Committee Member Packet Friday October 17

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Water Supply Advisory Committee October Meeting

Items that have been added or changed since the Thursday packet are listed in bold

TO: WATER SUPPLY ADVISORY COMMITTEE (WSAC)

FROM: HEIDI LUCKENBACH

SUBJECT: UPDATE ON SOQUEL CREEK WATER DISTRICT ACTIVITIES

DATE: OCTOBER 17, 2014

Following is a list of items received by the Soquel Creek Water District Board of Directors that may be of interest to the WSAC.

- On September 30, 2014 under the item of the General Manager annual evaluation, they received a memo recapping the District's more important issues and achievements over the past year (attachment pages 167-175).
- On October 7, 2014 an item related to the peer review of hydrological studies (attachment pages 59-72). The memo ultimately called for no action, though intended to provide staff direction for additional activities related to refining the sustainable yield estimates with the groundwater model and additional studies.
- Also on October 7, 2014 an item to add USGS to the team with Hydrometrics in developing the groundwater model for the Soquel Aptos groundwater management area. The City and Central Water District are also partners in this effort.

September 30, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: 2014 General Manager's Performance Evaluation

The General Manager's anniversary of hire date is July 8. The District's contract with the General Manager calls for an annual performance evaluation by the full Board of Directors and provides that merit increases in salary may be awarded at that time as determined by a majority vote of those Board members present. Also, in the absence of any merit increase, salary adjustments to address salary compaction issues must also take place in open session. The performance evaluation is conducted in Closed Session, and action to adjust salary, if any, must be taken in Open Session. At the Board's direction, this item will be placed on the next agenda. Currently the General Manager's salary is preventing the Managers group from negotiating a new agreement. Their current agreement expired in February 2014. All Managers salaries will have to be frozen indefinitely if the Board chooses not to include a salary adjustment on an upcoming Agenda.

The following is a recap of the District's more important issues and achievements over the past year. This list of the organization's accomplishments reflect a team effort, and I wish to acknowledge the dedication and significant contributions of the District Staff and Consultants. They have worked very hard over the past year to provide professional analysis and recommendations on issues and then effectively implement the Board's policy direction.

1. Integrated Resources Planning - Conjunctive Use Program

a. Dealt immediately with the City's withdrawal from the joint desal project by developing a plan to conduct several single-topic meetings that address components of the IRP. These meetings have been open to the public and have been well attended by the community.
b. Prepared background information and developed a criteria based process for completing selection of preferred alternative(s) for supplemental supply
c. Conducted public outreach and hearings, which also involved widespread notification, development of presentation materials on the issues and alternatives, and recording public comments both by court reporter and video footage
d. Conservation Analysis – Discovered financial planning flaws in Full Toolbox program and redesigned conservation program to avoid unforeseen financial pitfalls
e. Board action to select alternatives for further evaluation
f. Moving forward with planning for feasibility studies on supplemental supply
g. The following is a list of special topic meetings staff has initiated:

- September 17, 2013 Board Meeting: Workshop focused on water supply planning goals and objectives, what's "changed" since the 2012 Integrated Resources Plan Update was approved, previous and new alternatives to consider, and screening criteria to use for subsequent alternatives analyses and evaluation.
- October 16, 2013 Board Meeting: Exploratory discussion focused on desalination options that included a presentation by representatives from Deep Water Desal on the Moss Landing proposed project and a presentation by District staff on a District-Only desalination project.
- November 5, 2013 Board Meeting: Exploratory discussion focused on surface water options that included presentations by Jerry Paul and Bill Smallman (both local citizens engaged in water supply alternatives), and an update presentation by John Ricker on the surface water exchange report. Surface water attorney Peter Kiel and Lisa McCann (Regional Water Board's water rights liaison) both teleconferenced in.
- January 7, 2014 Board Meeting: Exploratory discussion focused on reducing water demands with mandatory water rationing. This option is not a supplemental water supply option but rather a demand reduction alternative should a supplemental supply not be secured. Staff presented a phased approach to water rationing that would allow the District to accelerate water savings while it continues evaluation and pursuit of a supplemental supply.
- February 4, 2014 Board Meeting: Exploratory discussion focused on recycled water options that included presentations by Dave Smith (Managing Director of WateReuse Association), Mark Dettle (Public Works Director for the City of Santa Cruz), Todd Reynolds (Kennedy/Jenks Technical Advisor), and Bill Smallman (local citizen and engineer). The alternatives discussed included recycled water for irrigation, seawater barrier, and potable reuse (directly as well as for groundwater replenishment). This meeting also included an overview of the proposed evaluation criteria and scorecard approach for assessing alternatives.
- March 4, 2014 Board Meeting: Exploratory discussion focused on groundwater rights and management framework. Presentations were given by Russell McGlothlin (attorney with Brownstein Hyatt Farber Schreck), John Ricker (SC County Water Resources Division Director) and staff. This meeting did not go into groundwater options per se, but rather gave an overview of groundwater law in California, the County's role and responsibilities with non-municipal pumping, and the District's current and future groundwater management activities. There was also discussion on establishing a Groundwater Replenishment District and/or having the

functions be part of the existing Joint Exercise of Powers Agreement (JPA) AB3030 framework, peer review of the District's hydrological analyses, and declaration of a groundwater emergency.

- March 18, 2014 Board Meeting: Staff requested that the Board provide direction and approve which back-up options that were introduced during the exploratory discussions should be brought back to the Board for the evaluations workshop. The options selected were Deep Water Desal, In-District desalination, surface water transfers, and recycled water (for seawater barrier, irrigation, and groundwater injection).
- April 1, 2014 Board Meeting: Exploratory discussion on accelerating conservation with a 'Water Use Reduction Program' (previously referred to as Phase 1) aimed at achieving a 500 acre-feet per year water savings within two years. The Board was very interested in moving forward with this type of long-term program.
- April 29 and June 3, 2014 Board Meetings: Focused on establishing a water connection moratorium or expanding the water demand offset program. Public comments were taken on 4/29 to address the aforementioned topics and a public hearing was held on 6/3 on these two issues as well on considering declaration of a groundwater emergency or water shortage declaration. The Board voted to expand the water demand offset program, declare a groundwater emergency, and declare a stage 3 water shortage emergency.
- June 17, 2014 Board Meeting: Focused on the Board adopting the declarations of the groundwater emergency and stage 3 water shortage emergency, adopting the revisions to the existing WDO program, and providing input on the CONSERVATION*plus* Program (previously known as the Water Use Reduction Program) components.
- July 15, 2014 Board Meeting: Focused on the peer review of the hydrological studies of the District and next steps to address the basin deficit and basin recovery yield. Also at this meeting, the Board kicked-off the alternatives-based evaluation of the back-up options with a staff memo related to the common criteria and conceptual technical evaluation of the alternatives. The concepts of a mid-county recycled water project and a regional recycled water project for groundwater replenishment were introduced and approved to be carried through the analysis process. The Board and Todd Reynolds (Kennedy/Jenks) discussed the next steps which included a workshop-style setting to conduct the scoring and ranking of the supply options as well as a "homework" assignment to fill out an evaluation matrix.

- August 12, 2014 Board Meeting: Focused on a public hearing for the CONSERVATION*plus* Ordinance 14-02. The Board requested that staff look more into flexibility, the method on how to determine occupancy to set long-term water budgets and also during short periods (such as summer vacations, etc.). The Board also wanted the August 26, 2014 meeting to be an opportunity for the public to comment on the CONSERVATION*plus* Program prior to the Ordinance's second reading on September 2.
- Currently preparing to present options for revising CONSERVATION*plus* and facilitating more public input at the Board's request.

2. Groundwater Management

a. Initiated monthly monitoring reports at the Board's request
b. Groundwater Management Plan Update – Reviewed and prepared for acceptance of six year update
c. Scoped project and obtained proposal for Soquel-Aptos Groundwater Model and obtained agreement from Central Water District and the City of Santa Cruz for a cost share
d. Scoped project and obtained proposal for Seawater Interface Location project at the Board's request
e. Collaborated with Stanford study to identify location of seawater interface onshore. Project will take place in October
f. Developed RFQ, completed consultant selection and completed Peer Review of District hydrology
g. Provided research and conducted public hearing for declaration of a Stage 3 Water Shortage with implementation of emergency rates
h. Provided research and conducted public hearing for declaration of a Groundwater Emergency
i. Ongoing monitoring program and presentation of annual basin status report
j. Obtained collaborative agreement to invite the City of Santa Cruz, Santa Cruz County and PVWMA to join the Basin Implementation Group
k. Monitored and provided input on Sustainable Groundwater Act legislation
l. Partnered with Central Water District and Santa Cruz County, implemented a community conversation of water supply issues through Groundwater Stakeholder meetings
m. Developed scope of work and initiated Service Area 3 Planning Study
n. Completed project to replace monitoring wells at Main St. Well (SC-18), Cherryvale Ave. (SC-10), and Porter Gulch Road (SC-11). New monitoring wells were drilled at Quail Run Road (SC-23) and Larkin Valley Tank (SC-A9)

o. Development of Private Well Monitoring Plan in cooperation with the City of Santa Cruz to monitor the effect of District and City wells on surface water, ground water and adjacent private wells

3. Conservation & Billing

a. Implemented outreach for voluntary 20% water reductions
b. Development of Mandatory Water Budget designed to reduce use by 11% per Board's request
c. County and City of Capitola Mandatory Retrofit at Time of Resale Ordinances – ordinances were coordinated and adopted and District started enforcing ordinances District-wide (previously we only provided this service in the city of Capitola)
d. Performed 560 in-home surveys, 207 landscape surveys and 300 water wise house calls for our customers
e. Performed Water Audits of all public schools in the District
f. Successfully piloted WaterSmart program and are preparing to roll program out District-wide
g. Successfully transitioned from bi-monthly to monthly billing
h. Launched e-bills to customers in order to reduce paper bills and provide more customer flexibility
i. Customers achieved a 26% reduction over last year's use in August and 34% reduction compared to the past 10 year average, year to date use is down 16%
j. Completed radio read meter installation program

4. Communications & Outreach

a. Development and rollout of new comprehensive website which has received approximately 35,700 unique hits to date
b. Developed District "Speakers Kit" and implemented media training for all management staff and Board members
c. Development of social media policy
d. Development and maintenance of District Facebook and Twitter accounts
e. Implemented monthly Water Wisdom column in Aptos and Capitola Times newspaper and wrote eight articles to date
f. Implemented monthly "e-blasts" which are currently being sent to approximately 4,500 subscribers with a 46% opening rate (industry average opening rate is 22.7%)
g. Transitioned from two page bimonthly newsletter to four page quarterly newsletter with bill inserts on months newsletters aren't scheduled
h. Presented, attended or have scheduled 59 public presentations or tabling events since January 1, 2014
i. Developed press release review process and issued 9 district press releases since January 1, 2014

j. Provided 13 television news interviews since January 1, 2014
k. Provided info or an interview for 111 print articles related to the District in the Santa Cruz Sentinel, Aptos Times, Capitola/Soquel Times, Aptos Life and Good Times since January 2014
l. Continued school and teacher training programs

5. New Service Applications

a. Provided research and options for Board consideration of water connection moratorium
b. Water Demand Offset Program – Proposed changes to existing program which will result in more meaningful, real and quantifiable projects that save or recharge water

6. Water Quality

a. O'Neill Well Iron & Manganese Treatment Plant designed, bid and under construction to be completed in spring 2015
b. Full compliance with Federal and State Drinking Water Standards and Testing Requirements
c. Prepared annual Water Quality Report and transitioned to electronic distribution with paper copies available upon request
d. Drinking Water Source Assessment completed for replacement Aptos Jr. High Well
e. Completed the first round of sampling under the US EPA's Unregulated Contaminant Monitoring Rule 3 (UCMR 3)
f. Chromium 6 – Completed pilot testing and published report. Subsequently became one of the first Districts in the state to receive a permit amendment for a full scale Chrome 6 treatment pilot plant. Raw water line and onsite piping is completed

7. Capital Improvement Program (Significant projects not otherwise listed)

a. Soquel Drive Cast Iron Main Replacement construction completed
b. Bye Way Main Replacement and Cliff Court Main Abandonment Project construction completed
c. Aptos Jr. High Well Replacement bid and completed
d. Main Street Well Rehabilitation and Pumping Equipment Replacement completed
e. Oakhill & Poplar Area Main Replacement Project designed, bid and under construction

f. McGregor Drive Pump Station designed, bid and starting construction in October
g. Aptos Pump Station designed and bid
h. Headquarters Master Plan – Consultant selection; relocation of records to new storage area and proceeding with demolition of Rosedale House; RFQ for architectural services

8. Organization Development & Personnel

a. Finalized and obtained Board approval for Memorandum Of Understanding (MOU) Between Soquel Creek Water District and Mid Management Employees Bargaining Unit
b. Develop job description, pay range and classification Human Resource Manager and successfully recruited for the position
c. Initiated quarterly meetings with bargaining groups to build relationships and stay abreast of problems
d. Completed revision of Customer Service Field Worker I/II Job Description
e. Negotiated settlement with former employee that avoided labor practices lawsuit
f. Developed job description, pay range and classification for Geographic Information Systems (GIS) Analyst
g. Developed job description, pay range and classification for Water System Operator/Instrumentation Technician
h. Revision of Certification Requirements for Senior Construction & Maintenance Worker Job Descriptions
i. Initiated a review of all job descriptions and entire District structure
j. Reviewed and revised Employee Handbook

9. Financial

a. Revised Financial Policy
b. Expanded long term investments to include federal bonds and laddered certificate of deposits for an increased return on investment
c. Successfully cut approximately $2 million from 2014-15 budget in order to meet debt coverage
d. Met all department and legal deadlines in the absence of the finance manager since April 2014. Board approved interim employee, but that position has not needed to be filled

10. Collaborative Efforts with Other Agencies (not otherwise listed)

a. Private Well Water Conservation Pilot Project (partnering with Resource Conservation District of Santa Cruz County) – Small group of interested private well owners have volunteered to track their water use and install water savings devices and measures at their homes.

b. Regional Recycled Water Plan grant application – partnered with City of Santa Cruz, Scotts Valley and Santa Cruz County
c. Santa Cruz Integrated Regional Water Management (partnering with the majority of water municipalities in the area, County of SC, and several non-profit organizations (NGOs)) – to develop a framework and address the region's water shortage challenges and create a plan of strategies, policy initiatives, and project for our region. Adopted updated plan in 2014
d. Collaborating with Resource Conservation District-UC Santa Cruz on Recharge Suitability and Runoff Analysis study
e. Co-hosted and co-presented with Scotts Valley, the City of Santa Cruz, Central Water District and Pajaro Valley Water Management Agency at ACWA Region 5 Spring Program
f. Developed Water Conservation Outreach program in partnership with Ecology Action, City of Santa Cruz and Scotts Valley Water District – Conducting numerous tabling events throughout the County to educate and increase awareness on our water conservation programs and our community's water shortage challenges.

11. Legislative Efforts

a. Northern California Water Bond Coalition – Continued active involvement, including lobbying, testifying at public hearings and regional coordination
b. ACWA State Legislative Committee – represent the District and Region 5 (San Francisco to Santa Barbara) on legislative committee and take part in regional caucuses on issues such as the water bond and groundwater legislation
c. ACWA Drought Action Group – Taj Dufor served as Vice Chair for group which issues 2014 Drought Impacts and Strategies for Resilience report including recommendations to guide ACWA's efforts at the state and federal level to advance actions to reduce impacts of drought

12. Miscellaneous

a. Prepared for and held twenty-one Public Board Meetings, five public Basin Implementation Group (BIG) meetings and four public Well Stakeholder Group meetings. By the end of September in a typical year we would hold thirteen Board meetings through September and two BIG meetings. Meetings typically had enough attendance that those meetings had to be coordinated and held offsite. For the meetings so far this year staff has prepared nearly 5,200 pages of material for the Board's review.
b. Revised out of date record retention and document destruction policy
c. Implemented Board consent agendas

By _____
Kim Adamson
General Manager

October 7, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: Agenda Item No. 6.1 — Peer Review of Hydrological Studies: Comparison of Yield Estimates and Refining Estimates with Groundwater Model and Additional Studies

Attachments:

1. Memorandum by Todd Engineers- Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates

2. Memorandum by HydroMetrics WRI- Peer Review of Sustainable Yield Estimates- Refining Estimates with the Groundwater Model and Additional Studies

Background

At the June 18, 2013 board meeting, staff was directed to begin the process for a peer review of the hydrologic studies completed by HydroMetrics, WRI. The Board has relied on such studies to make critical water policy decisions, and a peer review was needed to reaffirm the basis for such decisions.

On September 3, 2013, the Board authorized the solicitation of qualifications from various firms specializing in groundwater hydrology. A selection committee reviewed six statements of qualifications and on January 21, 2014, the Board approved a scope of work submitted by Todd Groundwater to perform a peer review of past District hydrological studies.

Peer Review

On May 20, 2014 Mr. Gus Yates of Todd Groundwater presented the draft copy of the peer review report that he prepared for the District. The draft report found:

- There are no fatal flaws in the hydrological work for the District by HydroMetrics WRI.
- For some steps of the hydrological analysis, conservative assumptions were made that may have led to an estimate of available yield too low. Alternative assumptions could also be applied that are not necessarily more accurate but that could corroborate the original results or help better characterize uncertainty.
- The biggest challenge for managing groundwater resources in the Soquel-Aptos basin is not weaknesses in technical analysis but weakness in correlations between pumping, water levels and water quality. Data for those variables often do not

exhibit the patterns expected from the physical laws governing groundwater flow. As a practical matter, this circumstance underscores the need for an adaptive management approach (approach the District is currently undertaking).

Mr. Yates in his presentation summarized that the work that HydroMetrics has been doing is high quality, acceptable, professional work. In reviewing the data, he did not find any fatal flaws. He focused on the uncertainty issues and whether there are alternative estimates of protective levels of outflows and yield. While agreeing the basin is in overdraft, there was a discrepancy in the calculated basin deficit. The Board asked Mr. Yates to review and clarify this information. He was also asked to include additional assessments in the final report.

On July 15, 2014, Mr. Yates presented the final version of his review for the Board's consideration. The Board accepted the final report that included the following:

- The alternative yield estimate is 100 AFY greater than the HydroMetrics, WRI yield estimates for both the Purisima and Aromas areas. This puts total yield at 4,200 AFY vs. 4,000 AFY.
- The yield results in an estimate of total historical accumulated deficit slightly greater than 12,100 AF.
- A 98% septic return flow assumption was applied to the historical deficit calculations, to be consistent with the estimates of sustainable yield.
- A recommendation to investigate septic system return flow percentage was made.

Based on the final report, there are still discrepancies between Todd Groundwater's and HydroMetrics' calculation of the accumulated deficit. In addition, both Todd Groundwater and HydroMetrics recommended that the Board reevaluate their decision to exclude future septic recharge from recovery predictions based on current information. The Board requested Todd Groundwater and Hydrometrics to collaborate and provide visuals (Attachment 1) to succinctly present the differences in the estimated sustainable yield so the Board can more easily understand how big a difference this is. In addition, the Board requested identifying areas of disagreement and which assumptions led to those disagreements, which items would be resolved by a groundwater model and which would be additional separate research projects. This information is contained in the two attached memos.

Next Steps in Hydrological Analyses: Refinement of Estimates with the Groundwater Model and Additional Studies (Attachment 2)

The development of a groundwater model through the Soquel-Aptos Basin Implementation Group will be the primary tool to quantify the Basin's sustainable yield. This model will replace the water balance approach that was peer reviewed by Todd Groundwater. HydroMetrics' attached memo includes a table of the recommendations and

refinements to assumptions that were proposed, how they will be incorporated into the model/additional studies, and the timeframe to conduct such work.

A technical advisory group (TAC) will also be convening to review and provide advisement into the development of all the groundwater model inputs and the additional studies recommended by the peer review.

The consultants will be in attendance to walk through the information for the Board.

POSSIBLE BOARD ACTION

1. Informational Item – No action required

2. Provide staff direction for additional activities related to refining the sustainable yield estimates with the groundwater model and additional studies.

By _____
Kim Adamson
General Manager

TODD GROUNDWATER

September 8, 2014

MEMORANDUM

To: Kim Adamson and Taj Dufour, Soquel Creek Water District

From: Gus Yates, Todd Groundwater

Re: Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates

The final version of my peer review of technical studies was discussed at the District board meeting on July 15, 2014. The Directors requested a summary of remaining differences between groundwater yield estimates developed by HydroMetrics WRI (HMWRI) in the technical studies and alternative estimates I developed as part of the peer review. The Directors also requested simple graphics illustrating the differences. Since that meeting, Cameron Tana of HydroMetrics and I have collaborated on developing the requested summary, which is attached as a pair of tables and a pair of graphs.

The attached tables present the derivation of the sustainable pumping yield estimate for the District as a sequence of adjustments to total rainfall recharge. The values for the HMWRI and Todd estimates are listed in parallel columns, with brief explanations of items that differ. Additional explanation is available in the final peer review memo. One table is for the Purisima area, and the other is for the Aromas area. Similarly, the two graphs are for the Purisima and Aromas areas, respectively. The graphs are X-Y plots with sustainable yield on the X axis and the recovery pumping yield on the Y axis (assuming recovery pumping eliminates the existing cumulative storage deficit within 20 years). The HMWRI and Todd estimates of yield are shown a representing the upper and lower bounds of the "plausible yield range". The solid green line on each graph quantifies how an increase in the estimated sustainable yield corresponds to an increase in the amount of water that can be pumped while still recovering from the cumulative storage deficit (recovery yield).

Features of the tables and graphs that differ from the final peer review memo include the following:

- Existing septic system return flow within the SqCWD service area is included in the sustainable yield estimate. Previously, it had been assumed that those residences would be connected to a sewer system. The new assumption increases the yield estimates, particularly for the Aromas area.
- My initial calculations of alternative yield resulted in estimates that were too large to be consistent with observed historical storage depletion. That implied that although my various adjustments to factors that affect sustainable yield were

individually plausible, they probably are not all simultaneously true. The final peer review memorandum discussed this issue with respect to the Purisima area, where a rough estimate of current cumulative storage deficit (about 5,000 acre-feet) corresponded to a sustainable yield of about 3,050 acre-feet per year (AFY). I subsequently contoured Aromas area water levels and the results similarly constrained the alternative estimate of sustainable yield to about 1,700 AFY. For the Aromas area, I also evaluated SqCWD pumping during historical periods of generally rising or falling water levels at coastal monitoring wells, and that analysis also supported a yield no larger than 1,700 AFY.

- The graphs indicate that total sustainable yield (Purisima plus Aromas) ranges from 4,330 AFY to 4,750 AFY and available yield during the recovery period ranges from 3,200 AFY to 4,250 AFY.

If you or the Directors have any questions about this summary, please do not hesitate to contact me.

