CITY OF SANTA CRUZ
City Hall
809 Center Street
Santa Cruz, California 95060

WATER COMMISSION

Regular Meeting

August 29, 2022

5:30 P.M. GENERAL BUSINESS AND MATTERS OF PUBLIC INTEREST, COUNCIL CHAMBERS/ZOOM

COVID-19 ANNOUNCEMENT: This meeting will be held via teleconference ONLY.

In order to minimize exposure to COVID-19, the Council Chambers will not be open to the public. The meeting may be viewed remotely, using the following sources:

- Online:https://ecm.cityofsantacruz.com/OnBaseAgendaOnline/Meetings/Search?dropid=4&mtids=124
- Zoom Live (no time delay): https://us06web.zoom.us/j/81923388269
- Facebook: https://www.facebook.com/SantaCruzWaterDepartment/?epa=SEARCH_BOX

PUBLIC COMMENT:
If you wish to comment on items 1-3 during the meeting, please see the information below:

- Call any of the numbers below. If one number is busy, try the next one. Keep trying until connected.
  +1 669 444 9171
  +1 346 248 7799
  +1 720 707 2699
  +1 253 215 8782
  +1 312 626 6799
- Enter the meeting ID number: 819 2338 8269
- When prompted for a Participant ID, press #.
- Press *9 on your phone to "raise your hand" when the Chair calls for public comment.
  - It will be your turn to speak when the Chair unmutes you. You will hear an announcement that you have been unmuted. The timer will then be set to three minutes.
  - You may hang up once you have commented on your item of interest.
  - If you wish to speak on another item, two things may occur:
    1) If the number of callers waiting exceeds capacity, you will be disconnected and you will need to call back closer to when the item you wish to comment on will be heard, or
    2) You will be placed back in the queue and you should press *9 to "raise your hand" when you wish to comment on a new item.

NOTE: If you wish to view or listen to the meeting and don't wish to comment on an item, you can do so at any time via the Facebook link or over the phone or online via Zoom.

Call to Order

Roll Call

Statements of Disqualification - Section 607 of the City Charter states that...All members present at any meeting must vote unless disqualified, in which case the disqualification shall be publicly declared and a record thereof made. The City of Santa Cruz has adopted a Conflict of Interest Code, and Section 8 of that Code states that no person shall make or participate in a governmental decision which he or she knows or has reason to know will have a reasonably foreseeable material financial effect distinguishable from its effect on the public generally.

Oral Communications

Announcements

Consent Agenda (Pages 1.1 – 2.4) Items on the consent agenda are considered to be routine in nature and will be acted upon in one motion. Specific items may be removed by members of the advisory body or public for separate consideration and discussion. Routine items that will be found on the consent agenda are City Council Items Affecting Water, Water Commission Minutes, Information Items, Documents for Future Meetings, and Items initiated by members for Future Agendas. If one of these categories is not listed on the Consent Agenda then those items are not available for action.

1. City Council Actions Affecting the Water Department (Pages 1.1 – 1.2)

   Accept the City Council actions affecting the Water Department.

2. Water Commission Minutes from July 21, 2022 (Pages 2.1 – 2.4)

   Approve the July 21, 2022 Water Commission Minutes.

Items Removed from the Consent Agenda

General Business (Pages 3.1 – 3.37) Any document related to an agenda item for the General Business of this meeting distributed to the Water Commission less than 72 hours before this meeting is available for inspection at the Water Administration Office, 212 Locust Street, Suite A, Santa Cruz, California. These documents will also be available for review at the Water Commission meeting with the display copy at the rear of the Council Chambers.

3. Securing Our Water Future – Additional Context, Modeling Results, Updated Project Evaluations, Reliability Goal and Economic Impact Analysis, and Working Draft Council Resolution and Policy Framework (Pages 3.1 - 3.37)

Receive and discuss updates on various Securing Our Water Future work products and efforts and provide feedback to staff.

Part A – Additional Background and Context

1. Primer on Water Supply Modeling
2. Modeling Results for Supply Deficits – Putting New Results in Context with Earlier Results
3. Historic Hydrology and Climate Change Hydrology

Part B – Aquifer Storage and Recover Water Supply Project Concept Modeling Results

Part C – Updated Results of Evaluation of All Project Concepts Against Evaluation Criteria

Part D – Reliability Goal and Economic Impact of Curtailments Study

Part E – Working Draft City Council Resolution and Policy Framework

Subcommittee/Advisory Body Oral Reports.

4. Santa Cruz Mid-County Groundwater Agency

5. Santa Margarita Groundwater Agency

Director's Oral Report

Information Items

Adjournment

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WATER COMMISSION
INFORMATION REPORT

DATE: 08/24/2022

AGENDA OF: 08/29/2022

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: City Council Actions Affecting the Water Department

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

BACKGROUND/DISCUSSION:

August 9, 2022

Graham Hill Water Treatment Plant Gate Entrance Replacement Project – Notice of Completion (WT)

Motion **carried** to accept the work of Anderson Pacific Engineering Construction, Inc. (Santa Clara, CA) as complete per the plans and specifications and authorizing the filing of a Notice of Completion for the Graham Hill Water Treatment Plant Gate Entrance Replacement Project and to authorize the Water Director to sign the Notice of Completion as the Owner's Authorized Agent.

Resolution to Reimburse Capital Expenditures from Future State Water Resources Control Board Financing for Newell Creek Pipeline Replacement Project (WT)

Resolution No. NS-30,022 was adopted authorizing the Water Department to be reimbursed by State Water Resources Control Board (SWRCB) for costs related to the Newell Creek Pipeline Replacement Project.

Santa Cruz Grand Jury Response (WT)

Motion **carried** to authorize the Mayor to respond to the Santa Cruz Civil Grand Jury on behalf of the City of Santa Cruz.

Beltz Water Treatment Plant Filter Rehabilitation Project – Notice of Completion (WT)

Motion **carried** to accept the work of ERS Industrial Services, Inc. (Fremont, CA) as complete per the plans and specifications and authorizing the filing of a Notice of Completion for the Beltz Water Treatment Plant Filter Rehabiliation Project and to authorize the Water Director to sign the Notice of Completion as the Owner's Authorized Agent.

<u>Laguna Creek Diversion Retrofit Project – Notice of Completion (WT)</u>

Motion **carried** to accept the work of Granite Rock Construction, Inc. (Watsonville, CA) as complete per plans and specifications and authorizing the filing of a Notice of Completion for the Laguna Creek Diversion Retrofit Project and to authorize the Water Director to sign the Notice of Completion as the Owner's Authorized Agent.

<u>Ratification of $100,000 Application Fee for Water Infrastructure and Finance Innovation Act Loan and Related Budget Adjustment (WT)</u>

Resolution No. NS-30,023 was adopted to approve the budget adjustment ratifying the July 15, 2022 payment of $100,000 Water Infrastructure and Finance Innovation Act application fee and appropriating funds from the Water Department FY 2023 budget for the application fee.

August 16, 2022

<u>Securing Our Water Future City Council Study Session (WT)</u>

Council **received** an update on the Water Department's progress in implementing the recommendations of the Water Supply Advisory Committee, the Securing Our Water Future initiative.

August 23, 2022

<u>Transfer within the Water Department's Capital Investment Program for FY 2022 Water Program Administration Expenses – Budget Adjustment (WT)</u>

Resolution No. NS-30,033 was adopted amending the FY 2022 budget by transferring $1,956,115 from the Water Department's Capital Investment Program (CIP) Project c701901, Water Program Administration, to various other Water Department CIP Projects for the purpose of allocating actual program administration expenses to active Water Program CIP Projects.

PROPOSED MOTION: Accept the City Council actions affecting the Water Department.

ATTACHMENTS: None.

Water Department

Water Commission
7:00 p.m. – July 21, 2022
Zoom Teleconference

DRAFT

Summary of a Water Commission Meeting

Call to Order: 7:00 PM

Roll Call

Present: D. Alfaro (via Zoom), J. Burks (Vice Chair) (via Zoom), T. Burns (Via Zoom), D. Engfer (via Zoom), A. Páramo (via Zoom), G. Roffe (via Zoom) S. Ryan (Chair) (via Zoom)

Absent: None.

Staff: R. Menard, Water Director (via Zoom); (via Zoom); C. Coburn, Deputy Director/Operations Manager (via Zoom); E. Cross, Community Relations Specialist (via Zoom); T. Kihoi, Associate Professional Engineer (via Zoom); H. Luckenbach, Deputy Director/Engineering Manager (via Zoom); Sarah Perez, Principal Planner (via Zoom); K. Fitzgerald, Administrative Assistant III (via Zoom)

Others: Five members of the public (via Zoom)

Presentation: None.

Statements of Disqualification: None.

Oral Communications: One member of the public spoke.

Announcements: None

Consent Agenda

1. City Council Items Affecting the Water Department

2. Water Commission Minutes From June 6, 2022

Item 3 was pulled for further discussion.

No public comments were received.

Commissioner Engfer moved the Consent Agenda as amended. Commissioner Páramo seconded.

VOICE VOTE: MOTION CARRIED

AYES: All
NOES: None
DISQUALIFIED: None

The discussion for Item 3 was held after the conclusion of General Business Item 4.

General Business

4. Workshop on Water Supply Vulnerability Assessment

R. Menard introduced Dr. Casey Brown (University of Massachusetts, Amherst) for the Workshop on Water Supply Vulnerability Assessment presentation and discussion.

In the chart on slide 18 of the presentation, does a 10 percent reduction in precipitation coupled with a two-year deficit mean that water usage must be reduced by 25 percent?

- The multi-year deficits are cumulative over the years you're looking at. If the 9% deficit from year one in the -10% reduced precipitation is achieved through some kind of curtailment, then the volume saved would reduce the amount that would have to be reduced in year two.

What do deficits that are over 100 percent indicate?

- These are deficits that span over multiple years whereas single-year deficits do not exceed 100 percent.

Does a zero percent change in precipitation row in the chart on slide 17 suggest that even during an average year a shortfall would still exist?

- Yes, this indicates that there is a two percent probability of a deficit in any given year.

Can staff elaborate on the significance of 98th percentile deficits? What is the difference between 98th percentile and maximum deficits?

- Imagine you had 100 years of water supply records and you ordered them from least amount of supply to most amount of supply. The 98th percentile value is basically the 3rd lowest amount of supply, with the 99th and 100th percentile values being the second lowest and the lowest amounts of supply, respectively. In the tables presented the worst years, those with the lowest amount of supply and the highest deficits are called the max shortages. A 98th percentile value has a 2% chance of occurring every year, and although the probability of these extreme scenarios is relatively low, the impacts in terms of the size of the shortages produced are dramatic. The consequence to customers and our community of some of the larger scale shortages resulting from the vulnerability modeling work indicated that considering approaches to preparing for them as we evaluate options for water supply augmentation planning would be a prudent thing to do.

