support of ACT UP and local health advocacy groups and eventual success in partnering with these constituencies on the issue of *Cryptosporidium* and cattle grazing.

"The First Barrier: Watershed Protection," AWWA Resources Conference. Discussed San Francisco's successful watershed protection program for its unfiltered water supply. Success of the program involved intensive water quality monitoring, cooperation of the CDPH, and a strong partnership with the US Park Service.

"Impacts of Filtration Avoidance on Water Supply Planning," AWWA Resources Conference. Discussed the interaction of watershed management, water supply planning, and thorough public debate as key elements in the development of an unfiltered water supply.

"Strategic Watershed Planning for Filtration Avoidance," AWWA. Outlined the development of a strategic watershed plan for an unfiltered water supply within Yosemite National Park.

"Managing *Cryptosporidium* in San Francisco," AWWA/WEF Joint Management Conference. Discussed the SFPUC's strategy for addressing *Cryptosporidium* risk with a combination of treatment, education, and public health involvement.

"San Francisco's Experience with *Cryptosporidium*," Water Quality Technology Conference Poster.

"Anatomy of a Water Treatment Plant Failure," AWWA/WEF Joint Management Conference. Reviewed the technical issues and management failures that combined to cause a major water quality treatment incident.

"EPA's Risk Reduction Paradigm: Implications for Decision-Making," AWWA. Outlined SFWD's strategy to evaluate water quality factors and risks in an analysis of the treatment alternatives for the Hetch Hetchy Aqueduct.

"The Role of Drinking Water in Cryptosporidiosis in the Immuno-Compromised Population." Co-Chair of expert WRF panel to review water's role in the transmission of *Cryptosporidium* to HIV/AIDS victims.

"San Francisco Water, Filtration and *Cryptosporidium*," USEPA/National Drinking Water Advisory Council. Presentation to inform USEPA on what San Francisco learned how best to address customer concerns.

"Is San Francisco Boiling?," Washington Metropolitan Council of Governments. Outlined the SFPUC's effort to address the *Cryptosporidium* issue through a community-based task force and proactive public health initiatives.

WRF Panel Report on the Peer Review of the Las Vegas *Cryptosporidium* Outbreak. Member of AWWA Cal-Nevada Section/WRF select team that reviewed a CDC investigation of a waterborne *Cryptosporidium* outbreak in Las Vegas, NV.

"San Francisco's *Cryptosporidium* Task Force," ACWA. Discussed San Francisco's successful efforts to identify technical, political, and social issues related to *Cryptosporidium*.

"*Cryptosporidium* Inactivation: An Assessment of Methods," Water Quality Technology Conference. Discussed the SFPUC's efforts to evaluate disinfection of the parasite.

"Doing More with Less!," Cal-Nevada AWWA. Outlined SFPUC's highly successful \$84 million capital improvement program to upgrade the San Andreas Filter Plant.

"San Francisco's Response Loma Prieta Earthquake," Cal-Nevada AWWA. Outlined the SFPUC's successful response to water quality and operational problems following the massive Loma Prieta earthquake.

"San Francisco Gets the Lead Out!," Cal-Nevada AWWA. Outlined San Francisco's measures to reduce lead in the City's drinking water supply.

"Shanghai's Water/Wastewater Master Plan," Cal-Nevada AWWA. Reported on San Francisco's Sister City efforts to help Shanghai develop a water supply and wastewater master plans.

"Tastes and Odors in Public Water Supplies," in *The Analysis and Control of Less Desirable Flavors in Foods and Beverages* (Academic Press, Inc.).

"Aqua Pura": A Cultural Overview of the Development of Water Systems on the San Francisco Peninsula.

STEVEN D. LEONARD

Supplemental

Materials

The attached news item in the Monterey Herald summarizes the views of local water officials on Steve Leonard's tenure as the manager of the Monterey system, especially his ability to work with groups and organizations.

Cal Am vice president resigns

By KEVIN HOWE Herald Staff Writer

Posted: 08/25/2007 01:27:34 AM PDT

MontereyHerald.com

Steve Leonard, vice president and Monterey division manager for California American Water, has announced he is leaving his position after five years with the company, effective Sept. 10.

He joined Cal Am in fall 2002 as vice president and general manager of the Monterey Coastal Division. He was previously with the San Francisco Public Utilities Commission, a water, wastewater and hydropower utility, for 30 years.

Employees at the Cal Am division office in Monterey heard the news Thursday, said water company spokeswoman Catherine Bowie.

Leonard's position is being temporarily filled by Thomas Bunosky of Chula Vista, director of network services for Cal Am since January, who is responsible for the operation of various water systems throughout the state. Bunosky was previously vice president and regional manager for Aqua Illinois Inc. in Kankakee, Ill.

Cal Am has begun a search for Leonard's replacement, Bunosky said, adding that anyone from within the company can apply and the position will be advertised nationally.

"I hope the process will move forward quickly," he said. "It's a challenging job."

Leonard said he plans to stay at his home in Pacific Grove and has no immediate plans to retire. The decision to resign was his, he said.

During his five years with Cal Am, Leonard said, the company pushed water resources issues toward a more regional approach, working with other water agencies and the state Public Utilities Commission.

"Keeping the water on is a 24/7 job," he said, made possible by "an outstanding staff with a good attitude."

The company has pursued several major projects, including a desalination plant and aquifer storage and recovery system "in an environment of uncertainty and high costs," Leonard said. Now the desalination issue boils down to "not whether the plant will be built, but where and how big."

Many problems involving water, he said, lie "in the values people have and their ideas about the future." Water supply on the Peninsula has to be approached in a manner "that is not detrimental to the way people live their lives."

Officials of the Monterey Peninsula Water Management District expressed shock, surprise and disappointment at the news of Leonard's departure.

"He's going to be missed," said Dave Berger, general manager of the water management district. "He's been a great communicator with the district on a whole variety of technical and operational policy issues and a good partner in the aquifer storage and recovery project."

In that project, excess water is pumped into aquifers to recharge them to prevent seawater intrusion and provide a dry-season water supply.

Leonard, Berger said, was a person who could effectively work through disagreements between the district

Joint Powers Agreement Members

Inland Empire
Utilities Agency

Irvine Ranch
Water District

Los Angeles
Department of
Water and Power

Orange County
Sanitation District

Orange County
Water District

West Basin
Municipal Water District

Jeffrey J. Mosher
Executive Director

E-mail:
jmosher@NWRI-USA.org

August 14, 2014

Ms. Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060

Subject: NWRI submittal of Statement of Qualifications for the Independent Review
Panel for the City of Santa Cruz's Water Supply Advisory Committee

Dear Ms. Menard:

The National Water Research Institute (NWRI) of Fountain Valley, California, is pleased to submit this State of Qualifications (SOQs) in response to the Request for Qualifications (RFQ) released by the City of Santa Cruz Water Department (SCWD) for an Independent Review Panel (IRP) to support a community-based Water Supply Advisory Committee (WSAC) in its efforts to consider water supply issues, alternative strategies and solutions, and the public policy implications for the City. The WSAC will provide recommendations to the Santa Cruz City Council.

The role of the IRP will be to support the WSAC in effectively interacting with a technical consultant team by providing:

- Critical review of the work products produced by the technical support team.
- Suggestions to the WSAC's lines of inquiry that will assist the WSAC in completing their work efforts.

NWRI has over 10-years of experience in managing independent review panels for water resources and water supply projects throughout California and other locations. Although the RFQ requests SOQs from individual panel members, we are proposing an approach where NWRI coordinates, manages, and facilitates the IRP on behalf of SCWD. As shown in the attached proposal (**Attachment A**), the advantages of this approach will provide SCWD and the WSAC with many benefits. The NWRI panel method will provide an independent and credible approach for IRP members to collaborate and reach consensus on specific recommendations and findings regarding the review of work and products produced by the City's technical support team (such as scientific methods, reports, and other analyses and/or documents).

As part of this cover letter, I would like to take a moment to briefly describe NWRI, our history with managing and facilitating independent expert panels, and our proposed IRP members. As noted above, more detail is provided in the proposal in Attachment A.

18700 Ward Street
P.O. Box 8096
Fountain Valley, California
92728-8096

(714) 378-3278
Fax: (714) 378-3375

WWW.NWRI-USA.ORG

About NWRI

NWRI is a 501c3 non-profit research organization governed by water and wastewater agency members. We sponsor projects and programs focused on ensuring safe, reliable sources of water now and for future generations. One of our research interests includes reviewing alternatives, such as potable reuse and desalination, as a means to develop drought-proof, sustainable water supplies – a vital concern as drought conditions spread across California and the United States and impact the quality and quantity of traditional supplies, like surface water and groundwater. As a result, we support leading-edge research on technologies, water quality, public health, and related topics in collaboration with other local, state, and national funding agencies.

About NWRI Panels

NWRI has extensive experience in organizing and facilitating independent, third-party expert peer review panels for scientific studies and projects on behalf of water/wastewater utilities, counties, and state agencies. These NWRI expert panels provide peer review of a wide range of scientific and technical areas, including areas crucial to water supply projects (such as recycled water, constituents of emerging concern, public health, protection of the environment, and regulatory requirements). Panel members include industry experts in areas such as economics, engineering, water resources management, microbiology, chemistry, risk assessment, and public health.

Examples of recent relevant NWRI expert panels include:

- *Surface Water Augmentation and Direct Potable Reuse Panel* for State Board Division of Drinking Water (formally the California Department of Public Health) (2014-Present)
- *Groundwater Recharge Scientific Study* for the LOTT Clean Water Alliance (Washington) (2013-Present)
- *Groundwater Replenishment System Program Review* for the Orange County Water District (California) (2004-Present)
- *Indirect Potable Reuse/Reservoir Augmentation Project Review* for the City of San Diego (2009-Present)
- *Recycled Water Master Plan* for Tucson Water (Arizona) (2011-2013)
- *Groundwater Replenishment Project Review* for the Los Angeles Department of Water and Power (California) (2010-Present)

About the Proposed IRP

NWRI proposes that the following experts from California serve on the IRP to support the WSAC:

Name	Affiliation
Katherine Cushing, Ph.D.	Director of Sustainability and Associate Professor, Environmental Studies Department, San Jose State University (San Jose, CA)
Martin Feeney, P.G., CHG,	Consulting Hydrogeologist (Santa Barbara, CA)
Brent Haddad, Ph.D.	Associate Dean of Engineering and Founding Chair of the Department of Technology Management, UC Santa Cruz (Santa Cruz, CA)
Kurt Schwabe, Ph.D.	Water Resource Economist, UC Riverside (Riverside, CA)
George Tchobanoglous, Ph.D.	Professor Emeritus, Department of Civil and Environmental Engineering, University of California, Davis (Davis, CA)

The proposed IRP fulfill the following requested characteristics from the RFQ:

- The IRP includes five (5) members with relevant expertise and backgrounds.
- As professors and consultants within the water industry, they have the required scientific and technical training, as well as substantial practical experience, in the scientific and technical disciplines relevant to the work of the WSAC.
- Their experience and expertise is diverse and complimentary, representing the areas of civil and environmental engineering, hydrogeology, water resources economics, environmental studies, environmental planning and management, and public policy.
- They have served on expert panels and committees for other organizations, and have the correct understanding and experience in applying their broad knowledge to the review process and applying their expertise to topics relevant to the WSAC.
- They have expressed a willingness and availability to (a) work with WSAC during the coming year (including attend meetings), (b) commit to review the needed documents, and (c) prepare and present summaries of their review efforts.
- The IRP has a broad teaching background, as well as experience serving on committees and panels for city, state, and national or international organizations; therefore, they have strong communication skills, which include the ability to explain complicated technical topics clearly and concisely to the general public.
- They have broad experience providing peer review for articles and other publications on scientific and technical topics.
- They have had previous experience supporting, advising, and engaging with citizens groups on topics with public policy implications.

Letter to R. Menard
August 14, 2014
Page 4

Altogether, these characteristics satisfy the requirements listed in the RFQ, as well as indicate their willingness to work with the WSAC over the coming year. The proposed IRP members also understand that the honorarium is limited to \$5,000 per member and direct travel expenses will be reimbursed.

Proposed IRP Process and Approach

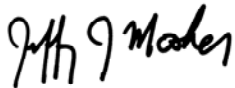
The attached proposal (**Attachment A**) provides the following information:

- Description of the proposed NWRI-facilitated IRP approach.
- Description of the proposed IRP members (with the provision that the actual IRP members would be finalized based on input from SCWD).
- Summary of information on meeting the IRP characteristics in the RFQ, compensation, and availability.

Please contact me directly at jmosher@nwri-usa.org or (714) 378-3278. Thank you for your time and consideration.

Sincerely,

NATIONAL WATER RESEARCH INSTITUTE



Jeffrey J. Mosher
Executive Director

Enclosure: **Attachment A**

ATTACHMENT A

NATIONAL WATER RESEARCH INSTITUTE

**Statement of Qualifications
for an Independent Review Panel (IRP)**

**for the
City of Santa Cruz Water Department's
Water Supply Advisory Committee**

Prepared for:

City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060

Prepared by:

National Water Research Institute
18700 Ward Street
Fountain Valley, CA 92728
Phone (714) 378-3278
www.nwri-usa.org

August 14, 2014

ABSTRACT

The National Water Research Institute (NWRI), a 501c3 nonprofit research organization based in Fountain Valley, California, is submitting this Statement of Qualifications (SOQs) to the City of Santa Cruz Water Department (SCWD) in response to a Request for Qualifications (RFQ) to form an Independent Review Panel (IRP) to support the SCWD's Water Supply Advisory Committee (WSAC) in effectively interacting with a technical consultant support team. Formed in 2014, the WSAC is made up of 14 stakeholders tasked with considering water supply issues, alternative strategies and solutions, and public policy implications for the City of Santa Cruz and providing recommendations to the Santa Cruz City Council.

The IRP will assist the WSAC by undertaking the following:

- Provide critical review of the work products produced by the team of technical consultants supporting the WSAC.
- Provide suggestions to the WSAC's lines of inquiry that would be helpful in completing their work.

As detailed below, NWRI proposes coordinating and administering the IRP on behalf of SCWD. The IRP would be comprised of five experts in areas relevant to supporting the WSAC, including civil and environmental engineering, hydrogeology, water resources economics, environmental studies, environmental planning and management, and public policy.