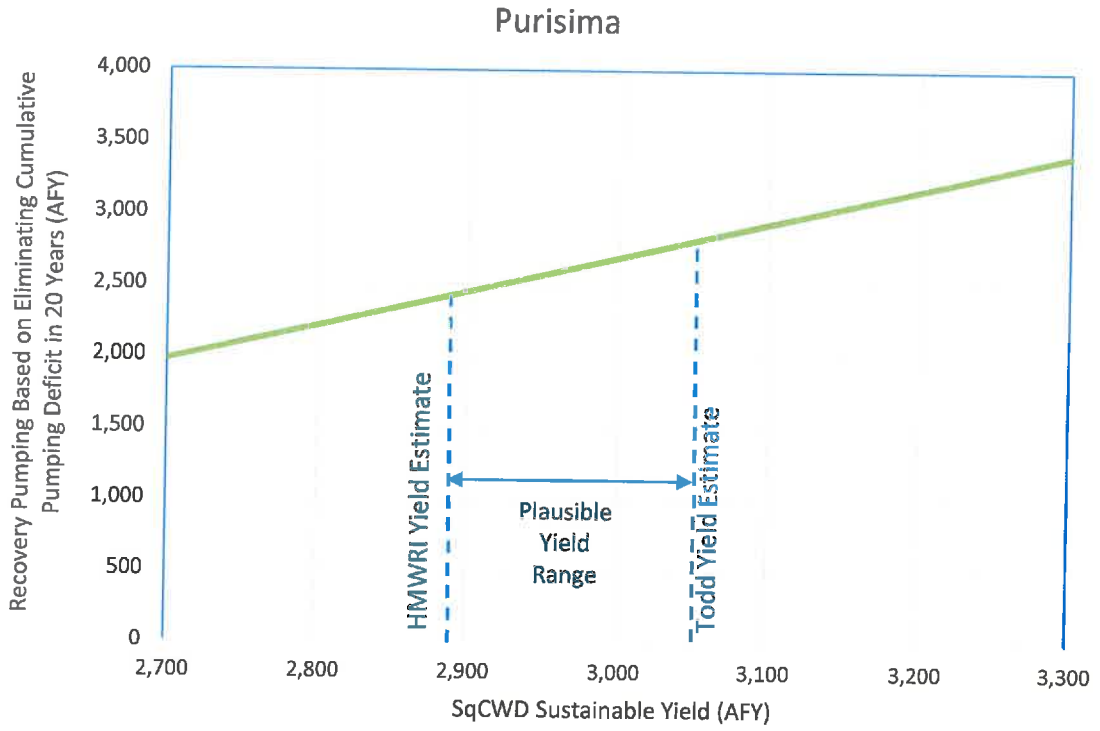
SqCWD Yield Comparison: Aromas Area

Aromas Water Balance Component	HMWRI (2012)	Todd (2014)	Notes for Todd Estimate
Aromas area recharge from precipitation (afy)	4,200	4,200	
Modeled protective outflows to ocean - 70th percentile (afy)	-1,950	-1,950	
Flow to Pajaro Valley	-370	-271	70th percentile outflow.
Total Yield Available for Consumptive Use (afy)	1,880	1,979	
Non-SqCWD consumptive use (afy)	-754	-673	Higher estimate of septic return flow partially offset by lower estimate of irrigation return flow (same as used for SqCWD below).
Total yield available for SqCWD's consumptive use (afy)	1,126	1,306	
SqCWD outdoor use (%)	30%	30%	
SqCWD indoor use (%)	70%	70%	
SqCWD septic parcels (%)	30%	30%	
SqCWD sewered parcels (%)	70%	70%	
Outdoor return flow (%)	20%	10%	Assumes greater use of drip and water conservation.
Septic return flow (%)	75%	98%	Assumes no ET loss of septic percolation.
Sewer return flow (%)	0%	0%	
SqCWD overall return flow (%)	22%	24%	
Total yield available for SqCWD delivery (afy)	1,438	1,708	
Subtotal for outdoor use (afy)	431	512	Follows from above assumptions.
Subtotal for indoor use to septic (afy)	301	358	"
Subtotal for indoor use to sewer (afy)	706	838	"
SqCWD outdoor return flow (afy)	86	51	"
SqCWD septic return flow (afy)	226	350	"
SqCWD sewer return flow (afy)	0	0	
SqCWD water pipe leak (%)	0%	7%	Average annual leak rate (SqCWD).
SqCWD water pipe leak (afy)	0	129	
SqCWD pumping yield (afy)	**1,438**	**1,836**	Maximum yield consistent with well locations and cumulative historical storage deficit is about 1,700 afy.

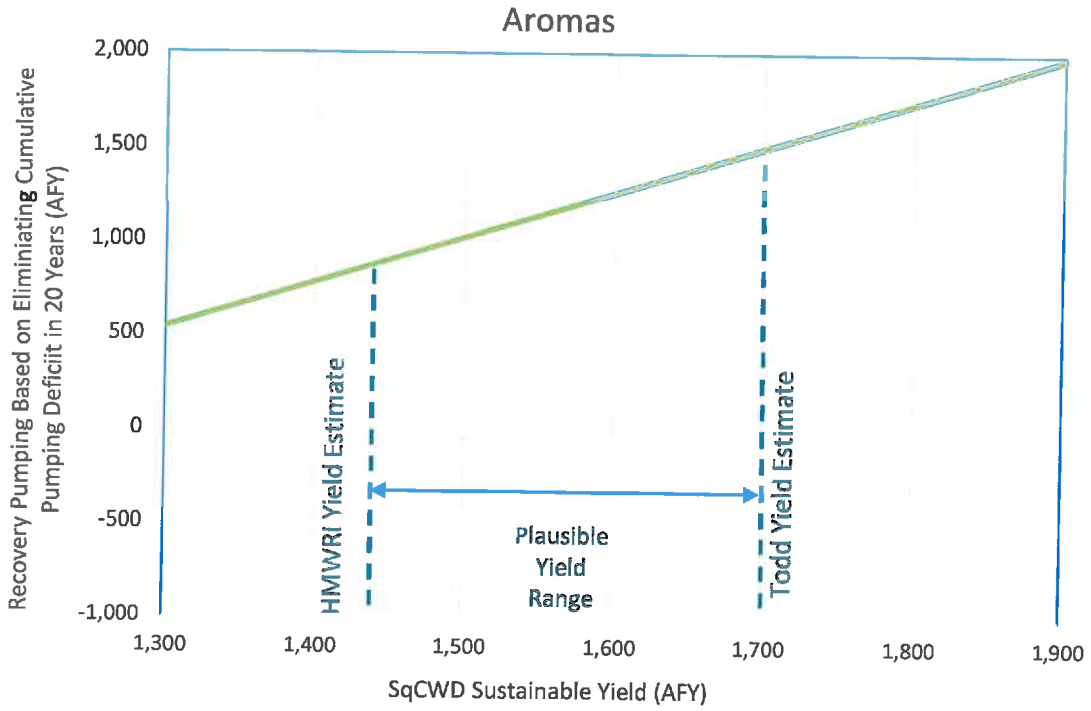
SqCWD Yield Comparison: Purisima Area

Purisima Water Balance Component	HMWRI (2012)	Todd (2014)	Todd w Possible Reductions (2014)	Notes for Todd Estimate
Purisima area recharge from precipitation (afy)	6,600	6,600	6,600	
Subtract recharge west of SC-1	-1,200	-889	-889	Sum of outflow estimate and 70th percentile of historical Santa Cruz pumping.
Modeled protective outflows to Ocean - 70th percentile (afy)	-775	-775	-775	
Increased ocean outflow Santa Cruz (afy)			-170	Reduction needs to be estimated by additional cross-sectional modeling
Increased ocean outflow SqCWD Purisima (afy)			-388	Reduction needs to be estimated by additional cross-sectional modeling
Decreased coastal plain recharge(afy)			-204	Reduction needs to be estimated based on evaluation of shallow coastal plain hydrogeology
Total yield available for consumptive use (afy)	4,625	4,936	4,174	
Non-SqCWD consumptive use (afy)	-1,992	-1,606	-1,606	Higher estimate of septic return flow partially offset by lower estimate of irrigation return flow (same as used for SqCWD below).
Total yield available for SqCWD's consumptive use (afy)	2,633	3,330	2,568	
SqCWD outdoor use (%)	30%	30%	30%	
SqCWD indoor use (%)	70%	70%	70%	
SqCWD septic parcels (%)	6%	6%	6%	
SqCWD sewered parcels (%)	94%	94%	94%	
Outdoor return flow (%)	20%	10%	10%	Assumes greater use of drip and water conservation.
Septic return flow (%)	75%	98%	98%	Assumes no ET loss of septic percolation.
Sewer return flow (%)	0%	0%	0%	
SqCWD overall return flow (%)	9%	7%	7%	
Total yield available for SqCWD delivery (afy)	2,890	3,572	2,755	
Subtotal for outdoor use (afy)	867	1,072	826	Follows from above assumptions.
Subtotal for indoor use to septic (afy)	111	138	106	"
Subtotal for indoor use to sewer (afy)	1,912	2,363	1,822	"
SqCWD outdoor return flow (afy)	173	107	83	"
SqCWD septic return flow (afy)	84	135	104	"
SqCWD sewer return flow (afy)	0	0	0	
SqCWD water pipe leak (%)	0%	7%	7%	Average annual leak rate (SqCWD).
SqCWD water pipe leak (afy)	0	269	207	
SqCWD pumping yield (afy)	**2,890**	**3,841**	**2,962**	Maximum yield consistent with cumulative historical storage deficit is about 3,050 afy.

Ranges of Sustainable Yield and Recovery Pumping



Notes: Yield includes septic system recharge. Recovery pumping based on 1984-2011 deficit.



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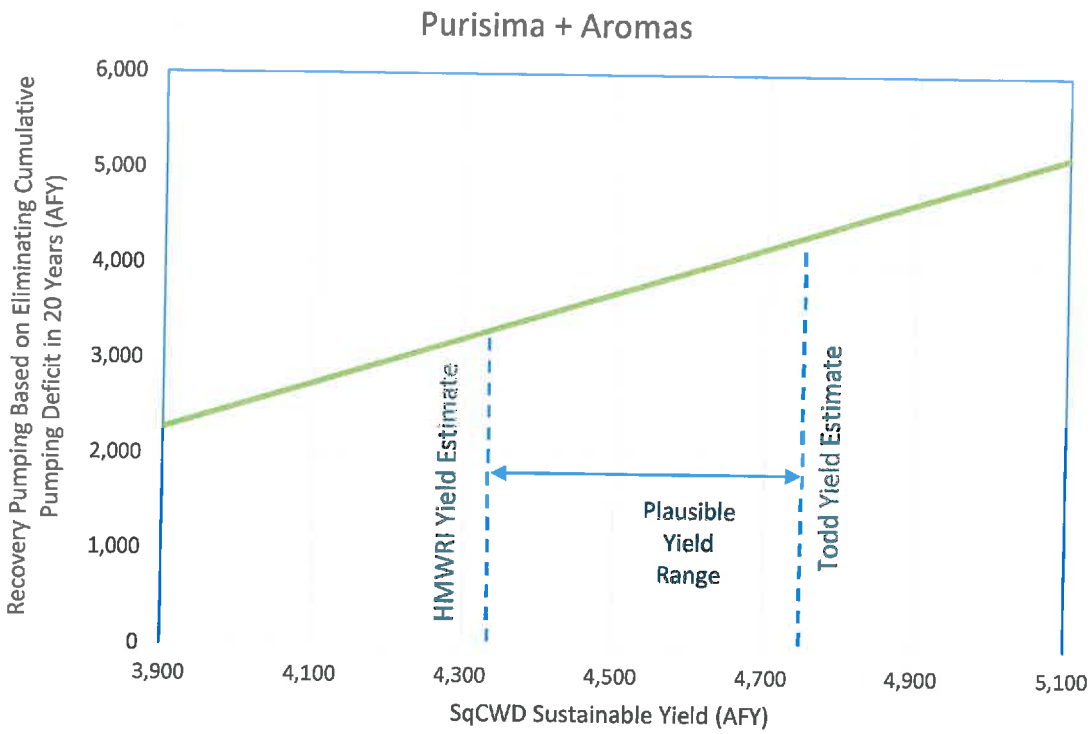


Notes: Yield includes septic system recharge. Recovery pumping based on 1984-2011 deficit.

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

TECHNICAL MEMORANDUM

To:	Kim Adamson and Taj Dufour, Soquel Creek Water District
From:	Cameron Tana and Derrik Williams
Date:	October 3, 2014
Subject:	Peer Review of Sustainable Yield Estimates – Refining Estimates with the Groundwater Model and Additional Studies

The final version of Todd Groundwater's peer review of HydroMetrics WRI's technical studies related to sustainable yield estimates was discussed and approved by the SqCWD Board of Directors on July 15, 2014. The Board requested that the two firms collaborate on a simplified executive summary describing differences in our estimates. The result of this collaboration is Gus Yates' memorandum from September 8 titled *Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates*. Part of the Board's request was to identify which differences would be resolved by a groundwater model, and which would require separate research projects. This memorandum responds to this request with a plan for refining the sustainable yield estimates considering the peer review.

GROUNDWATER MODEL VS. WATER BALANCE APPROACH

Development of a groundwater model has been undertaken by the Soquel-Aptos Basin Implementation Group. The groundwater model will be the primary tool for accurately quantifying the Basin's sustainable yield. The groundwater model's main benefit is not resolving differences in estimates of specific water balance components. The main benefit is that the model will integrate the components of the water balance while honoring principles of groundwater flow and the hydrogeology of the basin. The model will simulate groundwater level response to changes in pumping to better guide SqCWD in planning for recovery of the basin's groundwater levels to protect against seawater intrusion. The current estimate of sustainable yield using the water balance approach does not

calculate water level response and instead uses the cumulative pumping deficit as a proxy for recovery. The water balance approach also assumes that pumping is distributed to maximize use of yield estimated by the water balance while the model will calculate yield based on specified pumping locations.

CALIBRATED WATER BALANCE COMPONENTS IN THE GROUNDWATER MODEL

The groundwater model will incorporate similar components to those used in the water balance approach, but all components will be refined as part of the groundwater model effort. Some components will be inputs into the groundwater model, and the groundwater model will be calibrated to calculate other components, particularly the flows used in the water balance. The model will calculate head dependent flows such as flow to Pajaro Valley and underflow entering the basin from west of well SC-1. The model will also calculate the outflows to the ocean needed to achieve and maintain protective levels. These modeled flows will be calibrated to groundwater level data.

The groundwater model calibration will also improve and refine some water balance components such as precipitation recharge and groundwater supported baseflow. This will improve the sustainable yield estimate by incorporating time dependent recharge and baseflow, rather than average numbers.

RE-EVALUATING INPUTS TO GROUNDWATER MODEL

Some of the water balance components are inputs to the groundwater model. All of these components will be re-evaluated as part of groundwater model development. One of these components is return flow (return flow from outdoor use, return flow from septic, return flow from pipe leaks), for which there are major disagreements between the HydroMetrics WRI water balance estimate and the Todd Groundwater alternative estimates. These assumptions will be inputs to the groundwater model and the differences will not be resolved by the model itself. Therefore, the assumptions included in the model for this component need to be re-evaluated for the groundwater model with a literature review as suggested by the peer review and any available local data. For example, SqCWD has provided an estimate of pipe leaks in its system of approximately 7%, which should be included in the model input. However, the groundwater model will differ from the water balance approach in that the re-evaluated return flow

assumptions will be used in the groundwater model based on a geographic distribution of land use. With that input, the groundwater model will be able to estimate how much of return flow contributes to what is available for wells to extract given the locations and depths of the wells.

Estimates for other water balance components used as input to the model will be re-evaluated during groundwater model development. These include the proportion of outdoor versus indoor water use by land use, and non-water agency pumping estimates. Most of the water use factors are based on estimates compiled in the 1990s. We will do a literature review to update the estimates and incorporate any available local data. For the groundwater model, non-agency water use will be applied based on a geographic distribution of land use and will be able to assess effects of pumping given estimated pumping locations.

ADDITIONAL STUDIES TO SUPPLEMENT GROUNDWATER MODEL

Todd Groundwater recommended additional studies to reduce uncertainties in the estimates for sustainable yield. We see value in these studies in conjunction with development of the groundwater model, not necessarily for revising the yield estimate based on the water balance approach.

The first suggestion is to modify the cross-sectional models along the diagonal planes of the Purisima units to re-evaluate the protective elevations. If protective elevations are revised, the basinwide model simulations will be used to assess the sustainable yield. The basinwide model will be constructed to represent the diagonal planes of the Purisima unit and can also be used to estimate the coastal outflow needed to achieve and maintain these new protective elevations. Outflows could be estimated based on the modified cross-sectional models for comparison with outflows from the original cross-sectional models, but we recommend using the calibrated groundwater model to evaluate the effect of revised protective elevations on the sustainable yield. The basinwide model could also assess the outflow needed to maintain protective elevations at City of Santa Cruz wells, whether they use the estimates developed by cross sectional models or the City's more conservative proposed target elevations.

The cross-sectional models can be modified in a 3 month time period. For use with the groundwater model, the protective elevations need to be evaluated by December 2015. However, the District already manages its basin to protective

elevations, so evaluating any potential change to those protective elevations should be expedited. One possible goal is to complete the evaluation by March 2015, in time for use in the Water Year 2014 Annual Report and Review.

The other recommendation is to compile groundwater elevation data for shallow monitoring wells in the coastal plain area and compare them with creek elevations to evaluate whether shallow groundwater discharges to creeks. This will provide additional data for model calibration, especially if the model is developed as an integrated surface water-groundwater GSFLOW model. Including these data will make the model more defensible for evaluating sustainable yield, especially considering the uncertainty about return flow which may contribute to shallow groundwater discharge to creeks. Compiling these data are not part of the approved groundwater model scope and cost estimate. It would take 1-1.5 months to complete the task and it is suggested that it is completed before the GSFLOW development task in the groundwater model (Task 2B) as it may inform the conceptual model for surface water-groundwater interaction. Task 2B is scheduled to begin April 2015.

SUMMARY

Using the groundwater model to evaluate sustainable yield will replace the water balance approach reviewed by Todd Groundwater. The main advantage of the groundwater model is that it will integrate the water balance while honoring principles of groundwater flow and the hydrogeology of the basin. The results of the groundwater model are more important for evaluating sustainable yield than resolving differences in estimates of individual components. However, all inputs to the groundwater model should be re-evaluated when developing the model. Throughout the model development process, a Technical Advisory Committee will provide oversight and input for the groundwater model development, including this re-evaluation of model inputs. Additional studies recommended by Todd Groundwater will also have value for strengthening the groundwater model and management of the basin. The attached table provides a summary of the model sub-tasks and additional studies that will improve sustainable yield estimates provided by the groundwater model.

Table 1. Summary of Model Sub-Tasks and Additional Studies for Estimating Sustainable Yield with Groundwater Model

Model Sub-Task/ Additional Study	Included in Model Scope?	Water Balance Components Addressed	Use in Model	Timeframe
Literature Review and Local Data Evaluation for Return Flow Assumptions (Model Task 3: Water Balance)	Yes	Return Flow from Indoor Use on Septic Return Flow from Outdoor Use Return Flow from Pipe Leaks	Geographically Distributed Model Input (recharge)	December 2014-June 2015
Literature Review and Local Data Evaluation for Non-Agency Water Use (Model Task 3: Water Balance)	Yes	Indoor and Outdoor Water Use by Land Use Non-Agency Pumping	Geographically Distributed Model Input (recharge and pumping)	December 2014-June 2015
Modify Cross-Sectional Models to Evaluate Protective Elevations	No	Outflow to Prevent Seawater Intrusion	Protective Elevations for Evaluating Simulations	January 2015-March 2015
Compile Shallow Groundwater Data	No	Flows between Creeks and Groundwater	Calibration Data for GSFLOW	March 2015-April 2015
Model Task 2B: GSFLOW	Yes	Flows between Creeks and Groundwater Recharge	Calibrated Model Output	April 2015-August 2015
Model Task 5: Simulations[1]	Yes	Outflow to Pajaro Valley Inflow from west of SqCWD Outflow to ocean	Calibrated Model Output	December 2015-February 2016

[1] Estimates of sustainable yield will be based on evaluation of simulation results in this task.

October 7, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: Agenda Item No. 6.2 — Approve Scope of Work from USGS to Attend Scoping Meetings for Support of Basin Groundwater Model

Attachments: 1. Proposal from USGS

Background

At the July 15, 2014 meeting, the Board reviewed a proposal from HydroMetrics, WRI to create a water model for the basin. The Board approved moving forward with the work and voted to propose it be done through the Basin Implementation Group (BIG). At the BIG Board meeting on August 14, 2014 the Board, made up of Directors from both Central and Soquel Creek Water Districts, approved a scope of work for Hydrometrics to develop a groundwater model for the basin. They are proposing to start with scoping activities that will be beneficial to the ultimate success of the groundwater modeling effort by ensuring that our needs are fully addressed by the model. They plan to use MODFLOW and related groundwater model codes developed by the US Geological Survey (USGS). Hydrometrics has invited the USGS to participate in this project as well. The scope of work and cost estimate included in the attached proposal (Attachment 1) is for the initial USGS effort and is in addition to the previously approved Hydrometrics proposal. The USGS proposal was approved by the BIG Board at the September 23, 2014 BIG meeting.

Peer Review

On January 21, 2014 the Soquel Creek Board initiated a peer review of Hydrometrics work for the District. The peer review was completed by Todd Groundwater, who found:

- A yield estimate 100 AFY greater than the Hydrometrics yield estimates for both the Purisima and Aromas areas. This puts total yield at 4,200 AFY vs. 4,000 AFY.
- The calculated yields result in an estimate of historical accumulated deficit slightly greater than 5,100 AF.
- A 98% septic return flow assumption was applied to the historical deficit calculations, to be consistent with the estimates of sustainable yield. This increased the accumulated deficit to 5,700 AF.

The report also makes recommendations to investigate the impacts of septic recharge. The report states that an adaptive management approach is an appropriate way to prevent seawater intrusion, but it also points out some

shortcomings and suggests that a groundwater flow model that takes into account base flow depletion would provide a better picture. The report also suggests that a groundwater model that incorporates density effects would provide more accurate estimations of the rate of intrusion and the location of the seawater-freshwater interface. Additionally, impacts of septic recharge and that could be better determined with a groundwater model. The Board has also expressed interest in locating the position of the seawater-freshwater interface, which will help make this modeling very valuable. This aspect of the modeling is not included in the attached scope since the location is currently not identified.

In addition to providing a more refined estimate of recovery time, a basin-wide groundwater model would provide information on potential for recharge using either recycled water or captured storm water. It would also advise on how much water the District could transfer back to the city in a conjunctive use scenario. This modeling would be helpful as we move forward with options for supplemental supply.

USGS Support for Groundwater Model Proposal

USGS's role for support in the groundwater model effort will largely be defined by the scoping meetings we are planning and their overall budget may be $50,000-$100,000 as reported in the August Groundwater Model memo. Because the total amount will vary depending on our needs that emerge from the scoping meeting, they suggested providing a proposal and budget to participate in the scoping meetings and then providing another proposal and budget based on the identified work from those meetings. Attached you will find a proposal for USGS to attend the scoping meetings for an estimated cost of $7,000.

POSSIBLE BOARD ACTION

1. By MOTION, approve the proposal from USGS to attend scoping meetings for the Soquel Aptos Basin Groundwater Model.

2. Take no action and provide staff further direction.

By_____
Kim Adamson
General Manager

Water Supply Advisory Committee

Meeting

First session: Thursday October 23 5:00 p.m. – 9:30 p.m.

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

900 High Street, Santa Cruz

Second session: Friday October 25 2:00 p.m. – 6:00 p.m.

Police Department Community Room
155 Center Street, Santa Cruz

Flow Agenda[1]

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

[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.

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 (5:10-5:20)
See document 2a
Members provide news of significant communication between them and organizations with significant interest in the development of water policy in Santa Cruz.

3. **Agenda Review (5:20-5:30)**
See documents 3a & 3b (note that 3b is the official agenda and does not have a Packet Document 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

4. Results of the Attitudinal Survey (5:30-6:00)
Gene Bregman, Principal of Gene Bregman & Associates, will present the findings of the Attitudinal Survey and answer questions.

Desired outcome:

- Understanding of the findings of the attitudinal survey so that the Committee Members can evaluate the appropriateness of the criteria and weighting used in the decision model.

5. Review Outcomes of the Convention (6:00-7:00)
Note: Materials will be sent as soon as possible after the Convention
The Convention Subcommittee leads a discussion about the outcomes of the Convention.

Desired outcomes:

- Understanding of the community's response to the Convention and to the proposals
- Agreement on any directives to the Recon Outreach Subcommittee
- Understanding of the utility of the "Small" MCDS model used at the Convention
- Identification of MCDS questions to be addressed during discussion of the Decision Model on Friday

6. Break (7:00-7:15)
A fifteen-minute break (only fifteen minutes, *really*).

7. Weights in the Convention Decision Model (7:15-7:40)
Note: Materials will be sent as soon as possible after the Convention
Carie and Philip will lead a discussion about the Members' experience weighing the importance of criteria and the best ways to use this feature. Members will also discuss what standards they use when deciding on the relative importance of criteria: personal standards, the standards described by their stakeholder groups or some other standards.

Desired outcome:

- Understanding of the impact on the decision model of weighing the importance of criteria so that Members can use this feature most effectively in November.