How does increased variability lead to more significant supply deficits?

- The variability analysis looks at what happens to precipitation, for example, if existing variability is further exacerbated by climate change. Examples include longer periods of drought, increases in the amount of annual precipitation that come in a limited number of storms leading to winter droughts such as experienced this year. Our goal in including the variability analysis was to assess how changes in climate patterns affect system reliability even if other climate changes, such as decreases or increases in precipitation don't change or don't change much. The results show that increased variability can have a significant effect on the size of shortages that may accure over time.

Can staff clarify what time span was used to generate the supply deficits on slide 17 of the presentation?

- The deficits on this slide are based on 2020 demand and a two-degree temperature change.

When is the work on the vulnerability analysis variability going to be communicated to the public?

- A study session with the City Council is tentatively planned for sometime in mid to late August to review the work completed to date. We'll be talking about these results in that forum and also on an ongoing basis in the coming months as the Water Commission continues its work on Securing Our Water Future.

No public comments were received.

No action was taken on this item.

Items Pulled from the Consent Agenda

3. <u>Water Supply Augmentation Strategy (WSAS) Quarterly Report</u>

On page 3.2, does the 4.5 - 5% leak rate for single-family residents represent the number of meters that are leaking or the volume of water loss?

- This is the percentage of single family residential accounts that are leaking at any given time based on newly- installed meters.

Can staff elaborate on how in-lieu transfers could be pursued if water is being extracted from aquifer storage and recovery (ASR)?

- While there are no seasonal constraints for water transfers to other agencies (e.g., Soquel Creek Water District) they would likely only occur during injection and perhaps storage phases of ASR when excess surface water is available. They would not occur during ASR extraction.

What is the frequency of the social media calendar content turnover referenced on page 3.12?

- On average, there two-four posts on the Water Department's social media account, two posts per week on the City's social media account as well as posts on Nextdoor as needed.

No public comments were received.

Commissioner Engfer moved the staff recommendation on Item 3. Commissioner Burns seconded.

VOICE VOTE: MOTION CARRIED
AYES: All

NOES: None
DISQUALIFIED: None

Subcommittee/Advisory Body Oral Reports

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

The MGA met on June 16th and focused on the response to the Santa Cruz Grand Jury report. The MGA will meet again on August 18th so that the response can be approved and submitted by the August 22nd deadline.

6. Santa Margarita Groundwater Agency (SMGWA)

The SMGWA met on June 23rd and focused on developing a response to the Santa Cruz Grand Jury report. The next SMGWA meeting will be held on July 28th.

Director's Oral Report: R. Menard announced that she representing the Association of Metropolitan Water Agencies as a member of the Microbial and Disinfection Byproducts Rule Revisions Working Group organized by the National Drinking Water Advisory Council.

Information Items: Informational items included in the agenda packet were discussed.

Adjournment: The meeting was adjourned at 8:54 PM.

WATER COMMISSION
INFORMATION REPORT

DATE: 08/25/2022

AGENDA OF: 08/29/2022

TO: Water Commission

FROM: Rosemary Menard, Water Director

SUBJECT: Securing Our Water Future - Additional Context, Modeling Results, Updated Project Evaluations, Reliability Goal and Economic Impact Analysis, and Working Draft Council resolution and Policy Framework

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RECOMMENDATION: That the Water Commission receive and discuss updates on various Securing Our Water Future work products and efforts and provide feedback to staff.

SUMMARY: At the August 29, 2022, Water Commission meeting Commissioners will receive updated information on the ongoing Securing Our Water Future work efforts including presentations of new modeling results on how the Aquifer Storage and Recovery (ASR) project concept contributes to reducing vulnerabilities to shortage, and updated evaluation results for all four project concepts. Project evaluation results are still a work in progress, pending modeling results for all the concepts.

In addition, Robert (Bob) Raucher, Ph.D. will provide a brief overview of the planned economic impact assessment of water curtailments that will provide useful information for the Commission and staff to consider in developing recommendations to the Council on a reliability goal. And, finally, Commissioners will have an opportunity to review and provide feedback to staff on a working draft of a Council resolution that includes an outline of the topics to be covered in the planned Council policy.

To further support the Commission's work on these topics, staff has also developed additional information to create greater continuity between modeling results from Confluence® modeling work that has been the basis of water supply planning for many years and the newer modeling work that is being produced with the Santa Cruz Water System Model (SCWSM). This staff report summarizes these materials and, where appropriate, provides attachments that can provide direct links to earlier work and results. Specific topics to be covered include the following:

1. Primer on Water Modeling – this relatively brief memo provides an overview of the purpose of supply modeling is done and how its results are generated. An earlier version of a modeling Primer was developed and provided as part of the April 2019 Water Commission meeting materials (see Attachment A1).

2. Modeling Results for Supply Deficits – this brief overview provides continuity between Confluence and SCWSM results using brief tables updated to show earlier and newer results side-by-side and includes a link to a July 2020 Water Commission tech memo on the size and probability of shortages (see: https://ecm.cityofsantacruz.com/OnBaseAgendaOnline/Documents/ViewDocument/Summary%20Sheet%20for%20-%20Size%20and%20Probability%20of%20Potential%20Future%20Water%20Shortages.pdf?meetingId=1395&documentType=Agenda&itemId=4273&publishId=3612&isSection=false), which is a more detailed version of the table presented here.
3. An initial overview on hydrology and hydrologic changes that are being produced by Water Balance Model (using temperature and precipitation changes from the Climate/Weather Generator component). This information is useful in a variety of ways including visualizing how various potential future droughts might occur and how historic hydrology compares to potential plausible future hydrology.

Staff is not planning to present this background material at the August 29 Water Commission meeting, which is covered in more detail in Part A of this memo, but the meeting will start with an opportunity for Commissioners to ask questions or for further explanations on any of the topics covered. If needed, additional materials or agenda items will be planned to address any outstanding questions or topics.

Below are additional details for each major component of the August 29, 2022, Water Commission Agenda.

DISCUSSION:

Part A: Securing Our Water Future – Additional Background and Context

1. Primer on Water Supply Modeling

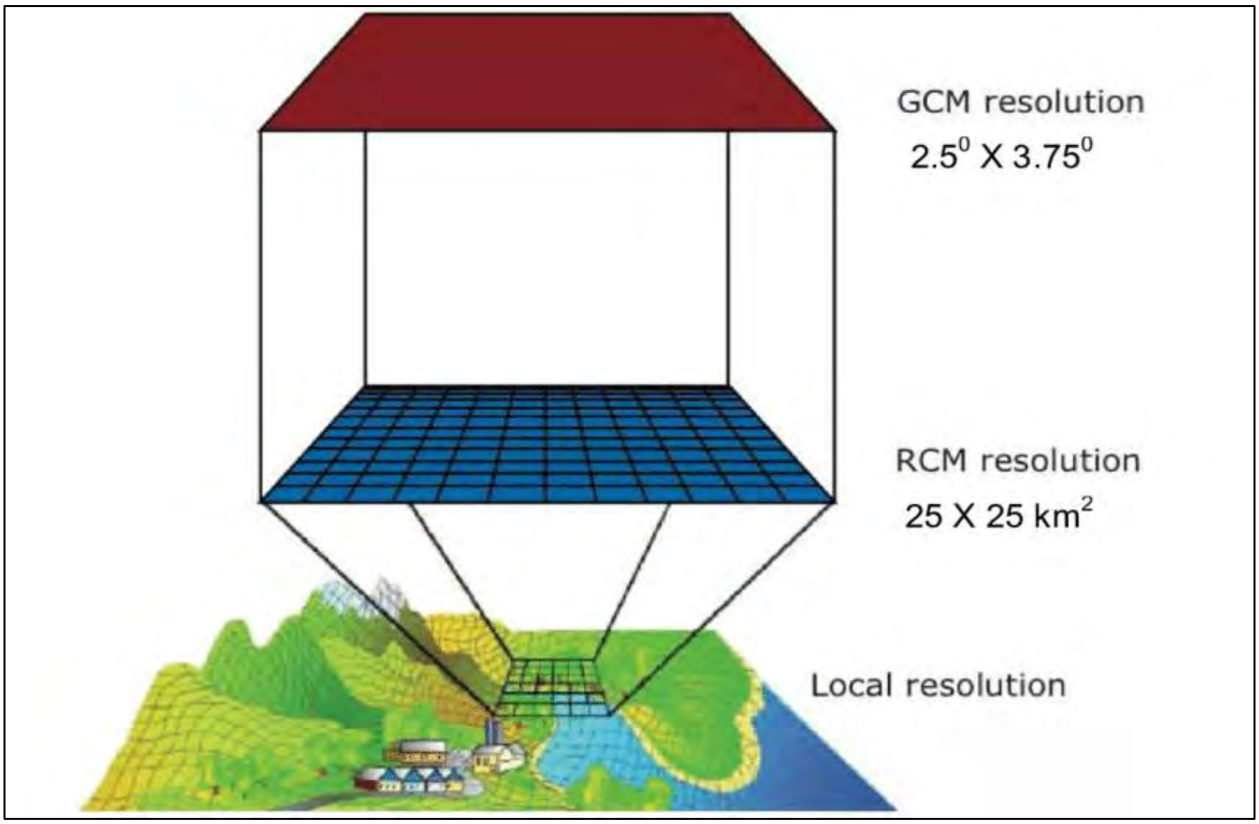
Water supply modeling is an immensely useful tool to help identify potential supply shortages and evaluate the potential incremental improvements that could be provided by various supply augmentation strategies. The kinds of models used for these purposes produce lots of numbers – both estimated supply deficits and also probabilities of variously sized deficits occurring. These data are most useful when there is a deeper understanding of where the numbers come from and what they mean.

Attachment A is an updated version of an earlier Confluence Primer (see link above) that provides an overview for the reader of the various elements of the SCWSM as well as the Confluence model and how they work to produce useful input on supply deficits and the benefits of various supply augmentation projects in reducing those deficits.

It is important to note that Confluence and the SCWSM do the same job and basically in the same way, although Confluence runs us a single set of results based on a single hydrologic data set. Examples of these data sets include historic hydrology and the hydrology for the GFDL 2.1 climate change scenario used by the Water Supply Advisory Committee (WSAC). Nevertheless, there is a key difference between the two models, and that is in how they develop and use key inputs such as climate change and related hydrologic modeling inputs.

When Confluence results have provided climate change scenarios, the climate model inputs to create local hydrology for use in the system have come from a selected global climate model or an ensemble of models that have been downscaled. The graphic in Figure 1 below shows conceptually how this is done: Basically, a climate model that covers a huge area is reduced to a regional model, which is subsequently reduced to an even smaller area covering a single watershed. This approach produces a single estimate of a potential future climate, leaving many other potentially plausible futures as unknowns.