During the coming year, it is anticipated that the IRP will perform the following tasks on an as-needed basis:

- Work with the WSAC and attend WSAC meetings. This commitment includes attending WSAC meetings in person and/or using conference calls or web-enabled conference calls (as needed) to participate in meetings.
- Prepare and present summaries of the IRP review efforts at these WSAC meetings.
- Commit the time needed to review relevant documents.

This proposal also provides information on:

- Description of the IRP approach as facilitated by NWRI.
- Description of the proposed IRP members (with the provision that the actual IRP members would be finalized based on input from SCWD).
- Summary of information on meeting the IRP characteristics in the RFQ, compensation, and availability.

1. DESCRIPTION OF THE PROJECT

SCWD is in the process of evaluating options for providing a sustainable water supply that meets long-term demand requirements, as well as addresses changes in environmental conditions, climate change, persistent drought, and other factors. SCWD's water supply is

comprised of 95-percent surface water and 5-percent groundwater, leaving the water supply susceptible to water scarcity due to variations in seasonal rainfall.

After researching new water supply opportunities, including a proposed ocean desalination plant, the City of Santa Cruz established a citizens committee, the Water Supply Advisory Committee (WSAC), to provide advice on water supply issues, alternatives strategies and solutions, and public policy implications. Formed in early 2014, the WSAC is made up of 14 citizens with a variety of backgrounds, representing a diverse set of stakeholders.

Throughout this process, which involves monthly meetings, the WSAC will be supported by a team of technical consultants led by Stratus Consulting. In addition, an Independent Review Panel (IRP) will be established to assist the WSAC in interacting with the consulting support team. Specifically (and as detailed in the RFQ), the IRP will provide the following:

- Critical review of the work products produced by the team of technical consultants supporting the WSAC.
- Suggestions to the WSAC's lines of inquiry that would be helpful in completing their work.
- Offer feedback to the WSAC's questions that may be evaluated by the technical support team.

On an assigned or as-needed basis, the IRP will also provide responses to the WSAC in the form of written findings and recommendations.

Specific items that will be evaluated by the IRP include:

- The accuracy and appropriateness of analytical, scientific, and technical methods.
- The clarity and accuracy of statements of assumptions.
- The appropriate characterization of the strengths and weaknesses of the analyses, especially with respect to uncertainty, data quality, or other factors that, if different, could affect the results in a significant manner.
- Offer advice or suggestions to the WSAC's lines of inquiry or technical questions that may be evaluated by the technical support team.

2. NWRI'S PROPOSED IPR PROCESS

The RFQ requests individual panel member submittals. However, NWRI proposes to form and administer a five-member IRP to provide support to the WSAC in effectively interacting with a technical consultant support team. As listed below, the NWRI-administered IRP approach has added value and benefits for the WSAC.

2.1 Benefits from an NWRI-Facilitated IRP

Overall, the IRP process will be designed to provide the following benefits:

- **Objective Review.** The IRP will provide independent, third-party feedback to the

WSAC and SCWD.

- **Expert Advice.** The IRP will provide scientific, technical, and policy advice by knowledgeable experts in the field.
- **Direct Support.** The IRP will help address challenging questions and issues that pertain to WSAC's review efforts and products.
- **Timely Guidance.** The role of the IRP is to provide findings and recommendations in a timeframe that supports the WSAC's schedule.

2.2 NWRI Administrative Responsibilities

As the IRP administrator, NWRI would be responsible for the following:

- **Coordination with WSAC/SCWD.** NWRI will serve as liaison between the IRP and WSAC (on technical matters) and SCWD (on technical and administrative matters). This set-up will maximize the IRP's time and effort to support the WSAC.
- **IRP Composition.** For this SOQ, NWRI has proposed five experts with various backgrounds to serve as IRP members. However, NWRI can modify the list of IRP members based on input from SCWD regarding other candidates.
- **Manage IRP Review.** NWRI would coordinate the support and review provided by the IRP. Tasks may involve reviews by individual IRP members. However, it is anticipated that most tasks will involve two or more IRP members or (possibly) all the IRP members. In such a case, NWRI will ensure that a consensus response is achieved as part of the IRP's review. NWRI will manage this effort by email and conference calls with the IRP members. Overall, this process will allow for a robust IRP review involving a consensus approach. NWRI staff will also provide writing and editing support for IRP responses.
- **Flexibility.** NWRI will use the IRP members in the most efficient manner. IRP members will be provided honorariums of \$500 per day in support of their tasks. As a result, IRP members will be used based on need.
- **Accountability.** NWRI has a proven and tested approach for expert panel administration. Our proposed IRP process will ensure that the WSCA and SCWD are provided expert review in a timely fashion.
- **Logistics.** When IRP members are needed to attend WSCA meetings, NWRI will manage travel and other logistics for IRP members.
- **Accessibility.** Although it is not feasible for all IRP members to attend all WSAC meetings, individual IRP members can attend specific WSAC meetings, as needed, to provide input and/or give presentations. IRP members local to the area would have

greater flexibility in attending meetings in person. All IRP members can be made available through email and conference calls.

Over the course the WSAC effort, we expect that documents, reports, and/or other materials may be compiled and forwarded to the IRP for review. The requests may involve specific questions from the WSAC. NWRI will coordinate the IRP's review (through email and conference calls), manage a consensus response, document findings in written responses, and forward the results to SCWD and the WSAC.

In addition, SCWD staff and the WSAC will be able to interact with the IRP outside of meetings, as needed. IRP members and NWRI staff will also be available for project-related meetings with the WSAC, as needed.

2.3 *NWRI Tasks*

The following tasks, as undertaken by NWRI, will be included in the IRP process:

- Work with SCWD and the WSAC on specific requests to the IRP.
- Assemble background material required for the IRP review.
- Determine which IRP members will be involved in the review.
- Schedule and coordinate the IRP review.
- Work with IRP members when travel is needed to attend and/or present at WSAC meetings.
- Hold conference calls of the IRP, as needed.
- Conduct administrative tasks to work with IRP members on the review process.
- Develop a consensus response from IRP members.
- Assist the IRP in documenting written responses for submittal to SCWD and the WSAC.

2.4 *IRP Deliverables*

The IRP process will be designed to provide a consistent, thorough, and transparent review of the work products produced by the team of technical consultants supporting the WSAC, as well as assist with providing suggestions to the WSAC's lines of inquiry that would be helpful in completing their work. After each task or review request, NWRI and the IRP members will prepare a response summarizing the IRP's comments and recommendations based on the outcomes their review. The response will be submitted to SCWD and the WSAC.

3. PROPOSED IRP MEMBERS

The IRP members proposed for this effort will consist of five individuals who are experts in water supply (note that the actual IRP members would be finalized based on input from SCWD). The proposed experts include members of academia and independent consultants within California. Their names, affiliations, and areas of expertise/disciplines (as related to this IRP effort) are listed in Table 1.

Table 1: Proposed IRP Members

Name	Affiliation	Disciplines
Katherine Cushing, Ph.D.	Director of Sustainability and Associate Professor, Environmental Studies Department, San Jose State University (San Jose, California)	<ul style="list-style-type: none"> • Environmental engineering • Sustainability • Urban planning • Resource management
Martin Feeney, PG, CHG	Consulting Hydrogeologist (Santa Barbara, CA)	<ul style="list-style-type: none"> • Hydrogeology • Desalination and potable reuse • Ocean intake wells
Brent Haddad, Ph.D.	Associate Dean of Engineering and Founding Chair of the Department of Technology Management, UC Santa Cruz (Santa Cruz, CA)	<ul style="list-style-type: none"> • Sustainability • Technology management (water reuse, desalination) • Economics • Communications • Governance
Kurt Schwabe, Ph.D.	Water Resources Economist, UC Riverside (Riverside, CA)	<ul style="list-style-type: none"> • Economics • Demand management, water usage, water rates, and conservation • Valuing ecosystems • Fisheries management
George Tchobanoglous, Ph.D.	Professor Emeritus, Department of Civil and Environmental Engineering, University of California, Davis, (Davis, CA)	<ul style="list-style-type: none"> • Wastewater treatment • Recycled water • Indirect and direct potable reuse • Treatment technologies

Included below are brief biosketches of each IRP member (please see Section 9 of this proposal for 2-page resumes of each proposed IRP member).

Katherine Cushing, Ph.D. Katherine Cushing is an Associate Professor in the Department of Environmental Studies at San Jose State University, where she is engaged in research on environmental policy and program implementation. Her primary areas of expertise are water resources management and sustainability in higher education. Prior to joining the university in 2003, she worked in a variety of academic and professional positions, such as serving as the Associate Director for the Program on Urban Studies at Stanford, where she taught and conducted research in environmentally sustainable cities, business and the environment, and qualitative research methods. She was also a Senior Research Associate at the Pacific Institute for Studies in Development, Environment, and Security in Oakland, where she conducted research on environmental certification systems and global water issues. As a private consultant, Cushing has conducted research for the U.S. Army Corps of Engineers, Santa Clara Valley Water District, World

Commission on Dams, and City of Palo Alto. She is also Project Lead on the Urban Water Cycle Scenario Evaluation Tool for Sustainable Silicon Valley, a collaborative initiative to produce significant environmental improvement and resource conservation in Silicon Valley. Recently, she was the Principal Investigator for a research project that examined evaluative criteria for municipal and regional recycled water programs in the U.S. sponsored by the WaterReuse Research Foundation. Cushing received a B.S. in Industrial Engineering and Science from Northwestern University and both an M.S. in Civil and Environmental Engineering and a Ph.D. in Civil and Environmental Engineering, with a specialty in Environmental Planning and Management, from Stanford University.

Martin Feeney, PG, CEG, CHg. Martin Feeney has been a consulting hydrogeologist since 1997, providing hydrogeologic consulting services to water agencies, private industry, and engineering firms. Prior to this, he served as hydrogeologist at various consulting firms such as Balanced Hydrologics, Inc. and Fugro West, Inc., where he provided analysis of groundwater basins, developed groundwater flow and transport, and developed saline groundwater source for desalination plants, injection wells/artificial recharge programs, and underground storage tank site assessment and remediation. Currently, he serves as a member of the “Hydrogeologic Working Group” evaluating the feasibility and potential water rights impacts of the installation of a 24 MGD capacity slant well array on the edge of Monterey Bay to support a regional desalination facility. He is also a member of the Expert Panel mediating between Poseidon and the California Coastal Commission regarding the use of subsurface intakes for the proposed Huntington Beach desalination facility. Mr. Feeney serves on the DDW-mandated Independent Advisory Panel for the Monterey Regional Water Quality Control Agency’s Groundwater Replenishment project utilizing highly treated wastewater for groundwater recharge. He has previously served on advisory panels focusing on the overdraft issues in the Salinas and Pajaro Valleys, the sewer system in Los Osos, and groundwater management plan development in the Carpinteria Basin. Feeney received a B.S. in Earth Sciences from the University of California, Santa Cruz and an M.S. in Environmental Planning (Groundwater) from California State University. He is also a California Professional Geologist with specialty certifications in engineering geology (CEG) and hydrogeology (CHg).

Brent Haddad, MBA, Ph.D. Brent Haddad is Professor of Environmental Studies and Associate Dean of Engineering and Founding Chair of the Department of Technology Management at the University of California, Santa Cruz. His research interests focus on sustainable water systems, including technologies, economics, communications, and governance. He is also co-leader of the UCSC-NASA Sustainable Water Technology Collaborative, and founder of WaterLab, the Water Teaching and Research Laboratory located at the Watsonville Water Resources Center. In addition, Haddad is an award-winning teacher whose course “Introduction to Fresh Water: Processes and Policies” is offered at all 10 UC campuses via the internet. He has published on water conservation, water reclamation and reuse, climate change, sustainable water supply, and desalination. He also received a 2014 Prosser Trust Award to prepare a report on the environmental effects of hydraulic fracturing (fracking) on surface waters in California. Haddad has undertaken research on water challenges in Monterey and Santa Cruz Counties. Locally,

as a consultant, he facilitated the creation of the operations agreement of the proposed SCWD2 desalination facility and served on the GHG technical advisory committee. He also prepared (with Prof. Gary Griggs) the City of Santa Cruz Climate Change Vulnerability Assessment and the proposed water rate plan for the Trout Gulch Mutual Water Company.

Kurt Schwabe, Ph.D. Kurt Schwabe has taught courses in environmental and natural resource economics at the University of California, Riverside, where he serves as Associate Professor of Environmental Economics and Policy and Associate Director of the Water Science and Policy Center. He specializes in the following research areas: water economics, alternative policy instruments for pollution control, salinity and drainage management and policy, wildlife and fisheries management, valuing ecosystem and forest services, and revealed and stated preference valuation methods. Recent publications have addressed the issue of drought in semi-arid and arid environments, the impacts of changes in water supply reliability and quality on agricultural sustainability, the effects of budget-based tiered water rates on residential water consumption, and the value of ecosystem services in developing countries. He has also has worked on water and environmental resource issues in the US, Australia, and Southeast Asia. Among his honors, he was awarded a Flagship Fellowship by Australia's Commonwealth Scientific and Industrial Research Organization to help address the salinity and drainage issues related to Australia's irrigated agricultural production. Schwabe received a B.A. in Mathematics/Economics from Macalester College, and M.S. in Economics from Duke University, and a Ph.D. in Environmental Economics from North Carolina State University.

George Tchobanoglous, PH.D., P.E. For over 35 years, wastewater expert George Tchobanoglous has taught courses on water and wastewater treatment and solid waste management at the University of California, Davis, where he is Professor Emeritus in the Department of Civil and Environmental Engineering. He has authored or coauthored over 500 publications, including 22 textbooks and eight engineering reference books. Tchobanoglous has been past President of the Association of Environmental Engineering and Science Professors and currently serves as a national and international consultant to both government agencies and private concerns. Among his honors, he received the Athalie Richardson Irvine Clarke Prize from NWRI in 2003, was inducted to the National Academy of Engineers in 2004, and received an Honorary Doctor of Engineering degree from the Colorado School of Mines in 2005. In 2012, he received the first Excellence in Engineering Education Award from AAEE and AEESP. In 2013, he was selected as the AAEE and AEESP Kappe Lecturer. Tchobanoglous received a B.S. in Civil Engineering from the University of the Pacific, an M.S. in Sanitary Engineering from the University of California, Berkeley, and a Ph.D. in Environmental Engineering from Stanford University.

4. CHARACTERISTICS OF THE IRP

The RFQ noted desired characteristics of the IPR. The following section lists those characteristics, as well as our response as to how the proposed NWRI-administered IRP fulfills these characteristics.