8. Demonstration of Sensitivity Analysis using Convention MCDS Results (7:40-8:05)
Note: Materials will be sent as soon as possible after the Convention
Philip will use examples of sensitivity analysis based on the results of the Convention decision model and show how it can be used as a tool for prioritizing research. The Committee Members will discuss it's applicability to their work and will consider what method to use for prioritization of research.

Desired outcomes:

- Understanding of the use and applicability of Sensitivity Analysis
- Agreement on how to prioritize research

9. Simplified Scenarios and problem statements (8:05-9:05)
See Document 9a
Karen and Bob will present the Simplified Scenarios, explain their purpose and their relationship to the more developed Scenarios and to the Baseline and will work with Committee Members to agree on a "crayon-quality" problem statement for each one.

Desired outcomes:

- Understanding of the relationship between the four Simplified Scenarios (SSs) and the more complex scenarios so that all are satisfied that the SSs will be adequate for use in the "big" MCDS model in Recon
- Agreement that the 2x2 SSs will be used in the "big" MCDS model in November
- Agreement on problem statements for each of the four SSs that is adequate for Recon

10. Recon Outreach Subcommittee Update (9:05-9:20)
Subcommittee Members will report on outreach activities.

Desired Outcome:

- Agreement on any direction to the Subcommittee

11. Wrap up, plan for second session and evaluation of this session (9:20-9:30)
Desired Outcomes:

- Continuity between sessions
- Understanding of the quality of the session's process

12. Adjourn (9:30)

Second Session

13. Public comment (2:00-2:10)
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 that are not on the meeting's agenda during the Oral Communication section at the end of this session.

14. **Correspondence received from the community (2:10-2:15)**
Mike Rotkin reports on correspondence received from the community.

Desired outcomes:

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

15. Reflections on the previous session (2:15-2:25)
The Committee considers the salient points from the previous session and reviews the agenda for today's session.

Desired outcomes:

- Acknowledgement of the major achievements of the previous session
- Agreement on any changes to today's agenda

16. Clarification of all the components of the Recon Decision Model (2:25-3:25)
Carie will work with Committee Members to build on their experience with the Convention model and clarify all the component parts of the Recon Decision Model so that it is adequate for Recon in November and to agree on any related assignments for Stratus to perform in time for the November meeting.

Desired outcome:

- Agreement on who (Committee, Department Staff or Consultants) will provide the initial Ratings and Uncertainty

- Agreement on improvements to the Decision Model so that it is adequate for Recon

- Agreement on any necessary input from Stratus or Water Dept Staff for finalization of Recon criteria, rating scales or ratings

17. Forecasting Water Demand (3:25-4:05)
See documents 17a & 17b
Toby will present information describing how the demand forecast used in the 2010 Urban Water Management Plan and the Water Supply Assessment for the City's 2030 General Plan were developed, and will describe current trends in new water accounts as compared to the historical information on this topic presented to the Committee in August (Document L, August meeting packet).

Desired outcomes:

- Understanding of the way the current demand forecasts were developed

- Understanding of current trends in new water accounts as compared to historical information presented in August.

18. Break (4:05-4:20)
A fifteen-minute break (only fifteen minutes, *really*).

19. General Plan growth targets (4:20-4:35)
The presenter (TBD) will explain what drives the growth estimates in the GP and what actions the GP requires the Water Department (and other City departments) to take. S/he will explain to what extent the City is bound to plan for the growth levels specified in the GP.

Desired outcome:

- Understanding of applicable planning protocols

20. Stratus Work Plan report (4:35-5:00)
See Documents 20a, 20b, 20c, 20d & 20e
Bob brings the Committee Members up to date about progress on current assignments

Desired outcomes:

- Understanding of the progress on work plan assignments from September

21. Agendas for the next two meetings (5:00-5:25)
See Document 21a
The Committee discusses the agenda outlines for the Committee's next two meetings.

Desired outcomes:

- Understanding of the tasks anticipated for the next two meetings
- Agreement on direction to the co-facilitators regarding the plans for Committee meetings during the next two months

22. Real Deal Planning Subcommittee (5:25-5:35)
Carie/Nicholas will describe how the Subcommittee's role fits in the time-table of the Committee's work.

Desired outcome:

- Understanding of the schedule of the Subcommittee's work

23. Materials resulting from the previous meeting (5:35-5:45)
See documents 23a & 23b (note that 23b is the official Action Agenda and does not have a Packet Document label)

Desired outcome:

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

24. Oral communication (5:45-5:55)
We invite public comments about items relevant to the Committee's work but not on the meeting's agenda

25. Evaluation and wrap up (5:55-6:00)
Review the session and consider items to be carried forward to the next meeting.

26. Adjourn (6:00)

Simplified Scenarios

Once the WSAC has had a chance to learn about and discuss the information generated by the Water Supply Convention, there will be an opportunity to begin to test the full range of alternatives to see how well they might meet future needs to improve water supply reliability. The "big" MCDS model is a major tool we will be using in this process, but it will be a more useful exercise if we aren't just using one problem definition when we apply the model.

One possible approach to providing the alternative problem statements is to use the scenarios the Committee has been working on. The technical team does not recommend this approach at this stage because the information needed to do this isn't ready yet. An alternate approach we're recommending is to use Simplified Scenarios that we've created using your work from the last months. The insights we get from applying the Simplified Scenarios to the MCDS model will provide insight for the long-term task of developing the more complex scenarios.

Still, being able to view alternatives at this early stage in the context of a range of potential future demands would be valuable in considering the scale of options and how they individually could work as individual projects or strategies to address the gap between supply and demand. To support this purpose, the technical team has created a simple two-by-two matrix of simplified alternative futures for use by the Committee as part of its initial work with the outcomes of the Water Supply Convention. *This simplified approach is meant to be used only in the context of the November meeting and is meant to be a transition between a "one number" problem statement and more sophisticated scenario based problem statements.*

Simplified Scenarios for 2035[1]

	High Fish Flows	Low Fish Flows
High Climate Change Impact	High Fish Flows High Climate Change Impact **S-D Gap = 1.84 bgy**	Low Fish Flows High Climate Change Impact **S-D Gap = 780 mgy**
Low Climate Change Impact	High Fish Flows Low Climate Change Impact **S-D Gap = 1.53 bgy**	Low Fish Flows Low Climate Change Impact **S-D Gap = 650 mgy**

In advance of the Committee's November meeting, the range of possible future demands presented here will be used by committee members to run the MCDS model and rate alternative within at least 2 different futures. Committee member results will be combined by Philip Murphy to explore all 4 futures, providing insight about weights and sensitivity to weights, ratings and sensitivity to uncertainty in the ratings, prioritization of research, etc.

[1] Here are the basic assumptions about this chart as it stands now :

- Simplified Scenarios are relevant to circumstances in 2035
- Demand is 3.5 bgy
- High fish flows are based on DFG-5 which produced a supply-demand gap of 1.53 bgy impact in current climate and 1977 hydrology, which is the historical "worst case year."
- Large climate impact would potentially make circumstances such as those in 1977 more frequent, and it may be that additional, more severe droughts, or longer, multi-year droughts would occur, so the high climate change/high fish flow supply-demand gap has been increased by 20%, making it 1.84 mgy under the high fish flows/high climate impact condition.
- The low climate change impact/high fish flow condition, maintains the current estimate of the supply-demand gap in 1977 hydrological condition, so that gap is 1.53 bgy.
- Low fish flows are Tier 3/2 which produced a supply-demand gap of 650 mgy in current climate and 1977 hydrology.
- Large climate impact would potentially make circumstances such as those in 1977 more frequent, and it may be that additional, more severe droughts, or longer, multi-year droughts would occur, so the high climate change/low fish flow supply-demand gap has been increased by 20%, making it 780mgy under the low fish flows/high climate impact condition.
- The low climate change impact/low fish flow condition, maintains the current estimate of the supply-demand gap in probably wouldn't be worse than the 1977 hydrologic condition, so that gap is 650 mgy.

WATER DEPARTMENT
MEMORANDUM

DATE: October 17, 2014

TO: Water Supply Advisory Committee

FROM: Toby Goddard

SUBJECT: Future Water Demand

BACKGROUND: This report is the second of two parts exploring community growth and development in Santa Cruz. The first report focused on the rate and type of growth and development experienced over the last two decades and the effect of that development on system demand. This report looks at potential future growth and development within the service area and summarizes the approach the Water Department used in 2010 to develop a forecast for water demand out to 2030.

Regulatory Background

Two key state laws are important in guiding water agencies in how they go about describing and evaluating their future water resource supplies and needs:

1. Urban Water Management Planning Act (CA Water Code section 10608 – 10656), and
2. Senate Bill 610 (Chapter 643, Statutes of 2001)

Under the Urban Water Management Planning Act, water suppliers are all required to follow a common framework for reporting their water use projections. This framework includes:

- 20-year planning horizon
- 5-year increments
- Breakdown by water use sector (single-family residential, multi-family, commercial, etc.)

This same basic framework, a 20-year forecast presented in 5-year increments, is used for comparing total water supply sources with the total projected water use for assessing an agency's water service reliability under other provisions of the Act. This approach is

also consistent with the way regional population and growth forecasts are typically presented.

The second main regulatory requirement is set forth under Senate Bill 610 of 2001. This law was intended to improve the linkage between land use decisions made by cities and counties and water supply availability. It recognizes Urban Water Management Plans as important source documents for cities and counties, just as General Plans are for water suppliers, and seeks to ensure coordination and collaboration when developing and updating these long-range planning documents. Pursuant to SB 610, a Water Supply Assessment is required for projects that are subject to CEQA and meet certain size thresholds.

In 2010, the City was well along towards completing a comprehensive General Plan update, and had elected to prepare a Water Supply Assessment on the document to support the environmental review process. With the City's new General Plan and next Urban Water Management Plan sharing the same 2030 planning horizon, it was an opportune time to align the projected land use changes envisioned in the General Plan with projected future water needs of the City.

Another related regulatory factor that needs to be considered in connecting future land use and water use is the statewide and regional process for determining housing needs in cities and counties. In Santa Cruz, the Regional Housing Needs Allocation, or RHNA, is developed by AMBAG as part of the state-mandated housing element law. It establishes the total number of housing units, as well as the breakdown for various income categories, that each city and county must plan for within an eight year planning cycle. The current RHNA extends from 2014 through 2023.

Basis for Updated Water Demand Projections

Any long-term projection involves uncertainties and estimates which may or may not prove to be correct over time. Recognizing this fact, the most recent Urban Water Management Plan evaluated two possible "scenarios" for future demand. One of these scenarios, the higher of the two, ultimately was eliminated as being unlikely, given the recent statewide mandate calling for reduction in per capita water use by 2020. The plan also included some narrative discussion about another possible scenario in which water demand might actually remain relatively constant into the foreseeable future.

Each demand scenario was built around two main components of demand: 1) existing water demand, and 2) potential new water demand from 2010 to 2030. The two components were then added together, along with a factor for miscellaneous unmetered uses and system losses, to produce a projection of total water demand to 2030.

The first component was the existing water demand associated with the City's 24,350 active accounts. This includes all residential, commercial, institutional, and irrigation accounts connected to the system and using water as of 2010.

One of the challenges in establishing the level of water demand for the existing customer base at the time was the dynamic nature of water use. In 2009, the City experienced a sharp downturn in water use that was considered a temporary phenomenon caused by the implementation of Stage 2 water restrictions, the broader economic recession, and other factors. This downward trend persisted into 2010. Therefore, instead of using the actual level of demand at the time, the approach that was taken was to combine the number of existing accounts in 2010 and average water use per account in each sector during the period immediately preceding the downturn. This approach was believed to be more representative of normal system water demand without being distorted by the external influences of drought and economy. The City tracks long-term changes in average water use per account over time by customer sector, both inside and outside the City. These tracking models, and the number of accounts obtained from the utility billing system, were the primary sources of information used to estimate demand for existing customers.

The second component making up each scenario was the incremental new water demand possible from 2010 out to 2030. Different methods were used inside the City and outside the City to quantify these potential future water demands, as follows:

- Land use changes envisioned in the General Plan 2030 (not including the University) served as the basis for water demand projections within the City limits. The General Plan 2030 "buildout" estimate envisions a total of 3,350 new residential units, 3.1 million square feet of additional commercial, office, and industrial development, and some 300+ new hotel rooms (Design, Community & Environment, 2009). Within the City, water duties were developed from the utility billing system for each of the various residential and commercial sectors listed in the General Plan 2030 buildout analysis. These water duties were combined with 2030 land use projections to estimate water demands associated with new development, presented below.

  The City's General Plan did not provide specific information about new landscape irrigation or municipal parks. Growth in landscape irrigation was assumed to parallel the rate of new residential and commercial development. Additional water for new municipal facilities was estimated based on the potential for new park acreage.

General Plan 2030 Water Demand

	Buildout Projections (a)	**Water Factor**	**Water Demand (mgy)**
Single Residential (b)	840	194 gal/unit/day	59.6
Multiple Residential (b)	2,510	70 gal/unit/day	64.3
Business/Industry:			
- Commercial Sq Ft	1,087,983	66 gals/ft^2/year	71.8
- Hotel Rooms	311	93 gal/room/day	10.6
- Office Sq Ft	1,273,913	18 gal/ ft^2/year	22.9
- Industrial Sq Ft	776,926	12 gal/ ft^2/year	9.3
Total			**238.5**

Notes:

(a) Source DC&E, 2009

(b) Assumes a breakdown of 75% MFR and 25% SFR for 3,350 new dwelling units

- Water demands for UCSC were based on the University's 2005 LRDP, as modified by the final EIR for the 2005 LRDP and the Comprehensive Settlement Agreement resulting from litigation of the EIR.

- For the portion of the City's service water area outside the Santa Cruz city limits, future water demand was scaled up based on population projections developed by AMBAG. This population-based approach was used instead because of the lack of useful information about land use changes in either the unincorporated part of the service area or the part of the city of Capitola served by the Santa Cruz City water system.

Other than past growth rates and future population projections, there really was nothing to help inform the rate of change going forward other than the one overall buildout estimate for the General Plan at the end of the 2030 planning horizon within the City. Therefore water demands were calculated only for year 2030, and then broken down into five-year increments though interpolation.

The 2030 water demand forecast associated with Scenario 2 is summarized in Tables 1-4 and is illustrated, alongside historic water demand, in Figure 1. The existing water demand component is shown in blue, and the future increment of demand shown in red. The total projected water demand in the City's water service area was estimated in 2010 to rise from 3.5 billion gallons per year to slightly over 4.0 billion gallons in 2030.

More detail about the methods and assumptions used to develop the current water demand forecast is contained in the 2010 Urban Water Management Plan, Chapter 4 and Appendix I.

Effect of Additional Water Conservation Measures

At the time this forecast was prepared in 2010, the City was in the process of developing information on market saturation of water conserving fixtures, devices, equipment and features within residential and commercial properties. This information was being gathered to support an analysis of additional water conservation potential and the development of a new Water Conservation Master Plan. Although this project has not been completed, the analysis performed to date shows that the potential exists for gains in water use efficiency at both existing and new water service accounts could compensate for the growth in water demand anticipated with the City's General Plan and other parts of the service area over the next twenty years.

Figure 2 shows how future water demands would be modified downward with implementation of the recommended water conservation measures in Program C.

Next Water Demand Forecast

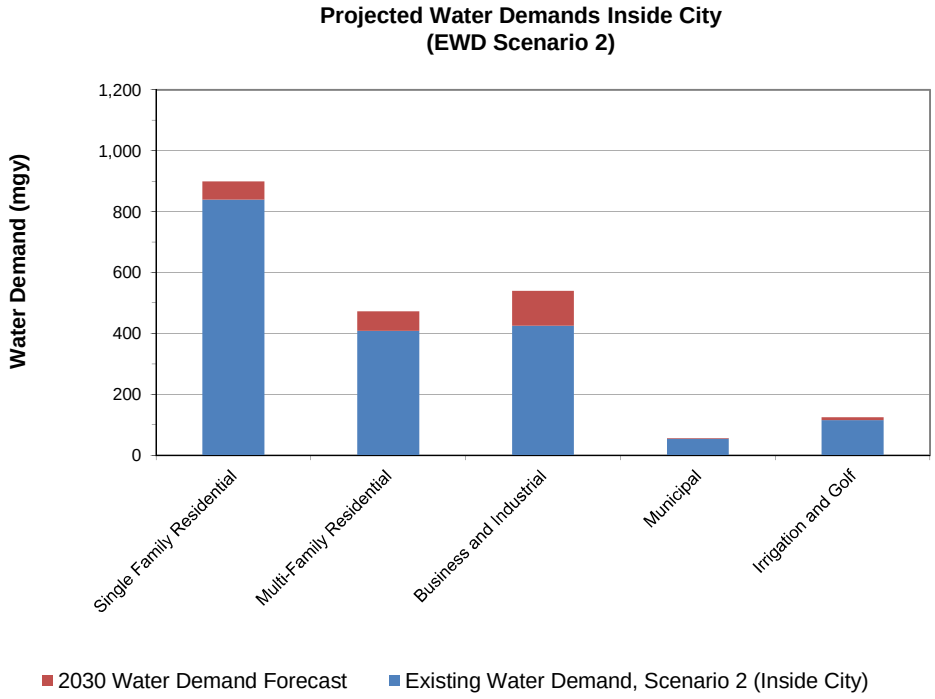
State law requires Urban Water Management Plans to be updated every five years. Under legislation signed by the governor in September, the next update will be due July 1, 2016. The Water Department will be preparing a new forecast using a different approach that would take into account additional socio-economic characteristics including pricing, elasticity of demand, and income into the forecast of demand. The next forecast would extend to 2035. It would also take into account the latest regional growth forecast prepared by AMBAG earlier this year (AMBAG, 2014).

Attachments:

Table 1. Projected Water Demand Inside the City of Santa Cruz
Table 2. Projected Water Demand Outside the City of Santa Cruz
Table 3. Projected Water Demand Service Area Total
Table 4. Projected Water Demand Service Area Total
Figure 1. Historic and Projected Water Production
Figure 2. Future Water Demand with Program C

Table 1
Projected Water Demand
Inside City of Santa Cruz, California

Category	Water Demand (mgy)		
	Existing Water Demand, Scenario 2 (Inside City)	Incremental Water Demand from General Plan 2030 Buildout	2030 Water Demand Forecast
Single Family Residential	839	60	899
Multi-Family Residential	408	64	472
Business and Industrial	425	115	540
Municipal	54	2	57
Irrigation and Golf	115	10	125
Totals	**1,843**	**251**	**2,094**

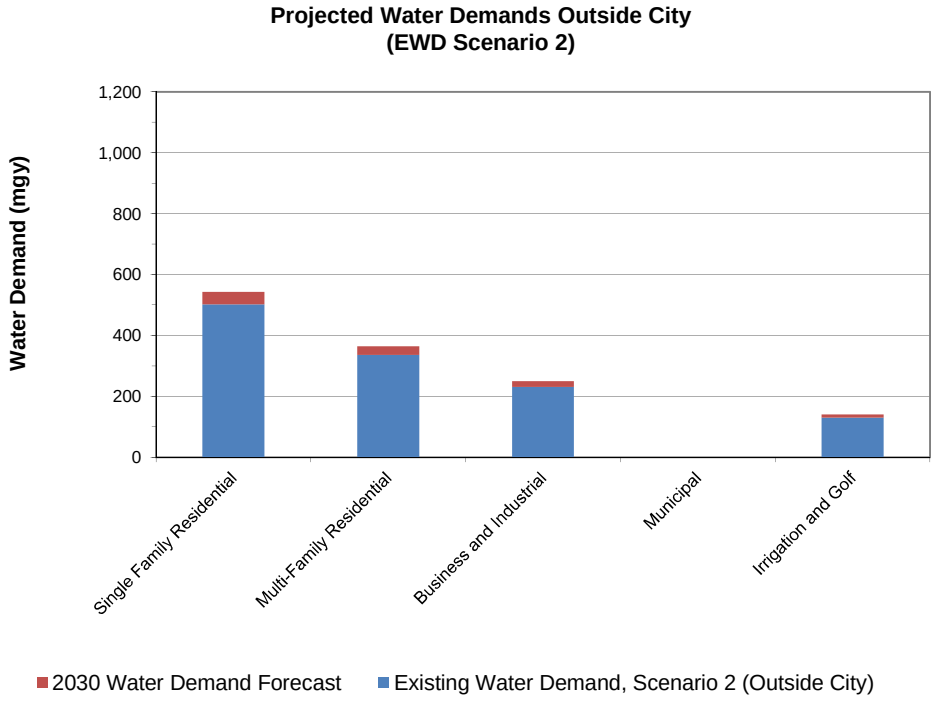


Abbreviations:
EWD - existing water demand
mgy - million gallons per year

Reference:
1 Santa Cruz, 2010. Memorandum to Bill Kocher, Water Director (City of Santa Cruz) entitled: *Updated 2010-2030 Water Demand Forecast,* dated 15 October 2010.

Table 2
Projected Water Demand
Outside City of Santa Cruz, California

Category	Water Demand (mgy)		
	Existing Water Demand, Scenario 2 (Outside City)	Incremental Water Demand	2030 Water Demand Forecast
Single Family Residential	502	41	543
Multi-Family Residential	336	28	364
Business and Industrial	231	19	250
Municipal	0	0	0
Irrigation and Golf	130	11	141
Totals	**1,199**	**99**	**1,298**



Abbreviations:

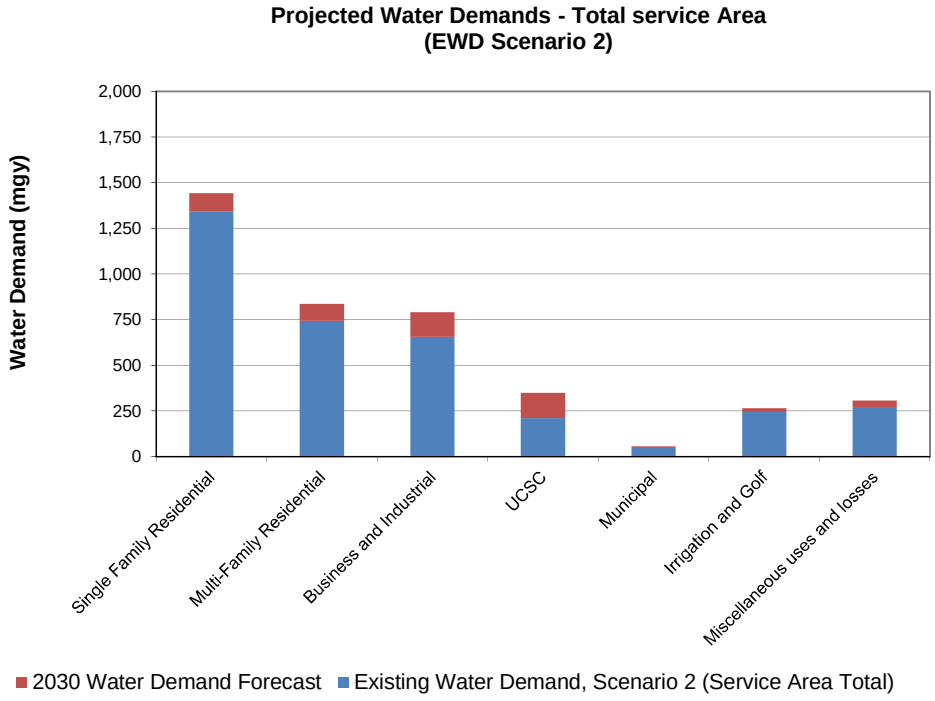
EWD - existing water demand
mgy - million gallons per year

Reference:

1 Santa Cruz, 2010. Memorandum to Bill Kocher, Water Director (City of Santa Cruz) entitled: *Updated 2010-2030 Water Demand Forecast,* dated 15 October 2010.

Table 3
Projected Water Demand
Service Area Total

Category	Water Demand (mgy)		
	Existing Water Demand, Scenario 2 (Service Area Total)	Incremental Water Demand	2030 Water Demand Forecast
Single Family Residential	1,341	101	1,442
Multi-Family Residential	744	92	836
Business and Industrial	656	134	790
UCSC	212	137	349
Municipal	54	2	56
Irrigation and Golf	245	21	266
Miscellaneous uses and losses	268	39	307
Totals	**3,522**	**526**	**4,046**



Abbreviations:

EWD - existing water demand

mgy - million gallons per year

Reference:

1 Santa Cruz, 2010. Memorandum to Bill Kocher, Water Director (City of Santa Cruz) entitled: *Updated 2010-2030 Water Demand Forecast,* dated 15 October 2010.