Figure 1 – Conceptual Diagram of Climate Model Downscaling



The approach to considering climate change being used in the SCWSM is different. It provides hundreds of different combinations of potential future temperature changes and precipitation changes to the Water Balance Model. The Water Balance Model then produces local hydrology for each combination, all of which are then used to challenge the water system.

No one specific global climate model is used as the basis for generating the potential future temperature and precipitation inputs to the Water Balance Model, although the range of inputs being used has been vetted by an independent panel of experts to assure suitability for our purposes. Figure 2 is slide 7 from the May 2, 2022, Water Commission presentation by

Dr. Casey Brown showing how the 10 climate scenarios selected as the basis for the temperature/precipitation inputs relate to no change in historical conditions.
In reviewing Dr. Brown's materials from the July 21st meeting, staff also wants to note that the small bar charts below the main probability chart (see Figure 3 as an example) includes information on how several Global Climate Models (GCMs) using the Representative Concentration Pathway (RCP) 8.5 project changes to precipitation by 2040 and 2070. This information is provided only as a reference for comparing the ranges projected by GCMs under RCP 8.5 conditions with the ranges of precipitation variation used for the SCWSM. The RCP 8.5 pathway was not driving the results of the SCWSM being presented at the July 21st presentation on supply deficits.

Figure 2 – Slide 7 May 2, 2022, Water Commission Presentation on Climate Scenario Generator

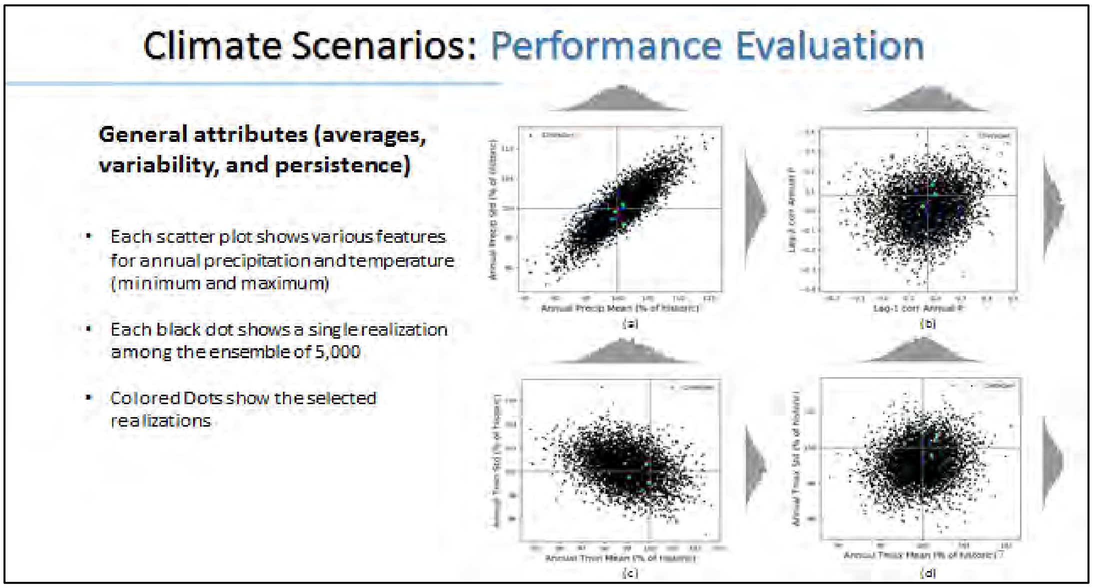
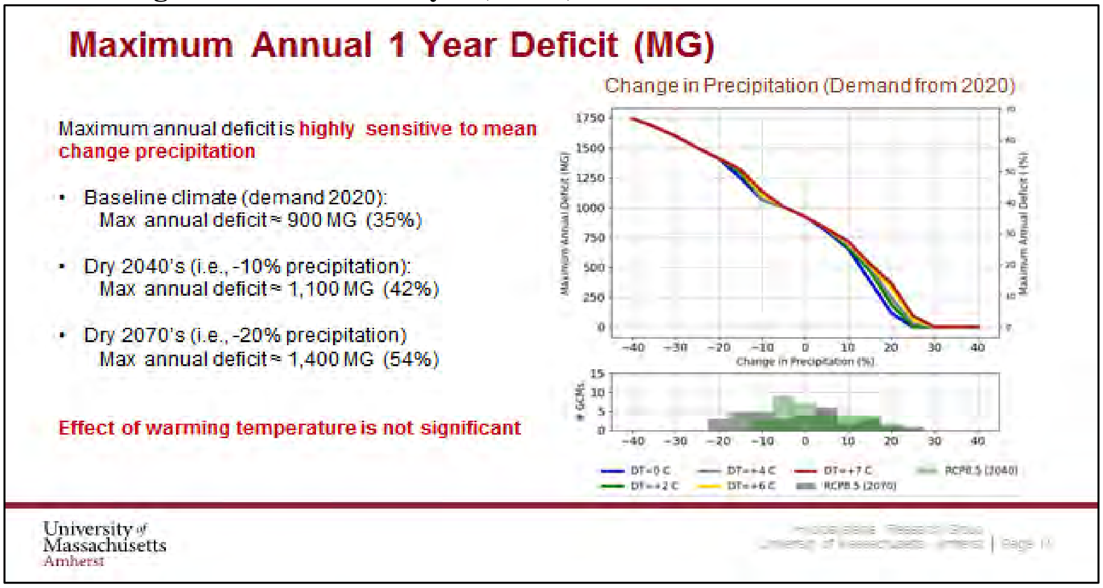


Figure 3 – Slide 14 July 21, 2022, Water Commission Presentation



2. Modeling Results for Supply Deficits – Putting New Results in Context with Earlier Results

An April 2019 Water Commission workshop summarizing the Department's first three years of work on implementing the recommendations of the WSAC included a major update to the WSAC assumptions about future water demand and showed how that changed assumption affected projected worst-year supply deficits under historic hydrology as well as under three other climate change assumptions. Figure 4 summarizes these results.

Figure 4 – Water Shortage Projections from April 2019

April 2019 Updates on the "Gap" Current-System Worst-Drought Peak-Season Shortages (mg)

Drought Year	Historical Hydrology		GFDL Climate Change		CMIP 5 Climate Change		Catalog Climate Change	
	3.2 bgy	2.6 bgy	3.2 bgy	2.6 bgy	3.2 bg	2.6 bgy	3.2 bg	2.6 bgy
Yr 1	728	0	1,109	419	816	241	1,067	315
Yr 2	1,141	781	956	570	864	454	1,276	834
Yr 3	–	–	–	–	794	408	–	–
Total	1,869	781	2,066	989	2,474	1,103	2,343	1,149

The reduction in demand from the projected 3.2 billion gallons per year (bgy) used by the WSAC to the 2.6 bgy figure does have a significant impact on reducing the size of the worst year shortage and also the worst drought shortages. But it does not eliminate the shortfall, and even in the historic hydrology data, the size of the potential worst-case drought shortage represents more than 50% of the total peak season demand.

Figure 5 updates these results to eliminate the 3.2 bgy deficits, recognizing that these demands are no longer relevant as the lower level of demand has persisted through the seven years beginning in 2016 through a variety of wet and dry conditions, and adds additional deficits as presented to the Commission on July 21st. Note, additional results using a 98th percentile shortage were also presented to the Commission by Dr. Brown at the July 21st meeting, and these results show shortages that were substantially lower than those for the worst year drought conditions. Those results aren't included in Figure 5 because all the other results in the table are for worst-year droughts, so using similar results from the most recent modeling work is more comparable to the other results. To see the results for the 98th percentile shortage, please refer to slide 19 of Dr. Brown's July 21st presentation.

Figure 6 shows results that include both the size and probabilities of shortages across the full range of worst-case results that have been developed throughout the WSAC follow-up work. The results in Figure 6 are a rolled-up version of the results provided to the Water Commission in July 2020 (see link provided earlier) and include the updated results from the SCWSM results presented on July 21st.

Figure 5 - Worst Year Shortages for Various Historic and Climate Change Modeling Scenarios, with water demand of 2.6 bgy and shortages in millions of peak season gallons

Drought Year	Historical	GFDL	CMIP 5	Catalog	No Precip Change	-10% precip change
Year 1		419	241	315	612	1,030
Year 2	781	570	454	834	923	1,065
Year 3	--	--	408	--	26	110
Total	781	989	1,103	1,149	1,561	2,205

Figure 6 - Size and Probability of Worst-Case Shortages

Scenario:	Historic	GFDL2.1	CMIP5	Catalog	dP 0% dT 0 max	dP –10% dT +2 max
Largest shortfall mg (and %); probability	781 mg (57%) 1:100	570 mg (41%) 6:100	454 mg (33%) 20:100	834 mg (60%) 2:100	923 mg (68%) 1:100	1065 mg (78%) 4:100
Stage 1 or 2: % years, and range of shortfalls (mg)	0% (0 mg)	16% (1mg - 304 mg)	24% (1mg – 304 mg)	8% (1 mg – 304 mg)	1.6% (1 mg – 304 mg)	3.% (1 mg – 304 mg)
Stage 3 or greater: % years, and range of shortfalls	1% (>761 mg)	24% (305 mg - 760 mg)	26% (305 - 608 mg)	12% (305 mg – > 761 mg)	.07% (305 mg – > 761 mg)	1.5% (305 mg – > 761 mg)

3. Historic Hydrology and Climate Change Hydrology

Many Water Commissioners will be familiar with the often-used figures shown in Figures 7 and 8. Figure 7 shows water year classifications in an annual order and Figure 8 shows the same information grouped by the type of water year classification, starting with the critically dry years on the left and moving to the wet years on the right. These data are important because they help us see variability in annual water availability and also link to historical actions and responses to variable conditions.