The IRP characteristics would include:

- Three to five members.
NWRI Response: The proposed IRP would be made up of five (5) experts of areas relevant to WSAC's needs and who would be used on an as-needed basis.
- Scientific, technical, and policy training and experience, as well as practical experience evaluating similar projects.
Response: As professors and consultants within the water industry, the proposed IRP members have the required scientific and technical training, as well as substantial long-term practical experience, in the scientific and technical disciplines relevant to the work of the WSAC.
- Diversified backgrounds and experience that compliment and supplement each other.
Response: The experience and expertise of the proposed IRP members are diverse and complimentary, representing the areas of civil and environmental engineering, hydrogeology, water resources economics, environmental studies, environmental planning and management, public policy, and more.
- Experience applying their backgrounds and expertise in providing peer review, particularly of topics of interest for the WSAC.
Response: The proposed IRP members have served as members of scientific- and/or policy-focused expert panels and committees for NWRI and other national/international organizations, and have the correct understanding and experience in applying their broad knowledge to the review process and applying their expertise to topics relevant to the WSAC (such as water resources management, technology management, and so on).
- Availability to schedule their review of products (such as reports) and attend WSAC meetings on an as-needed basis.
Response: The proposed IRP has expressed a willingness and availability to (a) work with WSAC during the coming year (including attend meetings), (b) commit to review the needed documents, and (c) prepare and present summaries of their review efforts. This effort would also include developing consensus responses to the WSAC and presenting findings and recommendations to the WSAC.
- Demonstrated ability to (a) explain complicated technical topics clearly and concisely to a general audience, and (b) present facts without concealing values and with clear articulation of assumptions.
Response: The proposed IRP has a broad teaching background, as well as experience serving on committees and panels for city, state, and national or international organizations; therefore, they have strong communication skills, which include the ability to explain complicated technical topics clearly, concisely, and factually to the general public.
- Experience in supporting citizen-led groups.

Response: The proposed IRP members have previous experience supporting, advising, and engaging with citizens groups on topics with public policy implications.

- Agree to provide their review based on an honorarium-based approach.

Response: The proposed IRP members understand that the honorarium is limited to \$5,000 per member and direct travel expenses will be reimbursed.

Altogether, these characteristics satisfy the requirements listed in the RFQ, as well as indicate the willingness of the IRP to work with and support the WSAC over the coming year (using an honorarium-based approach).

5. IRP SCHEDULE

NWRI will commit to contacting IRP members about a review request within 24 hours of being contacted by SCWD. Depending upon the scope of the request and the schedules of the IRP members, the written responses may take days or weeks to prepare. However, the IRP would be cognizant of the need to respond within the requested timeframe.

6. BUDGET

The proposed budget (see **Appendix A**) for this effort is \$34,421 (\$25,000 for panel honorariums, \$9,421 for NWRI and expenses). The budget estimate represents the following:

IRP member and NWRI staff time to prepare for and attend meetings (as needed), develop IRP responses, and participate in additional project activities, if needed. These costs are based on the following assumptions:

- Five IRP members with honorariums of \$500 per day per (and \$5,000 maximum per panel member).
- NWRI staff members, as needed.

Travel, hotel, and logistical expenses for attending meetings in Santa Cruz as needed.

Other expenses include:

- Web-enabled conference call services.
- Conference calls.

Other notes:

- Mileage reimbursement rate will be at current City of Santa Cruz mileage rate (mileage log required).
- Travel expenses for the lowest cost-effective air fare or train fare will be reimbursed at actual costs (receipts required).

- Lodging and Per Diem will be reimbursed at actual costs (receipts required) up to the maximum allowance for the Santa Cruz area as published/posted on the U.S. General Services Administration website (<http://www.gsa.gov/portal/category/100120>).
- All subconsultant costs are reimbursed as “direct expense” at actual costs (invoice/receipts required).
- NWRI will not charge an administrative fee.

7. BACKGROUND OF NWRI

7.1 *Description of NWRI*

NWRI, a 501c3 nonprofit, was established in 1991 by a group of water, wastewater, and recycled water agencies in Southern California for the purpose of collaborating on research projects and activities that produce beneficial change and improved policy decisions. NWRI is a scientific and technical organization, having invested over \$17 million in research studies with over 120 partners in the U.S. and abroad. Areas of research interest include treatment technologies, monitoring, water quality assessment, knowledge management, and exploratory research. Our program has produced over 350 publications and conference presentations. In addition to research, NWRI provides extensive outreach through publications and educational activities. NWRI also provides services such as awarding graduate fellowships, facilitating conferences and workshops, and organizing Independent Advisory Panels or Peer Review Panels, which involve the peer review of scientific and technical projects and studies.

NWRI receives funding from the Joan Irvine Smith and Athalie R. Clarke Foundation and NWRI Member Agencies, which include the Inland Empire Utilities Agency, Irvine Ranch Water District, Los Angeles Department of Water and Power, Orange County Sanitation District, Orange County Water District, and West Basin Municipal Water District. These Member Agencies serve on NWRI’s Board of Directors.

NWRI has conducted over 30 Panels in the past 10 years. These Panels offer credible, objective review of studies and projects. The Panel outcomes help project sponsors verify and validate studies and projects and support public policy decisions.

NWRI offers the following range of services for the water/wastewater community: 1) a research program, including sponsoring, administering, and managing scientific and technical research projects; 2) an education program, including preparing outreach materials and sponsoring student fellowships; 3) meeting support, including planning workshops and conferences; and 4) an Independent Advisory Panel Program, which involves conducting peer review of agency projects or studies.

In support of these services, NWRI staff have the following capabilities: 1) knowledge of the water and wastewater industry, including understanding leading-edge issues such as reclaimed water, compounds of potential concern, and innovative technologies; 2) peer review services, including access to scientific experts and researchers in the industry and at universities; 3) project administration and management, including budgeting, scheduling, and reporting; 4) event planning and meeting facilitation; and 5) report preparation, including writing and technical editing. Under the NWRI Independent Advisory Panel Program, NWRI Panels provide expert

peer review of projects, studies, or policies related to water, wastewater, and water resources. The NWRI Panel process and results are credible, objective, and transparent.

7.2 *Description of NWRI's Panel Program*

NWRI specializes in facilitating Independent Advisory Panels on behalf of water and wastewater utilities, as well as local, county, and state government agencies, to provide credible, objective review of scientific studies and projects in the water industry. NWRI Panels consist of academics, industry professionals, government representatives, and independent consultants who are experts in their fields.

The Panel process provides numerous benefits, including:

- Third-party review and evaluation.
- Scientific and technical advice by leading experts.
- Assistance with challenging scientific questions and regulatory requirements.
- Validation of proposed project objectives.
- Increased credibility with stakeholders and the public.
- Support of sound public-policy decisions.

NWRI has extensive experience in developing, coordinating, facilitating, and managing Expert Panels. Efforts include:

- Selecting individuals with the appropriate expertise, background, credibility, and level of commitment to serve as Panel members.
- Facilitating hands-on Panel meetings held at the project's site or location.
- Providing written report(s) prepared by the Panel that focus on findings and recommendations of various technical, scientific, and public health aspects of the project or study.

Over the past 5 years, NWRI has coordinated the efforts of over 20 Expert Panels for water and wastewater utilities, city and state agencies, and consulting firms. The majority of these Panels have dealt with projects or policies involving potable reuse. Specifically, these Panels have provided peer review of a wide range of scientific and technical areas related to potable reuse, such as water quality and monitoring, constituents of emerging concern, treatment technologies and operations, public health, water reuse criteria and regulatory requirements, and outreach, among others.

Examples of recent NWRI Panels include:

- **Development of Water Recycling Criteria for Indirect Potable Reuse through Surface Water Augmentation and the Feasibility of Developing Criteria for Direct Potable Reuse** for the State Water Resources control Board Division of Drinking Water (CA)
- **Advanced Purified Water Treatment Plant (WTP) – Phase 1** for the El Paso Water Utilities (TX)

- **Evaluating Water Quality Testing at the Silicon Valley Advanced Water Purification Center for Future Potable Reuse Applications** for the Santa Clara Valley Water District (CA)
- **Developing Proposed Direct Potable Reuse Operational Procedures and Guidelines for New Mexico** for the New Mexico Environment Department (NM)
- **Monterey Peninsula Groundwater Replenishment Project** for the Monterey Regional Water Pollution Control Agency (CA)
- **Groundwater Recharge Scientific Study** for the LOTT Clean Water Alliance (WA)
- **Groundwater Replenishment System Program Review** for the Orange County Water District (CA)
- **Examining the Criteria for Direct Potable Reuse** for Trussell Technologies (CA) and WaterReuse Research Foundation (VA)
- **Indirect Potable Reuse/Reservoir Augmentation Project Review** for the City of San Diego (CA)
- **BDOC as a Surrogate for Organics Removal in Groundwater Recharge** for the California Department of Public Health (CA)
- **Recycled Water Master Plan** for Tucson Water (AZ)
- **Groundwater Replenishment Project Review** for the Los Angeles Department of Water and Power (CA)

More information about the NWRI Independent Advisory Panel Program can be found on the NWRI website at <http://nwri-usa.org/Panels.htm>. An updated list of NWRI Panel efforts dating from 2003 to present is included in Table 2.

Table 2. List of NWRI Independent Advisory Panels

Agency	Project/Program	Years	Panel Chair
California Department of Health Services (CA)	Development of Water Recycling Criteria for Indirect Potable Reuse through Surface Water Augmentation and the Feasibility of Developing Criteria for Direct Potable Reuse	2014-Present	Adam Olivieri and James Crook
California Department of Health Services (CA)	BDOC as a Surrogate for Organics Removal in Groundwater Recharge	2011-2012	Jörg Drewes
California Department of Health Services (CA)	Review of Water Recycling Criteria for Agricultural Irrigation	2011-2012	Robert Cooper
County of Orange (CA)	Nitrogen and Selenium Management Program	2005-2006	Brock Bernstein
County of Orange (CA)	Assessment of TMDL Targets for Organochlorine Compounds for Newport Bay	2008-2011	Brock Bernstein
County of San Luis Obispo (CA)	Los Osos Wastewater Management Plan	2007-2008	George Tchobanoglous
City of Davis (CA)	Davis-Woodland Water Supply Project Review	2007-2008	Harvey Collins
Helix Water District (CA)	El Monte Valley Groundwater Recharge, Mining, and Reclamation Project	2010-2011	James Crook
Los Angeles Department of Water & Power (CA)	Salt Balance Analysis of the San Fernando Groundwater Basin	2009	Timothy Moore
Los Angeles Department of Water & Power (CA)	Groundwater Replenishment Project Review	2010-Present	Michael Stenstrom

LOTT Clean Water Alliance (WA)	Groundwater Recharge Scientific Study	2013-Present	To Be Decided
Monterey Regional Water Pollution Control Agency (CA)	Monterey Peninsula Groundwater Replenishment Project	2013-Present	George Tchobanoglous
New Mexico Environment Department (NM)	Developing Proposed Direct Potable Reuse Operational Procedures and Guidelines for New Mexico	2014-Present	James Crook
Orange County Sanitation District (CA)	Achieve Full Secondary Treatment	2003-2009	George Tchobanoglous
Orange County Water District (CA)	Groundwater Replenishment System Program Review	2004-Present	James Crook
Orange County Water District (CA)	Santa Ana River Water Quality Monitoring Study	2004-Present	Harvey Collins
Padre Dam Municipal Water District (CA)	Full Advanced Treatment Demonstration Project	2013-Present	James Crook
Rancho California Water District (CA)	Indirect Potable Reuse Conceptual Design Study	2012-2013	James Crook
City of San Diego (CA)	Indirect Potable Reuse/Reservoir Augmentation Project Review	2004-Present	George Tchobanoglous
San Francisco Public Utilities Commission (CA)	Water Reuse Master Plan	2006	James Crook
Santa Clara Valley Water District (CA)	Evaluating Potable Reuse	2012-Present	James Crook
Trussell Technologies, Inc. (CA)	Examining the Criteria for Direct Potable Reuse (WateReuse Research Foundation)	2012-2013	James Crook
Tucson Water (AZ)	Recycled Water Master Plan	2011-2013	Shane Snyder.

8. NWRI STAFF

NWRI is experienced in planning and facilitating Panel efforts and meetings. On average, NWRI facilitates between six to 10 Panel meetings a year. The names, titles, and responsibilities of NWRI staff who will be involved in the IRP effort are included in Table 3.

Table 3. NWRI Staff Members and Duties, as Pertaining to the IRP Program

Name	Title	Duties
Jeff Mosher	Executive Director	Provides overall project management for all IRP efforts. Responsible for organizing and planning IRP activities.
Brandi Caskey	Events Manager	Responsible for IRP meeting planning and logistics, as well as tracks finances.
Gina Melin Vartanian	Communications and Outreach Manager	In coordination with IRP, prepares IRP responses.

Brief biographies and IRP responsibilities for NWRI staff are provided below:

Jeff Mosher, Executive Director, NWRI. Jeff Mosher has a broad background in the operational management of non-profit organizations and private sector firms. He has served as Executive Director for the National Water Research Institute (NWRI), a nonprofit research organization, since 2005, managing all of NWRI's activities, including research projects, publications, and conference and meeting facilitation. He also specializes in organizing peer review Expert Panel efforts. In 2013 alone, he organized 11 in-person Panel meetings, all of which he attended and facilitated. These in-person meetings resulted in consensus-based Panel reports summarizing the findings and recommendations of the Panel Members. Mosher guided and facilitated the report development process with the Panel Chairs. Altogether, he has personally overseen 22 different Panel efforts (representing 20 different project sponsors) since joining NWRI. Prior to NWRI, he served as the Director of Technical Services for the WaterReuse Association and Director of Research Programs for the WaterReuse Foundation. He also was Director of Technical Services for the Association of Metropolitan Water Agencies. At present, Mosher is the Administrative Director for the Southern California Salinity Coalition. He also serves on the Board of Directors for the American Membrane Technology Association and Multi-State Salinity Coalition. Mosher received a B.S. in Chemistry from the College of William and Mary and an M.S. in Environmental Engineering from George Washington University.

Brandi Caskey, Events Manager, NWRI. Ms. Caskey is responsible for coordinating and planning events (such as conferences and workshops), as well as accounting and office administration, for NWRI. She has over 10 years of experience in conference coordination and general management. Among her responsibilities for the Panel process: serve as the administrative contact for Panel members; assist with financial management of the Panel, including invoicing and tracking the Panel budget; plan and arrange travel and lodging for Panel members.