Table 4
Projected Water Demand
Service Area Total

Location:	Customer Class	2010	2015	2020	2025	2030
City of Santa Cruz	Single Residential	839	854	869	884	899
	Multiple Residential	408	424	440	456	472
	Business/Industry	425	454	483	511	540
	Municipal	54	54	55	55	56
	Irrigation/Golf	115	118	120	122	125
	UC Santa Cruz	212	276	339	344	349
Inside City Subtotal		**2,055**	**2,180**	**2,306**	**2,373**	**2,441**
Outside City: *County, Capitola, & North Coast Irrigation*	Single Residential	502	513	523	533	543
	Multiple Residential	336	343	350	357	364
	Business/Industry	231	236	240	245	250
	Municipal	-	-	-	-	-
	Irrigation/Golf	130	133	135	138	141
Outside City Subtotal		**1,199**	**1,224**	**1,248**	**1,273**	**1,297**
Other miscellaneous uses including water losses		268	280	292	300	307
Total System Water Demand		**3,522**	**3,684**	**3,847**	**3,946**	**4,046**

Figure 1
Historic and Projected Water Production
Scenario 2

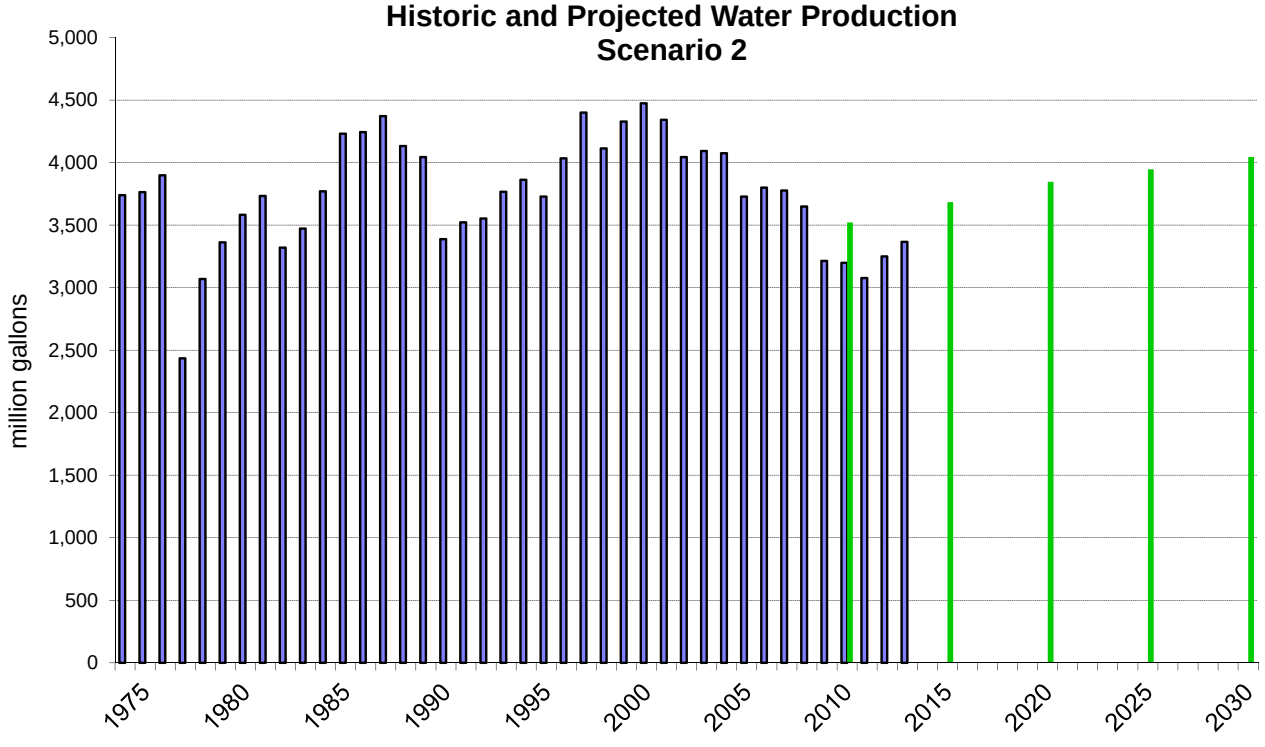
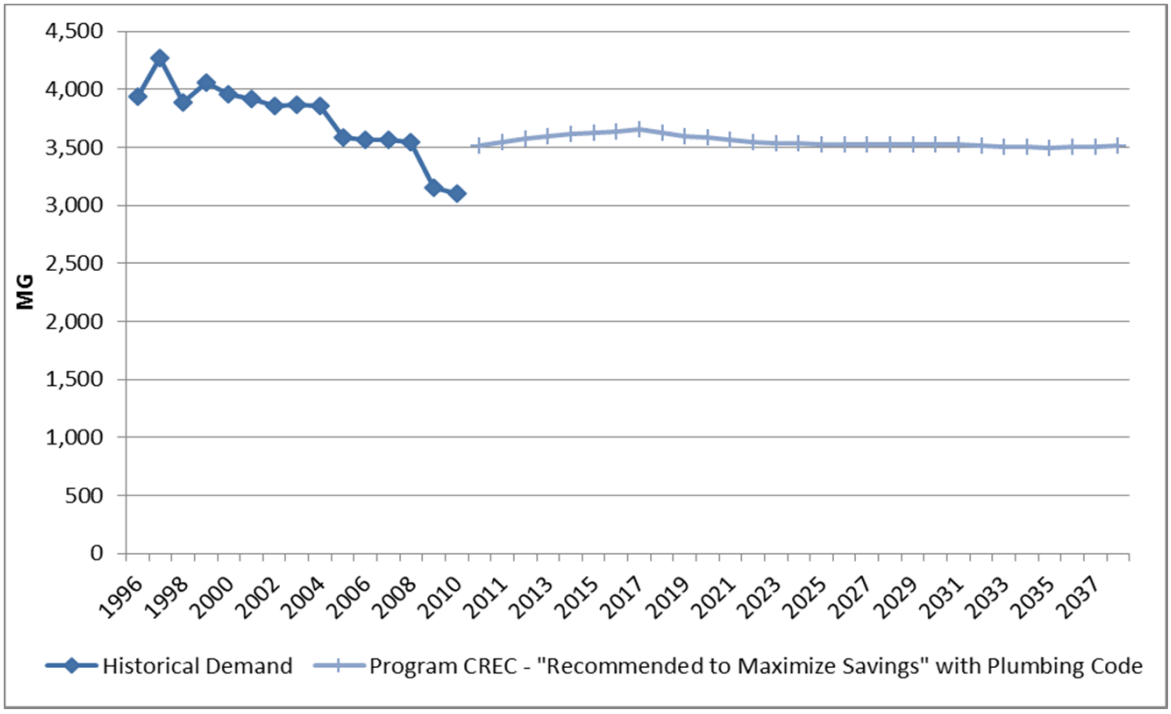


Figure 2
Future Water Demand with Conservation Program C



WATER DEPARTMENT
MEMORANDUM

DATE: October 17, 2014

TO: Water Supply Advisory Committee

FROM: Toby Goddard

SUBJECT: Follow up to Report on Historic Water Demand Related to Growth

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BACKGROUND: At the August 27, 2014 meeting, The Water Supply Advisory Committee received a report about historic water demand related to growth. The question was since raised whether there has been any change in the rate of new accounts being added as of late (faster, slower or no change in 2014)?

DISCUSSION: A billing system report was run October 13, 2014 to assess the number of new connections added to the system so far this year. The total number of accounts added so far is 66. As in past years, the majority of these accounts (55) are single family residential accounts. On an annualized basis, one would except to see about 80 new accounts for 2014, assuming meters are added uniformly over time. The following table shows the total number of accounts added over the last 10 years:

Year	New Accounts
2005	126
2006	166
2007	125
2008	81
2009	67
2010	69
2011	27
2012	64
2013	32
2014 (part)	66

For 2014 to date, the number of new connections is twice the amount as were added in 2013, but comparable in rate seen after 2007, when the numbers dropped significantly. It is probably too soon to know, by looking at new connections alone, if there has been any real change in the amount of development occurring in the service area.

Staff also contacted the City Planning Department, which provided a summary of the number of building permits issued, project valuation, and fees charges annually from 2005 through 2013, attached, and for 2014 to date.

The number of building permits issued annually, both residential and commercials has been on the rise since 2009. However, there was no breakdown provided as to the type of permit issued, whether for major remodeling, minor additions, tenant improvement, or new construction. For 2014 to date, the Planning Department so far has issued 1,241 permits, including 958 residential and 283 commercial building permits, a little less than the level from the past two years.

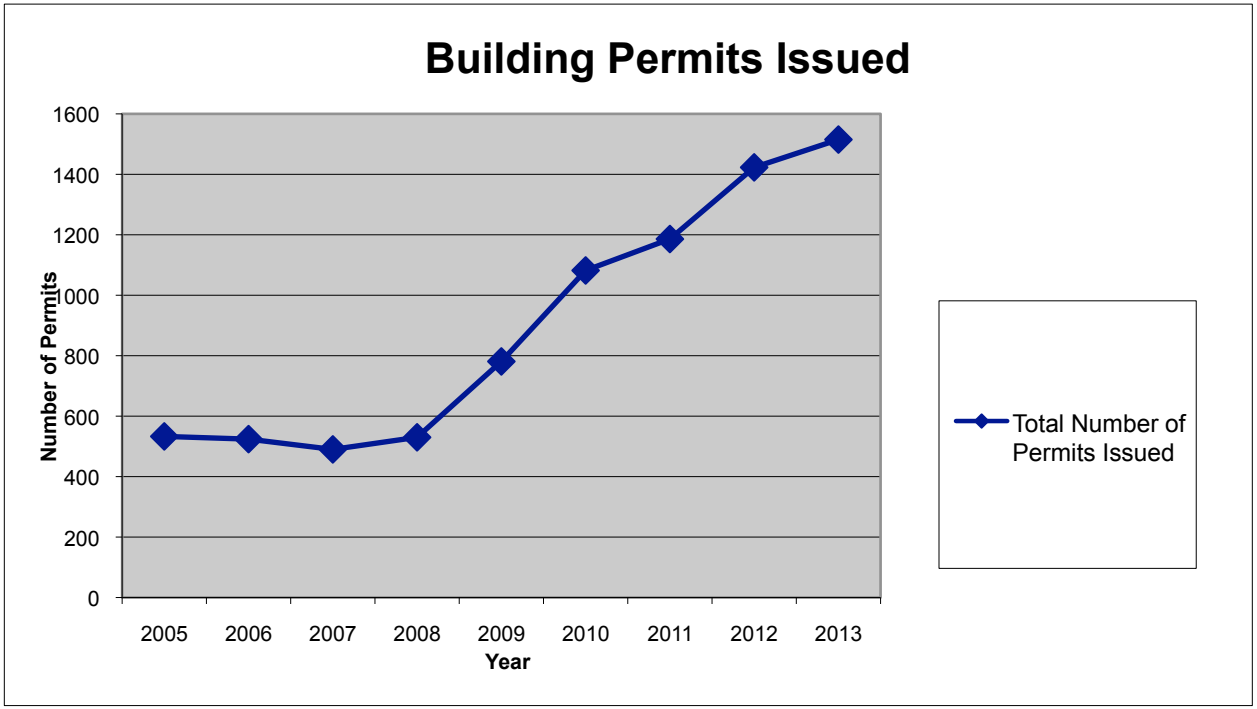
Project valuation and fees charged are both still down from levels seen in the 2007 time frame. For 2014 to date, commercial permit valuation is $55,692,549 and residential permit valuation is $32,142,398 for a total of $87,834,947. This is comparable to the valuation level seen over the past two years, but these figures could change before the year is over.

Attachment:

City of Santa Cruz Planning and Community Development
- Building Permit Trend
- Project Valuation Trend
- Fee Trend

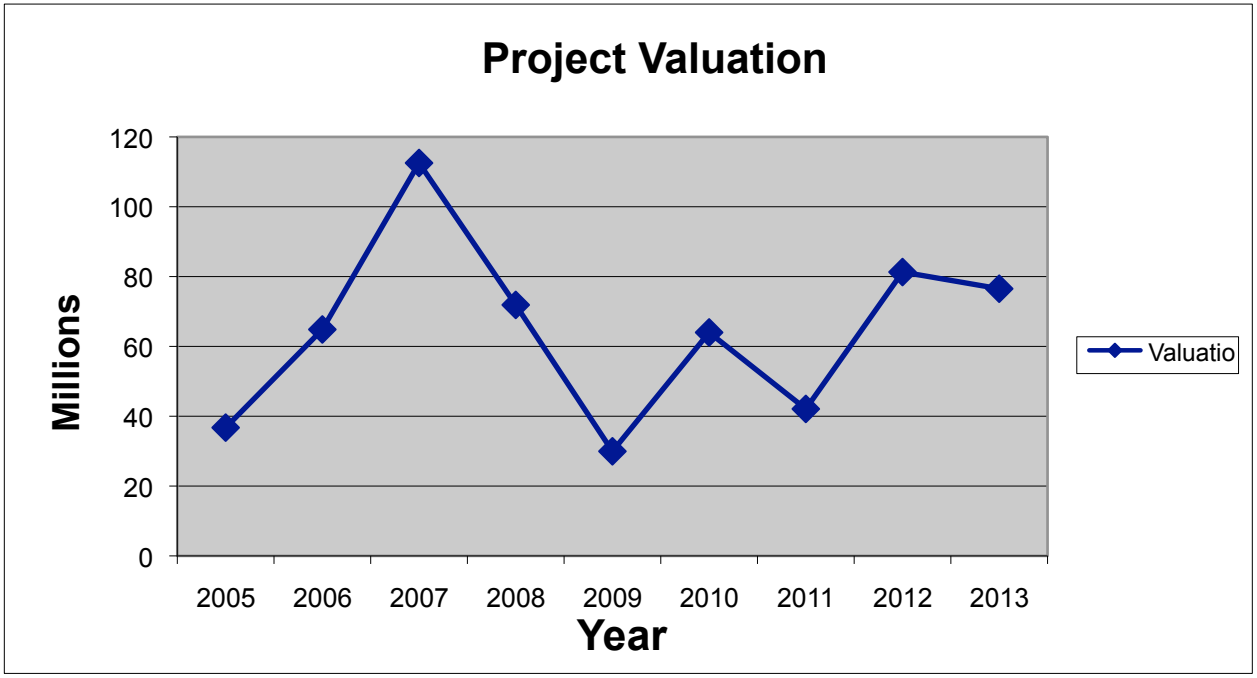
Planning and Community Development- Building Permit Trend

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Number of Permits Issued	533	524	490	530	781	1,082	1,186	1,423	1,515
Commercial Permits	122	124	121	184	201	260	297	412	439
Residential Permits	411	400	368	346	580	818	886	1,009	1,076
Other	0							2	



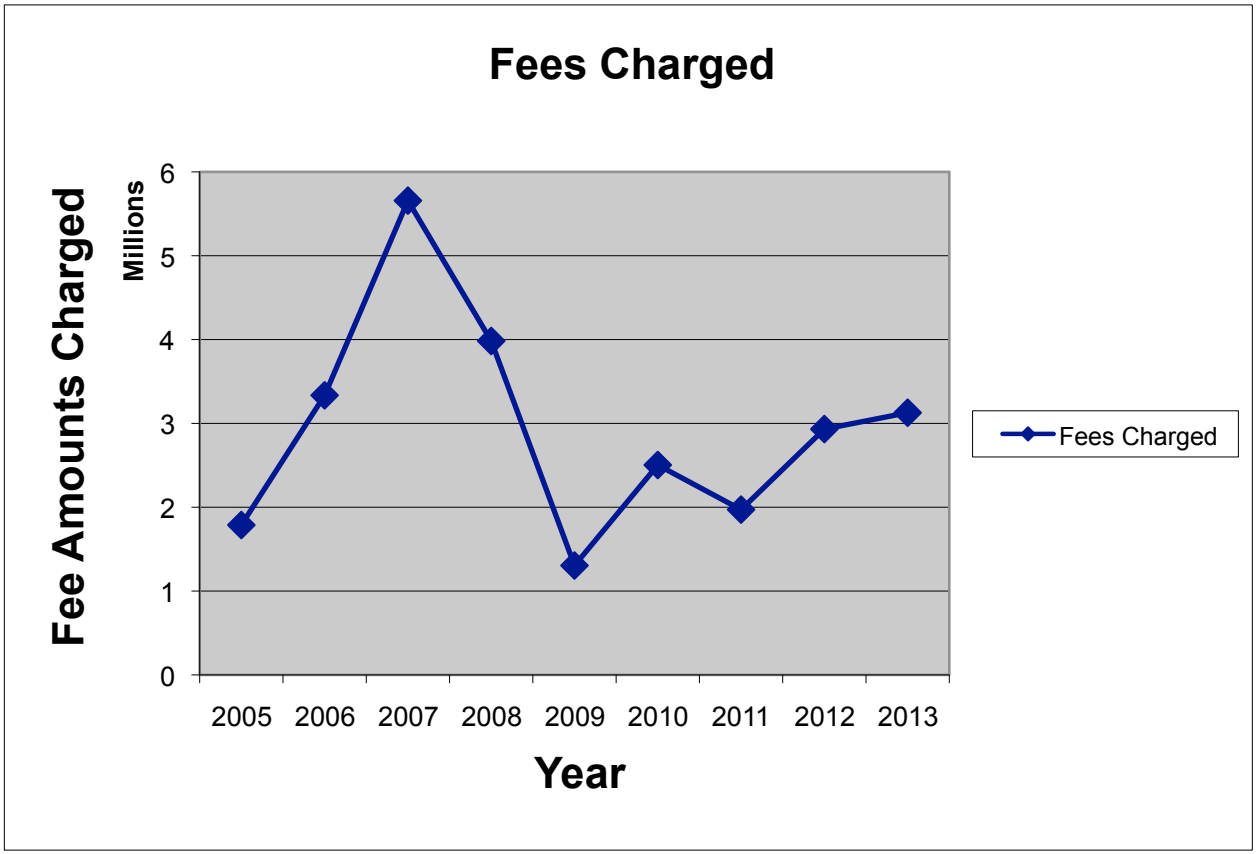
Planning and Community Development- Project Valuation Trend

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Valuation	36,737,011	64,850,591	112,534,245	71,881,385	29,954,214	63,999,327	42,094,296	81,294,880	76,520,656



Planning and Community Development- Fee Trend

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Fees Charged $$	1,787,639	3,334,978	5,657,349	3,983,121	1,304,710	2,503,539	1,971,539	2,932,186	3,127,356



Memorandum

To: Santa Cruz Water Supply Advisory Committee

From: Bob Raucher, Stratus Consulting Inc.

Date: 10/15/2014

Subject: October Work Plan Update

This memorandum provides a brief overview of progress on tasks described in the September 17, 2014 "Work Plan Development Update, and Subcontractor Recruitment and Preliminary Assignments."

1. Demand Management: Conservation, Water Use Efficiency, and Improved Forecasts

We are working with David Mitchell of M-Cubed on this task. We have included an enrichment memo in which we compare water use to several economic indicator variables for the Santa Cruz and Santa Barbara utility districts, and for the state of California. In that memorandum, we also present a comparison of 48 of Santa Cruz's top 100 water users' water consumption rates compared to the number of employees and revenue by subsector. Additionally, we have included a summary of the "Green Industry and Hospitality Industry" focus group workshops to understand the effect on Santa Cruz businesses of water use curtailments during drought that were held on September 24, 2014.

We also are working with Maddaus Water Management to tee up work on ways to shave peak season demands, and may complement this work with some input from John Rosenblum.

2. Climate Change: How Will Climate Change Impact Santa Cruz's Water Future?

We currently are in the process of working with Shawn Chartrand (Balance Hydrologics) and Gary Fiske (Gary Fiske and Associates) in conducting initial scoping investigations of: (1) how projected climate changes can be integrated into the hydrologic instream flow model, and then (2) how those flow results can be integrated into the *Confluence* model to project water system performance (e.g., surface water yields and associated projections of system reliability). This work is well underway, and we will summarize briefly at the October meetings.

3. Energy Requirements and Carbon Footprints of Potential Water Options

We are working to finalize a Task Order with John Rosenblum (Rose Environmental) to provide a preliminary assessment in which he develops preliminary estimates of energy use and carbon footprints associated with the baseline (including possible water treatment or pumping upgrades

as may be required for continued water quality compliance), desal, water reuse, water exchanges, demand management, and other relevant options. The alternatives to be investigated will be refined based on WSAC activities related to the Alts Fair and the October meetings. Brown and Caldwell may contribute to this exercise of assessing energy use requirements for the alternatives.

4. Fisheries: Flow Requirements and Impacts on Yields

This work is underway in concert with item number 2 (above), and will be included in that work product. Jeff Hagar is conferring with Shawn Chartrand and Gary Fiske as they model flow and yield impacts.

5. Water Storage (Inter-seasonal and/or Inter-annual)

We are working to finalize a Task Order with Pueblo Water Resources to conduct a review of (1) the feasibility of aquifer storage and retrieval (or other groundwater recharge and down-gradient extraction) of winter flows or reclaimed water within the aquifer systems in the region, and (2) The viability of developing North Coast brackish (or other) wells.

6. Groundwater Supplies and Management

See item number 5, Water Storage. Also, we are following up with HydroMetrics to see if they are available to research seawater intrusion questions and related topics, as related to the basin shared with Soquel Creek (HydroMetrics is checking with their Soquel Creek Water District clients to assure there is no perceived or actual conflict of interest in working with WSAC).

7. Water Recycling

Nothing underway yet on water recycling, although we can readily provide WSAC with good background information on nonpotable reuse (NPR) options as well as indirect potable reuse (IPR) and direct potable reuse (DPR).

8. Lifecycle Costing and Technical Scoping for Key Alternatives (Water Supply Options)

We are finalizing a Task Order with Brown and Caldwell to work on scoping key alternatives. They will attend the October WSAC meeting to get oriented to the committee and the multi-criteria decision support (MCDS) model. After WSAC selects of a set of potential Alternatives, Brown and Caldwell will provide preliminary estimates and related information on the following, to be presented at the November meeting:

a. Approximate costs

b. Energy requirements
c. Technical feasibility
d. Yields
e. Reliability
f. Other technical topics as requested, if reasonably achievable within the timeframe and budget of this TO
g. Indication of the extent of uncertainty associated with the above estimates (for use within the MCDS model).

9. Enrichment Series

We have developed an initial list of enrichment presentations. See enrichment overview memo (also in this packet) for more information.

Memorandum

To: Santa Cruz Water Supply Advisory Committee

From: Bob Raucher, Stratus Consulting Inc.

Date: 10/15/2014

Subject: October Subcontractor Update

The table in this memorandum presents a summary of the current status (as of Oct 15) of subcontracts and Task Orders (TOs) for the Santa Cruz Water Supply Advisory Committee process. We have prioritized subcontracts that are needed for the scoping work this fall.

Table 1. Summary of Subcontractor Status

Subcontractor	Subcontract status	TO
Balance Hydrologics	In process	
Brown & Caldwell	In process	In process
David Abbot		
Ebin Moser + Skaggs, LLP		
Gary Fiske and Associates, Inc.	Fully executed	
Hagar Environmental Science	In process	
HydroMetrics		
Lennihan Law		
Maddaus Water Management	In process	In process
Luhdorff & Scalmanini		
M-Cubed	Fully executed	Fully executed
Pueblo Water Resources	In process	In process
Rose Env. Engineering	Fully executed	In process
Trussell Technologies	In process	
George Tchobanoglous	In process	
Andy Fisher	In process	

Memorandum

To: Santa Cruz Water Supply Advisory Committee

From: Carolyn Wagner and Bob Raucher, Stratus Consulting Inc.