Figure 7 - Water Year Classification System

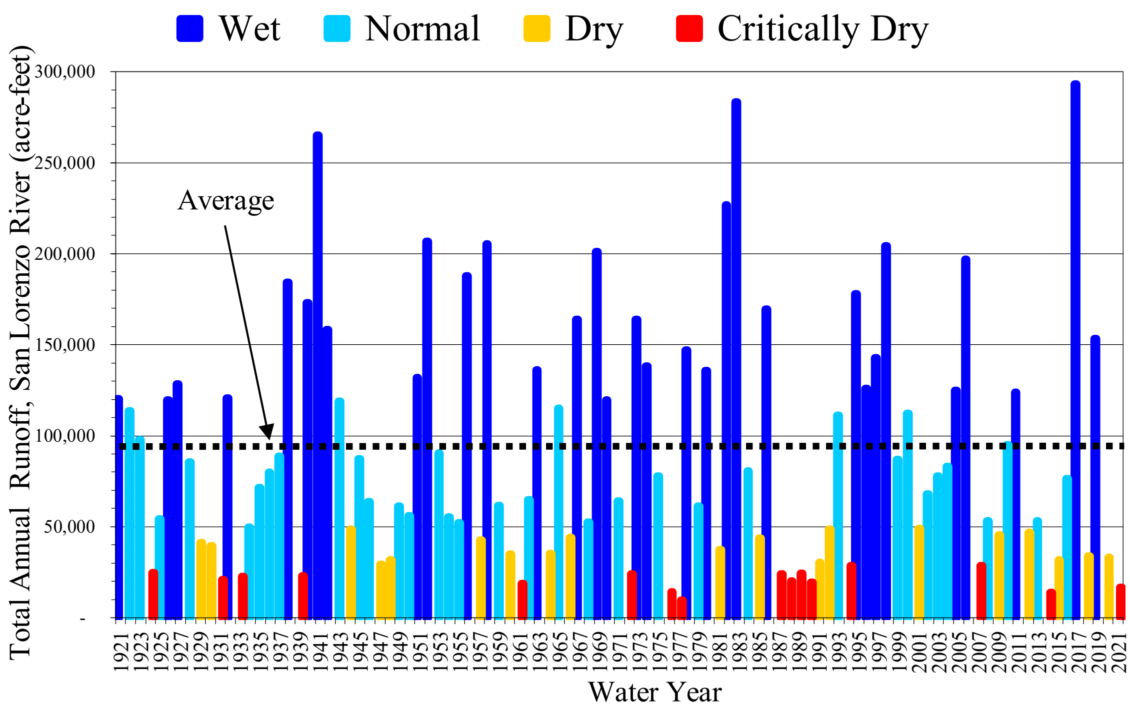
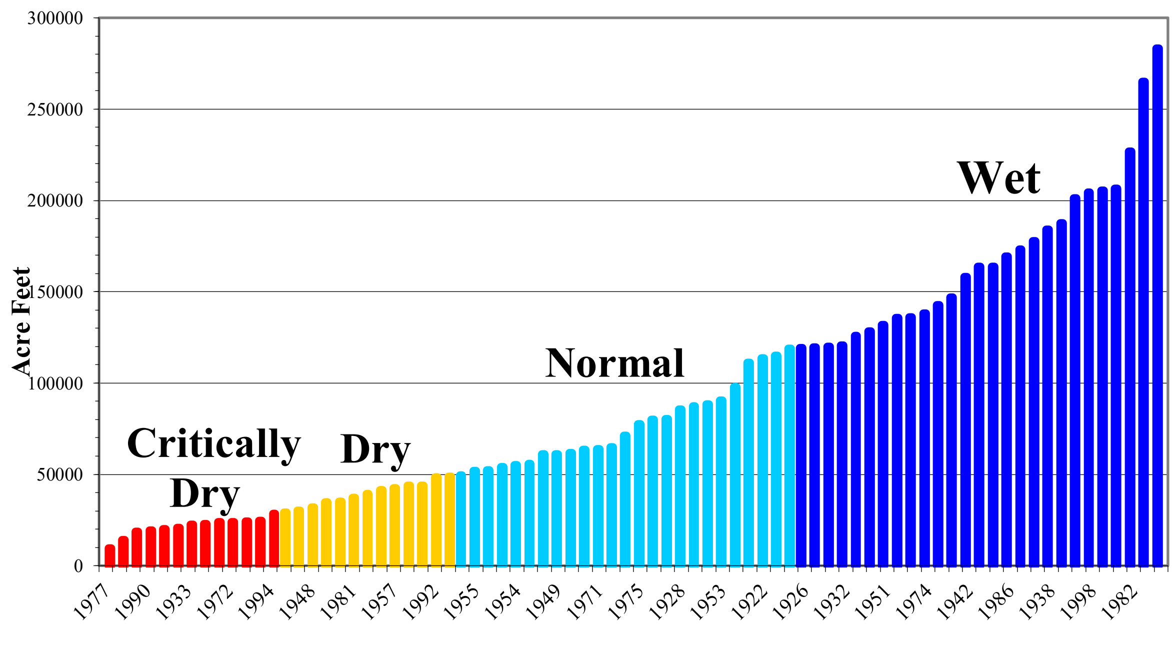


Figure 8 - Water Year Classification System Based on San Lorenzo River Runoff



Hydrologic inputs are a huge driver of water supply modeling so when looking at the deficit results as staff and Water Commissioners have been doing, understanding what's going on with system hydrology is quite important. Working with Dr. Shawn Chartrand, the City's long-time hydrology consultant, staff asked to see hydrology results for a range of potential future climate scenarios, starting with the scenario that produced the worst-case drought results for no precipitation change and a -10% precipitation change. Figures 9 and 10 show are analogous to Figure 8 for these scenarios. In these graphs that follow, water year classifications have been shifted from four classifications to five, with the addition of a very wet classification. The historical definition of critically dry, dry, normal, and wet basically divided established cut offs between classifications at the 25th, 50th, and 75th percentile respectively. The five-year classification scheme, which is used in the City's fish flow agreements with state and federal fishery agencies separates critically dry, dry, normal, wet, and very wet years at the 20th, 40th, 60th and 80th percentiles respectively. As a general observation, the charts below contain many more dry and critically dry years than historic data shown in Figure 8, even considering the influence of shifted classification system, which generally classifies fewer years as dry or critically dry than the four-classification version.

Figures 9 and 10 show a significant increase in the number of critically dry and dry years when compared to historical hydrology. And, as shown in Figure 10, as expected, changes in precipitation shift more of the dry years to the critically dry category.

Figure 9 - No Change in Precipitation

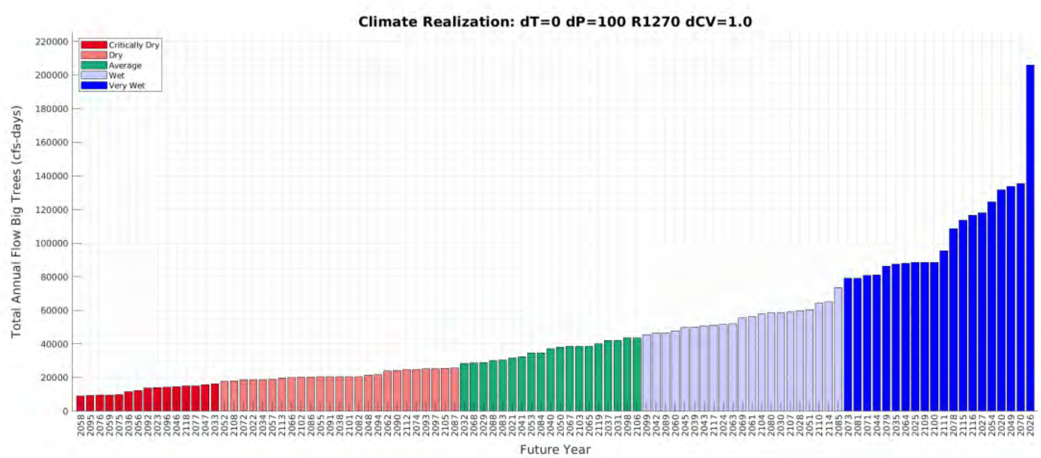
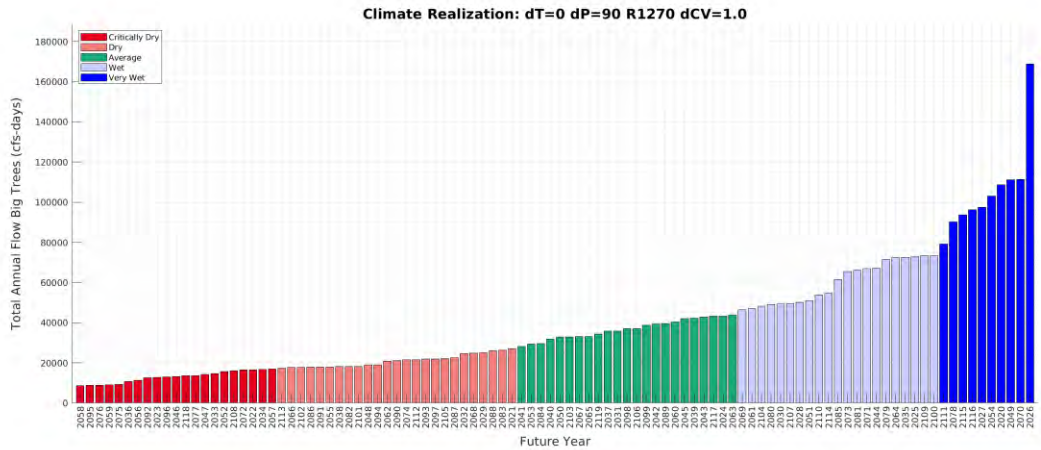


Figure 10 – Minus 10% Change in Precipitation



Figures 11 and 12 show the same data as shown in Figures 9 and 10 but in a sequential, future year order.