Gina Melin Vartanian, Communications and Outreach Manager, NWRI. Ms. Vartanian received a B.A. in English Literature and an M.P.W. (Masters of Professional Writing) from the University of Southern California. She has served as editor, writer, and project manager for NWRI since 1998, focusing on publications, website development, grants, and national awards such as the NWRI Athalie Richardson Irvine Clarke Prize and NWRI Fellowship. With the Panel process, Ms. Vartanian specializes in the development of Panel reports. She has been actively involved with the NWRI Expert Panel program for over 10 years, providing transcripts of Panel meetings and serving as the editorial manager of Panel reports. She provides direct support to Panel Chairs in regards to developing and editing Panel written responses, as well as coordinates the review of draft responses among Panel members.

9. PROPOSED IRP MEMBERS – CURRICULUM VITAE

Attached in **Appendix B** are brief (2-page) curricula vitae of each proposed IRP member.

Appendix A

Proposed Budget

**National Water Research Institute
Statement of Qualifications
for an Independent Review Panel (IRP)
for the City of Santa Cruz Water Department's
Water Supply Advisory Committee
Proposed Budget
August 14, 2014**

Program Expenses

1. Assumptions

Number of Panel Members	5
-------------------------	---

2. NWRI Labor

NWRI Salary & Benefits	Hourly Rate	No. of Hours		
Executive Director	\$ 90.86	25.00	\$	2,271.50
Program and Events Manager	\$ 42.00	25.00	\$	1,050.00
Communications and Outreach Manager	\$ 40.00	10.00	\$	400.00
Administrative Assistant	\$ 25.00	10.00	\$	250.00

2. Other Direct Costs (ODCs)

Meeting, Logistics (Room, Meals, Audio Visual, etc.)	No. of Meetings	Cost per meeting		
Meeting Room			\$	-
Food & Beverage			\$	-
Audio Visual			\$	-

Honorariums (Panel Members) \$750/day	No. of Panel Members	No. of Days		
Panel members	5	5,000.00		25,000.00

Travel (Airline, Meals, Mileage, etc.)	No. of Trips		Cost		
Airline	4	\$	350.00	\$	1,400.00
	No. of Individuals		Days		
Meals during travel (\$20 per day)	5		4	\$	400.00
Lodging (\$120 per night)	5		2	\$	1,200.00
Mileage/Car Rental				\$	1,400.00
Misc Expenses				\$	-

Panel Expenses

Conference calls (Web-enabled)	\$ 350.00
Copying/Printing	\$ 500.00
Mailings	\$ 200.00

Contingency	\$ -
-------------	------

Subtotal Expenses	\$ 34,421.50
-------------------	--------------

Total Expenses	\$ 34,421.50
----------------	--------------

Appendix B

Proposed Panel Member Resumes

KATHERINE KAO CUSHING
Department of Environmental Studies
San Jose State University
San Jose, CA 95192-0115
kcushing@email.sjsu.edu

EDUCATION

- 1993 – 1998 Stanford University, Stanford, CA
Ph.D., Civil and Environmental Engineering Department with
Specialization in Environmental Planning and Management.
- 1992 – 1993 Stanford University, Stanford, CA
M.S., Civil and Environmental Engineering Department,
Environmental Engineering and Science Program
- 1986 – 1990 Northwestern University, Evanston, IL
B.S., Industrial Engineering and Management Science

APPOINTMENTS

- 07/09 – 08/11 Director of Sustainability, San Jose State University San Jose, CA
Responsible for coordinating and directing University sustainability
activities across curriculum, research, facilities, and community
relations. High-level administrative position reporting directly to the
University President and Cabinet.
- 08/08 – present Associate Professor, San Jose State University San Jose, CA
Conduct and supervise research on environmental issues. Current
projects include: Water reuse (See Synergistic Activities) and
analyzing the Impacts of an Ecological Footprint Challenge on the
University Community. Design and teach courses on Water
Resources Management (EnvS 128), Western Water Policy
(EnvS129), Research Methods (EnvS 290 and 297), Field Studies in
Water Resources Management (EnvS 270) and general
environmental issues (EnvS 01) at the undergraduate and graduate
level.
- 08/05 – 07/08 Assistant Professor, San Jose State University San Jose, CA
- 09/00 – 07/03 Associate Program Director, Stanford University Stanford, CA
Conducted research in implementation of ISO 14001 in China,
environmental and social performance of Silicon Valley computer
companies, and environmentally sustainable cities. Taught classes in
urban planning and thesis research.
- 05/99 – 08/01 Senior Research Associate, Pacific Institute Oakland, CA
Developed and managed research projects on California urban water
conservation, environmental certification systems, and global water
supply, sanitation, and hygiene.
- 01/99 – 12/99 Visiting Professor, University of California Berkeley, CA
Taught graduate course CP251 “Environmental Planning and
Regulation (CP251) in Department of City and Regional Planning,

Spring Semester 1999 and Fall Semester 1999.

SELECT PUBLICATIONS AND REPORTS

- Cushing, K., Arias, M., Larabee, J. and Rosenblum, E. (2014). Urban Recycled Water Programs: Identifying Evaluation Metrics and Understanding Key Organizational Relationships (10-17-1). Peer-reviewed Technical Report WateReuse Association. Alexandria, VA. (ISBN: 978-1941242049)
- Cushing, K., Arias, M., Larabee, J. and Rosenblum, E. (2012). How should we measure program performance? A Delphi survey of urban recycled water stakeholders. Proceedings of the International Water Association's Wastewater Purification and Reuse Conference. March 28, 2012. Heraklion, Crete, Greece.
- Delaveau, B., Cushing, K., and Klee G. (2011) Environmental Impact of the Photoprocessing Industry: Santa Clara, CA-Case Study. LAP Lambert Academic Publishing Saarbrücken, Germany (ISBN-13: 978-3845478692).
- Cushing, K.K., McGray, H., and Liu, H. (2005). "ISO 14001 Adoption and Implementation in China" *International Journal of Environment and Sustainable Development*. Vol.4, No. 33. pp. 246-268.
- Gleick, P., Haasz, D., Henges-Jeck, C., Srinivasan, V., Wolff, G., Cushing, K.K., and Mann, A. (2003). *Waste Not, Want Not: The Potential for Urban Water Conservation in California*. Pacific Institute: Oakland, CA.
- Ortolano, L., and K. Cushing. (2002). "Grand Coulee Dam 70 Years Later: What Can We Learn?" *Water Resources Development*. Vol. 18, No. 3. pp. 373-390.

SELECT PROFESSIONAL ACTIVITIES

WateReuse Foundation Research (October 2010 to December 2013)—Principal Investigator for research project that identifies criteria at the regional and municipal level for evaluating the performance of recycled water programs in the U.S.

National Water Research Institute, Independent Advisory Panel Member to the Santa Clara Valley Water District on Potable Reuse (April 2013 to present)—Provide advice on the strategic and operational aspects of the District's water reuse program.

Green Wave (June 2010 to June 2011). Developed new service-learning project providing energy-efficiency audits and tools to local homes and offices. Audits conducted by SJSU students. Program received commendation by the City of San Jose and San Jose Mayor.

Sustainable Silicon Valley (September 2010 to June 2011) Principal team member of EcoCloud Project a consortium of industry, academia, government and business applying principles of industrial ecology to the San Francisco Bay area.

CONTACT: P.O. Box 30020, Santa Barbara, CA 93130
805-643-7710, 831-915-1115
mfeeney@ix.netcom.com

EDUCATION: M.A., Environmental Planning (Groundwater), California State University, 1987
Graduate Program, Water Science, University of California, Davis, 1981-1982
Secondary Teaching Credential, University of California, Santa Barbara, 1979
B.S., Earth Science (Geology), University of California, Santa Cruz, 1976

QUALIFICATIONS: Professional Geologist, California, No. 4634
Certified Engineering Geologist, California, No. 1454
Certified Hydrogeologist, California, No. 145
Certified Groundwater Professional, NGWA, 1994

EXPERIENCE: Mr. Feeney has more than 30 years experience in groundwater consulting. After employment as a well-site geologist in the oil industry and again as an engineering geologist, Mr. Feeney was a founding Principal of Staal, Gardner and Dunne, Inc. (later became Fugro West, Inc.) and managed this firm's Monterey County office for 9 years. Mr. Feeney later was a member of the firm, Balance Hydrologics, Inc. Mr. Feeney is currently a private consultant. Mr. Feeney's experience in groundwater supply issues includes well siting and design, preparation of project specifications and contractor supervision, well maintenance and repair, water treatment, groundwater modeling (both flow and solute-transport), perennial yield analysis, artificial recharge (surface and injection), water quality assessments, regulatory compliance and groundwater modeling.

Mr. Feeney has significant experience in drilling and well construction technology. During his career Mr. Feeney has designed and managed the construction of over 80 municipal wells with diameters up to 24-inches and discharge rates of up to 6,000 gpm at locations around the world.

Selected representative project experience includes:

WATER SUPPLY PROJECTS: **Point of Diversion Study, Monterey County, California-American Water Co.**
The feasibility of diverting subsurface flow from the Carmel River rather than direct diversion from the reservoirs was evaluated. The change would allow existing treatment facilities and pipelines to be utilized while providing important fisheries and riparian habitat benefits as well as reduced treatment costs. The scope included re-evaluating the geometry of the uppermost Carmel River alluvial aquifer, adapting the existing groundwater model to incorporate the proposed changes in point diversion, and assisting the local water district in modifying its operational models and in-stream flow simulations.

Desalination Project, Marina Coast Water District. Marina Coast Water District built the first operating desalination facility in mainline California. Work included design and supervision of construction of the project's seawater intake and brine disposal wells. Additional work included performance of aquifer and injection testing and analysis, detailed groundwater flow and transport modeling as part of feasibility analysis, and assessment of injection well plugging phenomena.

Sand City Desalination Plant Saline Intake and Brine Disposal Monterey Peninsula Water Management District —, Monterey County
In order to satisfy increased water demands, the MPWMD has proposed the construction of a 3.0 MGD seawater desalination facility that will extract water from coastal dune sands through the use of Ranney collectors. The feasibility of this approach was investigated and the conclusion reached that three Ranney collectors at the site would be capable of producing the required design flow. Also investigated was the use of Ranney collectors to inject brine into the shallow subsurface offshore. The project included drilling, well construction, aquifer testing and solute/flow modeling. It successfully demonstrated that Ranney collectors would be suitable for use and that brine injection was feasible.

Pilarcitos Creek Study -San Mateo County

Anticipating the listing of certain species of fish that migrate up coastal streams, the Coastside Water District, in conjunction with San Francisco Water Department, contracted for a study of the feasibility of modifying the method of diversion from Pilarcitos Creek. The study included the review of reservoir operations, analysis of distribution system, evaluation and modeling of the District's wellfield, and the assessment of fisheries conditions in specific reaches of the creek. The report concluded that it was feasible to shift diversions to the wellfield from the reservoir and that this would result in the re-establishment of up to 2 miles of additional fisheries habitat. However, the overall benefit of the proposed modification was not clear as the modification would have no effect on the more-critical impacted fisheries habitat downstream of the District's property.

**EXPERT/3rd
PARTY REVIEW
PROJECTS**

Salinas Valley Hydrogeologic Conference "White Paper".

Mr. Feeney was a one of eight participants in a "blue-ribbon" committee convened by the MCWRA to address the hydrogeologic issues facing the Salinas Valley. As part of two day conference, the committee evaluated available data regarding seawater intrusion, the overall water balance and water quality issues. The committee reached general consensus and prepared a report recommending a solution to the water supply shortfall.

Soquel Creek Water District IGSM Development -- Technical Advisory Committee (TAC) Member.

Mr. Feeney was retained by Soquel Creek Water District to participate in a TAC reviewing the development of the IGSM model by a consultant for the District. This recently completed model, shares its southern boundary with the Pajaro IGSM model. Water level and water quality conditions within the northern portion of PVWMA area are linked between the two models.

Pajaro Valley Water Management Agency -- Groundwater Model Development Project -- TAC Chairperson

The USGS was contracted to convert the Pajaro Valley Water Management Agency's (PVWMA) existing groundwater model from the IGSM code to MODFLOW2000 code. Mr. Feeney was retained by PVWMA to chair and as a participant in the advisory TAC that supervised the conversion of the model. This task entailed review and acceptance of a revised hydrostratigraphic model of the Pajaro Basin, review and acceptance of the water balance and recharge assumptions. The conversion project is on-going and a working, calibrated model has been completed.

Seaside Groundwater Basin Watermaster -- Groundwater Model Development Project -- TAC Chairperson

As part of the court decree, the Seaside Groundwater Basin Watermaster (Watermaster) was tasked with developing a groundwater model of the basin for management purposes. Mr. Feeney was retained to chair a panel of modeling experts to evaluate the existing groundwater models of the basin and the need for a new model. This review focused on the need and desired uses for a model, identification of data gaps that may limit model utility and validity, the suitability of flow verses solute transport models, and generalized approaches to the modeling effort. The results of the review resulted in the selection and modification of an existing model to meet the Courts requirement.

National Water Resources Institute -- TAC Panel Member--

Monterey Regional Water Pollution Control Agency --Reclaimed Water Recharge Project in the Seaside Basin.

Mr. Feeney was again asked to serve as the groundwater expert on a NWRI panel reviewing the Monterey Regional Water Pollution Control Agency's proposed Reclaimed Water Recharge Project in the Seaside Basin. This project proposes to take highly-treated wastewater and use it for recharge in the Seaside Basin -- either through percolation or direct injection. The review focused on the feasibility of the plan and the potential impacts and benefits of implementation. The panel is on-going.

**PROFESSIONAL
AFFILIATIONS:**

Groundwater Resources Association
Association of Groundwater Scientists and Engineers
American Institute of Hydrology
Monterey Bay Geologic Society

Brent Haddad, MBA, PhD

Professor of Environmental Studies
Professor and Chair, Department of Technology Management
Associate Dean of Engineering, Technology Management
Director, Center for Integrated Water Research, and Center for Entrepreneurship
University of California, Santa Cruz
1156 High Street/SOE3, Santa Cruz, CA 95064
831-331-0654; (f) 831-459-4015 bhaddad@ucsc.edu

EMPLOYMENT HISTORY

2012- Associate Dean of Engineering, Technology Management
2007- Founder and Director, Center for Integrated Water Research,
University of California, Santa Cruz
1997- Professor of Environmental Studies
1991- Consultant on energy, water, environmental regulation and
policy, and market development.