Date: 10/13/2014

Subject: Water use, use intensities, and the local economy

In this memorandum, we compare water use to several economic indicator variables for the Santa Cruz and Santa Barbara utility districts, and for the state of California. We compare Santa Cruz to Santa Barbara because comparable data were made available for both cities. We also present a comparison of 48 of Santa Cruz's top 100 water users' water consumption rates compared to the number of employees and revenue by sector. We report all data sources in section 3.

1. Local economic indicator comparison

We have developed two metrics to examine the economics associated with annual water use – real gross domestic product (GDP) per million gallons (MG) of water use and employment (number of jobs) per MG of water use. These metrics are presented as indicators of how water use is related to the local economy in terms of overall economic health (as indicated by real GDP) and employment. These metrics may also be viewed as indicators of the water-intensity of the current mix of business sectors in each location. For both metrics, we present the economic indicator in terms of total water use, which includes domestic consumption. Where data permit, we isolate water use to consumption by the Commercial, Industrial, and Institutional (CII) sector.

In Table 1, we present real GDP and employment data (reported by Metropolitan area) compared to water consumption for the Santa Cruz and Santa Barbara utility districts, in 2010. We also include real GDP and employment for the state of California per MG of water withdrawals (note that withdrawals are often considerably larger than consumption, especially in the agricultural and energy sectors). Where available, we show data relative to Commercial, Industrial and Institutional (CII) water use, as well as to total (CII plus residential) water use.

The results are a bit difficult to interpret. The results represent ratios of economic health to water use –for example, the results reported for Santa Cruz's Real GDP per MG CII, can be interpreted as every MG of water used in Santa Cruz's CII sectors generates a real GDP of $8.3 million. While these results provide relative relationships between economic health and water use, there are several data-related limitations to these metrics. First, comparing Santa Cruz only to one other city (Santa Barbara) provides a very limited and possibly misleading perspective. While

Santa Barbara does appear to generate more economic return per MG of water use, the underlying factors are not discernable from the data available. Additionally, we are comparing water use for the Santa Cruz and Santa Barbara utility service areas to economic indicators for the metropolitan statistical areas, which do not coincide and may distort the metrics.

Table 1: GDP and Employment per Million Gallons of Water Use, 2010

	Santa Cruz	Santa Barbara	California
Real GDP (Millions of chained 2009 dollars) per MG	2.88	4.53	0.14
Real GDP (Millions of chained 2009 dollars) per MG CII	8.30	18.55	
Employment (number of jobs) per MG	48.33	64.82	1.43
Employment (number of jobs) per MG CII	139.23	265.52	
Wage and salary employment (jobs) per MG	33.62	49.13	1.08
Proprietors employment (jobs) per MG	14.71	15.69	0.35

Second, the state-level data are very different from the city-level findings, because the California data embody the considerable volume of water devoted to agricultural irrigation (whereas limited city waters are applied for such purposes). The statewide data are also from a different source (the United States Geological Survey; USGS), and reflect estimated water *withdrawals* which are considerably higher than water consumption for some large water-reliant users such as power plants.

2. Top water users: employees and revenue by sector

We next compared the top 100 water users' consumption to their revenue and employment, using data from Lexis Nexis, which is database that provides company-level revenue and employment data. We were able to link 34 of these large water using customers to the Lexis Nexis data. We present employment and revenue per MG water used by businesses within each sector in Table 2. General businesses (a broad category) provide considerably more employment per MG than other subsectors, and the hotel subsector generates a considerable amount of revenue per MG.

Table 2: Employment and Revenue per Million Gallons per Year for Large Water Users by Sector						
Sector	***Number of users***	***Consumption (MG)***	***Employees***	***Revenue***	***Employees per MG***	***Revenue per MG***
Business-Hotel	2	11	87	$2,990,000	8	$269,300
Business-General	13	79	16,577	$45,563,779	210	$577,500
Multi-Family	19	102	80	$4,644,000	1	$45,500
Total	**34**	**192**	**16,744**	**$53,197,779**	**87**	**$279,900**

For comparison, we have included results from another study we conducted for the WateReuse Research Foundation in which we did a similar analysis comparing water consumption to sectorial revenue and employment data. We present the results in Tables 3 and 4. The results of Santa Cruz are not directly comparable to the results of the WateReuse report in that our Santa Cruz data set consists of the 100 largest water users, whereas the WateReuse report includes all CII customers for each utility. While there are data limitations with our Santa Cruz analysis (e.g., limited dataset, small number of observations and a non-random sample), a comparison of the results to these other cities does offer some insights. Specifically, there is noteworthy variation across the cities, both in terms of magnitude and distribution across sectors. One possible explanation for the variation across sectors is an artifact of how different utilities classify the sectors (e.g., their respective definitions of which entities belong in the "industrial" subcategory). Additionally, the cities vary substantially in their climates, populations, and local economies.

Table 3. Employment per MG per Year for Comparison Cities

	San Francisco	Phoenix	Oklahoma City
Commercial	350	75	134
Industrial	840	272	4
Institutional	63	15	101

Table 4. Revenue per MG per Year for Comparison Cities

	San Francisco	Phoenix	Oklahoma City
Commercial	$53 M	$8.3 M	$27 M
Industrial	$175 M	$85 M	$6.2 M

3. Data sources

2010 water use data for Santa Cruz and Santa Barbara is from the utility's respective Urban Water Management Plans:

- City of Santa Cruz. 2011. 2010 Urban Water Management Plan. Prepared by City of Santa Cruz Water Department. December 2011.
- City of Santa Barbara. 2011. Urban Water Management Plan. 2010 Updated – Adopted June 2011. Prepared by the City of Santa Barbara Water Resources Division. June 2011.

2010 water use data for the State of California is from the USGS:

- USGS. 2014. California Water Use 2010. US Department of Interior. US Geological Survey. Available: http://ca.water.usgs.gov/water_use/2010-california-water-use.html. Accessed 10/13/2014.

Employment and GDP data for Santa Cruz and Santa Barbara is from the US. Bureau of Economic Analysis:

Bureau of Economic Analysis. 2014. Real Gross Domestic Product (GDP) by Metropolitan Area, 2008-2013. Millions of chained (2009) dollars. Available http://www.bea.gov/regional/. Accessed 10/13/14.

Bureau of Economic Analysis. 2014. CA04 Personal income and employment summary by Metropolitan Statistical Area. Available http://www.bea.gov/regional/. Accessed 10/13/14.

Employment and GDP for the State of California is from the Bureau of Economic Analysis (BEA) (as reported by BEA and U.S. Energy Information Administration):

- Bureau of Economic Analysis. SA04 State Income and Employment Summary for 2005. Available: http://www.bea.gov/regional/. Accessed 10/13/14.
- U.S. Energy Information Administration. 2012. Real Gross Domestic Product by State. Available: http://www.eia.gov/state/seds/sep_use/notes/use_gdp.pdf. Accessed 10/13/14.

Water use data for large Santa Cruz customers is from the City of Santa Cruz. Personal Communication, 9/22/14.

Company employment and revenue is from the Lexis Nexis database:

- LexisNexis. Multiple company profiles. Retrieved 2014, March 24-25 from LexisNexis online database.

Results for the comparison cities in the WateReuse research Foundation study come from:

Raucher, R., J. Henderson, J. Clements, T. Meernik, M. Duckworth, J. Oxenford, J. Kiefer, and B. Dziegielewski. 2014. The Value of Water Supply Reliability in the CII Sector. WateReuse Research Foundation. WRF-09-04. (in print)

Summary of Focus Group Workshops to Understand the Effect on Santa Cruz Businesses of Water Use Curtailments During Drought

Jim Henderson, David Mitchell, Toby Goddard
Oct 15, 2014

Green Industry and Hospitality Industry Focus Group Workshops – September 24, 2014

The City of Santa Cruz, along with the rest of California, is facing one of the most severe droughts on record. In February 2014, the City Council declared a Water Shortage Emergency and Stage 3 restrictions from the City's drought response plan. Restrictions on water use went into effect May 1, 2014, including strict water rationing of all residential and irrigation customers within the City's water service area. Rationing of water for commercial businesses is not being required at this stage of the drought response plan, but businesses that provide services related to care of lawns and gardens, along with managers of large irrigated spaces such as parks and golf courses, are already being affected by irrigation restrictions under Stage 3. Rationing of water to all users including all Santa Cruz businesses would be required if the drought persists and the City is forced to adopt Stage 4 of the drought emergency response plan.

The Santa Cruz Water Department is seeking to better understand and document the current and potential future impacts of the drought on its business customers. On September 24, 2014, the Santa Cruz Water Department conducted two workshops to hear about drought impacts on the Santa Cruz business community. The first workshop was designed for "green industry" representatives to discuss impacts on gardening suppliers, landscaping and irrigation contractors, golf courses and city and county parks. The second workshop was a forum for the "hospitality industry" to discuss drought impacts on hotels, motels, restaurants, and the Santa Cruz Boardwalk. These sectors represent businesses that are either being directly affected by restrictions on landscape irrigation, or that may be among the first businesses affected by potential impacts on tourist visitation to Santa Cruz. Both workshops were hosted by Toby Goddard of the Water Department, with contractor David Mitchell of M.Cubed facilitating the discussion.

Green Sector Workshop Summary

At the first workshop, the green industry discussed current impacts from restrictions on landscape irrigation. Irrigation by residential customers has been cut by one-third, and irrigation by golf courses has been cut by one-half, and irrigation by parks has been cut by two-thirds. Two workshop participants representing landscape nurseries report their sales are down approximately 13 to 20% because not as many plants and other products are being sold. A shift in sales to drought-tolerant plant and non-plant products prevented the revenue impact from being even

greater. The impact of the drought on garden centers was stated to be roughly equal to the impact of the recent economic downturn starting in 2008. Uncertainty about water availability is likely to affect next year's net revenues by preventing garden centers from confidently placing large orders for the lowest cost supplies at trade shows due to the fear of not being able to sell this inventory during the next irrigation season.

Workshop participants representing irrigation contractors serving commercial and residential clients did not know the financial impact from the drought restrictions on their businesses yet, but they are already feeling them in several ways – particularly in spending extra time allocating manpower and discussing with frustrated clients how to best protect their landscaping investments. Often those customers have decided that they cannot protect their investments, and are letting their turf go without water.

A reduction in water use at the golf courses by 50% has meant that much of the turf on the courses is dead and weeds and warm season grasses are encroaching. This means that golf courses have become difficult to play, requiring players to now use "winter rules" to improve the lie of the ball to compensate for poor and inconsistent playing conditions. Two golf courses were represented at the workshop: the City of Santa Cruz's DeLavega course and the Pasatiempo Golf Club. The City's DeLavega course reports that golfers are now thinking twice about whether to come back because of difficult conditions. The Pasatiempo Golf Club is a destination course that caters to players from out of town. The Pasatiempo course is currently projecting a $500,000 decrease in annual revenues, and expects that if Stage 3 conditions persist next year, that losses could total approximately $1 million. Pasatiempo staff were particularly concerned about the effect the water use restrictions are likely to have on future demand. Visitation to Pasatiempo is highly dependent on recommendations from golfers, and the long-term concern is that reduced revenues will persist at Pasatiempo course even after the drought is over because of lingering effects from this drought on "word-of-mouth" regarding the course.

City of Santa Cruz and Santa Cruz County parks have also been experiencing drought impacts. The impact on turf has been severe with all of the turf turning brown and severe stress on the trees. The parks departments have been trying to water enough to keep the turf from dying so that it can be brought back when there is water available in the future. The community is feeling the effects of fields not being available for all of the desired kids and adult recreation activities due to irrigation restrictions.

The green industry representatives discussed long-term water supply and demand solutions for Santa Cruz. Participants discussed that there is a cost to doing nothing to solve water supply needs in Santa Cruz. They articulated that business owners have a long-term desire to develop healthy businesses that maintain their value over time, such that they can sell the businesses they have built at a reasonable price when they are ready to retire.

Hospitality Sector Workshop Summary

At the second workshop, the hospitality industry explained that business is generally very good this year and in the recent past for restaurants, hotels and motels, and the Santa Cruz Boardwalk. Business at the Boardwalk has increased every year since the Boardwalk's Centennial year in 2007. Occupancy is up at area hotels and motels. Santa Cruz is generally thought of as a desirable place to visit.

Businesses explained that they have made significant investments in water conservation in the past, and generally believe that they have already accomplished the easiest water conservation measures. The hospitality industry has been able to adapt to irrigation restrictions so far – there is generally less green turf now at these properties, and for areas where green grass is essential for marketing, businesses like the Boardwalk have been considering installing artificial turf. The Boardwalk has retrofitted all water using fixtures that it could (such as urinals) in order to save water, and has installed meters on all points of water use so that they can quickly narrow down any leaks or overages. Hotels are doing laundry every other day and sheets upon checkout. Properties are changing less of the pool water at one time in order to conserve.

Businesses have been educating their customers about the drought with approaches such as a letter in the room from the general manager that describes the drought situation and asks for the customers' help. Employees at these businesses have come up with their own ideas for how to save water, such as reusing melted ice from ice buckets used by visitors – employees pour this water onto the property's landscaping on their own initiative rather than under instruction.

The potential for continued Stage 3 water use restrictions, or rationing of future business water use under Stage 4 water restrictions, was a significant concern for the hospitality industry. All workshop participants strongly felt they had already undertaken all reasonable measures to conserve water. They were very concerned that further restrictions would start to impact both revenue and profitability of their operations. Businesses requested help in determining any additional water conservation measures they should take – either from the Water Department or from businesses that provide water use audits. The hospitality industry was concerned about getting credit for past water conservation, and for the role it plays in providing public services, such as restrooms used by the general public, that are paid for by the business. There was concern about fairness in any future requirements to meet a certain percent reduction in water use, if businesses are not given credit for past water use reductions.

Memorandum

To: Santa Cruz Water Supply Advisory Committee

From: Stratus Consulting Inc.

Date: 10/15/2014

Subject: Enrichment Opportunities

In this memorandum we present possible enrichment opportunities to share with the Santa Cruz Water Supply Advisory Committee (WSAC). We suggest offering a series of supplemental "enrichment" presentation/discussions because there are so many technical analysis issues for WSAC to consider within the context of its deliberations, and there is limited time available for such presentations and discussions within the constraints and other priorities associated with WSAC meetings. Some of the items listed below have been suggested by WSAC members. And, we are open to additional suggestions or requested priorities.

There are several options for how we can organize these enrichment presentations: immediately preceding the formal WSAC meetings, and/or at other times and venues as convenient for Committee members, as on-line Webinars, that can be recorded for viewing at any time, or perhaps some of the topics you want to actually include during a meeting.

Some of the topics that may be considered for the enrichment series include:

- **History of water treatment technology and where we are headed**. Some topics could include: membranes, UV and ozone today, and whether forward osmosis is a viable option in the near future.

  Potential Presenter: Rhodes Trussell

- **Water reuse: regulatory, public health, and technology overview.** To provide more context before the enrichment presentation, we would first distribute a white paper on regulatory developments and public health implications of indirect potable reuse (IPR) and direct potable reuse (DPR), and on technologies for IPR and DPR, including status of deployment or planned deployment of such technologies. Some topics could include water quality, regulatory development, and public health perspectives.

  Potential Presenter: Rhodes Trussell, George Tchobanoglous, or Bob Raucher

- **Desal technology** – A WSAC presentation on desal technology (including a glimpse at the concept and viability of forward osmosis) examples of technology applications, including capital and operating costs, energy footprint, energy offset strategy, life cycle cost analysis

Potential Presenter: Brown & Caldwell, or possibly others

- **Flows and Supply**. This could easily turn into two enrichment presentations. The first would focus on the relationship between surface water flows and extraction levels. The second would focus on how climate change will impact precipitation, temperatures and evapotranspiration and therefore flows and extraction levels.

  Potential Presenters: Gary Fiske and Shawn Chartrand

- **Climate change impact on water demands**.

  Potential Presenter: Karen or Bob Raucher, perhaps with input from Gary Fiske

- **Revenue Gaps and the Rate Impacts of Reduced Water Consumption.** In recent years, water utilities have struggled to develop appropriate pricing structures to allow for sufficient financial reserves for maintenance and growth and also promote conservation of water resources.

  Potential Presenter: David Mitchell, or Bob Raucher, or possibly someone from Raftelis

- **Lowering Peak Season Demands** –Presentation on regarding potential demand management programs that would result in lowered peak season demand. Program design and analysis for 10, 20 and 30 % reductions in peak season demand including public and private cost analysis. Data inputs to TBL and regional economic analysis of these three levels of peak season demand reduction

  Potential Presenter: Bill or Lisa Maddaus, possible input from John Rosenblum

- **Aquifer/hydrology/hydrogeology 101, as relates to Santa Cruz aquifers.**

  Potential Presenter: To be determined (possibly a principal from Pueblo Water resources, or Andy Fisher)

- **Water rights 101, as relates to Santa Cruz water-rights issues.**

  Potential Presenter: To be determined (probably Lennihan)

- **"Life Lessons" panel from the IRP on water-supply challenges they've faced and solved**

  Presenters: IRP members

- **Carbon footprint**. What is a carbon footprint, how is one developed, how can WSAC use this information?

Potential Presenter: John Rosenblum

DRAFT NOVEMBER MEETING

Public Comment, IRP feedback not built into this yet. // Before the November meeting the Ctte will have used the October Mtg version of the big model, with technical ratings supplied, against different futures and these private 'runs' will be collated, analyzed and presented at the Ctte meeting. In the meantime, someone or other will be preparing better technical ratings.

Time	Draft November Agenda Item	Lead	Pckt
5:00	Opening Remarks, Agenda Review, Updates	ND	
5:30	MCDS Report,* Overview (below not necessarily in this order)	CF/PM	**YES**
	Ctte's Weights Distribution, Decision's sensitivity to Weights; Discussion	CF/PM	
	Ratings—Initial, Changes, Comments; Sensitivity to the Ratings; Discussion	CF/PM	
	Uncertainty— overall uncertainty, uncertainty of the alternative	CF/PM	
	Shifts in weights and ratings depending on Simplified Scenarios; Discussion	CF/PM	
7:30	Break		
7:50	More Refined Ratings and *perhaps* stronger baseline/simplified scenario gap numbers (don't know yet whether that is realistic)	Consultants	yes
	How that affects the model	CF/PM	
	Model Runs: "What If?"		
8:15	Early Identification of no- or low-remorse portfolio items (unless this actually should happen in October, which I am more and more convinced of)	ND/PM	
9:15	Wrap Up	ND	
9:30	Adjourn	ND	
2:00	Opening, Correspondence, Reflection		
2:25	Using Different MCDS Runs: "What If?" (IRP?)	CF/PM	
	Explore the "its probably gonna hurt somewhere" proposals		
3:25	Insights on Research Agenda, Discussion and Agreement	CF/PM/BR	
4:25	Insights on Scenarios, Discussion and Agreement	KR	
5:00	The Planning Subctte ; Report to Council		

5:15	The Usual Wrap Up		
6:00	Adjourn		

Santa Cruz Police Department
Police Community Room
155 Center St.
Santa Cruz, CA 95060

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

WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA

Special Meeting

September 24 & September 26, 2014

ACTION Agenda prepared October 7, 2014 with action taken in bold type.

5:00 P.M. SPECIAL MEETING - SESSION ONE (SEPTEMBER 24): COMMUNITY ROOM

2:00 P.M. SPECIAL MEETING - SESSION TWO (SEPTEMBER 26): 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.

September 24, 2014 - 5:00 PM

SESSION ONE

Call to Order – Co-Facilitator Nicholas Dewar called the meeting to order at 5:17 p.m.

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

Welcome to the Public and Public Comment

Co-facilitators Fox and Dewar welcomed the public. Three members of the public spoke on matters relating to the availability of meeting materials, agreement on agenda items frequency of public comment, Committee Members' abilities to stand aside, recycling water, water storage and a potential alternative supply of water.

Committee Member Updates

Two Committee Members discussed matters related to outreach.

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.

Agenda Review

Co-Facilitator Dewar led the Committee Members in a review of the agenda for the WSAC's sixth meeting. **By consensus, the Committee agreed to accept the agenda as presented.**

The Baseline

WSAC Consultant Bob Raucher led Committee Memebrs in a presentation on the composition and use of the Baseline.

Scenarios

WSAC Consultant Karen Raucher led Committee Members in a discussion of Scenarios and a group exercise examining independent Scenarios regarding sustainability, fish and regulatory systems, Santa Cruz's economy, and climate change. **By consensus, the Committee agreed that the scenarios**

exercise was proceeding in a beneficial manner, and formed a work group that would meet between sessions to further develop the criteria that were described in the materials. Committee Members Stearns, Jacobson and Holt volunteered to participate in the work group.

Public Comment

Members of the public spoke on matters related to Scenarios.

Subconsultant Tasks

WSAC Consultant Bob Raucher led Committee Members in an overview of the draft work plan, which was circulated in the packet in advance of the meeting.

The Decision Model

Work on the Recon Decision Model was postponed to the following session in order to address the Convention decision model.

Santa Cruz Water Supply Convention

Committee Member Engfer led Committee Members in a report on the progress of the Santa Cruz Water Supply Convention Subcommittee and a discussion on the Convention Decision Model. The discussion was further postponed to the next session.

Public Comment

Three members of the public spoke on matters related to the decision tool.

Materials Resulting from the Previous Meeting

Committee Members reviewed the Meeting Summary and Action Agenda of the Committee's July meeting. **By Consensus the Committee agreed to approve the Action Agenda and the Summary of its August meeting.**

Public Comment

Two members of the public spoke on items related to the Convention.

Written Review and Wrap Up

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

<u>Adjournment</u> – At 9:33 p.m. the Water Supply Advisory Committee adjourned from its first session on September 24, 2014 of the sixth regular meeting to its second session on September 26, 2014 at 2:00 p.m. in the Fellowship Hall, at the Peace United Church of Christ.

Water Supply Advisory Committee

September 26, 2014 – 2:00 PM

SESSION TWO

Call to Order – Co-facilitator Nicholas Dewar called the meeting to order at 2:17 p.m.

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

Public Comment

Two members of the public spoke on matters regarding the Committee's ability to select solutions and a Water Convention presentation.

Correspondence Received from the Community

Acting Corresponding Secretary Sue Holt led Committee Members in a report on the letter received from Gary Patton, which was discussed during the previous session.

Review of Previous Session

Committee Members noted the number of issues that were carried over from the previous session and asked that issues be resolved rather than postponed.

Review Agenda for this Session

Committee Members reviewed the agenda. **By consensus, the Committee agreed to include a report from Assistant City Manager Tina Shull regarding the Public Attitudinal Survey.**

Economics of Reliability

WSAC Consultant Bob Raucher led Committee Members in a description and discussion of the economics of reliability.

Real Deal Planning Subcommittee

Committee Members discussed the report on the Real Deal Planning Subcommittee. **By consensus, the Committee agreed to create the**

Real Deal Planning Subcommittee. Committee Members Mesiti-Miller, Longinotti, Beckmann, Engfer, Baskin, Slatter and Stanojevic volunteered for the Real Deal Planning Subcommittee. The Real Deal Planning Subcommittee will be charged with sequencing and structuring the Committee's discussion by identifying what it has explored and rejected and using the support of the Committee's consultants and facilitators to recommend a range of alternative work plans for the Committee; the Subcommittee's duration will be no longer than six months; and the Subcommittee will not communicate externally and will report to the Committee by including written reports in the meeting packet.

Real Deal Consultant

Co-Facilitator Fox led Committee Members in a discussion regarding the progress of the City in recruiting a technical support consultant for the Real Deal. **By consensus with one member standing aside, the Committee agreed to recommend the confirmation of Stratus as the technical support consultant for the Real Deal.**

Evolution of the Decision Model and Plans for November

Co-Facilitator Fox led Committee Members in a discussion regarding the decision model. **By consensus, the Committee agreed that a working group should meet during the week of September 29 to consider these issues and develop a version of the model for use by the Committee at the Convention. Committee Members Stanojevic, Engfer, Baskin, Holt, Longinotti and Mesiti-Miller volunteered for the working group.**

Public Comment

One member of the public spoke on matters related to the decision model.

Recon Outreach Subcommittee Update

Recon Outreach Subcommittee member Charlie Keutmann reported that the Speakers' Bureau is organizing presentations to meetings of civic groups.