Figure 11 – No Precipitation Change

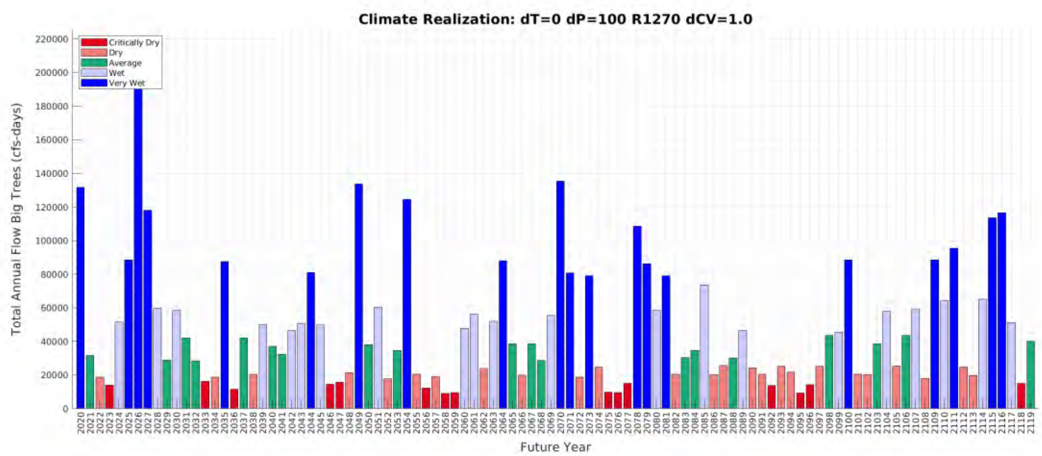
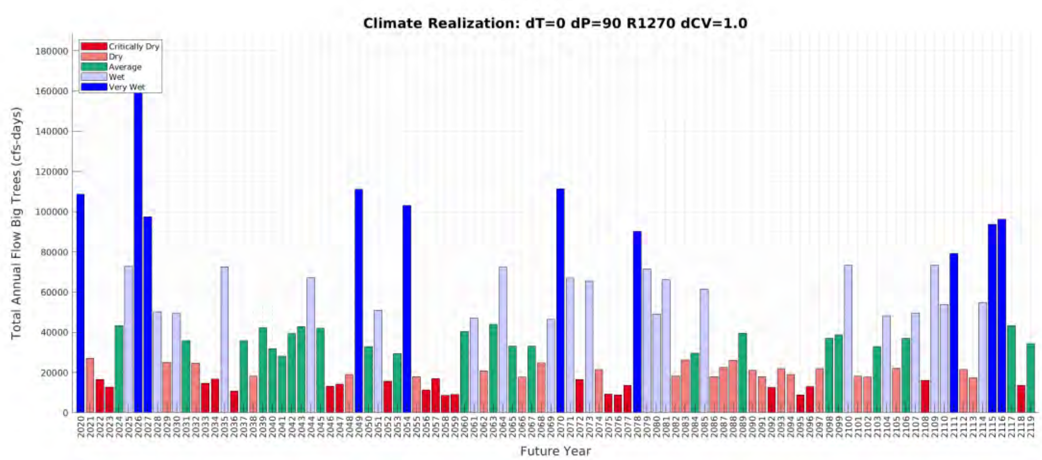
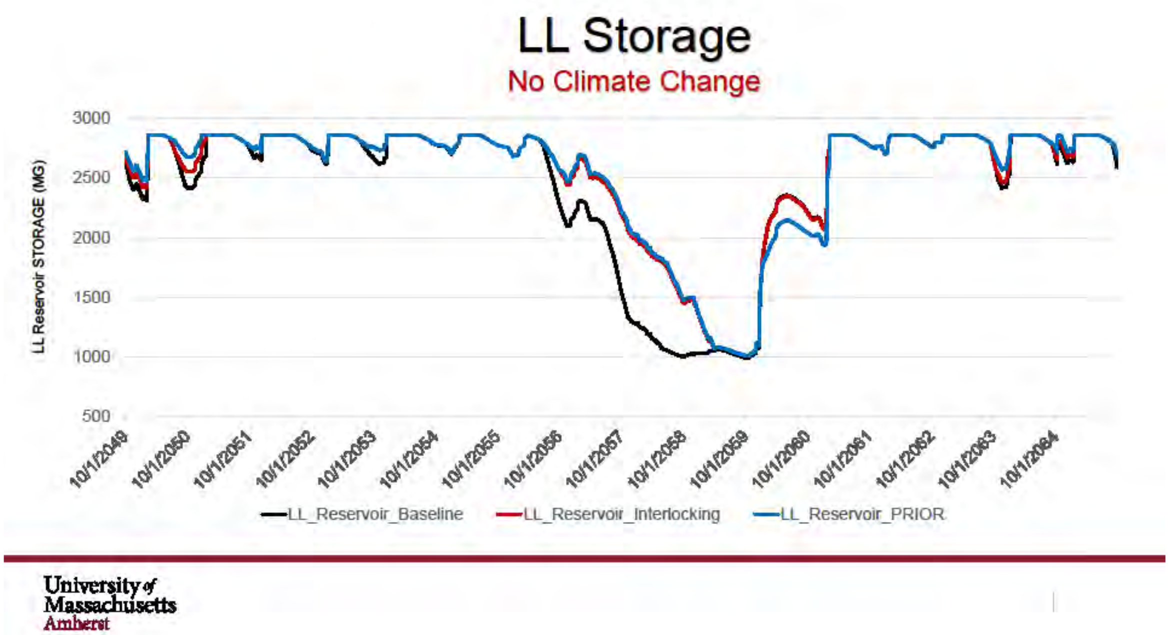


Figure 12 – 10% Precipitation



Staff noticed two things when reviewing Figures 11 and 12. First that the three-year drought as shown in the results from the SCWSM producing the worst-case shortages (2057, 2058, and 2059) is really a five-year drought starting in 2055. Figure 13 provides information about how reservoir storage in Loch Lomond is being modeled for this period.

Figure 13



During the first three years of this dry period, shortages aren't reported because storage is being depleted and then not being replenished during subsequent winters, leading to large shortfalls in the fourth and fifth years of this drought, followed by a smaller shortfall in Water Year 2060 as more normal conditions return.[1]

And second, referring back to Figures 11 and 12, there is a period beginning 2086 and running through 2097 involving multiple dry years in a row with few opportunities to replenish supplies during winters. Two recent examples of dry but not critically dry years are 2018 and 2020. Dry conditions in 2020 were followed by critically dry conditions in 2021, ultimately leaving Loch Lomond storage at 54% at the beginning of Water Year 2022.

[1] For modeling purposes and to assess shortages, staff has asked the U. Mass team not to make decisions about implementing curtailments as a management action when conditions might otherwise warrant. This was done to make sure that we could fully understand the degree to which conditions being modeled would or would not fully meet customer demand. Further, as has been the case in all the Department's water supply modeling for decades, modeling isn't challenged by questions about what will happen in coming years since the hydrology used always covers long, contiguous time periods. In reality, system operation is always challenged by questions about what is going to happen next year and, when dry conditions are causing depleted reservoir conditions, whether it rains or not in the following winter is not only unknown but also presents a critical risk that is typically managed conservatively to minimize the risk of running out of water in future years. There is no doubt but that this reality results in more instances of implementing curtailments than are ultimately required, though it is highly unlikely that this situation is going to change until supply reliability is improved to the point where the consequences of curtailments to respond multiple dry years back-to-back are lower than they are now.

Additional work looking at hydrologic results is planned, including reviewing multiple climate scenarios. More of this type of analysis will help inform Water Commission discussions and recommendations on the reliability goal.

Part B – Aquifer Storage and Recovery (ASR) Water Supply Augmentation Project Concept Modeling

City Staff and its consulting team have been working together over the last few weeks to produce modeling results on how implementing the Mid-County ASR project would contribute to reducing or eliminating supply deficits under a range of supply conditions. Dr. Casey Brown will be presenting those results.

Part C – Updated Results of Evaluation of All Project Concepts Against Evaluation Criteria

Following a robust discussion of preliminary project concept evaluations at the Water Commission's June 6, 2022, meeting, staff from the Kennedy Jenks team will be presenting updated Fact Sheets and looking to Commissioners for feedback. Additional details will be added to project fact sheets and evaluation results in the coming weeks, including details from modeling results for the Indirect Potable Reuse, Direct Potable Reuse, and Desalination project concepts. See Attachments B and C for materials related to this segment of the agenda.

Part D – Reliability Goal and Economic Impact of Curtailments Study

During the August 16, 2022, City Council Study Session on Securing Our Water Future, staff made several points about why a reliability goal is needed and the challenges of developing one. Included were:

- A reliability goal guides our sizing of water supply augmentation solutions for implementation.
- The basic challenge involves balancing the amount of risk of a shortage we want to be exposed to against the cost of the solutions.
- In considering the level of risk to accept, we need to be clear about what steps we would need to take to respond to the supply shortages we don't plan projects to address unmet demands.

The work being presented by Dr. Brown includes information on the size of shortages if a reliability goal lower than that required to meet the worst-case shortage is adopted. In the Council presentation staff shared this information and noted that, given the significant difference between the size of shortages at the 98th percentile reliability and those in the worst-case shortages, understanding the frequency and direct and indirect costs of curtailments is going to be important. Dr. Raucher will be providing a brief overview of the consequence economic impact analysis that is being developed and describe work done in other situations that will provide Commissioners with information about what's planned and get feedback on what questions Commissioners have.

Part E – Working Draft Council Resolution/Policy Framework

Attachment D to this staff report is a working draft of a City Council resolution and a broad outline of the topics that would be presented in the resolution's policy framework (i.e., the NOW THEREFORE part of the resolution). Staff's goal in sharing this working draft with Commissioners now is to get feedback on the recitals (i.e., the WHEREAS parts) to see if there are questions or suggestions about what's included in the recitals. Suggestions or questions about the topics to include in the policy section will also be welcome at this time. Commissioners can expect to see this document on the agenda for the October and November Commission meetings, with a proposed action for the November 7th meeting to recommend a resolution and policy statement to the Council for their consideration before the end of the year.

FISCAL IMPACT: None.

PROPOSED MOTION: No motion required. This agenda item is part of ongoing Securing Our Water Future work, which will result in Water Commission Recommendations to the Council at the Commission's November 7th meeting.

ATTACHMENTS:
Attachment A – Modeling Primer
Attachment A-1 – Confluence Modeling Primer
Attachment B – Fact Sheets
Attachment C – Project Summary Table (to be distributed during the meeting)
Attachment D – Working Draft City Council Resolution

Attachment A

A PRIMER ON WATER SUPPLY MODELING – 2022

Background on Water System Modeling

Much of the information and analyses on water supply deficits and system reliability being presented and discussed in Water Commission meetings as part of the Securing Our Water Future work is based on water system modeling. For many years the City used the Confluence® modeling runs performed by Gary Fiske to support this kind of work. Over the last couple of years, Water Department staff has been working with Professor Dr. Casey Brown and the University of Massachusetts' Hydrosystems Research Group to develop a model that basically performs in the same way the Confluence model does but uses current technology and computing speeds to allow for quicker run times. Using new technology supports the ability to look at results across many more potential scenarios than would be feasible using Confluence. Examples of scenarios include challenging the water system with many potential future climates rather than just one or two and learning more about how the water system performs under a wide range of differing conditions.

For those less familiar with the use of modeling tools, trying to understand the water supply deficits that are being presented as modeling results can be challenging, and without the necessary context, the resulting numbers are basically meaningless. To facilitate greater understanding of the water supply modeling results, this primer is being provided as background.

Basis of Water System Modeling

Neither the Confluence model nor the UMass Santa Cruz Water System Model, which we'll refer to as SCWSM, is an operational model. Rather these models are used as planning tools that give us information about the size of water supply shortages under a range of scenarios (e.g., changes in precipitation, temperature, demand, seasonality, etc.) and information about the probabilities that are associated with those outcomes.

Understanding the system's ability to reliably meet customer demand is critical to water system planning. This is particularly true if water system reliability is an issue for the system as it is in Santa Cruz. Models are used to analyze how the system performs under a variety of conditions, and the volumes of supply deficits, when they occur, answer the "how much" question. Models can also help us understand the "how often" question, which is important context to consider. Models, however, cannot answer the "so what" question, but models can help inform decision-making about what to do to improve system reliability by telling us how the addition of various supply augmentation strategies improves system performance.