EDUCATION

1996 University of California, Berkeley, Ph.D. in Energy and
Resources
1991 University of California, Berkeley, Haas School of Business,
MBA in Business and Public Policy
1985 Georgetown University, MA
1982 Stanford University, B.A

SELECTED AWARDS

2013 UCSC-NASA Sustainable Water Technology Collaborative,
Phase 2, to prepare space-oriented water treatment technologies
for use on earth, 4 years, ~\$1,500,000.
2007 California Public Utilities Commission, Division of Ratepayer
Advocates, research and administrative coordination of a
process to identify a regional solution to Monterey County
water supply needs, \$326,000.
2007 Monterey Regional Water Pollution Control Agency, exploring
the federal role in regional water treatment and supply projects.
\$42,000.
2006 WateReuse Foundation. "The New Urban Water Customer,"
developing a 3-5 year research program on the social
psychology of water reclamation and reuse. \$175,000.
2006 California Public Utilities Commission, Division of Ratepayer
Advocates, research support for analysis of the Central
California Water Project, \$100,000.

- 2005 California Department of Water Resources Proposition 50 grant competition. "Developing a Tool to Guide State and Local Desalination Planning," \$2,597,149.

SELECTED PUBLICATIONS

- 2012 Member, Committee on the Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs. Published: *Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater*. Washington, D.C.: National Academies Press.
- 2010 Haddad, B., Rozin, P., Nemeroff, C., and Slovic, P. "The Psychology of Water Reclamation and Reuse: Survey Findings and Research Road Map," Alexandria, VA: WaterReuse Foundation, 78 pp.
- 2009 Kidson, R., Haddad, B., and Zheng, H. 2009, Improving Water Supply through Portfolio Management: Case Study from Southern California. *Proceedings, 4th WEAS International Conference in Water Resources, Hydrology and Hydraulics*, University of Cambridge, 24-26 February.
- 2006 Haddad, B. "Achieving Numerous Watershed-Management Goals in a Multi-Watershed System," extended abstract in *Proceedings*, International Conference on Forest and Water in a Changing Environment (Beijing, August 8-10).
- 2006 Buckley, M., and B. Haddad. "Socially Strategic Ecological Restoration: A Game-Theoretic Analysis," *Environmental Management*. 38(1): 48-61.
- 2004 Haddad, B. "Research Needs Assessment Workshop: Human Reactions to Water Reuse," Alexandria, VA: WaterReuse Foundation.
- 2004 Haddad, B. "Water," in S. Krech III, J.R. McNeill, and C. Merchant, eds., *Encyclopedia of Environmental History*. Volume 3, 1299-1303.
- 2000 Haddad, B. *Rivers of Gold: Designing Markets to Allocate Water in California*. Washington, D.C.: Island Press.

OTHER

- 2012- Founder, WaterLab, the Water Teaching and Research Laboratory, located at the Watsonville Water Resources Center. <http://ciwr.ucsc.edu>
- 2010-11 Co-author (with Prof. Gary Griggs) of the Santa Cruz City Climate Change Vulnerability Assessment (published Jan. 11, 2011).
- 1990- Consultant on numerous projects. Clients have included SCWD2, for which I facilitated preparation of the operations agreement for the proposed desalination facility.

Kurt Anthony Schwabe

Associate Professor of Environmental Economics and Policy

University of California-Riverside

Email: kurt.schwabe@ucr.edu

Phone: 951-827-2361

EDUCATION

Ph.D., North Carolina State University, Economics, Statistics Minor, 1996

M.A., Duke University, Economics, 1992

B.A., Macalester College, Mathematics/Economics, 1988

RESEARCH AREAS

Water Economics; Market-based Instruments; Wildlife and Fisheries Management; Valuing Ecosystem and Forest Services; Revealed and Stated Preference Valuation Methods.

SELECTED HONORS/AWARDS

Visiting Flagship Fellowship. 2007-2008. CSIRO, Australia.

Outstanding Journal Article Award. 2002. *Journal of Agricultural and Resource Economics*.

Editor's Citation for Excellence in Manuscript Review 2002. *Journal of Environmental Quality*

Best Teaching Practices Award Recipient. Center for Teaching Excellence, Ohio University. 1998.

Kenneth R. Keller Research Award for Excellence in Doctoral Research. NCSU. 1996.

MEMBERSHIPS/ORGANIZATIONS

Giannini Foundation of Agricultural Economics; American Agricultural Economics Association

American Economics Association; Western Economics Association; Association of Environmental and

Resource Economics; Australian Agricultural and Resource Economics Society

RECENT APPOINTMENTS

Associate Professor (2006-present). Department of Environmental Sciences, UC-Riverside.

Associate Director (2012-2014). Water Science and Policy Center, UC-Riverside

Editorial Council (2013-present). Water Economics and Policy

Vice-Chair (2008-2011). Department of Environmental Sciences, University of California.

Associate Editor (2007-2010). *Australian Journal of Agricultural and Resource Economics*.

Visiting Fellow (2007-2008). Commonwealth Scientific and Industrial Research Organization (CSIRO),

Cooperating Faculty Member (1999-present). Department of Economics, UC-Riverside.

Assistant Professor (1999 – 2006). Department of Environmental Sciences, UC-Riverside

Assistant Professor (1996 - 1999). Department of Economics, Ohio University.

COURSES TAUGHT (u~undergraduate; m~masters; p~Ph.D.)

Environmental/Natural Resource Economics (u,m,p), Econometrics (u,m), Environmental Valuation (u,m,p), Microeconomics (u), Managerial Economics (m), Southeast Asian Economics (u,m).

SELECTED REVIEWER ACTIVITY

American Journal of Agricultural Economics, Australian Journal of Agricultural and Resource Economics, British Journal of Environment and Climate Change, California Agriculture, Canadian Journal of Agricultural and Resource Economics, Choices, Contemporary Economic Policy, Empirical Economics, Environment and Development Economics, Forest Science, Irrigation Science, Journal of Agricultural and Resource Economics, Journal of Environmental Economics and Management, Journal of Environmental Quality, Journal of Management Mathematics, Journal of Water Resources Planning and Management, Lake and Reservoir Management, Marine Resource Economics, Water Resources Research

RECENT RELEVANT PRESENTATIONS

- (Invited talk) Given by K. Schwabe. "The mean isn't the only message: the implications of accounting for other water supply characteristics on irrigated agricultural sustainability." Presented at *Water Use Efficiency Symposium: Water Policy and Politics*. American Society of Enology and Viticulture National Conference, Austin, Texas, June 24, 2014.
- (Invited talk) Given by K. Schwabe. "State Policy for Future Drought." Presented at the UC-Governor's Office Drought Summit. Sacramento, CA, April 25, 2014.
- (Invited talk) Given by K. Schwabe. "Demand-side Management for Addressing Water Scarcity and Drought: What Do We Know?" Presented at the *Urban Water Workshop*, Water Science and Policy Center, University of California, Riverside, Riverside, CA June 4, 2014.
- (Invited talk) Given by K. Schwabe. "The role of demand-side measures and flexible incentive-based instruments for addressing drought." Presented at the Santa Ana Watershed Project Authority's Board Meeting, Santa Ana Project Authority, Riverside, CA., February 4, 2014.
- (Invited talk) Given by K. Schwabe. "Meeting Future Urban Water Demand: Some Considerations as to Agriculture's Role and the Larger Issues of Water Scarcity." Presented at Urban Water Roundtable: Bringing Together the Best in Current Research and Applications. Arizona State University, April 24, 2013, Tempe, Arizona.
- (Invited talk) "How Effective are Water Conservation Strategies?" Southern California World Water Forum College Grant Program, Kick-off event. October 7, 2012, Los Angeles, CA.
- (Plenary Speaker/Invited) "Managing California's Water." Presented at the Sustainable Food Systems Conference, UC. Davis. October, 2011.

RECENT RELEVANT PUBLICATIONS

- Vincent, J., R. Carson, J.R. DeShazo, K. Schwabe, I. Ahmad, C. Kook, C. Tan, and M. Potts). 2014. "Middle-Income Developing Countries May be Willing to Pay to Protect their Own Tropical Rainforests," *Proceedings of the National Academy of Sciences*. June 30. doi:10.1073/pnas.1312246111
- Baerenklau, K., K. Schwabe, and A. Dinar. 2014. "Residential Water Demand Effect of Increasing Block-rate Budgets," *Land Economics* (Accepted, February, 2014). 34 ms pages.
- Schwabe, K. 2014. Drought. In (editors) Whitehead, J. and T. Haab. *Environmental and Natural Resource Economics: An Encyclopedia*. Greenwood Press, Santa Barbara, California.
- Schwabe, K. and K. Knapp. *In press*. Salinity and Groundwater Management: A Hydro-Economic Analysis. In (editors) A. Dinar and K. Schwabe, *Handbook of Water Economics*, Edward Elgar Publishing Ltd. 40 ms pages.
- Mukherjee, M., and K. Schwabe. 2014. "Where's the Salt? A Spatial Hedonic Analysis of the Value of Groundwater to Irrigated Agriculture," *Agricultural Water Management*. Accepted 1/23/14 for a special edition titled, Sustainable Agriculture.
- Schwabe, K., J. Albiac, J. Connor, R. Hassan, L. Meza-Gonzalez. 2013. *Drought in Arid and Semi-arid Regions: A Multi-disciplinary and Cross-Country Perspective*. Springer Publishing. Dordrecht.
- Schwabe, K. and J. Connor. 2012. "Drought in Semi-arid and Arid Environments," *Choices* 27(3):1-5.
- Connor, J., K. Schwabe, D. King, and K. Knapp. 2012. "Irrigated Agriculture and Climate Change: The Influence of Water Supply Variability and Salinity on Adaptation," *Ecological Economics* 77:147-153.
- Qureshi, E., K. Schwabe, J. Connor, and M. Kirby. 2010. "Environmental Water Incentive Policy and Return Flows," *Water Resources Research* 46: 1-12.
- Connor, J., K. Schwabe, M. Kirby, D. Kaczan and D. King. 2009. "Impacts of Climate Change on Lower Murray Irrigation," *Australian Journal of Agricultural and Resource Economics* 53(3): 437-456. 2009
- Knapp, K. and K. Schwabe. 2008. "Spatial Dynamics of Water and Nitrogen Management in Irrigated Agriculture," *American Journal of Agricultural Economics* 90(2): 524-539.
- Schwabe, K., I. Kan and K. Knapp. 2006. "Drainwater Management to Reduce Salinity Problems in Irrigated Agriculture," *American Journal of Agricultural Economics* 88(1), 133-149.
- Kan, I., K. Schwabe and K. Knapp. 2002. "Microeconomics of Irrigation with Saline Water," *Journal of Agricultural and Resource Economics* 27(1), 16-39.

GEORGE TCHOBANOGLIOUS

662 Diego Place
Davis, California 95616
(530) 756-5747, FAX (530) 753-6365
e-mail: gtchobanoglous@ucdavis.edu

Education

Ph.D., Civil Engineering, Stanford University, 1969
M.S., Sanitary Engineering, University of California, Berkeley, 1960
B.S., Civil Engineering, University of the Pacific, 1958

Present Position

Professor Emeritus of Civil and Environmental Engineering, Department of Civil and Environmental Engineering, University of California at Davis, Davis, CA. Research areas include solid waste management, innovative water and wastewater treatment systems, wastewater filtration, UV disinfection, small wastewater treatment systems, onsite systems, and aquatic treatment systems.

Honors, Awards

2013 Kappe Lecturer, AEESP and AAEE.
2012 Elected as a WEF Fellow
2012 Excellence in Engineering Education Award, AAEE and AEESP
2011 Inducted into the Greek Technical Chamber (Association of Engineers) as an Honorary member. First such honoree.
2010, Distinguished Speaker, Distinguished Speaker Series 2009-2010, University of Miami, Miami, FL
2007, The Frederick George Pohland Medal, AAEE and AEESP.
2006, Distinguished Lecturer, Department of Civil, Architectural, and Environmental Engineering, University of Texas, Austin, TX.
2005, Honorary Doctor of Engineering Degree, Colorado School of Mines.
2004, Waste-To-Energy Research and Technology Council Distinguished Service Award for Research and Education in Integrated Waste Management.
2004, National Academy of Engineering.
2003, Athalie Richardson Irvine Clarke Prize, National Water Research Institute.
2002, AEESP/WEF Keynote Research Lecture
1999, Jack Edward McKee Medal, Water Environment Federation.
1993, Special Recognition Award For Service To The Profession, The Engineering Council of Sacramento Valley, California.
1991, Thomas R. Camp Lecturer, Boston Society of Civil Engineers.
1990-2007, Who's Who in America
1989, President, Association of Environmental Engineering Professors.
1985, Gordon Maskew Fair Medal, Water Pollution Control Federation.
1985, Distinguished Alumnus of the Year for Public Service, University of the Pacific.
1980, Outstanding Teacher Award, School of Engineering, University of California at Davis
1957, Blue Key

Society Memberships

American Academy of Environmental Engineers (AAEE)
American Society of Civil Engineers (ASCE)
American Water Works Association (AWWA)
Association of Environmental Engineering and Science Professors (AEESP)
California Water Pollution Control Association (CWPCA)
International Water Quality Association (IWQA)
Sigma XI
Water Environment Federation (WEF)

Registration

Registered Civil Engineer in California (C-14,430)

Employment Record

1994 - Present: Professor Emeritus, University of California at Davis, Davis, CA
1976 - 1994: Professor, University of California at Davis, Davis, CA
1971 - 1976: Associate Professor, University of California at Davis, Davis, CA
1970 - 1971: Assistant Professor, University of California, Davis at Davis, CA
1967 - 1969: Acting Assistant Professor, Stanford University, Stanford, CA
1970 - Present: Consultant, Over 150 municipal, industrial, and consulting engineering clients
Both domestic and foreign)
1981 - Present: Special Consultant, Nolte & Associates, Sacramento, CA
1990 - Present: Member, Technical Advisory Board, Nishihara, Ltd, Japan
1973 - 1980: Consultant, State Water Resources Control Board, Sacramento, CA
1963 - 1969: Sanitary Engineer (Part time while studying for Ph.D. degree), Metcalf & Eddy,
Inc., Palo Alto, CA
1962 - 1963: Sanitary Engineer, Water Resources Engineers, Inc., Berkeley, CA
1960 - 1962: Research Sanitary Engineer, Sanitary Engineering Research Laboratory,
University of California, Richmond, CA

Professional Activities

Consulting Editor, McGraw-Hill Series in Water Resources and Environmental Engineering
Member, Editorial Board, Aquatic Systems Manual of Practice, Water Environment Federation
Member, Editorial Board, Asian Institute Of Technology, Bangkok, Thailand
Member, Selection Subcommittee, Outstanding Achievement in Water
Member, Health Advisory Committee, A Dynamic Model to Assess Microbial Health Risks
Associated With Beneficial Uses of Biosolids WERF Project #98-REM-1
Member, Awards Subcommittee, G. M. Fair Award, Water Environment Federation
Member, WERF Review Subcommittee - Impact of Surface Storage on Reclaimed Water:
Seasonal and Long Term
Member, WERF Review Subcommittee - Emerging Treatment Technologies for Water
Reclamation
Member, Technical Advisory Committee, San Diego Aquaculture Project (1979-1998)
Member, Health Advisory Committee, San Diego Aquaculture Project (1990-1998)
Member, Blue Ribbon Panel, City of San Jose, CA (1990)
Past President, Association of Environmental Engineering Professors (1989)
Member, California Senate Task Force On Solid Waste Management (1988-1990)
Member, California Waste Management Board (1988-1990)
Member, Advisory Board On Solid Waste Management, California Prisons Industry
(1985-1992)
Member Editorial Board, Hydrogen Sulfide Manual of Practice, American Society of
Civil Engineers (1985)
Member, Yolo County Solid Waste Advisory Committee (1982-1990)

Publications

Author or co-author of over 500 articles, books, and reports. Included in the list of publications are 22 text and 8 reference books dealing with the subject areas of environmental engineering, water quality, the collection and pumping of wastewater, wastewater treatment, and solid waste management. The textbooks are used in more than 225 Colleges and Universities throughout the United States. The textbooks and reference books are also used extensively by practicing engineers both here and abroad. A list of publications is available on request.