Independent Review Panel

Committee Members discussed the IRP Policy, Role and Procedures Protocols that the IRP Subcommittee had recommended to the

Committee. **By consensus, the Committee agreed that the Committee's meeting materials should be provided to the IRP as early as possible and agreed to the Protocols, Roles and Procedures recommended by the Subcommittee with the additional provision that the Real Deal Planning Subcommittee will be able to directly ask the IRP for advice.**

Agendas Through the End of Recon

Co-Facilitator Fox led Committee Members in a review of the outline for topics for the October, November and December Committee meetings. By consensus, the Committee agreed that the Convention Subcommittee should immediately forward to Water Director Menard any evident patterns of research needs that emerge from the proposals of the Convention.

Oral Communication

One member of the public spoke on matters related to the rating system and its connection to capital projects.

Reflections with IRP Members

IRP Members discussed their perspectives, insights and reflections on the issues discussed and actions taken by the Committee at this meeting.

Written Review and Wrap Up

Co-Facilitator Dewar 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 6:03 p.m., the Water Supply Advisory Committee adjourned from the regular meeting of September 24 & 26, 2014 to its next meeting on October 23-24, 2014 in the Fellowship Hall, at the Peace United Church of Christ and Police Community Room, at the Police Department.

2nd Draft Recon Model

Oct 20th after Friday call: Doug, Sue, Rick, Erica, Rosemary, Karen, Nicholas (Mark sent notes).

Implementability

Note: The likelihood of getting this approach done.
Question: How much does each subcriterion matter to you in meeting the requirements for implementability?

Technically Feasibility

Note: Technical feasibility is an estimate of whether this approach would work as envisioned.
Question: How feasible is this approach technically?
Proven in cities, Demonstrated in field, Promising in 3-5 years, Promising in 6-10 years, Not promising

Legal and Regulatory Feasibility

Note: This addresses siting, water rights, environmental and regulatory review and other legal and regulatory issues related to supply as well as legal and regulatory issues related to demand reduction.
Question: Is the approach feasible from a legal and regulatory perspective?
Precendented, simple, Precedented,
complex, No precedent but likely, No precedent difficult, Very unlikely

Politically Feasibility

Note: Extent to which an approach will claim and retain the support of formal political entities as well an informal social and political groups. This applies to demand reduction (e.g. volunteerism, finances for incentives or enforcement of regulations) and to supply. (E.g. majority public vote requirement for desalination, willingness to make large capital investments or concerns about oversupply and water inmigration.)
Question: What level of political reaction is this approach likely to have?
Broad Enthusiastic, Solid, Moderate, Indifference, Active Resistance

Cost-Effectiveness

Note: Cost-Effectiveness includes capital expenditure, operational expenditure and lifecyle costs.
Question: How cost-effective is this approach?

(This criterion has no subcriteria.)

Community Well-being

Note: Encompasses a range of social and community values.
Question: How important are the subcriteria to you in evaluating the criterion 'Community Well-being?'

Traditional Community Character

Note: This goes to the desire to have a future Santa Cruz that looks like Santa Cruz does now, in terms of landscaping and gardens and in other ways as well.
Question: How well would this approach support traditional community character?
No change, A few minor changes, Significant change, Major changes, Water migrants leave area

Climate-Adapted Community Character

Note: The look and feel of the community as it relates to a climate-adapted paradigm. Santa Cruz would change, but the change could be as beautiful or pleasing as the present landscape or character, but be more sustainable. This change would be embraced by the community.
Question: How well does this approach foster a shift towards a community character that differs from the present: While being more frugal of water is beautiful in a different way? [note I meant 'resounding' as in—wholeheartedly accepted but now that I am working on the text output I see that doesn't work.]
Resounding Beautiful, Accepted often pleasing, Some stresses, Discord displeasing, Severe distress

Regional Water Stability

Note: This gets at approaches that would not only redound to the benefit of SC water customers, but to the region.
Question: Would this approach improve regional water stability?
Greatly Improves, Improves, Has little effect [The fact that this scale is so generic suggests that I am not really sure what the subcriterion means. Not that there isn't a meaning, just that I don't know it.]

Local Economy

Note: This refers to the health of Santa Cruz's economy.
Question: How might this proposal affect Santa Cruz's economy?
Water isn't an issue, Water a mild concern, Water concerns drag, Key worry in BUSI plans, Major disincentive [BUSI is the official abbreviation for 'business.' Doug, could I please use 'biz?']

Environmental Well-being

Note: This criterion relates to the degree to which a water supply or demand management strategy contributes to or impacts the quality and sustainability of the natural environment.
Question: How important are the subcriteria to you in evaluating the criterion "Environmental Well-being?'

Energy Intensity

Note: The degree to which a proposal will demand energy from cradle to grave: the making of component parts, the building or installation of materials or facilities including delivery systems, operation and maintenance as well as disposal.
Question: Taking the entire cycle into account, from producing parts to disposal, how much energy will this approach require per MG of water?
0 -1,000 tonnes/MG,
1,000 -2,000 tonnes/MG,
2,000 -3,000 tonnes/MG,
3,000 - 4,000 tonnes/MG,
> 4,000 tonnes/MG

Marine Ecosystem Health

Note: I'd like to have a better scale--how does it harm? Then the bottom of the scale would be "creates severe turbidity" or "confuses fish" or whatever the feared impact is....
Question: How would this approach affect marine ecosystem health?
Note:
Negligible effect, May harm, Will harm

Freshwater Ecosystem Health

Note: This rating encompasses the positive (e.g. when restoring watersheds or by creating an easier option to leave more water in the river) as well as potential harm. One of the commenters on the Convention model referred to the former as 'direct impact' and the latter as 'indirect impact.'
Question: If this approach were implemented, how would it affect freshwater ecosystems?
Plentiful healthier water, About as it is now, Degraded ecosystem health

Terrestrial and Riparian Health

Note: There's some question about whether to put 'riparian' with 'freshwater.'
Question: How does this approach affect terrestrial or riparian health?
Actively restores, Allows restoration, Does not affect, Depletes Resource, Greatly Depletes Resource [between 'actively' and 'allows' trying to get at the difference between pumping water in versus just leaving it alone to recover]

Groundwater Resources

Question: How would this approach affect groundwater resources?
Actively restores, Allows restoration, Does not affect, Depletes Resource, Greatly Depletes Resource

Adaptability

Note: Characteristic of a supply project that relates to how well the approach can be modified over time to respond to changing conditions.
Question: How important are the subcriteria to you in evaluating the criterion 'Adaptability?'

Infrastructure Resilience

Note: Infrastructure resilience relates to the approach's ability to withstand earthquakes, fires, disruption of energy supply etc.
Question: How well would this approach withstand natural disasters and other disturbances?
Most challenges well, Many moderately well, Some somewhat, Few barely, Fragile

Reliable Supply

Note: Reliability of water supply relates to how much water can be produced under various climate conditions such as drought or extreme precipitation.
Question: Will this approach consistently produce as envisioned?
98% of the time or more, 90 to 98% of the time, Less than 90% of the time

Scalability

Note: Scalability measures the extent to which an approach can be scaled up or down as needs change. This includes changes in cost-effectiveness.
Question: How easily can this approach be scaled up or down while still working as envisioned?
Easy broad range, Moderate ease and range, Not scalable

Preserves Future Choices

Question: How well does this approach preserve future choices?
Many options kept open, Some kept open, Few closed off, Some closed off, City locked in

Effectiveness

Note:
The ability for a particular alternative to align supply and demand.
Question: How well will this alternative align supply and demand?

Yield

Note: Reduction in demand or increase in supply.
Question: How much water will this approach save or produce?
More than 3 MG / day,
2 MG - 3 MG / day,
1 MG - 2 MG / day,
0.2 MG - 1 MG / day,
Less than 0.2 MG / day

Flexibility

Note: The degree to which this approach increases management flexibility that in turn helps the system "get by with less" while still meeting resilience, reliability and other goals. (This is particularly designed for approaches that

don't actually increase supply or reduce demand, but might nevertheless be useful.)
Question: To what extent does this approach increase flexibility?
Maximizes, Greatly increases, Moderately increases, Somewhat increases, Does not increase

Addresses Peak Demand

Question: Does this approach address peak demand?
Yes, Maybe, No

WSAC Record of participation combined with anticipated attendance

	30-Apr	1-May	2-May	29-May	30-May	26-Jun	27-Jun	30-Jul	1-Aug	27-Aug	29-Aug	24-Sep	26-Sep	23-Oct	24-Oct	19-Nov	21-Nov	17-Dec	19-Dec
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																			

Peace United Church of Christ
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Police Community Room
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WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA

Regular Meeting

October 23 - 24, 2014

5:00 P.M. REGULAR MEETING - SESSION ONE (OCTOBER 23): FELLOWSHIP HALL

2:00 P.M. REGULAR MEETING - SESSION TWO (OCTOBER 24): POLICE COMMUNITY ROOM

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."

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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.

The City of Santa Cruz does not discriminate against persons with disabilities. Out of consideration for people with chemical sensitivities we ask that you attend fragrance free. Upon request, the agenda can be provided in a format to accommodate special needs. Additionally, if you wish to attend this public meeting and will require assistance such as an interpreter for American Sign Language, Spanish, or other special equipment, please call the City Clerk's Department at 420-5030 at least five days in advance so that we can arrange for such special assistance, or email CityClerk@cityofsantacruz.com. The Cal-Relay system number: 1-800-735-2922.

Water Supply Advisory Committee Agenda

October 23, 2014 - 5:00 PM – 9:30 PM

SESSION ONE

Call to Order – Meeting Convenes

Roll Call

Welcome to Public and Public Comment

A hand out will be provided to attendees. An opportunity for public comment on agenda items is provided at the beginning of each session of the meeting. An opportunity for oral communication by members of the public about issues relevant to the work of the Committee is provided at the end of the final session of the meeting. Additionally the Committee will provide an opportunity for public comment before major decisions are made.

Committee Member Updates

Committee Members will update the Committee on significant communications between them and other Santa Cruz entities with significant interest in the development of water policy in Santa Cruz.

Agenda Review

Committee Members will review the agenda for the WSAC's seventh meeting.

Results of the Attitudinal Survey

Principal of Gene Bregman & Associates, Gene Bregman, will lead Committee Members in a discussion on the findings of the Attitudinal Survey.

Review Outcomes of the Convention

Members of the Convention Subcommittee will lead Committee Members in a discussion on the outcomes of the Convention.

Weights in the Convention Decision Model

Co-Facilitator Carie Fox and Consultant Philip Murphy will lead Committee Members in a discussion on the Members' experiences weighing the importance of criteria and the best ways to use this feature. Committee Members will also discuss what standards they use when deciding on the relative importance of criteria.

Demonstration of Sensitivity Analysis Using Convention MCDS Results

Consultant Philip Murphy will use examples of sensitivity analysis based ont eh results of the Convention decision model and describe how it can be used as a tool for prioritizing research. The Committee Members will also discuss its applicability to their work and will consider what method to use for prioritization of research.

Simplified Scenarios and Problem Statements

WSAC Consultants Karen and Bob Raucher will lead Committee Members in a presentation on the Simplified Scenarios.

Recon Outreach Subcommittee Update

Members of the Recon Outreach Subcommittee will lead members in a report on outreach activities.

Written Review and Wrap Up – Identification of any incomplete issues to be carried forward to tomorrow's session.

Adjournment – The Water Supply Advisory Committee will adjourn from its first session on October 23 of the regular meeting of October 23 - 24, 2014 to its second and final session on October 24 for an open session after the hour of 2:00 p.m. in the Police Community Room at the Santa Cruz Police Department.

Water Supply Advisory Committee Agenda

October 24, 2014 – 2:00 PM – 6:00 PM

SESSION TWO

Call to Order – Meeting Reconvenes

Roll Call

Public Comment

Presentation – Correspondence Received from the Community

Committee Corresponding Secretary Mike Rotkin will lead the Committee Members in a discussion on correspondence received from the community.

Review of Previous Session

Committee Members will review the previous session and the agenda for the current session.

Clarification of All the Components of the Recon Decision Model

Co-Facilitator Carie Fox will work with Committee Members to build on their experience with the Convention model and clarify all the component parts of the Recon Decision Model.

Forecasting Water Demand

Water Department Staff Toby Goddard will lead Committee Members in a presentation of information describing how the demand forecast used in the 2010 Urban Water Management Plan and the Water Supply Assessment for the City's 2030 General Plan were developed. Toby will also describe current trends in new water accounts as compared to the historical information on this topic.

General Plan Growth Targets

The presenter will lead Committee Members in an explanation on what drives the growth estimates in the GP and what actions the GP requires the Water Department (and other City departments) to take.

Stratus Work Plan Report

WSAC Consultant Bob Raucher will lead Committee Members in an update on the progress of current assignments.

Agenda for November and December

Committee Members will discuss the agenda outlines for the Committee's November and December meetings.

Real Deal Planning Subcommittee

The Committee will discuss how the Real Deal Planning Subcommittee's role fits in the time-table of the Committee's work

Materials Resulting from the Previous Meeting

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

Oral Communication

Written Review and Wrap Up – Identification of any incomplete issues to be carried forward to next meeting.

Adjournment – The Water Supply Advisory Committee will adjourn from the second session on October 24 of the regular meeting of October 23 - 24, 2014 to its next meeting on November 19, 2014 at 5:00 PM and November 21, 2014 at 2:00 PM in the Fellowship Hall at Peace United Church of Christ, 900 High St. Santa Cruz, CA 95060 and the Police Community Room at the Santa Cruz Police Department, 155 Center St. Santa Cruz, CA 95060.

DATE: October 16, 2014

TO: Members of the Water Supply Advisory Committee

FROM: Mark Mesiti-Miller

SUBJECT: Santa Barbara Water Supply Summary from the Chamber's Community Leadership Visit

This year's Santa Cruz Chamber - Community Leadership Visit was to Santa Barbara. This location was chosen, in part, because of some similarities between Santa Barbara's water issues and those in Santa Cruz. The visit occurred in early September of this year.

Attached is a short summary of what the Chamber collectively learned about Santa Barbara's water issues on the visit. There are some interesting strategies here the WSAC might consider as we continue to work on Santa Cruz's water issues.

Community Leadership Visit Report:

Why Santa Barbara Water Supplies Exceed Requirements

Water department managers from districts in Santa Barbara County described their current situation as a "water crisis" in presentations to the Chamber's Community Leadership Visit (CLV). But their water supply problems don't begin to compare to those facing water districts in Santa Cruz County.

For instance, the two largest districts on Santa Barbara's south coast have instituted drought-motivated conservation measures but, unlike Santa Cruz, neither has had to institute mandatory rationing. The Goleta district was particularly proud of their 10% reduction in water use, exceeding the targets of their Stage 1 Water Shortage measures first introduced in March of 2014.

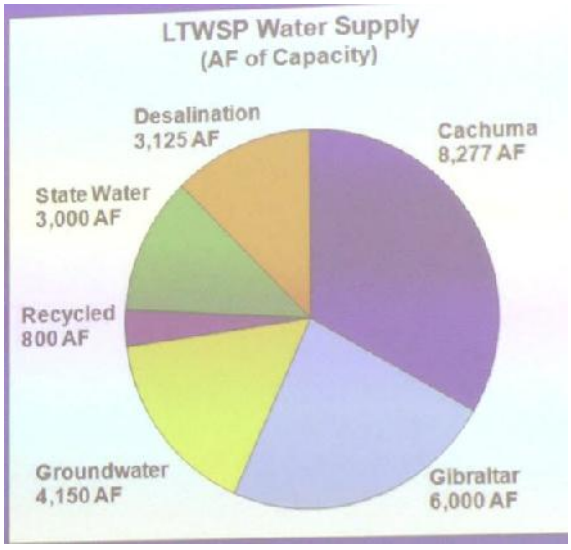
How have these Santa Barbara districts avoided the more intrusive conservation measures the City of Santa Cruz (30% reduction) and the Soquel Creek Water District (proposed 30% reduction for the next 20 years)? The annual average rainfall in Santa Barbara is about 1/3rd less than in Santa Cruz. Per capita use of water in Santa Barbara water district is 130 gross gallons per day compared to 95 g.g.p.d. in Santa Cruz. So, Santa Barbara's comparative water advantage is not attributable to either greater natural supply or better water conservation.

They attribute their relative success in addressing water issues to two initiatives. First, the relative security of their water supply is the result of a long-term public commitment to diversifying sources. Second, it is the result of strategic management of both those sources and of their delivery systems.

Water Supply History.

In the 1980s the Santa Barbara City Water District was almost entirely dependent upon two sources: surface water and ground water sources. This already provided them with greater diversity than either the Santa Cruz district, which is almost entirely dependent upon surface water (i.e. current rainfall), or the Soquel Creek District, which relies entirely on ground water (i.e. stored rain water.)

During the early 1980s plans were implemented to construct a water recycling plant and a gray-water delivery system. In the late 1980s Santa Barbara also joined with the Goleta and Montecito water district to develop a desalination plant. The recycled water plant came online in 1989, the desalination plant was completed in 1992.



And the Goleta and Santa Barbara districts joined with other districts in Santa Barbara and San Luis Obispo Counties to construct a link to the state water system.

The result has been to provide a range of supply resources that don't depend entirely on local rainfall. The graph of the Santa Barbara water supply

resources depicts the average annual water resources available to the City's water department.

They include annual rights to a portion of the water stored in the Cachuma and Gibralter reservoirs (Santa Barbara's annual share is 14,277 acer feet (AF)), an estimated average ground water capacity of 4,150 AF, recycled water of 800 AF per year, state water of 3,000 AF per year, and desalinated water of 3,125 AF per year. These sources provide a total estimated average annual capacity of 22,352 against an estimated annual demand of 14,000 AF.

In addition the 1989 drought was a catalyst for the development of a conservation plan which has succeeded in a long-term reduction in per capita water demand to the current 130 g.g.p.d. level.

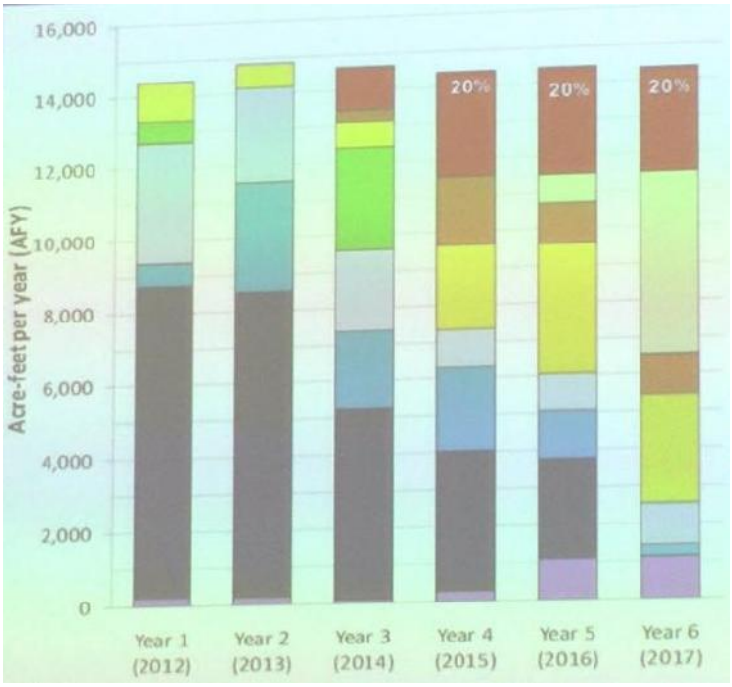
Strategic Water Planning.
The drought that began in 1989 also made clear that for these resources to insure water availability in a changing environment it was necessary to develop a flexible strategic plan for their use. These plans have permitted both the Santa Barbara and Goleta districts to provides strategies adaptive to complex circumstances without relying on draconian measures such as a moratorium on water connections or significant increases in water rates.

The chart (to the right) reflects the Santa Barbara City Water District's Drought current Annual Supply Strategy. The strategy document is revised annually beginning with one critical assumption: if the region is not currently in a drought, the District assumes that a drought will begin in that planning year and last for six years. Once a drought does begin, the District updates the drought water strategy to adapt to current supply conditions assuming that drought will continue for the full six years.

California's current drought began in 2012. This chart describes the amount of water drawn from each resource in 2012 and 2013 and the expected water draws for the years 2014 through 2017 from those and other sources. These sources and expected sources include the following (from the bottom block on each bar to the top.

Recycled water.
(Purple box at the bottom) This relatively small source has been shutdown in 2014 to rehabilitate the plant, permitting significantly greater production in subsequent years.

Cachuma Reservoir.
(Black box) Historically the largest single source, this reservoir is currently about 45% full. Shared by several water districts, it was necessary this year to fund and install a pumping station to insure that water will reach the gravity-feed distribution pipes. At current drought levels the District does not expect to be able to draw any water from this reservoir in the year 2017.



Cachuma Reservoir Carry-over.
(Darker-blue box) As a result of prior supply management the District has "banked" rights to water in the Cachuma reservoir in excess of its annual allowance. These banked amounts will be drawn down by the end of 2017 if the drought continues.

Gibralter Reservoir and the Mission Tunnel.
(Light-blue box) The City's older reservoir, Gibraltar, and its transport system, the Mission tunnel (which is also collects a relatively small amount of ground water) will provide water through 2017.

State Water.
(Green box) State water is predominantly sourced in the Sierras and piped from the Central Valley. While it does permit banking of water rights, delivery is much less certain than other locally controlled sources. The District does not expect to receive any state water in 2015.

Ground Water.
(Yellow box) The City has been able to mimimize its pumping of ground water for the last decade, creating a relatively secure supply for later years of the drought.

Water Purchases.
(Brown box) Availability is both uncertain and certain to be quite expensive compared with other sources. Note that the District expected to begin water purchases in 2014.

Extraordinary Conversation.
(Red box). This reflects the expected saving from the City's voluntary Stage 2 conservation declaration in 2014 and likely Stage 3 conservation requirements beginning in 2015.

Desalination.
(Light-green box) The key element for later drought years will be the restart of the District's mothballed desalination plant. Without this resource the City's would either have to increase its conservation measures to be more than a 50% reduction in use or find other sources of water.

It is also noteworthy that in beginning the 2015 revision of the Districts conservation strategy it has begun planning for a seven year drought.

The Santa Barbara and Goleta water systems provides significantly greater flexibility than those in Santa Cruz County. By not using some available resources in a given year it is possible for those districts to create reserve supplies for drought periods, to perform maintenance on significant sources without risk to supplies, and to limit the use of more expensive sources such as desalination for periods of need.

Memorandum

To: WSAC

From: Stratus Consulting Inc.

Date: 10/15/2014

Subject: Links to relevant documents

Below are links to research that may be of interest to you. Please let us know if you would like us to present information related to these studies at a future WSAC meeting, or if you would like us to research other areas and provide you with the links to relevant documents. Feel free to reach out with questions concerning any of this material.