To understand how these models are applied and what their results mean, it is best to describe the modeling inputs and outputs using a specific example. This primer is going to use a baseline scenario using historic flows to evaluate how the current water system would perform. Under the baseline scenario, the key inputs include the following data:

- historic hydrologic record,
- current system configuration, without additional supply augmentation projects, which includes water supply and system constraints due to water rights and system hydraulic capacities, etc.,
- agreed fish flow requirements[1], and
- current and projected water system demand as it changes over time.

The historic hydrologic record data set includes actual daily flows in the streams the City diverts water from to meet customer demands for each and every day of the historical period are used.

Here's how the models work under this example:

1. Assume that we're using a historical record flow set that covers 70 years. This record includes 25,550 daily records of flow, each of which has been adjusted based on the agreed fish flow requirement for that day based on the actual conditions that had been in place on that day in the historical record.

2. Assume that day one is October 1, 1948, and the final day is September 30, 2018, or 70 complete water years[2] each with actual historic data to work with.

3. Assume the forecast used by the Water Supply Advisory Committee (WSAC) that resulted in a 1.2-billion-gallon worst year shortage was 3.2 billion gallons per year which is disaggregated into daily demands.[3]

4. Assume that water from the Department's sources is "dispatched" to meet daily demands in the following order: North Coast, San Lorenzo source (including Tait wells), Beltz (typically only during the summer/fall) and finally Loch Lomond.[4]

5. On day one, October 1, 1948, the water from the flowing sources (after fish flows have been subtracted) is used to meet projected water system demand using the water demand forecast. If Loch Lomond water was used on day 1, the amount of available water from Loch Lomond to meet demand on day 2 is lowered by the amount used on day 1 as adjusted by whatever inflows to the reservoir have occurred.

[1] After many years of work, in 2016, the City and state and federal fishery management agencies reached agreement on a set of bypass flows, called the Agreed Flows, that would become part of water system operations. These flow releases are being provided to support the various life stages of threatened steelhead trout and endangered coho salmon using the City's North Coast and San Lorenzo River sources as habitat. These flow commitments affect the amount of water available from the City's sources and influence the City's ability to meet customer demand during all year and are based on monthly hydrologic conditions, with more water being provided in wetter conditions than in drier conditions.
[2] A water year in North America starts on October 1 and tuns through September 30 of the following year. This approach captures a full wet season followed by a typical dry season and then starts over.
[3] In 2018, Water Department Staff directed our modelers to use the 2.6 billion gallons per year demand that had been established under water rationing in 2014 and 2015 and has been firmly established as current demand since that time. This change for the scenarios running historical data reduced the worst year shortage to around 800 million gallons.
[4] As might be expected, there are many nuances to this dispatch order, including seasonality, water quality parameters such as turbidity, etc. For simplicity, however, these details have not been included here.

6. Days 2 through 365 of the water year repeat the process described for day one, keeping track of any days in which there is not enough water to meet daily demand, if any, using all available resources.

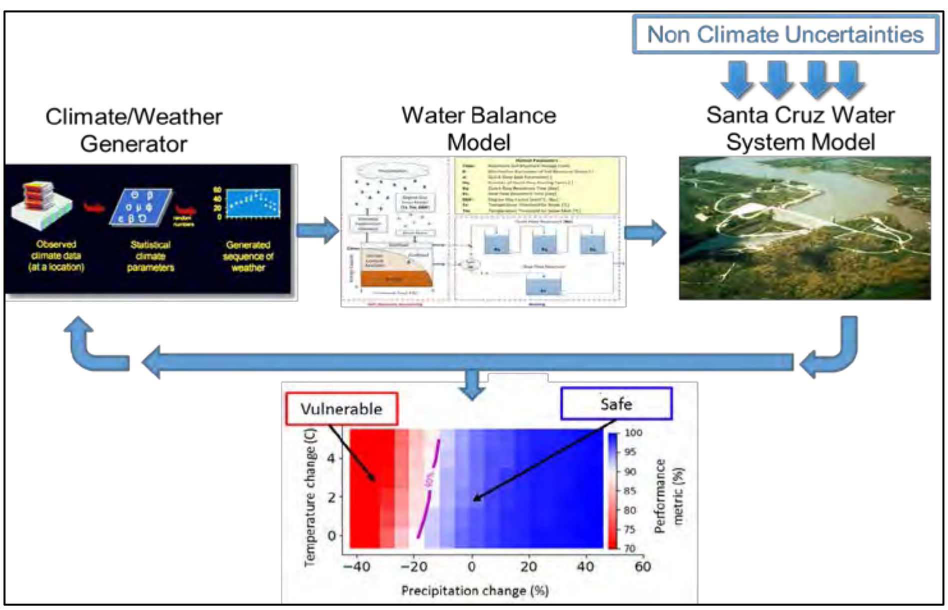
7. Water year #2 picks up exactly where water year #1 left off with respect to Loch Lomond's reservoir level, and the model runs again and so on until every year of the historical flow set has run.

8. At the end of each water year, any daily shortage of water needed to meet demand is accumulated into a single number by volume for that year. So, when you see an annual deficit number it means that during some portion of that water year there wasn't enough water available to meet daily demand from available sources.

9. When all years in the data set are run, the model reports results including the percent of all years in the flow set in which system demand is not met as well as the size of the shortages. These data provide a probability distribution that is useful in understanding the size and annual probability of shortfalls in meeting customer demand.

Until recently, for model runs based on climate change hydrology, flows for every single day of the period being modeled have been developed by downscaling one or a combination of global climate models. The downscaling process translates climate model parameters into local precipitation and temperature, which is then used to create the hydrologic flows used in the modeling**.**

The new SCWSM, however, doesn't use a specific global climate model or combination of models. Rather the Climate/Weather Generator provides combinations of temperature and precipitation changes as inputs to the Water Balance Model, which produces the hydrologic inputs to the SCWSM.



Stress Testing the Water System

A major purpose of developing the new SCWSM is to be able to stress test the water system to see how it performs across a wider range of potential future conditions than can be evaluated using a limited set of future climate scenarios developed through down-scaling. The stress testing of the Santa Cruz water system is facilitated by faster computing speeds of the SCWSM which allows us to challenge the system with literally thousands of different climate scenarios and see how the system performs. The red, white, and blue graphic[5] above has been used by Dr. Brown in several of his presentations and shows one product of stress testing. This graphic has been called a "heat map" and provides a visual representation of how temperature and precipitation changes affect the system's vulnerability to shortages.

Running the model for stress testing or supply planning works in basically the same way as described earlier for the Confluence model. The Climate/Weather Generator provides hundreds of different plausible potential future combinations of temperature and precipitation to the Water Balance model, which uses these inputs to create hundreds of scenarios with differing local hydrologic flows. These flows are adjusted as needed to meet fish flow requirements and then go to the SCWSM for processing. The model runs produce the same system performance metrics, that is, size of annual deficits and frequency of years with deficits, with these results being used to populate the vulnerability heat map figures as well as provide other information about system performance.

The modern computing processes used by the SCWSM support the capability to look at and process thousands of climate change driven flow inputs to see how the system performance changes under different conditions. For example, figures such as the example heat map show how increases in temperature and various increases or decreases in precipitation shift the line between what is safe and what is vulnerable.

Modeling Future Supply Scenarios

As noted in the opening paragraph of this Primer, using current technology and computing speeds allows for quicker run times, which supports the ability to look at results across many more potential plausible climate scenarios than would be feasible using Confluence. The same is true regarding the SCWSM's capacity to look at a wide range of supply augmentation projects. To assess how adding new water supply resources to the system changes water supply reliability, for example, modelers:

- add virtual reservoirs or other additional supply sources to the basic system configuration,
- assign the water available from that resource a priority in the supply dispatch order discussed above, and
- run the model to see how the size and probabilities of shortages change once the new resource is online.

[5] Please Note: The heat map in the figure above is an example only and doesn't reflect results for Santa Cruz's water system performance.

Conclusions

Water system modeling tools can be readily adapted to look at a wide range of climate and adaptation scenarios and incorporate key assumptions about system capacities, constraints, and operations. Santa Cruz has a long history of effectively using Confluence to support water system planning and that work has formed a firm foundation upon which the SCWSM is building. It is important to note that earlier Water Commission presentations by Dr. Brown on the development of the new model showed examples of how the new model's results were like those produced by the Confluence model. This alignment is important as it demonstrates that key assumptions driving the models are producing similar results.

Attachment A-1
Confluence® Modeling – A Primer

Note: A lot of the information and analyses presented in this Tech Memo is based on Confluence® modeling runs performed by Gary Fiske. Additional attachments to Confluence modeling results are referenced in the memo, and for those less familiar with the model the results may require more background explanation than typically provided in those products. To facilitate greater understanding of the Confluence® modeling results, this primer is being provided as background.

The Confluence model isn't an operational model, but rather is a planning model that focuses on giving us information about the probabilities of various outcomes as well as giving us the ability to compare scenarios.

For runs based on historic hydrology, the model uses actual daily stream flows associated with each and every day of the historical period. For runs based on a climate change scenario flows for every single day of the period being modeled have been developed using precipitation and runoff, temperatures etc. that are created as part of the downscaling of global climate models or other approaches for projecting potential implications of climate change.

Here's a simplified example of how the Confluence model works: Assume that we're using a historical record flow set that covers 70 years. This record includes 25,550 daily records of unimpaired stream flow in which each record daily flow has been adjusted based on the agreed fish flow requirement for that day based on the actual conditions that would have been in place on that day in the historical record – so higher dedications of flow in wetter conditions and lower dedication of flows in drier conditions.

Assume that day one is October 1, 1948 and the final day is September 30, 2018 so we have 70 complete water years each with actual historic data to work with. On day one the water from the flowing sources (after fish flows have been subtracted) is used to meet projected water system demand using the water demand forecast. The forecast used by the WSAC was 3.2 billion gallons per year which is disaggregated into daily demands. (The more recent model runs were run using the reduced demand – more about that later).

Water from the department's sources is "dispatched" to meet daily demands in the following order: North Coast, San Lorenzo source (including Tait wells), Beltz (typically only during the summer/fall) and finally Loch Lomond[1,2]. If Loch Lomond water was used on day 1, the amount of available water from Loch Lomond to meet demand on day 2 will be lowered by the amount used on day 1 as adjusted by whatever inflows to the reservoir have occurred.

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[1] With the potential addition of stored groundwater to the system, Gary has developed a strategy for optimizing the use of stored water from both surface and groundwater reservoirs.

[2] The Confluence model does include an ability to deploy the water available from the Felton Diversion and includes other operating constraints such as amount of draw-down of Loch Lomond allowed in a given year, but those details have been left out for the sake of simplicity.

Days 2 through 25,550 of the model run in the same way with the model keeping track of any days in which there is not enough water to meet daily demand, if any, using all available resources. At the end of the water year any annual shortage of water needed to meet that year's demand is accumulated into a single number by volume.