Lectures and Presentations

Presented more than 500 lectures on various environmental engineering subjects, with more than 250 being invited as a keynote speaker.

August 13,
2014

From: Jerome
E. Paul
120 S.
Morrissey
Ave.
Santa Cruz,
CA 95062

To: Rosemary
Menard
Water
Director
City of Santa Cruz Water Department
212 Locust Street, Suite C, Santa Cruz
CA 95060 Email:
RMenard@cityofsantacruz.com

Re: Statement of Qualifications (SOQ) for Independent Review Panel (IRP)

I would like to offer my services as a member of the Independent Review Panel for the Water Supply Advisory Committee (WSAC.) In this cover letter, I will show how my qualifications provide a perfect complement and supplement to the experience of other technical panel members. I am available to work with WSAC over the coming year, glad to attend meetings, review materials and provide reports. I am willing to accept the offered compensation.

Scientific and Technical Training

In addition to my MS in Electronic Engineering, I have many years of experience in using objective criteria to evaluate and develop projects. In my professional life as an electronic and electrical engineer, I've worked in teams of a variety of technical specialists, translating the needs of the client into technical specifications to produce over 200 inventions. I've assisted many inventors in the process of moving from an idea to implementation. Unlike many specialists, I instinctively go all of the way from the big picture to the smallest level of detail in evaluating a design.

Broad knowledge and experience

I apply my scientific orientation to objective evaluation, and also bring experience with strategic planning and sales to ask the question "what does it take" to solve a problem, rather than surrendering to the first perceived flaw. I've been responsible for strategic recommendations in governmental and corporate environments. A marketing perspective helps me see ways to work with regulators

that haven't been used to date. This broad managerial experience allows me to evaluate (as you say in your RFQ) "the accuracy and appropriateness of analytical, scientific, and technical methods; the clarity and accuracy of statements of assumptions; and the appropriate characterization of the strengths and weaknesses of the analyses, especially with respect to uncertainty, data quality, or other factors that, if different, could affect the results in a significant manner." I'm a geek for all science, e.g., reading Scientific American cover-to-cover for 45 years. I look forward to working with the technical team to offer advice or suggestions to the WSAC regarding *all* lines of inquiry.

Substantial Practical Experience Relevant to Water Supply in Santa Cruz.

I've been studying the local water problem for over two years and have devoted over 1100 hours of engineering work to the challenge. I've read in their entirety scores of the most pertinent technical and summary reports of Santa Cruz, Soquel Creek, the County, California State Water Resources Control Board and other agencies, some 20,000 pages, including the entire desalination dEIR, Kennedy/Jenks Conjunctive Use...Phase 1, UWMPs, GWMPs, IRPs, Water Source Alternatives, Tait Street Sanding Study, and many others, and I've created a bibliography of key facts. (Piles of technical documents don't intimidate me.) I've attended over 50 meetings of Boards, Commissions and Councils regarding local water issues. I've made two presentations to the Soquel Creek Water District Board of Directors, at their invitation. I've had private interviews on the subject with numerous local authorities and experts, ranging from 1½ to 20 hours each, and voluminous e-mails. I've spoken with and translated the technical language of hydrologists, geologists, fish biologists, regulators and others.

My strategies and concepts already shared in overview form with the WSAC demonstrate my grasp of the key issues. I am prepared to collaboratively participate on this panel; I'm also confident that anyone who examines my work to date will conclude that I'm especially "open to new information and outcomes", and that I've consistently sought to create, identify and evaluate new possibilities.

Translation of technical language

I also bring an ability to translate complex issues into understandable language, which will help with community engagement. In my 500-word editorial for the Sentinel and numerous publications on water sources, I "demonstrated (an) ability to explain complicated topics in terms non-technical people can understand." (We don't have a water shortage problem, we've got a storage problem.) I've written user manuals and data sheets for technical equipment, procedures, criteria and policies, and I've translated the technical jargon of scores of specialties.

Skills as a technical reviewer

I wrote papers and presented at conferences on microprocessors, solving the puzzles of features optimized for the applications in which they are used. I'm dedicated to using objective criteria and processes for decision-making, without predisposition regarding

any alternative. Evaluation needs to take into account perhaps a hundred factors including demand, supply, construction costs, finance costs, operating costs, operating lifetimes, energy consumption, water rights, environmental impacts, regulatory matters, startup dates, climate change and a host of other issues, notably risks.

Supporting, advising, engaging citizen groups

One of the founders of Engineers for Water Alternatives, I joined other volunteers to discuss and publicize issues of public policy. I've collaboratively assisted in the development of community outreach and educational materials. In addition to my Sentinel article which had a large and lasting effect, I provided information for a documentary film on water alternatives, and I appeared on a radio talk show.

Regarding new outcomes, I'd like to identify and implement a set of measures where *everybody* wins, including ratepayers, owners of threatened wells, the local economy, businesses, the University, the environment--and anadromous fish populations.

Working as part of a team

My training in Nonviolent Communication (NVC), Landmark Forum, etc., helps me to be a better listener, and to be "soft on the people, hard on the problem." I enjoy maintaining cordial productive relationships.

By the way, it was a real pleasure to meet with you today. Thank you.
My Resume is attached.

Sincerely,

Jerome E. Paul, M.S.E.E.

Jerome E. Paul, M.S.E.E
831-824-4370 • jpaul@ix.netcom.com • 120 S. Morrissey, Santa Cruz CA 95062

Consultant: **Corporate Strategy**
 Technology-transfer Management
 Marketing Management
 Electrical Design Engineering Management

Unusual combination of technical and people skills. Provides translation of complex technical concepts into direct language. Develops heuristics & implements systems that support clients to identify and meet goals. Respected as brilliant, persistent, jovial, sociable professional that builds successful business relationships. Proven problem solver with experience in creating new ideas and bringing them to implementation. Assists clients to achieve remarkable results.

AREAS OF EXPERTISE

Strategic

Management

Profit & Loss
SWOT Analysis
Financial ratios & tests
Best Practices
Intellectual Property
Patents & Searches
Trademarks/Copyrights
Trade Secrets
Technology Transfer
Product Development
Make vs. Buy
Contracts
Business Law
Tracking/Supervising
PERT, GANTT, etc.

Technical Writing
Energy Saving
Applications Engineering
Training

**Design Engineering
Management**

Project Design
System Partitioning
Analog Design
Circuit Design
Logic Design
Simulation
Physical Layout
Design Verification
Quality Testing
Reliability Testing
Statistical Process Control
Field Applications
Speech Recognition
Sound/Recording
Gate Arrays/PLAs/PLDs
Embedded Computers
LED Applications
Power Supplies

Marketing Management

Requirements Definition
Ramification
Competitive Analysis
Market Positioning
Pricing Strategies
Distribution Channels
Product Literature
Promotions
Advertising Strategy
Sales Presentations

WATER SOURCE RESEARCH, Santa Cruz, California

2012-present

Interviewed experts at the facility, district, city, county, and state level to discover facts and describe patterns that could influence solutions. Published summaries outlining designs, strategies and principles. Published in Santa Cruz Sentinel and featured in documentary. Reviewed some 20,000 pages of technical documents; commented on EIR.

PAUL ENTERPRISES, Santa Cruz and San Jose California

1985-present

CONSULTANT

Projects have included presenting new products to potential funding sources, licensing and joint marketing, patent search, speech recognition staffing in Russia, engineering a laser level for construction grading, backlit dimmable fluorescent display, sound baffle wall, acoustic baffle vent, multi-blinds.

PROPERTY OWNER AND MANAGER

Advertising, screen tenant applicants, repairs, adapt and negotiate leases. Used CAD program to design remodel, manage contract teams, and permit process.

ELECTRONIC ENGINEERING, MARKETING AND CORPORATE STRATEGY

1970-1985

DESIGN ENGINEERING MANAGER

Working for American Microsystems, Inc. (AMI), designed over 200 products for clients in the computer, telecommunications, automotive, appliance and many other market sectors, often by coordinating the work of various technical specialists from multiple organizations. Translated highly technical and business language to be understood in a variety of contexts. Managed projects and staff, travelled extensively. Authored and managed training of customer engineers in how to design semiconductor chips. Managed quality control and distribution of some 100 software programs and databases.

TECHNOLOGY TRANSFER MANAGER

Managed technology licensing pre-agreement negotiations between officers of AMI and other companies, and managed the implementation of many programs agreed upon with competitors and large customers, including the government of India, the Brazilian national telephone company, Bosch, Iskra, Mostek and others.

CORPORATE STRATEGY DEVELOPER

Reported to the Executive VP at AMI. The company grew to \$160M annual sales.

MARKETING MANAGER

Responsible for National Semiconductor's relations with their largest customer, IBM. Sales doubled in six months.

PUBLICATIONS AND PUBLIC SPEAKING

Putting desalination into perspective

a 500-word article published in the Santa Cruz Sentinel on 2012-05-06

Conversion Factors Relevant to Santa Cruz Water Supplies

a set of spreadsheets specifying technical relations among 19 disparate units of water volume, flow rate, time, energy and elevation, followed by examples of estimated values for 28 locations in the Santa Cruz area 2012-03-04

Head Loss in Pipeline, 2012-05-09

a chart showing, among other things, the results of applying the Hazen-Williams equation to a likely Santa Cruz situation, yielding head loss estimates for various pipe diameters

"Crossfire" interview show on KSCO radio 1080,

90-minute discussion of desalination with host Michael Zwerling and fellow-guests Dr. Jason Holt and Douglas Deitch 2012-05-19

Some Thoughts and Facts,

written in collaboration with physicist Steve Newman, a 6-page report regarding the Lochquifer Alternative 2013-07-30

The Lochquifer Alternative version 5.3,

a 17-page report submitted to SCWD2 for the Seawater Desalination dEIR 2013-08-12 (version 8 is current as of 2014-08-13)

dEIR Questions from the Public -JP v2 2013-08-12,

10 pages of analysis and ideas submitted to SCWD2 for the Seawater Desalination dEIR

Proposal Phase 1,

a 20-minute televised invited speech given to the Soquel Creek Water District Board of Directors 2013-11-05

70 Ideas for Water Supply,

a confidential presentation under nondisclosure agreement to the president and one other member of the Soquel Creek Water District Board of Directors, their General Manager and the Acting Director of the Santa Cruz Water Department 2013-12-10

WSAC-invited Strategy and Idea Overviews by J Paul 2014-07-28 v1-1,

22 pages containing overviews of 41 of J. Paul's ideas regarding the Santa Cruz area water supply; 2-page limit per idea

various informal speaking engagements, e.g., to a realtors' association, neighborhood groups and other meetings, as well as brief public comments to councils and boards

How to Sell,

S2000 User Manual, for an embedded microprocessor

Integrated Circuit Design, a computer chip design course for engineers

Numerous electronic product data sheets & speeches about them at technical conferences

Many proprietary documents

Some 200 music arrangements performed publicly; many have been published

EDUCATION, TRAINING, LICENSES

Windows programs: Microsoft Office (Word, Excel, PowerPoint), relational databases

Finale, Sonar, CAD, CADENCE, CAE, SPICE, many other design tools

Design seminars regarding various types of integrated circuits

Corporate sales training courses

Landmark Forum, Life Training, Listening Skills, Nonviolent Communication

MSEE, University of Illinois, 1974, emphasis in computer speech recognition

Brian L. Ramaley, PE
Independent Civil/Environmental Engineer
408 Green Tree Cove
Newport News, Virginia 23606
(757) 339-0798
bramaley@gmail.com

City of Santa Cruz Water Department
212 Locust Street, Suite A
Santa Cruz, CA 95060
Attention: Rosemary Menard
(delivered via email)

August 13, 2014

To whom it may concern:

In response to your request for proposals for members of an Independent Review Panel I would like to offer this Statement of Qualifications consisting of this letter of transmittal and my attached resume as an expression of interest. I have worked previously in many similar settings and am acquainted with Bob Raucher and Rosemary Menard from work on Federal Advisory Committees and other related projects over the last 20 years. Having worked for many years both as a utility director and as a consulting engineer I believe I am well-qualified to assist the Water Supply Advisory Committee in dealing with its team of consultants and others. Past roles or assignments that prepare me for this work in particular include:

- serving as the project engineer in the analysis of alternatives for wastewater reuse in the Orange and Los Angeles Counties Reuse Study (OLAC) study 25 years ago, and spending seven years in California working as a consultant with a number of utilities throughout the State;
- serving on and chairing the National Drinking Water Advisory Council from 2001 to 2007;
- chairing a Regional Raw Water Supply Group for more than ten years while Director of Newport News Waterworks in Virginia;
- testifying to Congress on three occasions related to water quality regulations and system security;
- presenting to elected officials, citizen groups, state boards and national/international associations on matters related to water supply, water quality regulations, infrastructure security, development of new standards and the inherent risk/cost tradeoffs of new technologies and regulatory standards on dozens of occasions;
- serving as technical editor for the Journal of the American Water Works Peer Review Editorial Board for the past five years;
- providing advice to utilities, both public and private, for development and design of all aspects of water supply, treatment, conservation, and delivery for nearly 40 years; and,
- extensive experience as a civil/environmental engineer dealing with impacts of climate change on coastal water supplies, watersheds, groundwater, river, lake and stream systems, and essentially all aspects of drinking water treatment, operations and management of water utilities.