- Water reliability (this document is available for purchase at the site below)
  - https://www.watereuse.org/product/08-09-1
- Stakeholder process
  - http://www.sca.nsw.gov.au/__data/assets/pdf_file/0007/36898/Climate-Change-Impact-Assessment-2010.pdf
  - http://www.cap-az.com/index.php/departments/planning/service-area-planning/wheeling
  - http://www.austintexas.gov/department/city-austin-lcra-water-partnership
  - http://cfwiwater.com/
  - https://www.cityofmadison.com/water/documents/ENG-0101-080702-WUFacilitiesPublicParticipationProcess.pdf
  - http://water.epa.gov/infrastructure/sustain/upload/EPA-s-Planning-for-Sustainability-Handbook.pdf
- Demand forecasting
  - The Water Research Foundation published this study led by University of Louisville Kentucky researchers to document changes in water use over time since 1992 (when the National Energy Policy Act required low-flow toilets and showerheads). This report documents reduced sales of water by water utilities over time, has a good discussion of possible causes in the background and literature review.

http://www.waterrf.org/PublicReportLibrary/4031.pdf

- Orange Water and Sewer Authority in North Carolina produced it's 2010 Long-Ranger Water Supply Plan, which contains demand projections over time with some discussions of the reasons why.

  http://www.owasa.org/Data/Sites/1/media/whatwedo/appendix%20ii%20complete%20090211.pdf

- See page 78 of the PDF (page 5-6 of the document) for a graphic of forecasts over time from Washington DC Metro Area water providers

  http://www.potomacriver.org/publicationspdf/ICPRB05-6.pdf

- The same thing has been happening with electric utility industry forecasting. See this page from the book *Experts in Uncertainty: Opinion and Subjective Probability in Science*.

  http://books.google.com/books?id=4taZBr_nvBgC&pg=PA45&lpg=PA45&dq=oil+prices+in+1985+dollars+and+projected+prices+from+Dutch+experts.+(Kok,+private+communication)&source=bl&ots=k8-ocl0H69&sig=tLJkoNY9l8FJ6yz2dwuuBEO_ysc&hl=en&sa=X&ei=S405VJUBi6vIBIv8gZgC&ved=0CB4Q6AEwAA#v=onepage&q=oil%20prices%20in%201985%20dollars%20and%20projected%20prices%20from%20Dutch%20experts.%20(Kok%2C%20private%20communication)&f=false

- The Seattle area also has a classic graphic of forecasts being wrong over time. This document has a brief section on the history of demand forecasts in Seattle.

  http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=books&cd=1&ved=0CCsQFjAA&url=http%3A%2F%2Fwww.ecs.umass.edu%2Fwaterresources%2Fprojects%2FKingCounty%2FKCReviewSeattleDemand_9-8-06.doc&ei=7Y05VNT-NsqqyASn74GgDw&usg=AFQjCNGwXL6UuFp-EuPxx2QfJ9svryezXQ&sig2=NJku_-

Criterion	SubCriterion		
Implementability	Technically Feasible	Reg Legal Feasibilty	Politically Feasible
Cost	Cost-Effectiveness		
Community Well-Being	Trad-'I Character	Climate- Adapt Character	
	Regional Water Stability	Local Economy (?)	
Environmental Well-Being	Energy Intensity	Marine	Freshwater
	Terrestrial Riparian	Groundwater	
Adaptability	Infrastructure Resilience	Scalability	
	Reliability Water Supply	Future Choices	
Effectiveness	Yield (?)	Flexibility	Seasonality

September 30, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: 2014 General Manager's Performance Evaluation

The General Manager's anniversary of hire date is July 8. The District's contract with the General Manager calls for an annual performance evaluation by the full Board of Directors and provides that merit increases in salary may be awarded at that time as determined by a majority vote of those Board members present. Also, in the absence of any merit increase, salary adjustments to address salary compaction issues must also take place in open session. The performance evaluation is conducted in Closed Session, and action to adjust salary, if any, must be taken in Open Session. At the Board's direction, this item will be placed on the next agenda. Currently the General Manager's salary is preventing the Managers group from negotiating a new agreement. Their current agreement expired in February 2014. All Managers salaries will have to be frozen indefinitely if the Board chooses not to include a salary adjustment on an upcoming Agenda.

The following is a recap of the District's more important issues and achievements over the past year. This list of the organization's accomplishments reflect a team effort, and I wish to acknowledge the dedication and significant contributions of the District Staff and Consultants. They have worked very hard over the past year to provide professional analysis and recommendations on issues and then effectively implement the Board's policy direction.

1. Integrated Resources Planning - Conjunctive Use Program

a. Dealt immediately with the City's withdrawal from the joint desal project by developing a plan to conduct several single-topic meetings that address components of the IRP. These meetings have been open to the public and have been well attended by the community.
b. Prepared background information and developed a criteria based process for completing selection of preferred alternative(s) for supplemental supply
c. Conducted public outreach and hearings, which also involved widespread notification, development of presentation materials on the issues and alternatives, and recording public comments both by court reporter and video footage
d. Conservation Analysis – Discovered financial planning flaws in Full Toolbox program and redesigned conservation program to avoid unforeseen financial pitfalls
e. Board action to select alternatives for further evaluation
f. Moving forward with planning for feasibility studies on supplemental supply
g. The following is a list of special topic meetings staff has initiated:

- September 17, 2013 Board Meeting: Workshop focused on water supply planning goals and objectives, what's "changed" since the 2012 Integrated Resources Plan Update was approved, previous and new alternatives to consider, and screening criteria to use for subsequent alternatives analyses and evaluation.
- October 16, 2013 Board Meeting: Exploratory discussion focused on desalination options that included a presentation by representatives from Deep Water Desal on the Moss Landing proposed project and a presentation by District staff on a District-Only desalination project.
- November 5, 2013 Board Meeting: Exploratory discussion focused on surface water options that included presentations by Jerry Paul and Bill Smallman (both local citizens engaged in water supply alternatives), and an update presentation by John Ricker on the surface water exchange report. Surface water attorney Peter Kiel and Lisa McCann (Regional Water Board's water rights liaison) both teleconferenced in.
- January 7, 2014 Board Meeting: Exploratory discussion focused on reducing water demands with mandatory water rationing. This option is not a supplemental water supply option but rather a demand reduction alternative should a supplemental supply not be secured. Staff presented a phased approach to water rationing that would allow the District to accelerate water savings while it continues evaluation and pursuit of a supplemental supply.
- February 4, 2014 Board Meeting: Exploratory discussion focused on recycled water options that included presentations by Dave Smith (Managing Director of WateReuse Association), Mark Dettle (Public Works Director for the City of Santa Cruz), Todd Reynolds (Kennedy/Jenks Technical Advisor), and Bill Smallman (local citizen and engineer). The alternatives discussed included recycled water for irrigation, seawater barrier, and potable reuse (directly as well as for groundwater replenishment). This meeting also included an overview of the proposed evaluation criteria and scorecard approach for assessing alternatives.
- March 4, 2014 Board Meeting: Exploratory discussion focused on groundwater rights and management framework. Presentations were given by Russell McGlothlin (attorney with Brownstein Hyatt Farber Schreck), John Ricker (SC County Water Resources Division Director) and staff. This meeting did not go into groundwater options per se, but rather gave an overview of groundwater law in California, the County's role and responsibilities with non-municipal pumping, and the District's current and future groundwater management activities. There was also discussion on establishing a Groundwater Replenishment District and/or having the

functions be part of the existing Joint Exercise of Powers Agreement (JPA) AB3030 framework, peer review of the District's hydrological analyses, and declaration of a groundwater emergency.

- March 18, 2014 Board Meeting: Staff requested that the Board provide direction and approve which back-up options that were introduced during the exploratory discussions should be brought back to the Board for the evaluations workshop. The options selected were Deep Water Desal, In-District desalination, surface water transfers, and recycled water (for seawater barrier, irrigation, and groundwater injection).
- April 1, 2014 Board Meeting: Exploratory discussion on accelerating conservation with a 'Water Use Reduction Program' (previously referred to as Phase 1) aimed at achieving a 500 acre-feet per year water savings within two years. The Board was very interested in moving forward with this type of long-term program.
- April 29 and June 3, 2014 Board Meetings: Focused on establishing a water connection moratorium or expanding the water demand offset program. Public comments were taken on 4/29 to address the aforementioned topics and a public hearing was held on 6/3 on these two issues as well on considering declaration of a groundwater emergency or water shortage declaration. The Board voted to expand the water demand offset program, declare a groundwater emergency, and declare a stage 3 water shortage emergency.
- June 17, 2014 Board Meeting: Focused on the Board adopting the declarations of the groundwater emergency and stage 3 water shortage emergency, adopting the revisions to the existing WDO program, and providing input on the CONSERVATION*plus* Program (previously known as the Water Use Reduction Program) components.
- July 15, 2014 Board Meeting: Focused on the peer review of the hydrological studies of the District and next steps to address the basin deficit and basin recovery yield. Also at this meeting, the Board kicked-off the alternatives-based evaluation of the back-up options with a staff memo related to the common criteria and conceptual technical evaluation of the alternatives. The concepts of a mid-county recycled water project and a regional recycled water project for groundwater replenishment were introduced and approved to be carried through the analysis process. The Board and Todd Reynolds (Kennedy/Jenks) discussed the next steps which included a workshop-style setting to conduct the scoring and ranking of the supply options as well as a "homework" assignment to fill out an evaluation matrix.

- August 12, 2014 Board Meeting: Focused on a public hearing for the CONSERVATION*plus* Ordinance 14-02. The Board requested that staff look more into flexibility, the method on how to determine occupancy to set long-term water budgets and also during short periods (such as summer vacations, etc.). The Board also wanted the August 26, 2014 meeting to be an opportunity for the public to comment on the CONSERVATION*plus* Program prior to the Ordinance's second reading on September 2.
- Currently preparing to present options for revising CONSERVATION*plus* and facilitating more public input at the Board's request.

2. Groundwater Management

a. Initiated monthly monitoring reports at the Board's request
b. Groundwater Management Plan Update – Reviewed and prepared for acceptance of six year update
c. Scoped project and obtained proposal for Soquel-Aptos Groundwater Model and obtained agreement from Central Water District and the City of Santa Cruz for a cost share
d. Scoped project and obtained proposal for Seawater Interface Location project at the Board's request
e. Collaborated with Stanford study to identify location of seawater interface onshore. Project will take place in October
f. Developed RFQ, completed consultant selection and completed Peer Review of District hydrology
g. Provided research and conducted public hearing for declaration of a Stage 3 Water Shortage with implementation of emergency rates
h. Provided research and conducted public hearing for declaration of a Groundwater Emergency
i. Ongoing monitoring program and presentation of annual basin status report
j. Obtained collaborative agreement to invite the City of Santa Cruz, Santa Cruz County and PVWMA to join the Basin Implementation Group
k. Monitored and provided input on Sustainable Groundwater Act legislation
l. Partnered with Central Water District and Santa Cruz County, implemented a community conversation of water supply issues through Groundwater Stakeholder meetings
m. Developed scope of work and initiated Service Area 3 Planning Study
n. Completed project to replace monitoring wells at Main St. Well (SC-18), Cherryvale Ave. (SC-10), and Porter Gulch Road (SC-11). New monitoring wells were drilled at Quail Run Road (SC-23) and Larkin Valley Tank (SC-A9)

o. Development of Private Well Monitoring Plan in cooperation with the City of Santa Cruz to monitor the effect of District and City wells on surface water, ground water and adjacent private wells

3. Conservation & Billing

a. Implemented outreach for voluntary 20% water reductions
b. Development of Mandatory Water Budget designed to reduce use by 11% per Board's request
c. County and City of Capitola Mandatory Retrofit at Time of Resale Ordinances – ordinances were coordinated and adopted and District started enforcing ordinances District-wide (previously we only provided this service in the city of Capitola)
d. Performed 560 in-home surveys, 207 landscape surveys and 300 water wise house calls for our customers
e. Performed Water Audits of all public schools in the District
f. Successfully piloted WaterSmart program and are preparing to roll program out District-wide
g. Successfully transitioned from bi-monthly to monthly billing
h. Launched e-bills to customers in order to reduce paper bills and provide more customer flexibility
i. Customers achieved a 26% reduction over last year's use in August and 34% reduction compared to the past 10 year average, year to date use is down 16%
j. Completed radio read meter installation program

4. Communications & Outreach

a. Development and rollout of new comprehensive website which has received approximately 35,700 unique hits to date
b. Developed District "Speakers Kit" and implemented media training for all management staff and Board members
c. Development of social media policy
d. Development and maintenance of District Facebook and Twitter accounts
e. Implemented monthly Water Wisdom column in Aptos and Capitola Times newspaper and wrote eight articles to date
f. Implemented monthly "e-blasts" which are currently being sent to approximately 4,500 subscribers with a 46% opening rate (industry average opening rate is 22.7%)
g. Transitioned from two page bimonthly newsletter to four page quarterly newsletter with bill inserts on months newsletters aren't scheduled
h. Presented, attended or have scheduled 59 public presentations or tabling events since January 1, 2014
i. Developed press release review process and issued 9 district press releases since January 1, 2014

j. Provided 13 television news interviews since January 1, 2014
k. Provided info or an interview for 111 print articles related to the District in the Santa Cruz Sentinel, Aptos Times, Capitola/Soquel Times, Aptos Life and Good Times since January 2014
l. Continued school and teacher training programs

5. New Service Applications

a. Provided research and options for Board consideration of water connection moratorium
b. Water Demand Offset Program – Proposed changes to existing program which will result in more meaningful, real and quantifiable projects that save or recharge water

6. Water Quality

a. O'Neill Well Iron & Manganese Treatment Plant designed, bid and under construction to be completed in spring 2015
b. Full compliance with Federal and State Drinking Water Standards and Testing Requirements
c. Prepared annual Water Quality Report and transitioned to electronic distribution with paper copies available upon request
d. Drinking Water Source Assessment completed for replacement Aptos Jr. High Well
e. Completed the first round of sampling under the US EPA's Unregulated Contaminant Monitoring Rule 3 (UCMR 3)
f. Chromium 6 – Completed pilot testing and published report. Subsequently became one of the first Districts in the state to receive a permit amendment for a full scale Chrome 6 treatment pilot plant. Raw water line and onsite piping is completed

7. Capital Improvement Program (Significant projects not otherwise listed)

a. Soquel Drive Cast Iron Main Replacement construction completed
b. Bye Way Main Replacement and Cliff Court Main Abandonment Project construction completed
c. Aptos Jr. High Well Replacement bid and completed
d. Main Street Well Rehabilitation and Pumping Equipment Replacement completed
e. Oakhill & Poplar Area Main Replacement Project designed, bid and under construction

f. McGregor Drive Pump Station designed, bid and starting construction in October
g. Aptos Pump Station designed and bid
h. Headquarters Master Plan – Consultant selection; relocation of records to new storage area and proceeding with demolition of Rosedale House; RFQ for architectural services

8. Organization Development & Personnel

a. Finalized and obtained Board approval for Memorandum Of Understanding (MOU) Between Soquel Creek Water District and Mid Management Employees Bargaining Unit
b. Develop job description, pay range and classification Human Resource Manager and successfully recruited for the position
c. Initiated quarterly meetings with bargaining groups to build relationships and stay abreast of problems
d. Completed revision of Customer Service Field Worker I/II Job Description
e. Negotiated settlement with former employee that avoided labor practices lawsuit
f. Developed job description, pay range and classification for Geographic Information Systems (GIS) Analyst
g. Developed job description, pay range and classification for Water System Operator/Instrumentation Technician
h. Revision of Certification Requirements for Senior Construction & Maintenance Worker Job Descriptions
i. Initiated a review of all job descriptions and entire District structure
j. Reviewed and revised Employee Handbook

9. Financial

a. Revised Financial Policy
b. Expanded long term investments to include federal bonds and laddered certificate of deposits for an increased return on investment
c. Successfully cut approximately $2 million from 2014-15 budget in order to meet debt coverage
d. Met all department and legal deadlines in the absence of the finance manager since April 2014. Board approved interim employee, but that position has not needed to be filled

10. Collaborative Efforts with Other Agencies (not otherwise listed)

a. Private Well Water Conservation Pilot Project (partnering with Resource Conservation District of Santa Cruz County) – Small group of interested private well owners have volunteered to track their water use and install water savings devices and measures at their homes.

b. Regional Recycled Water Plan grant application – partnered with City of Santa Cruz, Scotts Valley and Santa Cruz County
c. Santa Cruz Integrated Regional Water Management (partnering with the majority of water municipalities in the area, County of SC, and several non-profit organizations (NGOs)) – to develop a framework and address the region's water shortage challenges and create a plan of strategies, policy initiatives, and project for our region. Adopted updated plan in 2014
d. Collaborating with Resource Conservation District-UC Santa Cruz on Recharge Suitability and Runoff Analysis study
e. Co-hosted and co-presented with Scotts Valley, the City of Santa Cruz, Central Water District and Pajaro Valley Water Management Agency at ACWA Region 5 Spring Program
f. Developed Water Conservation Outreach program in partnership with Ecology Action, City of Santa Cruz and Scotts Valley Water District – Conducting numerous tabling events throughout the County to educate and increase awareness on our water conservation programs and our community's water shortage challenges.

11. Legislative Efforts

a. Northern California Water Bond Coalition – Continued active involvement, including lobbying, testifying at public hearings and regional coordination
b. ACWA State Legislative Committee – represent the District and Region 5 (San Francisco to Santa Barbara) on legislative committee and take part in regional caucuses on issues such as the water bond and groundwater legislation
c. ACWA Drought Action Group – Taj Dufor served as Vice Chair for group which issues 2014 Drought Impacts and Strategies for Resilience report including recommendations to guide ACWA's efforts at the state and federal level to advance actions to reduce impacts of drought

12. Miscellaneous

a. Prepared for and held twenty-one Public Board Meetings, five public Basin Implementation Group (BIG) meetings and four public Well Stakeholder Group meetings. By the end of September in a typical year we would hold thirteen Board meetings through September and two BIG meetings. Meetings typically had enough attendance that those meetings had to be coordinated and held offsite. For the meetings so far this year staff has prepared nearly 5,200 pages of material for the Board's review.
b. Revised out of date record retention and document destruction policy
c. Implemented Board consent agendas

By _____
Kim Adamson
General Manager

October 7, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: Agenda Item No. 6.1 — Peer Review of Hydrological Studies: Comparison of Yield Estimates and Refining Estimates with Groundwater Model and Additional Studies

Attachments:

1. Memorandum by Todd Engineers- Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates

2. Memorandum by HydroMetrics WRI- Peer Review of Sustainable Yield Estimates- Refining Estimates with the Groundwater Model and Additional Studies

Background

At the June 18, 2013 board meeting, staff was directed to begin the process for a peer review of the hydrologic studies completed by HydroMetrics, WRI. The Board has relied on such studies to make critical water policy decisions, and a peer review was needed to reaffirm the basis for such decisions.

On September 3, 2013, the Board authorized the solicitation of qualifications from various firms specializing in groundwater hydrology. A selection committee reviewed six statements of qualifications and on January 21, 2014, the Board approved a scope of work submitted by Todd Groundwater to perform a peer review of past District hydrological studies.

Peer Review

On May 20, 2014 Mr. Gus Yates of Todd Groundwater presented the draft copy of the peer review report that he prepared for the District. The draft report found:

- There are no fatal flaws in the hydrological work for the District by HydroMetrics WRI.
- For some steps of the hydrological analysis, conservative assumptions were made that may have led to an estimate of available yield too low. Alternative assumptions could also be applied that are not necessarily more accurate but that could corroborate the original results or help better characterize uncertainty.
- The biggest challenge for managing groundwater resources in the Soquel-Aptos basin is not weaknesses in technical analysis but weakness in correlations between pumping, water levels and water quality. Data for those variables often do not

exhibit the patterns expected from the physical laws governing groundwater flow. As a practical matter, this circumstance underscores the need for an adaptive management approach (approach the District is currently undertaking).

Mr. Yates in his presentation summarized that the work that HydroMetrics has been doing is high quality, acceptable, professional work. In reviewing the data, he did not find any fatal flaws. He focused on the uncertainty issues and whether there are alternative estimates of protective levels of outflows and yield. While agreeing the basin is in overdraft, there was a discrepancy in the calculated basin deficit. The Board asked Mr. Yates to review and clarify this information. He was also asked to include additional assessments in the final report.

On July 15, 2014, Mr. Yates presented the final version of his review for the Board's consideration. The Board accepted the final report that included the following:

- The alternative yield estimate is 100 AFY greater than the HydroMetrics, WRI yield estimates for both the Purisima and Aromas areas. This puts total yield at 4,200 AFY vs. 4,000 AFY.
- The yield results in an estimate of total historical accumulated deficit slightly greater than 12,100 AF.
- A 98% septic return flow assumption was applied to the historical deficit calculations, to be consistent with the estimates of sustainable yield.
- A recommendation to investigate septic system return flow percentage was made.

Based on the final report, there are still discrepancies between Todd Groundwater's and HydroMetrics' calculation of the accumulated deficit. In addition, both Todd Groundwater and HydroMetrics recommended that the Board reevaluate their decision to exclude future septic recharge from recovery predictions based on current information. The Board requested Todd Groundwater and Hydrometrics to collaborate and provide visuals (Attachment 1) to succinctly present the differences in the estimated sustainable yield so the Board can more easily understand how big a difference this is. In addition, the Board requested identifying areas of disagreement and which assumptions led to those disagreements, which items would be resolved by a groundwater model and which would be additional separate research projects. This information is contained in the two attached memos.

Next Steps in Hydrological Analyses: Refinement of Estimates with the Groundwater Model and Additional Studies (Attachment 2)

The development of a groundwater model through the Soquel-Aptos Basin Implementation Group will be the primary tool to quantify the Basin's sustainable yield. This model will replace the water balance approach that was peer reviewed by Todd Groundwater. HydroMetrics' attached memo includes a table of the recommendations and

refinements to assumptions that were proposed, how they will be incorporated into the model/additional studies, and the timeframe to conduct such work.

A technical advisory group (TAC) will also be convening to review and provide advisement into the development of all the groundwater model inputs and the additional studies recommended by the peer review.

The consultants will be in attendance to walk through the information for the Board.

POSSIBLE BOARD ACTION

1. Informational Item – No action required

2. Provide staff direction for additional activities related to refining the sustainable yield estimates with the groundwater model and additional studies.

By _____
Kim Adamson
General Manager

TODD GROUNDWATER

September 8, 2014

MEMORANDUM

To: Kim Adamson and Taj Dufour, Soquel Creek Water District

From: Gus Yates, Todd Groundwater

Re: Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates

The final version of my peer review of technical studies was discussed at the District board meeting on July 15, 2014. The Directors requested a summary of remaining differences between groundwater yield estimates developed by HydroMetrics WRI (HMWRI) in the technical studies and alternative estimates I developed as part of the peer review. The Directors also requested simple graphics illustrating the differences. Since that meeting, Cameron Tana of HydroMetrics and I have collaborated on developing the requested summary, which is attached as a pair of tables and a pair of graphs.

The attached tables present the derivation of the sustainable pumping yield estimate for the District as a sequence of adjustments to total rainfall recharge. The values for the HMWRI and Todd estimates are listed in parallel columns, with brief explanations of items that differ. Additional explanation is available in the final peer review memo. One table is for the Purisima area, and the other is for the Aromas area. Similarly, the two graphs are for the Purisima and Aromas areas, respectively. The graphs are X-Y plots with sustainable yield on the X axis and the recovery pumping yield on the Y axis (assuming recovery pumping eliminates the existing cumulative storage deficit within 20 years). The HMWRI and Todd estimates of yield are shown a representing the upper and lower bounds of the "plausible yield range". The solid green line on each graph quantifies how an increase in the estimated sustainable yield corresponds to an increase in the amount of water that can be pumped while still recovering from the cumulative storage deficit (recovery yield).

Features of the tables and graphs that differ from the final peer review memo include the following:

- Existing septic system return flow within the SqCWD service area is included in the sustainable yield estimate. Previously, it had been assumed that those residences would be connected to a sewer system. The new assumption increases the yield estimates, particularly for the Aromas area.
- My initial calculations of alternative yield resulted in estimates that were too large to be consistent with observed historical storage depletion. That implied that although my various adjustments to factors that affect sustainable yield were

individually plausible, they probably are not all simultaneously true. The final peer review memorandum discussed this issue with respect to the Purisima area, where a rough estimate of current cumulative storage deficit (about 5,000 acre-feet) corresponded to a sustainable yield of about 3,050 acre-feet per year (AFY). I subsequently contoured Aromas area water levels and the results similarly constrained the alternative estimate of sustainable yield to about 1,700 AFY. For the Aromas area, I also evaluated SqCWD pumping during historical periods of generally rising or falling water levels at coastal monitoring wells, and that analysis also supported a yield no larger than 1,700 AFY.

- The graphs indicate that total sustainable yield (Purisima plus Aromas) ranges from 4,330 AFY to 4,750 AFY and available yield during the recovery period ranges from 3,200 AFY to 4,250 AFY.

If you or the Directors have any questions about this summary, please do not hesitate to contact me.