Water year #2 picks up exactly where water year #1 left off with respect to reservoir levels, and the model runs again and so on until every year of the historical flow set (or climate change alternative flow sets) has run. The model results tell us the percent of all years in which system demand is not met as well as the size of the shortages, creating a probability distribution that is useful in understanding the reliability of the system.

As noted in the footnote #2 on the previous page, the Confluence model has been adapted to integrate the idea of filling a "virtual" reservoir with water from either passive or active recharge.

One other important Confluence assumption is related to the benefit of planning to accumulate water in groundwater storage over several years so that an appropriate amount of water is available to provide drought supply. This approach is beneficial and has been being used in all the Confluence analyses we've been doing to test the feasibility of groundwater storage for meeting our drought supply needs. A three year "fill" cycle before a drought has been used in most of the analyses, but in one analysis presented to the Water Commission in October 2017, both a 3 year and a 7 year fill cycle to bank water before we needed to withdraw it.

Another assumption has been a 20% loss of stored groundwater – This is how a 1.2 billion gallons worst year shortage turned into 3 billion gallons of needed stored water: historic drought was 2 years x 1.2 billion gallons = 2.4 billion gallons. Assuming a 20% loss, to be sure you have 2.4 billion gallons available you need 3 billion gallons to start with.

A January 2015 version of the assumptions being used in Confluence and how they have changed over the years is shown here. There is likely a more up to date version of this somewhere, so I'm not suggesting that things haven't changed, but I do want to provide this so you can see some of the additional details about assumptions.

Fact Sheet

Description	Available winter flows from the City's surface water treated at the Graham Hill Water Treatment Plant (GHWTP) would be injected in the City's Mid County Groundwater Basin (MCGB) at the existing Beltz wells and additional new wells, and recovered as a supplemental groundwater supply in dry summer periods (referred to as "Scenario 11.2" in prior ASR feasibility investigations and groundwater modeling efforts) [1]
Water Source(s)	Average Injection: 930 AFY / 300 MGY (1.7 MGD) of potable city water supply [2] Max Injection: 1,110 AFY /360 MGY (2.0 MGD) of potable city water supply [2]
Project Yield	Average Extraction: 750 AFY / 250 MGY (1.3 MGD) of groundwater [3] Max Extraction: 1,620 AFY / 530 MGY (3.0 MGD) of groundwater [3]
Evaluation Criteria[4]	
Project's supply contribution as a % of worst year supply shortfall	44% [5] of the 1.2 billion gallons per year (bgy) supply gap [6]
Increases resilience to climate change	Yes; the project would utilize available capacity in the MCGB for storing winter flows, to be recovered through additional groundwater extraction during dry periods, thereby increasing resilience to drought and the impacts of climate change.
Annualized Cost per million gallons of Average Year Yield (ACAYY)[7]	
Total Annualized Cost[8]	Total Capital Cost: $97.6 Mil Annualized Capital Cost: $4.5 Mil O&M Annual Cost: $2.1 -$2.5 Mil Total Unit Cost: $4,300 – $8,700 per AF ($13,300 - $26,900 per MG)
Is understood and accepted by the public and key stakeholders	Yes, this alternative is understood and continues to be viewed favorably as a viable alternative to address water shortages.
Scalable or can be implemented incrementally or in phases	Yes; ASR can and should be implemented over time to ensure predicted outcomes; ASR is limited by groundwater basin capacity, surface water availability, and influence of Pure Water Soquel (PWS) injection to the MCGB.
Technical Feasibility	Yes; ongoing pilot testing demonstrated technical feasibility.
Likelihood project being funded by state or federal grants	Likely; funding from the Bureau of Reclamation and State Water Resources Control Board (SWRCB) is available for construction of new wells.
Opportunity for shared funding	No; City does not have a project partner and would likely assume all costs.
Greenhouse gas emissions	110 - 140 million ton (MT) of carbon dioxide (CO_2) emissions per year [9]
Time required for implementation	8 to 10 years for complete implementation of all ASR wells[10]
Operational Complexity	Low to Medium; would require minimal changes to current potable water supply operations, but increased effort for O&M of ASR wells.
Energy Use	710,000 – 930,000 KWh/yr [11] 0.6 – 0.9 MWh/AF [11]
Potential impacts for CEQA required mitigations to impact project cost or timeliness	Low; preliminary analysis indicates that the project would not have significant environmental impacts due to limited footprint of new facilities. The first phase of this project (conversion of existing Beltz Wells) was evaluated at the project level in the Water Rights EIR.
Adaptable to future regulatory or source water changes	Yes; for regulatory changes, but limited adaptability to new water sources. Prior to source water changes, geochemistry, travel time, and post-recovery water treatment needs will need to be revisited.
Degree of administrative complexity	Low; located within the City of Santa Cruz water service area and no need for partnerships with outside agencies.

Evaluation Criteria (cont.) [4]	
Ancillary Benefits	• Contributes to groundwater replenishment • May assist in limiting seawater intrusion and meeting GSP objectives • Adds storage water to system supply portfolio • Opportunity for regional collaboration
Ancillary Costs/Risks	• May mobilize constituents in basin • Subject to leakage from groundwater basin, aka “losses” • Sufficient cumulative storage may not be available in time of need • Reliant on surface flows: subject to wildfire, mudslide, and other watershed risks
Assumptions	• Based on Scenario 11.2 1 and does not consider operation of Pure Water Soquel project and impacts to injection or extraction rates. • Pipelines sized for peak injection (2.0 MGD) and peak extraction (3.0 MGD) • Injection period = 6-month (Nov – Apr) • Extraction period = 6-month extraction (May – Oct)

NOTES:

[1] Scenario 11.2 was performed by Pueblo Water Resources in their Phase 1 ASR Feasibility Investigation groundwater modeling (Pueblo, 2021). This scenario uses 2016-18 demands (2.6 bgy), the GFDL2.1A2 climate change scenario, uses the four existing Beltz wells plus four new wells. Does not include native groundwater supplies.

[2] Average and Max injection rates provided by City from Gary Fiske modeling results based on Scenario 11.2 (May, 2022).

[3] Average and Max extraction rates provided by City from Gary Fiske modeling results based on Scenario 11.2 (May, 2022).

[4] Evaluation criteria listed in order of importance as ranked by Commissioners

[5] Percentage based on max extraction rate of 530 MGY.

[6] As comparted with the supply gap identified by Santa Cruz Water Supply Advisory Committee (WSAC).

[7] ACAYY requires information from the water supply model identifying the average use of each supply alternative. This exercise is not yet completed.

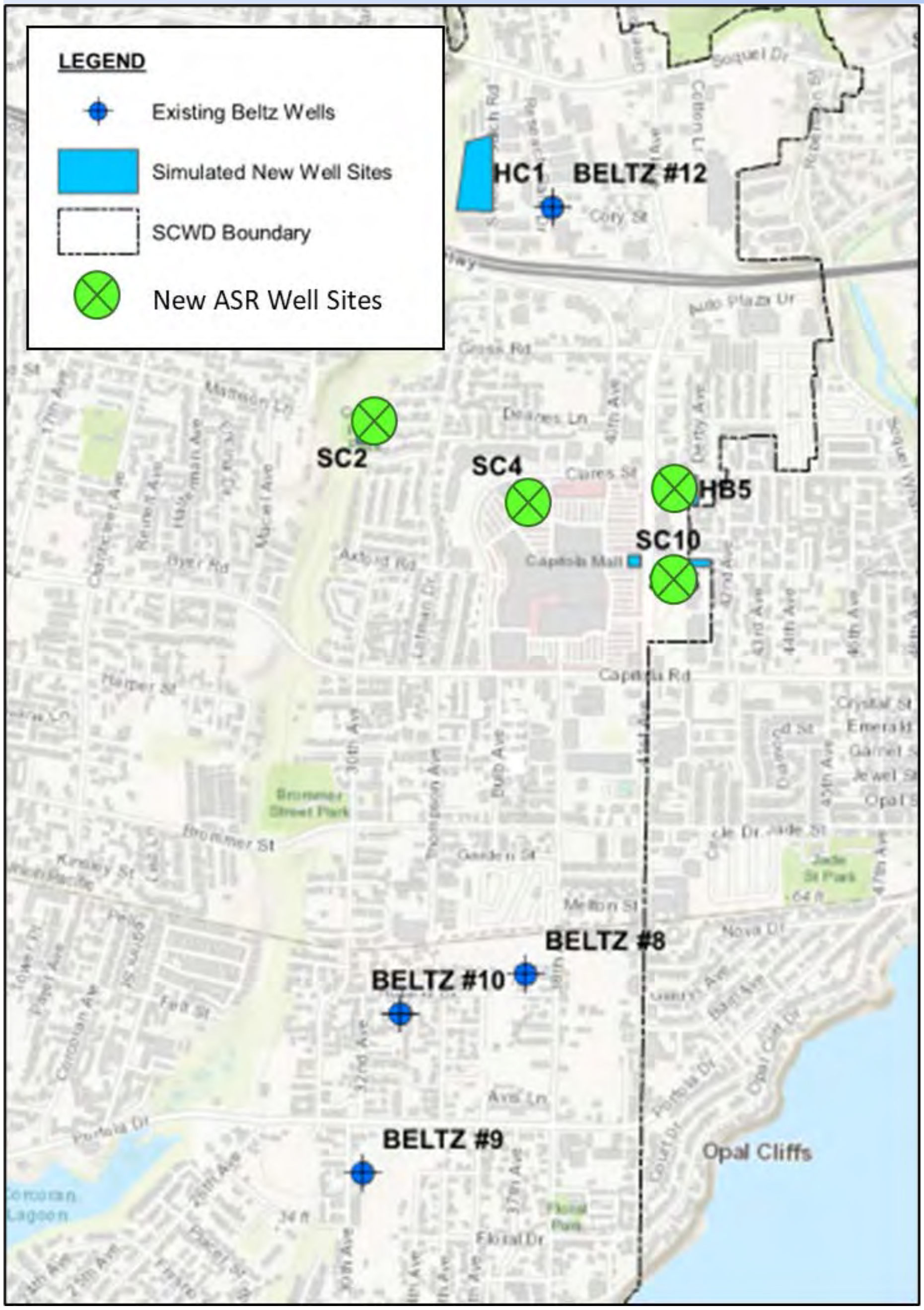
[8] Costs are estimated at an AACE Class 5 level with -/+50% cost variation. Costs include: conversion of 4 Beltz wells to ASR wells, 4 new ASR wells, modifications to wellhead treatment for Beltz 12 and wellhead treatment at new wells, upgrades to Beltz Water Treatment Plant (WTP), pilot testing, connections to/from water system, site acquisition, and additional facility costs. Costs also include markups, mobilization, contractor overhead, and a 30% estimate contingency. If additional new wells are required, infrastructure and treatment costs would be added accordingly. Cost sources include: Santa Cruz ASR Project - Phase 1 Feasibility Investigation; Summary of Groundwater Modeling Scenario 11.2 Results (Pueblo, 2021); Beltz Treatment Plant Rehabilitation Project (CDM, 2008); Beltz 12 Capital Asset Record Construction & Treatment Cost (City, 2015), and estimates from the City for Beltz 12 ammonia treatment costs (Dec, 2021).