I believe a review of my resume will confirm my qualifications for the IRP. I am available to provide the needed services over the coming year and am willing to travel to Santa Cruz for an occasional meeting. Please contact me if you have any questions regarding this proposal. I look to hearing from you.

Sincerely,

Brian L. Ramaley

BRIAN L. RAMALEY, P.E.
Independent Civil/Environmental Engineer
408 Green Tree Cove
Newport News, VA 23606
(757) 339-0798
bramaley@gmail.com

EDUCATION

M.S., Environmental Engineering, University of North Carolina, School of Public Health, 1979
B.S., Civil Engineering, Virginia Polytechnic Institute and State University, 1974
American Water Works Association, Water Utility Executive Management Institute, 1991
Senior Executive Institute, Weldon Cooper Center for Public Service, University of Virginia, 1997

REGISTRATION

Professional Engineer in Virginia (previously registered in CA, HI, AR and UT)

HONORS AND APPOINTMENTS

Member, EPA's National Drinking Water Advisory Council (NDWAC) (2001-2007), Chair (2004-2007)
Engineer of the Year, Tidewater Chapter, Virginia Society of Professional Engineers 2006
Distinguished Alumnus, UNC School of Public Health, Environmental Sciences and Engineering, 2004
President's Award, 2000 and 1997, Association of Metropolitan Water Agencies (AMWA)
Meritorious Service Award, 1993, AMWA
Fuller Award, 2003, Virginia Section AWWA
Chair, National Water Sector Critical Infrastructure Protection Advisory Committee (2001-2003)
Delegate, U.S./Australia Bilateral on Critical Infrastructure Protection (April 2004)
Federal Advisory Committee Member on Microbial and Disinfection Byproducts for AMWA (1996 to 2002)
Member, AMWA Board of Directors (1996-present), Treas. (2003-2005), VP (2005-2007), President (2007- 2009)
Director, Virginia Section of American Water Works Association (AWWA) (2009-2012)
Member, Water Research Foundation (formerly AwwaRF) Board of Trustees (2000-2006)
Member, Water Information Sharing and Analysis Center (ISAC) Board of Managers (2002-2007)
Member, Virginia State Water Policy Technical Advisory Committee (2002-2003)
Member, NDWAC Contaminant Candidate List Workgroup (2002-2004)
Past-chair, AMWA Regulatory Oversight Committee
Past-chair, Virginia Section AWWA Water Quality Committee and Water Utility Committee
Past-chair, Virginia Section AWWA (2006-07); Director (2009-12)
Technical Support Committee and Technologies Workgroup, MDBP Regulatory Negotiation Process, 1992-1993
Member, Dean's Advisory Board, Old Dominion University, College of Engineering & Technology, 1997-1998
Member, Alumni Board, Department of Civil and Environmental Engineering, Virginia Tech, 2007-Present
Journal American Water Works Association, Peer Review Editorial Board – Technical Editor for Utility Management and Operations, 2010-2014

SUMMARY

Mr. Ramaley has 40 years' experience in drinking water supply, treatment and distribution systems. From April 1994 to June 2013, he was director of one of the largest drinking water utilities in Virginia, supplying water to more than 400,000 Virginians. A civil/environmental engineer by training, particular emphases of his work have been in water treatment facilities, alternative water supply/treatment systems, water treatment and distribution technologies and modeling, and water utility operations and management. He has worked in staff, management and leadership positions as a consultant and with large municipal water and wastewater organizations. He has directed raw water source selection studies, water distribution system analyses, water quality studies, rate studies, corrosion control investigations, treatment plant rehabilitation projects, preliminary design, detailed design and construction supervision of water treatment plants, pipelines, and other water supply projects. He has served as a manager with the cities of Newport News, Virginia, and Durham, North Carolina, and in consulting while with the international firm James M. Montgomery, Consulting Engineers, Inc. (now known as MWH). From 1992 until 2000, he worked with EPA, environmental organizations, state regulators and many others to develop new drinking water regulations, both in a regulatory negotiation process and as a member of EPA's Federal Advisory Committee for microbial contaminants and disinfection byproducts. Since January 2001, he has served in a variety of leadership roles related to critical infrastructure for the Nation's water sector, including serving as a member of the WaterISAC Board of Managers, Chairing the CIP Advisory Group, and representing the U.S. water industry at the U.S./Australia Bilateral

in 2004. In this role, Mr. Ramaley has helped organize, coordinate and review various programs and projects aimed at making the water supply community more secure from attack. Mr. Ramaley was named Chairperson of EPA's National Drinking Water Advisory Council (NDWAC) in 2004. He has testified to Congress on three occasions on water quality and chemical security issues, and has presented on issues related to climate change and its impacts on water supplies in coastal communities, at international forums. Another area of interest is enhancing organizational performance through organizational development strategies and various benchmarking techniques. He is a credentialed Envision Sustainability Professional (ENV SP) through the Institute for Sustainable Infrastructure.

EXPERIENCE

CDM SMITH, 2013-2014

From June 2013 until August 2014 Mr. Ramaley worked as a Senior Technical Consultant for CDM Smith, a large international consulting firm providing services to water and wastewater clients (among others) throughout the US and abroad. He worked on a variety of projects including water system master planning for Detroit and a design/build water treatment plant for Annapolis, MD.

CITY OF NEWPORT NEWS DEPARTMENT OF PUBLIC UTILITIES (WATERWORKS), 1989 - 2013

Mr. Ramaley was Director of Newport News Waterworks from 1994 until his retirement from that position on May 31, 2013. He was responsible for leadership and direction of a 360-person organization, which delivers drinking water to more than 400,000 people in five jurisdictions in southeastern Virginia. Waterworks comprises six divisions, operates two major treatment complexes, five raw water reservoirs with one major river source and a groundwater desalination plant, 12,000 acres of watershed property, more than 1700 miles of pipeline and 128,000 metered connections.

Mr. Ramaley was Acting Assistant Director of the Waterworks from 1993 to 1994. In this position he had oversight and management responsibility for a wide range of activities within the department, including personnel actions.

Mr. Ramaley was the Water Production Manager for the Waterworks from 1989 to 1994. He was responsible for the management and operation of the raw water system, the Harwood's Mill and Lee Hall water treatment plants, the Water Quality Control Laboratory and the Water Production Division. He was responsible for all aspects of Waterworks' operations relative to production of drinking water, as well as ensuring that water met the highest quality standards. This included project oversight, personnel management, budgeting, facility planning and engineering, regulatory reporting, and public information.

While with Newport News Waterworks, Mr. Ramaley has overseen implementation or planning and design for major projects with over \$300 million in total project costs, including:

- Reorganization of the department from a more hierarchical structure keyed to professional disciplines to a flatter, integrated structure based on major functional areas of responsibilities.
- Proposed development of a new raw water source (river intake and reservoir) – through permitting/design.
- Residuals handling and land application facilities for dewatered alum residuals – complete and operating.
- A new 60 million gallon per day (mgd) surface water treatment plant – complete and operating.
- A six-mgd, brackish groundwater, reverse osmosis desalination plant – complete and operating since 1998.
- Conversion of primary disinfection with free chlorine to ozone/chloramination – complete and operating.

- A new consolidated operations and maintenance center – complete in May 2002.
- Utility customer information/billing system conversion from mainframe based to SAP.

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC., 1979 -1989

Principal Engineer and Southeast Regional Water Product Line Director - Mr. Ramaley was employed by James M. Montgomery, Consulting Engineers, Inc. (JMM, now known as MWH) for more than ten years. From 1986 to 1989 he was located in JMM's Reston, Virginia office. He was responsible for overseeing all waterrelated projects in JMM's Southeast Region. This included various aspects of project management and technical direction for a wide range of projects, including water source selection and water system master planning, facility planning, water supply and water quality studies, treatment plant design, construction services and operational consulting.

Principal Engineer and Division Manager, Water Treatment Division, Pasadena, California - Mr. Ramaley was manager of the Water Treatment Division in JMM's headquarters in Pasadena for three years. Mr. Ramaley was involved with dozens of projects; new water treatment plants with a total installed capacity of over 100 million gallons per day (mgd) were completed under his supervision.

Specific Project Assignments- Example projects for which Mr. Ramaley was responsible as project manager or project oversight include: a Master Planning Study and plant predesign for one of the largest water agencies in Arkansas; planning, design and construction of structures and life support for the Marine Mammal Pavilion at the National Aquarium in Baltimore; two reverse osmosis, membrane softening and ozone plants in Florida; upgrade of telemetry and instrumentation for a large Virginia utility; rehabilitative/expansion studies for a 58 mgd water treatment plant in suburban Atlanta; a 15 mgd direct filtration water treatment plant in California; planning and design of a 68 mgd water treatment plant in Southern California; an 8 mgd direct filtration plant on the island of Maui, Hawaii; analysis of alternatives for reuse of reclaimed wastewater in the Los Angeles basin; and various water treatment and supply projects in Arizona, Utah, California, Washington (joint research project with City for USEPA Office of Drinking Water, Cincinnati), New Jersey and California

CITY OF DURHAM, NORTH CAROLINA, 1974 - 1977

Civil Engineer, Water and Sewer Engineering Department - Mr. Ramaley served for three years as a civil engineer in the Water and Sewer Engineering Department, with responsibilities for water and sewer master planning.

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL, 1977 - 1979

While a graduate student in the Water Resources Engineering program of the School of Public Health, Mr. Ramaley participated in a number of research projects involving modeling and measuring particle interactions in water treatment under the direction of Dr. Charles O'Melia.

ORGANIZATIONS

American Society of Civil Engineers, Member
American Water Works Association, Life Member

PUBLICATIONS AND PRESENTATIONS (partial)

Water Treatment: Principles and Design, James M. Montgomery, Consulting Engineers, Inc., Coauthor, Wiley, 1985

Ramaley, B.L., Wright, W.C., Lawler, D.F., and O'Melia, C.R., "Integral Water Treatment Plant Design: Sensitivity of Plant Performance to Variations in Design." Paper presented at the 1979 AWWA National Conference, San Francisco, CA, June 1979.

Wright, W.C., Ramaley, B.L., and Lawler, D.F., "Measurement and Effects of Particle Size Distributions in Water Treatment Plants." Paper presented at the 1979 AWWA National Conference, San Francisco, CA, June 1979.

Russell, L.L., and Ramaley, B.L., "Treatment and Disposal of Hazardous Wastes from Tank Truck Washing." Paper presented at the 35th annual Purdue Industrial Waste Conference, West Lafayette, Indiana, May 1980.

Ramaley, B.L., Treweek, G.P., Grant, F., and Horne, E.W., "Reuse Alternatives in the Los Angeles Basin." Paper presented at the 1980 American Society of Civil Engineers Environmental Engineering Division Annual Conference, New York, New York, July 1980.

Ramaley, B.L., Lawler, D.F., Wright, W.C., and O'Melia, C.R., "Integral Analysis of Water Plant Performance." Journal of the Environmental Engineering Division of the American Society of Civil Engineers, June 1981.

Ramaley, B.L., Davis, W.E., Jr., and Tate, C.H., "Assessing Deterioration of AsbestosCement Pipe." Paper presented at the Water Quality Technology Conference of the AWWA, Seattle, Washington, December 1981.

Ramaley, B.L., and Kawamura, S., "State Project Water in Southern California: Treatment Considerations and Cost Implications." Paper presented at the 1983 Fall CaliforniaNevada AWWA Section Conference, Anaheim, California, October 1983.

Ramaley, B.L., and Kreft, P.H., "Package Water Treatment Plants for SmallScale Applications: Options and Economics." Paper presented at the 1985 Fall CaliforniaNevada AWWA Section Conference, San Diego, California, October 1985.

Ramaley, B.L., "Meeting the New Turbidity Standard." Paper presented at the 53rd annual meeting of the Virginia Section of the AWWA, Richmond, Virginia, October 1986.

Jacangelo, J., and Ramaley, B.L., "Disinfection ByProducts, What are They?" Paper presented at Water Quality Seminar sponsored by Virginia Section AWWA, Hampton, Virginia, April 1989.

Williams, S.L., Ramaley, B.L., Leininger, E.M., Manning, D.K., and Tilchin, M.J., "Analytical Studies of Land Application of Alum Residuals"; Proceedings of the AWWA Annual Water Quality Technology Conference, San Diego, CA, November 1990.

Ramaley, B.L., Leininger, E.M., and Williams, S.L., "The Decision to Land Apply Alum Treatment Residuals - A Case Study"; Proceedings of AWWA/WEF Joint Specialty Conference on Residuals, Raleigh, NC, August 1991.

M'Coy, W.S. and Ramaley, B.L., "Water Treatment Residuals: Unique Solution for Newport News," Virginia Review, Sept./Oct. 1992, Vol. 70, No.8

Ramaley, B.L., "Monitoring and Control Experience Under the Lead and Copper Rule," Journal AWWA, February 1993.

Ramaley, B.L., "Capital Outlay – Large Utilities – How the Process Works," Presentation at the Virginia Section AWWA Annual Conference, Richmond, VA, October, 1997

Ramaley, B.L., "EPA Rules – D/DBP and IESWTR: What Does This Mean For ME?" Presentation at the Annual Conference of the Virginia Section AWWA, Norfolk, VA, October 1999.

Ramaley, B.L., "Regulation of Disinfection Byproducts in Drinking Water", Continuing Education Teleconference Sponsored by Virginia Tech, December 20, 2000.

Ramaley, B.L., "Recent Developments in Water Sector Infrastructure Protection", Paper presented at the 2001 AWWA Annual Conference and Exhibition, Washington, D.C., June 2001.