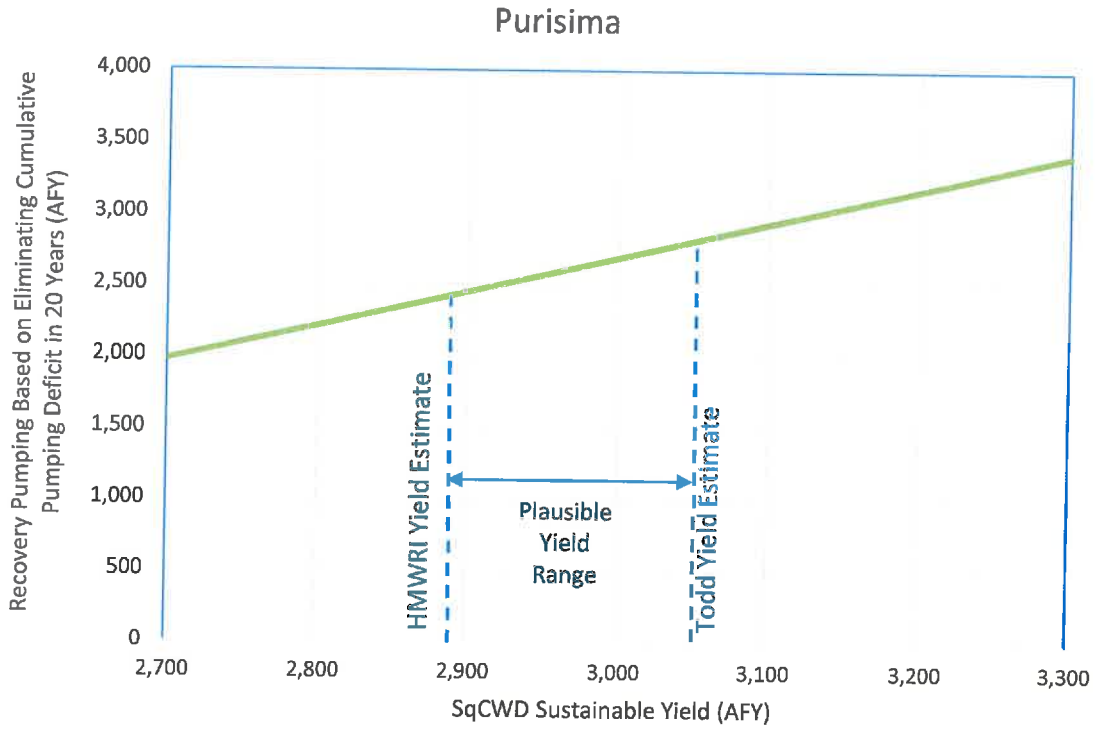
SqCWD Yield Comparison: Aromas Area

Aromas Water Balance Component	HMWRI (2012)	Todd (2014)	Notes for Todd Estimate
Aromas area recharge from precipitation (afy)	4,200	4,200	
Modeled protective outflows to ocean - 70th percentile (afy)	-1,950	-1,950	
Flow to Pajaro Valley	-370	-271	70th percentile outflow.
Total Yield Available for Consumptive Use (afy)	1,880	1,979	
Non-SqCWD consumptive use (afy)	-754	-673	Higher estimate of septic return flow partially offset by lower estimate of irrigation return flow (same as used for SqCWD below).
Total yield available for SqCWD's consumptive use (afy)	1,126	1,306	
SqCWD outdoor use (%)	30%	30%	
SqCWD indoor use (%)	70%	70%	
SqCWD septic parcels (%)	30%	30%	
SqCWD sewered parcels (%)	70%	70%	
Outdoor return flow (%)	20%	10%	Assumes greater use of drip and water conservation.
Septic return flow (%)	75%	98%	Assumes no ET loss of septic percolation.
Sewer return flow (%)	0%	0%	
SqCWD overall return flow (%)	22%	24%	
Total yield available for SqCWD delivery (afy)	1,438	1,708	
Subtotal for outdoor use (afy)	431	512	Follows from above assumptions.
Subtotal for indoor use to septic (afy)	301	358	"
Subtotal for indoor use to sewer (afy)	706	838	"
SqCWD outdoor return flow (afy)	86	51	"
SqCWD septic return flow (afy)	226	350	"
SqCWD sewer return flow (afy)	0	0	
SqCWD water pipe leak (%)	0%	7%	Average annual leak rate (SqCWD).
SqCWD water pipe leak (afy)	0	129	
SqCWD pumping yield (afy)	**1,438**	**1,836**	Maximum yield consistent with well locations and cumulative historical storage deficit is about 1,700 afy.

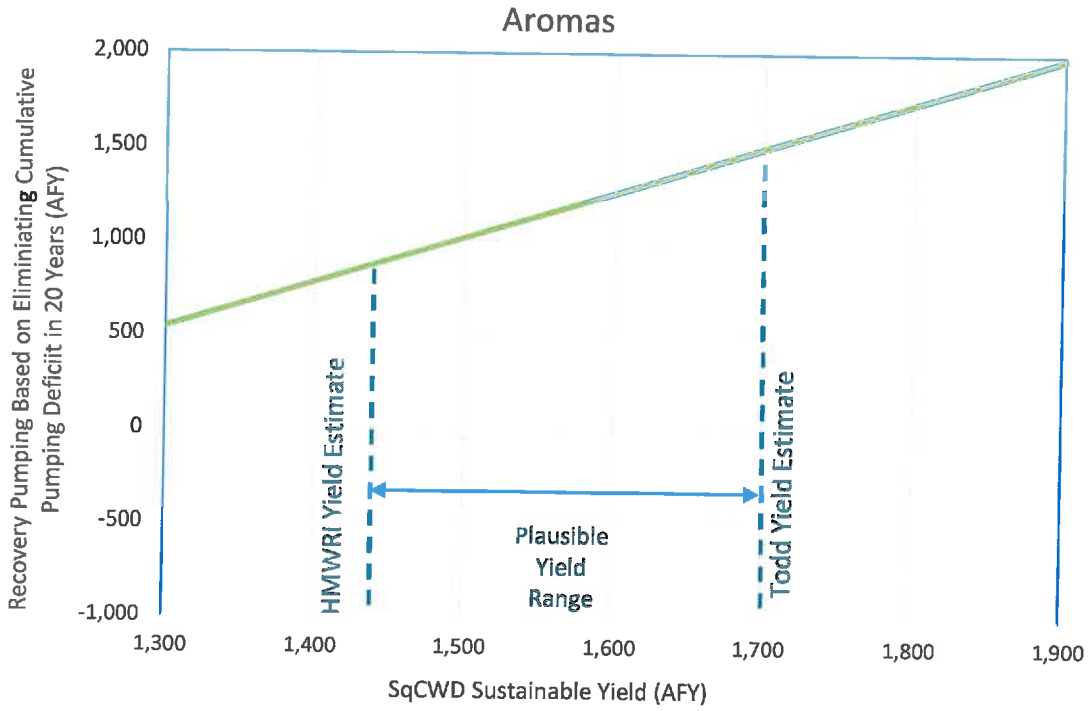
SqCWD Yield Comparison: Purisima Area

Purisima Water Balance Component	HMWRI (2012)	Todd (2014)	Todd w Possible Reductions (2014)	Notes for Todd Estimate
Purisima area recharge from precipitation (afy)	6,600	6,600	6,600	
Subtract recharge west of SC-1	-1,200	-889	-889	Sum of outflow estimate and 70th percentile of historical Santa Cruz pumping.
Modeled protective outflows to Ocean - 70th percentile (afy)	-775	-775	-775	
Increased ocean outflow Santa Cruz (afy)			-170	Reduction needs to be estimated by additional cross-sectional modeling
Increased ocean outflow SqCWD Purisima (afy)			-388	Reduction needs to be estimated by additional cross-sectional modeling
Decreased coastal plain recharge(afy)			-204	Reduction needs to be estimated based on evaluation of shallow coastal plain hydrogeology
Total yield available for consumptive use (afy)	4,625	4,936	4,174	
Non-SqCWD consumptive use (afy)	-1,992	-1,606	-1,606	Higher estimate of septic return flow partially offset by lower estimate of irrigation return flow (same as used for SqCWD below).
Total yield available for SqCWD's consumptive use (afy)	2,633	3,330	2,568	
SqCWD outdoor use (%)	30%	30%	30%	
SqCWD indoor use (%)	70%	70%	70%	
SqCWD septic parcels (%)	6%	6%	6%	
SqCWD sewered parcels (%)	94%	94%	94%	
Outdoor return flow (%)	20%	10%	10%	Assumes greater use of drip and water conservation.
Septic return flow (%)	75%	98%	98%	Assumes no ET loss of septic percolation.
Sewer return flow (%)	0%	0%	0%	
SqCWD overall return flow (%)	9%	7%	7%	
Total yield available for SqCWD delivery (afy)	2,890	3,572	2,755	
Subtotal for outdoor use (afy)	867	1,072	826	Follows from above assumptions.
Subtotal for indoor use to septic (afy)	111	138	106	"
Subtotal for indoor use to sewer (afy)	1,912	2,363	1,822	"
SqCWD outdoor return flow (afy)	173	107	83	"
SqCWD septic return flow (afy)	84	135	104	"
SqCWD sewer return flow (afy)	0	0	0	
SqCWD water pipe leak (%)	0%	7%	7%	Average annual leak rate (SqCWD).
SqCWD water pipe leak (afy)	0	269	207	
SqCWD pumping yield (afy)	**2,890**	**3,841**	**2,962**	Maximum yield consistent with cumulative historical storage deficit is about 3,050 afy.

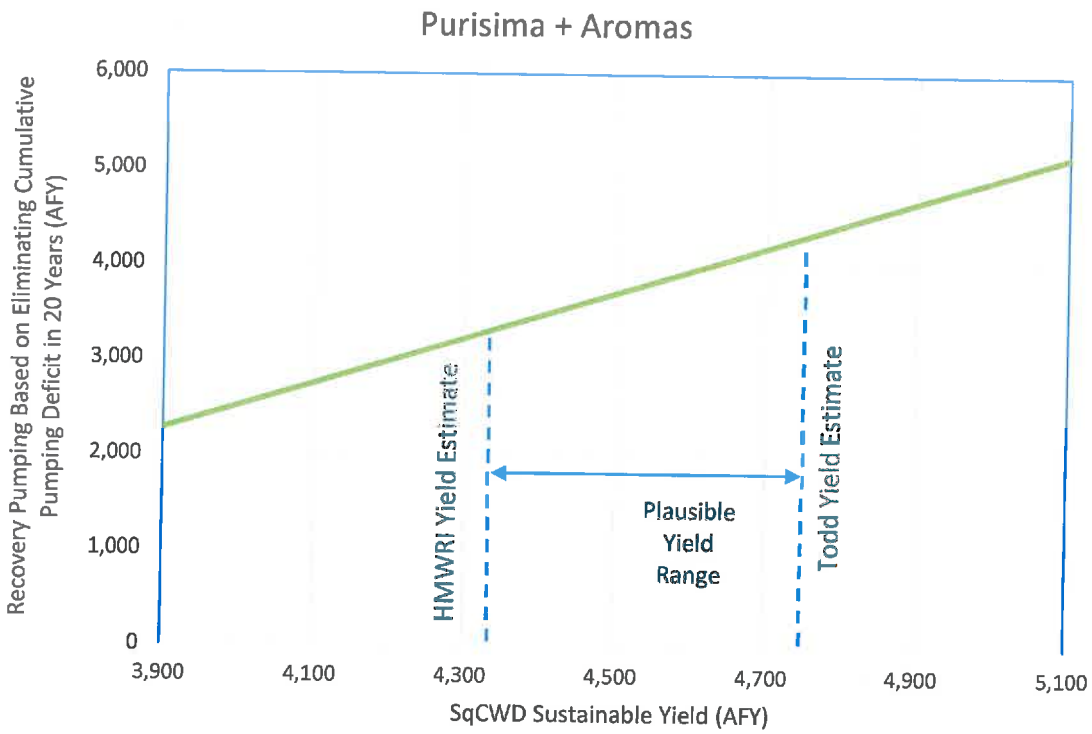
Ranges of Sustainable Yield and Recovery Pumping



Notes: Yield includes septic system recharge. Recovery pumping based on 1984-2011 deficit.



Notes: Yield includes septic system recharge. Recovery pumping based on 1984-2011 deficit.



Notes: Yield includes septic system recharge. Recovery pumping based on 1984-2011 deficit.

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

TECHNICAL MEMORANDUM

To:	Kim Adamson and Taj Dufour, Soquel Creek Water District
From:	Cameron Tana and Derrik Williams
Date:	October 3, 2014
Subject:	Peer Review of Sustainable Yield Estimates – Refining Estimates with the Groundwater Model and Additional Studies

The final version of Todd Groundwater's peer review of HydroMetrics WRI's technical studies related to sustainable yield estimates was discussed and approved by the SqCWD Board of Directors on July 15, 2014. The Board requested that the two firms collaborate on a simplified executive summary describing differences in our estimates. The result of this collaboration is Gus Yates' memorandum from September 8 titled *Peer Review of Technical Water Resources Studies Prepared for Soquel Creek Water District—Summary of Yield Estimates*. Part of the Board's request was to identify which differences would be resolved by a groundwater model, and which would require separate research projects. This memorandum responds to this request with a plan for refining the sustainable yield estimates considering the peer review.

GROUNDWATER MODEL VS. WATER BALANCE APPROACH

Development of a groundwater model has been undertaken by the Soquel-Aptos Basin Implementation Group. The groundwater model will be the primary tool for accurately quantifying the Basin's sustainable yield. The groundwater model's main benefit is not resolving differences in estimates of specific water balance components. The main benefit is that the model will integrate the components of the water balance while honoring principles of groundwater flow and the hydrogeology of the basin. The model will simulate groundwater level response to changes in pumping to better guide SqCWD in planning for recovery of the basin's groundwater levels to protect against seawater intrusion. The current estimate of sustainable yield using the water balance approach does not

calculate water level response and instead uses the cumulative pumping deficit as a proxy for recovery. The water balance approach also assumes that pumping is distributed to maximize use of yield estimated by the water balance while the model will calculate yield based on specified pumping locations.

CALIBRATED WATER BALANCE COMPONENTS IN THE GROUNDWATER MODEL

The groundwater model will incorporate similar components to those used in the water balance approach, but all components will be refined as part of the groundwater model effort. Some components will be inputs into the groundwater model, and the groundwater model will be calibrated to calculate other components, particularly the flows used in the water balance. The model will calculate head dependent flows such as flow to Pajaro Valley and underflow entering the basin from west of well SC-1. The model will also calculate the outflows to the ocean needed to achieve and maintain protective levels. These modeled flows will be calibrated to groundwater level data.

The groundwater model calibration will also improve and refine some water balance components such as precipitation recharge and groundwater supported baseflow. This will improve the sustainable yield estimate by incorporating time dependent recharge and baseflow, rather than average numbers.

RE-EVALUATING INPUTS TO GROUNDWATER MODEL

Some of the water balance components are inputs to the groundwater model. All of these components will be re-evaluated as part of groundwater model development. One of these components is return flow (return flow from outdoor use, return flow from septic, return flow from pipe leaks), for which there are major disagreements between the HydroMetrics WRI water balance estimate and the Todd Groundwater alternative estimates. These assumptions will be inputs to the groundwater model and the differences will not be resolved by the model itself. Therefore, the assumptions included in the model for this component need to be re-evaluated for the groundwater model with a literature review as suggested by the peer review and any available local data. For example, SqCWD has provided an estimate of pipe leaks in its system of approximately 7%, which should be included in the model input. However, the groundwater model will differ from the water balance approach in that the re-evaluated return flow

assumptions will be used in the groundwater model based on a geographic distribution of land use. With that input, the groundwater model will be able to estimate how much of return flow contributes to what is available for wells to extract given the locations and depths of the wells.

Estimates for other water balance components used as input to the model will be re-evaluated during groundwater model development. These include the proportion of outdoor versus indoor water use by land use, and non-water agency pumping estimates. Most of the water use factors are based on estimates compiled in the 1990s. We will do a literature review to update the estimates and incorporate any available local data. For the groundwater model, non-agency water use will be applied based on a geographic distribution of land use and will be able to assess effects of pumping given estimated pumping locations.

ADDITIONAL STUDIES TO SUPPLEMENT GROUNDWATER MODEL

Todd Groundwater recommended additional studies to reduce uncertainties in the estimates for sustainable yield. We see value in these studies in conjunction with development of the groundwater model, not necessarily for revising the yield estimate based on the water balance approach.

The first suggestion is to modify the cross-sectional models along the diagonal planes of the Purisima units to re-evaluate the protective elevations. If protective elevations are revised, the basinwide model simulations will be used to assess the sustainable yield. The basinwide model will be constructed to represent the diagonal planes of the Purisima unit and can also be used to estimate the coastal outflow needed to achieve and maintain these new protective elevations. Outflows could be estimated based on the modified cross-sectional models for comparison with outflows from the original cross-sectional models, but we recommend using the calibrated groundwater model to evaluate the effect of revised protective elevations on the sustainable yield. The basinwide model could also assess the outflow needed to maintain protective elevations at City of Santa Cruz wells, whether they use the estimates developed by cross sectional models or the City's more conservative proposed target elevations.

The cross-sectional models can be modified in a 3 month time period. For use with the groundwater model, the protective elevations need to be evaluated by December 2015. However, the District already manages its basin to protective

elevations, so evaluating any potential change to those protective elevations should be expedited. One possible goal is to complete the evaluation by March 2015, in time for use in the Water Year 2014 Annual Report and Review.

The other recommendation is to compile groundwater elevation data for shallow monitoring wells in the coastal plain area and compare them with creek elevations to evaluate whether shallow groundwater discharges to creeks. This will provide additional data for model calibration, especially if the model is developed as an integrated surface water-groundwater GSFLOW model. Including these data will make the model more defensible for evaluating sustainable yield, especially considering the uncertainty about return flow which may contribute to shallow groundwater discharge to creeks. Compiling these data are not part of the approved groundwater model scope and cost estimate. It would take 1-1.5 months to complete the task and it is suggested that it is completed before the GSFLOW development task in the groundwater model (Task 2B) as it may inform the conceptual model for surface water-groundwater interaction. Task 2B is scheduled to begin April 2015.

SUMMARY

Using the groundwater model to evaluate sustainable yield will replace the water balance approach reviewed by Todd Groundwater. The main advantage of the groundwater model is that it will integrate the water balance while honoring principles of groundwater flow and the hydrogeology of the basin. The results of the groundwater model are more important for evaluating sustainable yield than resolving differences in estimates of individual components. However, all inputs to the groundwater model should be re-evaluated when developing the model. Throughout the model development process, a Technical Advisory Committee will provide oversight and input for the groundwater model development, including this re-evaluation of model inputs. Additional studies recommended by Todd Groundwater will also have value for strengthening the groundwater model and management of the basin. The attached table provides a summary of the model sub-tasks and additional studies that will improve sustainable yield estimates provided by the groundwater model.

Table 1. Summary of Model Sub-Tasks and Additional Studies for Estimating Sustainable Yield with Groundwater Model

Model Sub-Task/ Additional Study	Included in Model Scope?	Water Balance Components Addressed	Use in Model	Timeframe
Literature Review and Local Data Evaluation for Return Flow Assumptions (Model Task 3: Water Balance)	Yes	Return Flow from Indoor Use on Septic Return Flow from Outdoor Use Return Flow from Pipe Leaks	Geographically Distributed Model Input (recharge)	December 2014-June 2015
Literature Review and Local Data Evaluation for Non-Agency Water Use (Model Task 3: Water Balance)	Yes	Indoor and Outdoor Water Use by Land Use Non-Agency Pumping	Geographically Distributed Model Input (recharge and pumping)	December 2014-June 2015
Modify Cross-Sectional Models to Evaluate Protective Elevations	No	Outflow to Prevent Seawater Intrusion	Protective Elevations for Evaluating Simulations	January 2015-March 2015
Compile Shallow Groundwater Data	No	Flows between Creeks and Groundwater	Calibration Data for GSFLOW	March 2015-April 2015
Model Task 2B: GSFLOW	Yes	Flows between Creeks and Groundwater Recharge	Calibrated Model Output	April 2015-August 2015
Model Task 5: Simulations[1]	Yes	Outflow to Pajaro Valley Inflow from west of SqCWD Outflow to ocean	Calibrated Model Output	December 2015-February 2016

[1] Estimates of sustainable yield will be based on evaluation of simulation results in this task.

October 7, 2014

MEMO TO THE BOARD OF DIRECTORS

Subject: Agenda Item No. 6.2 — Approve Scope of Work from USGS to Attend Scoping Meetings for Support of Basin Groundwater Model

Attachments: 1. Proposal from USGS

Background

At the July 15, 2014 meeting, the Board reviewed a proposal from HydroMetrics, WRI to create a water model for the basin. The Board approved moving forward with the work and voted to propose it be done through the Basin Implementation Group (BIG). At the BIG Board meeting on August 14, 2014 the Board, made up of Directors from both Central and Soquel Creek Water Districts, approved a scope of work for Hydrometrics to develop a groundwater model for the basin. They are proposing to start with scoping activities that will be beneficial to the ultimate success of the groundwater modeling effort by ensuring that our needs are fully addressed by the model. They plan to use MODFLOW and related groundwater model codes developed by the US Geological Survey (USGS). Hydrometrics has invited the USGS to participate in this project as well. The scope of work and cost estimate included in the attached proposal (Attachment 1) is for the initial USGS effort and is in addition to the previously approved Hydrometrics proposal. The USGS proposal was approved by the BIG Board at the September 23, 2014 BIG meeting.

Peer Review

On January 21, 2014 the Soquel Creek Board initiated a peer review of Hydrometrics work for the District. The peer review was completed by Todd Groundwater, who found:

- A yield estimate 100 AFY greater than the Hydrometrics yield estimates for both the Purisima and Aromas areas. This puts total yield at 4,200 AFY vs. 4,000 AFY.
- The calculated yields result in an estimate of historical accumulated deficit slightly greater than 5,100 AF.
- A 98% septic return flow assumption was applied to the historical deficit calculations, to be consistent with the estimates of sustainable yield. This increased the accumulated deficit to 5,700 AF.

The report also makes recommendations to investigate the impacts of septic recharge. The report states that an adaptive management approach is an appropriate way to prevent seawater intrusion, but it also points out some

shortcomings and suggests that a groundwater flow model that takes into account base flow depletion would provide a better picture. The report also suggests that a groundwater model that incorporates density effects would provide more accurate estimations of the rate of intrusion and the location of the seawater-freshwater interface. Additionally, impacts of septic recharge and that could be better determined with a groundwater model. The Board has also expressed interest in locating the position of the seawater-freshwater interface, which will help make this modeling very valuable. This aspect of the modeling is not included in the attached scope since the location is currently not identified.

In addition to providing a more refined estimate of recovery time, a basin-wide groundwater model would provide information on potential for recharge using either recycled water or captured storm water. It would also advise on how much water the District could transfer back to the city in a conjunctive use scenario. This modeling would be helpful as we move forward with options for supplemental supply.

USGS Support for Groundwater Model Proposal

USGS's role for support in the groundwater model effort will largely be defined by the scoping meetings we are planning and their overall budget may be $50,000-$100,000 as reported in the August Groundwater Model memo. Because the total amount will vary depending on our needs that emerge from the scoping meeting, they suggested providing a proposal and budget to participate in the scoping meetings and then providing another proposal and budget based on the identified work from those meetings. Attached you will find a proposal for USGS to attend the scoping meetings for an estimated cost of $7,000.

POSSIBLE BOARD ACTION

1. By MOTION, approve the proposal from USGS to attend scoping meetings for the Soquel Aptos Basin Groundwater Model.

2. Take no action and provide staff further direction.

By_____
Kim Adamson
General Manager

TO: WATER SUPPLY ADVISORY COMMITTEE (WSAC)

FROM: HEIDI LUCKENBACH

SUBJECT: UPDATE ON SOQUEL CREEK WATER DISTRICT ACTIVITIES

DATE: OCTOBER 17, 2014

Following is a list of items received by the Soquel Creek Water District Board of Directors that may be of interest to the WSAC.

- On September 30, 2014 under the item of the General Manager annual evaluation, they received a memo recapping the District's more important issues and achievements over the past year (attachment pages 167-175).
- On October 7, 2014 an item related to the peer review of hydrological studies (attachment pages 59-72). The memo ultimately called for no action, though intended to provide staff direction for additional activities related to refining the sustainable yield estimates with the groundwater model and additional studies.
- Also on October 7, 2014 an item to add USGS to the team with Hydrometrics in developing the groundwater model for the Soquel Aptos groundwater management area. The City and Central Water District are also partners in this effort.