Ramaley, B. L., "Water Sector Security – Lessons Learned from Vulnerability Assessments and WaterISAC Status", Presentation at the 3rd US/Australia Bilateral on Critical Infrastructure Protection, Canberra, Australia, April 2004.

Ramaley, B. L., "Impact of Climate Change on Water Supplies of Coastal Communities," Presentation at World Water Week, Stockholm International Water Institute, Stockholm, Sweden, August 2008.

Ramaley, B. L., “AMWA Water Security Efforts,” Presentation at W-SMART workshop, Lisbon, Portugal, March 2009.

Ramaley, B. L., “Using the Higher Performance Organization Model and Various Benchmarking Techniques to Enhance Performance,” Presentation at AMWA-W-SMART workshop, Washington, DC, March 2010.

Brandt, Peiffer, and Ramaley, B. L., “Balancing Fixed Costs and Revenues,” Presentation at AWWA Annual Conference and Exhibition (ACE), Dallas, TX, June 2012.

Ramaley, B.L., “Climate Change Planning and Impacts on Water Supply,” Presentation at Water Research joint sponsored workshop at College of William and Mary, September 2012.

William, "Bill", H. Smallman, P.E.
11765 Edgewood Drive
Felton, CA 95018
(831) 335-2911



August 14th, 2014

Rosemary Menard
Water Director
City of Santa Cruz Water Department
212 Locust Street, Suite C,
Santa Cruz CA 95060

Dear Ms. Menard and Water Supply Advisory Committee Members,

RE: Statement of Qualifications

I am extremely excited and pleased for the opportunity to submit my Statement of Qualifications, SOQ, for your review. I submit the following descriptions for the three topics required:

How I Fit Panel Characteristics: On the three examples of members of an effective panel in the Request for Qualifications letter, (part 2- B "Panel Characteristics"), I do fit in the Civil Engineer category extremely well, but also have much experience in the other two. My qualifications in each area are:

- **Environmental:** I am a passionate Environmentalist. Before choosing Civil Engineering as a major, I completed numerous college level science and environmental courses. I also am a supporter of the Sempervirens Group, Santa Cruz County Land Trust, Lompico Watershed Conservancy, and the Valley Women's Club of San Lorenzo Valley Environmental Committee.
- **Civil Engineer:** I am a licensed Civil Engineer and have 25 years' experience entirely in Water Resources as detailed on the attached curriculum vitae.
- **Public Policy:** I have served as Director for the Lompico County Water District, LCWD, for six years. I was elected in 2008, and re-elected in 2012, as the top vote getter in both elections. I'm proud to say of the accomplishments during this time, amid much controversy, of successfully moving forward to merging with the San Lorenzo Valley Water District. This experience has taught me how to work and communicate effectively in public meetings.

My Willingness to Accept Offered Compensation: The offered compensation is generous and highly appreciated, and I would be extremely thankful to accept it to help compensate for time spent away from my family and career.

My Availability: I work in San Jose. I am very involved with attending evening public meetings in Santa Cruz County, so I am always available for evening meetings after 6pm except for the third Tuesday, which is Lompico County Water District's regular meeting time. I would be available to attend every regular meeting and any special meetings as necessary.

More detail in regard to work experience and education is provided on the attached curriculum vitae.

Sincerely,

A handwritten signature in blue ink that reads "Bill Smallman". The signature is written in a cursive, flowing style.

Bill Smallman, P.E.

CURRICULUM VITAE

BILL SMALLMAN, P.E.

Education: Bachelor of Science in Civil Engineering, California State University at Chico, CA, May 1989.

Licensure: Registered Civil P.E. with the State of California, License #77329. For a number of years, the Board of Professional Engineers and Land Surveyors, BOPELS, would not allow me to take the P.E. exams stating that my work experience was not qualifying. Most of my work experience would fall under the heading of "Supervision of the Construction of Engineering Structures", clearly stated as qualifying in BOPELS documents. I was successful in arguing this against the Attorney General's office and had the issue dismissed and I passed the exam, after 20 years out of college, on the first time, with the exception I did have to take the Surveying portion twice.

Work Experience: The following types of water resources projects I have directly been involved with either as Estimator, Project Manager, Project Engineer, or Design-Build Engineer for over 25 years:

1. **Penn Valley Sewage Collection and Treatment Plant:** This was the first "S.T.E.P", (Septic Tank Effluent Pump), project in California. It was a two year project that installed new septic tanks which would pump water to a treatment plant rather than going into leech fields.
2. **San Lucas Sewer Collection + Treatment Plant:** This was a conventional system installed just south of King City. Like Penn Valley the treated sewage water is used for irrigation.
3. **Sewer Pipelines:** I worked on several large sewer pipeline projects in Eureka, San Francisco, Cameron Park, and others after item #2.
4. **Turlock WWTP Digester #5 Addition:** This added another digester and a lot of related piping connections and pumping equipment.
5. **Santa Cruz Wastewater Treatment Plant:** I worked the first year of the major 1994 upgrade of the Santa Cruz Plant for Humphrey Construction, and was let go in favor of another employee. This company went out of business after this project.
6. **Water:** It is impossible to make this list in perfect chronological order, but most of my experience for the past 15 years has been in potable water. I work presently for Lewis and Tibbitts Inc.. I am one of the most qualified senior construction estimators in the greater Bay Area. Our main client that I have been in charge with is the San Jose Water Company. I have been directly involved with just about every type of their infrastructure that they have. I believe they are the largest, (in one self-contained area), water agency in California. We also work all over the Bay Area. And have been responsible for several projects in Santa Cruz County from initial estimate to completion.

CURRICULUM VITAE

BILL SMALLMAN, P.E.

Recent Accomplishments: I developed the most comprehensive and best plan to improve water infrastructure and incentives for conservation improvements for the entire County of Santa Cruz. I created a website describing this plan which can be viewed on www.SCWaterSolutions.com. The five main categories are:

1. **Recycle:** This is by far the best plan to recycle and distribute 100% of the wastewater from both the Santa Cruz and Watsonville wastewater treatment plants. There is no better plan, nor will there be from anyone else, that will ever compare. It is the most cost effective plan providing numerous and highly beneficial assets to both the economy and the environment. It builds a highly desired bike path and ends huge amounts of pollution into the Bay. It creates a highly beneficial green energy source in the name of solar panel paving blocks. It also provides a means to build an emergency water connection to "Deep Water Desal".
2. **Storm Aquarries:** This is the best plan to solve all water issues in San Lorenzo Valley and Scotts Valley. It restores the Santa Margarita Ground Water Basin. It restores the fish habitat. It creates extremely valuable recreational areas out of abandoned sand quarries. Additional water can be supplied to Santa Cruz and Soquel, as needed via interconnect pipelines. In addition, it could also make the levees through Santa Cruz obsolete, and allow for more aesthetic improvements along the river.
3. **Water Conservation Savings Accounts:** This is means to create high incentives for property owners to add water conservation improvements on their homes. Water agencies are to create special accounts for its customers, which can only be used for conservation improvement(s). This places more money into the public's hands leading to a widespread effective use of water.
4. **Reservoirs:** Environmentalists will eventually come to the realization that not building additional reservoirs did not help save the fish habitat, and what we have been doing the past 30 years is far worse by depleting the ground water basin and polluting the streams with septic and silt. They will also become aware that, with the current population, this water is needed during droughts, as with the case of Loch Lomond. I chose 4 possible sites spread out in the County. Like Loch Lomond, they would be an emergency water supply, beautiful outdoor recreational areas, and percolate additional water into the groundwater basin.
5. **Water Skate Parks:** This idea is storm water collection and treatment like the "Storm Aquarry" plan in areas not close to large abandoned quarries. The settling basin dual as a skateboard park outside of the rainy season. It also treats storm water, but all the way to a potable degree and stores the water in conventional water storage tanks. These are located on Soquel Creek and the Pajaro River.

Rosemary Menard,

I would like to be considered as a member of the Independent Review Panel to assist the City of Santa Cruz's Water Supply Advisory Committee in their assessment of water supply alternatives. Described below is a summary of my background and how it addresses the request identified in the SOQ.

I have broad experience in the water industry having held a number of key positions at the Metropolitan Water District of Southern California, where I was employed for nearly 29 years before retiring earlier this year. I have managed the departments of Engineering, Water Quality, Real Property, Information Technology, Administrative Services, Human Resources, and the Small Business Outreach Program. Additionally, I oversaw the Capital Improvement Program, Energy Management Program, and restructuring of the conservation credits program. During my career, I managed a capital and O&M budget of more than \$600 M per year and over 700 staff. This career has provided me with a broad experience related to a number of water supply, treatment, quality, and business operation issues. In my capacity, I also served as liaison to several board committees where my role was to communicate complex issues in a manner that could be understood by the broad public. For years, I was co-host of Metropolitan's cable video news show, "Straight from the Tap", designed to convey water issues to the community.

In addition to my career at Metropolitan, I am the immediate past Chair of the Water Research Foundation's (WRF) Board of Trustees. The WRF is the world's premier research organization for water and represents the collective research interests of approximately 1,000 water utilities across the United States and North America. This unique experience has afforded me the opportunity to address many of the pressing needs related to the water community at large, including financial, supply, treatment and emerging technologies, regulatory, public communication, and project delivery issues. The objective of the WRF is to provide unbiased, objective information to assist its members in making decisions relating to critical and emerging issues.

I was also on the Board of Directors of the American Water Works Association, which represents the broad interests of the water industry through its 50,000 plus members.

I was appointed as the water industry representative to the National Academy of Sciences National Research Council to provide an independent review of priorities for the United States Environmental Protection Agency.

Academically, I possess a BA and Ph.D. Degree in the sciences from California universities (San Diego State University and UC Irvine) where my emphasis was on water related issues. This enables me to review, comprehend, and question complex and technical material.

I understand that the compensation is limited to an Honorarium and that this assignment will occur over the next 6 to 9 months. Both of these terms are acceptable.

In summary, I believe my broad background experience in California and national water issues, coupled with strong academic credentials, will provide the City of Santa Cruz an unbiased and

objective support in their search for sustainable water supplies. Please let me know if you require any additional information.

Very truly yours,

Roy L. Wolfe, Ph.D.
2830 Cedarglen Ct
Fullerton, CA 92835
Roylwolfe@aol.com
(714) 872-1744

Roy L. Wolfe, Ph.D.

2830 Cedarglen Ct.

Fullerton, Ca 92835

Education

1980 BA San Diego State University (Zoology)

1985 PhD University of California Irvine (emphasis in Environmental Analysis)

Professional Experience and Employment

Dr. Wolfe has held a number of executive management positions at the Metropolitan Water District of Southern California (MWD) and in the water community. In his nearly 29 years at MWD, he has overseen the Engineering, Water Quality, Information Technology, Real Property, Human Resources, and Administrative Services departments. In addition, he has managed the \$500 M/year Capital Improvement Program, the Energy Management Program, Small Business Outreach, a restructuring of the conservation credits program, as well as real property and labor negotiations. He has managed a staff of over 700 employees with an annual O&M budget of \$60M. Prior to his retirement from Metropolitan in April 2014, Dr. Wolfe also served on a number of boards in the water industry at the state and national level, including the Water Research Foundation, National Academy of Sciences National Research Council, American Water Works Association, Water Utility Council, and the California Urban Water Agencies. Dr. Wolfe is the immediate past Chair of the Water Research Foundation, the worlds foremost organization in providing onjective research on a myriad of water related issues to its more than 1,000 subscribing water utilities in North America. Dr. Wolfe has more than 70 scientific publications and given numerous presentations regarding water related topics to a broad range of audiences.

2011-April 2014 Metropolitan Water District of Southern California

Group Manager of Business and Technology

- Oversaw departments of Administrative Services, Information Technology, Annexations, Business Outreach, and Grants
- Developed Innovative Public/Private Partnership on New Techology for the Water Industry
- Chairman, Board of Trustees, Water Research Foundation (2010-2013)
- Board Member, American Water Works Association (2010-2013)

- 1999-2010** **Metropolitan Water District of Southern California**
- Group Manager of Corporate Resources**
- Managed Engineering, Business Services, Information Technology, Human Resources, Real Property, and Human Resources
 - Developed and Oversaw the Capital Improvement Program
 - Vice Chair, WRF Board of Trustees (2007-2010)
 - Chair, California Urban Water Agencies' Water Quality Committee
 - Appointed to National Academy Sciences Panel on EPA Research
 - Appointed to Governor of California's Panel on MTBE in water
- 1998-1999** **Executive Assistant to the General Manager**
- Oversaw development of Metropolitan's Board of Directors Strategic Visioning Process.
- 1993-1998** **Associate Director of Water Quality**
- Managed day to day activities of over 100 staff in Water Quality and the central laboratory and research for over 300,000 analyses per year.
- 1985-1993** **Senior and Principal Microbiologist**
- Managed compliance and research activities of the microbiology, reservoir management and source water protection programs.

Selected Publications and Presentations

Wolfe, R.L. **MWD Challenges and Strategies for a Sustainable Future.** *WEFTEC*, Los Angeles 2011 and *Water Services Association of Australia Conference*, 2012.

Wolfe, R.L. **Impacts of Global Climate Change on the Southern California Water Supplies,** Presented at Congressional Committee on Climate Change and the Water Industry, 2008, Washington, DC.

Wolfe, R.L. **Water Utility Response to the Recession,** presented at Metropolitan Member Agency Workshop, Los Angeles, 2009.

Wolfe, R.L. **Energy Management Strategies at Metropolitan,** presented at the joint USEPA/Japan Conference on Water, Las Vegas, 2009.

Wolfe, R.L. Overview of Metropolitan's Desalination Innovative Research Partnership, presented at the joint *US/Netherlands, Water Research Foundation sponsored workshop*, in Boston, 2008.

Wolfe, R.L. and Fulmer, A. 2012. A Research Roadmap for Hexavalent Chromium in Drinking Water. *Source* 26(1), pp 21-22.

Wolfe, R.L. Ultraviolet Disinfection of Drinking Water. *Environmental Science and Technology*, June 1990, 24 (6), pp. 768-773

Ferguson, D.W., McGuire, M.J., Koch, B., Wolfe, R.L. and Aieta, E.M. 1990. Comparing Peroxone, and Ozone for Controlling Taste and Odor Compounds, Disinfection By-Products, and Microorganisms. *Jour AWWA*, April 1990, Vol. 82 (4), pp. 181-191.

To solve the **Puzzle** to find *the best solution...*