[9] Based on average emission rates for PG&E (2014-2018). Low emissions range based on energy use for an average extraction year, and high emissions range based on energy used for a max extraction year. PG&E increase in use of green energy sources in the future will reduce or eliminate GHG emissions. GHG emissions from pipelines represent 1-5% of the total emissions, with the rest being emissions due to energy use.

[10] Based on estimates from the City and Pueblo Water Resources of 1.5 years for pilot testing existing wells, 3 years for pilot testing new wells, 1.5 years per well for upgrading existing wells, 2.5 years for developing new wells, and assuming 2 years of injection before commencing extraction. Estimates include property acquisition permitting, design, contractor procurement and construction. Construction will occur in phases

[11] Energy estimates for injection and extraction based on pumping information provided by the City. Energy for treatment based on estimate of energy use from Beltz Treatment Plant Rehabilitation Project (CDM, 2008). Low range is based on energy use for an average extraction year and high range is for energy used for a max extraction year. Unit energy estimated based on average and max AFY extraction rates.

Figure - Concept 1 - ASR in the MCGB



Modified figure from "Santa Cruz ASR Project - Phase 1 Feasibility Investigation; Summary of Groundwater Modeling Scenario 11.2 Results (Pueblo, 2021)"

Concept 2
Indirect Potable Reuse (IPR) in Santa Margarita Groundwater Basin (SMGB)

Fact Sheet

Description	Expansion of treatment capacity at Pure Water Soquel (PWS) Advanced Water Treatment Facility (AWTF) at Chanticleer, and conveyance of purified water to Scotts Valley for injection into the Santa Margarita Groundwater Basin (SMGB). This would require a purchase agreement with Soquel Creek Water District (SqCWD).
Water Source(s)	1,500 AFY/ 490 MGY (1.4 MGD) of purified water [1]
Project Yield	710 AFY/ 220 MGY of groundwater to restore SMGB levels [2] 790 AFY/ 260 MGY of groundwater extracted for City use
Evaluation Criteria [3]	
Project's supply contribution as a % of worst year supply shortfall	21%[4] of the 1.2 billion gallons per year supply gap.[5]
Increases resilience to climate change	Yes; the project would utilize available capacity in the SMGB for storing purified water,to be recovered as additional groundwater during dry periods, increasing resilience to drought and the impacts of climate change.
Annualized Cost per million gallons of Average Year Yield (ACAYY) [6]	
Total Annualized Cost [7]	Total Capital Cost: $145.7 Mil Annualized Capital Cost: $6.8 Mil O&M Annual Cost: $ 4.6 Mil Total Unit Cost: $7,600 per AF ($22,300 per MG)
Is understood and accepted by the public and key stakeholders	Yes, this alternative is viewed somewhat favorably by the public as a way to address water shortages.
Scalable or can be implemented incrementally or in phases	Yes; limited by groundwater basin capacity and PWS AWTF expansion capacity [1] unless additional AWTF capacity is added elsewhere.
Technical Feasibility	Yes; groundwater replenishment reuse projects have been succesfully implemented in Southern California for over 50 years. Additional groundwater modeling and/or pilot testing may be required to demonstrate feasibility for the SMGB.
Likelihood project being funded by state or federal grants	Likely; funding from the Bureau of Reclamation and SWRCB is available for water reuse projects.
Opportunity for shared funding	Yes; Scotts Valley Water District could provide cost-share, and potentially other member agencies of the Santa Margarita Groundwater Agency (SMGWA)
Greenhouse Gas Emissions	1,210 MT of CO_2 emissions per year [8]
Time required for implementation	8 -10 years
Operational complexity	High; would require coordination with multiple agencies to construct and operate the system and meet regulatory requirements.
Energy Use	8,200,000 KWh/yr [9] 5.5 MHh/AF [9]
Potential impacts for CEQA required mitigations to impact project cost or timeliness	High; short-term construction-related impacts that could likely be mitigated through alternative construction techniques, preconstruction surveys, and implementation of best management practices.
Adaptable to future regulatory or source water changes	Yes; beneficial to meet groundwater sustainability goals as well as potential opportunity to blend surface water could be considered.
Degree of administrative complexity	High; due to multi-agency involvement and complex regulatory requirements.

Ancillary Benefits	• Reliable source water supply (known quantity produced) • Independent source from flowing sources (provides portfolio diversification) • Contributes to groundwater replenishment • May assist in seawater intrusion and compliance with GSP objectives • Adds storage water to system supply portfolio • Opportunity for regional collaboration • Provides foundational treatment infrastructure for potential future consideration of DPR
Ancillary Costs/Risks	• May mobilize constituents in basin • Subject to leakage from groundwater basin, aka "losses" • Sufficient cumulative storage may not be available in time of need • Public acceptance of purified recycled water may be limited
Assumptions	• Injection of 1,500 AFY (710 AFY to replenish SMGB and 790 AFY for City extraction) • City would need new injection and extraction wells, and conveyance to Newell Creek Pipeline. • Groundwater modeling required to confirm injection, extraction, and well locations.

NOTES:

[1] PWS project was designed with a capacity to increase production by an additional 1,500 AFY for a total project capacity of 3,000 AFY of purified water produced. PWS requires 1,500 AFY for injection of purified water in Soquel Creek Water District area.

[2] SMGB Groundwater Sustainability Plan (GSP) objectives to restore groundwater levels by maintaining 710 AFY in the basin as preliminarily determined by the GSA of the SMGB.

[3] Evaluation criteria listed in order of importance as ranked by Commissioners.

[4] Percentage based on 260 MGY of groundwater extracted for City use.

[5] As compared with the supply gap identified by Santa Cruz Water Supply Advisory Committee (WSAC).

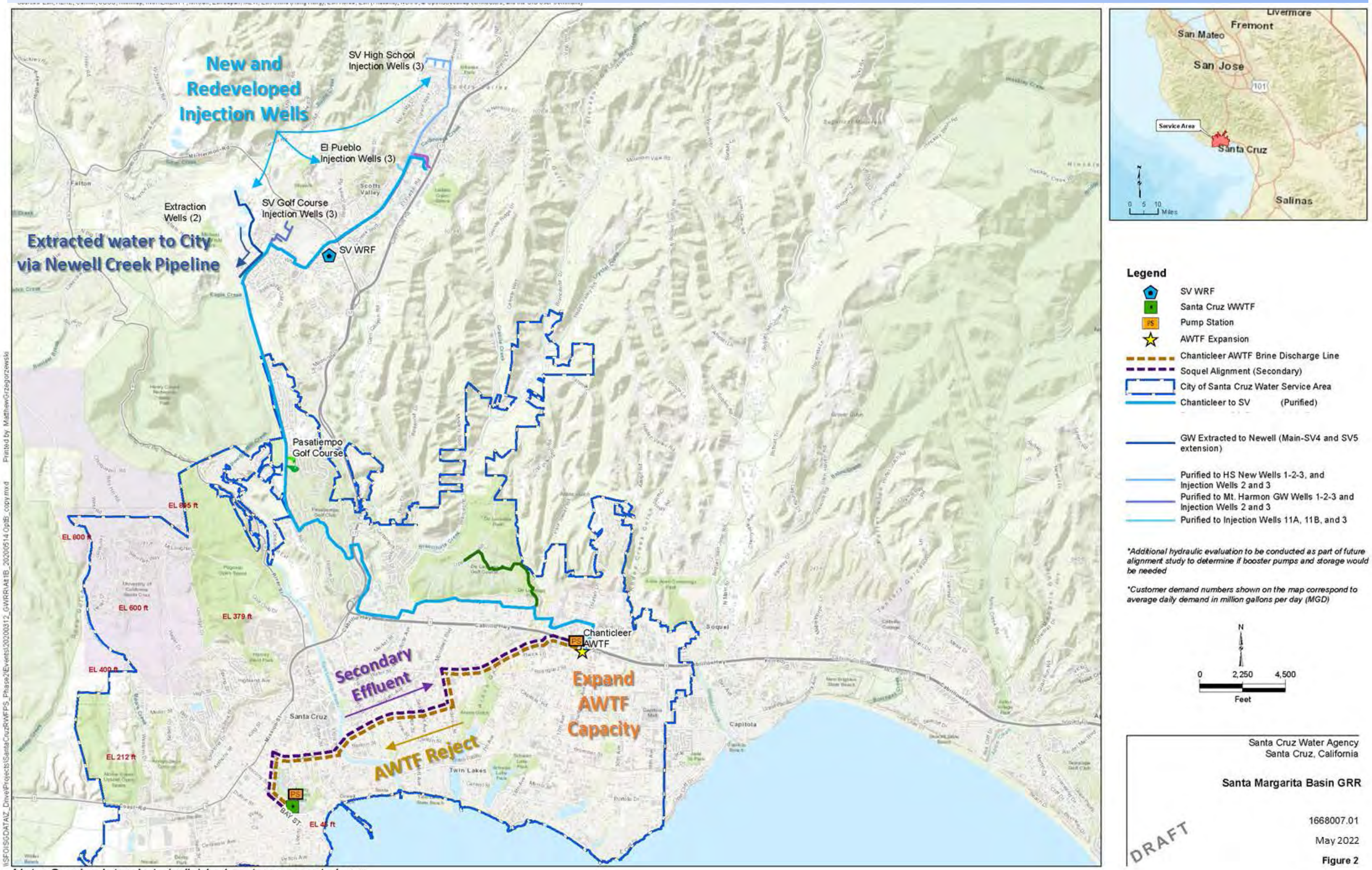
[6] ACAYY requires information from the water supply model identifying the average use of each supply alternative. This exercise is not yet completed.

[7] Costs are estimated at an AACE Class 5 level with -/+50% cost variation. Costs include: expansion of PWS treatment capacity, conveyance to Scotts Valley, upgrading 2 wells for injection at El Pueblo, 7 new injection wells, 2 new extraction wells, conveyance of extracted water to Newell Creek pipeline connection, and additional facility costs. Costs also include markups, mobilization, contractor overhead, and a 30% estimate contingency. Costs based on Regional Recycled Water Alternatives Evaluation TM (KJ, 2021), escalated to 2022 and adjusted to extract 790 AFY for City use.

[8] Based on average emission rates for PG&E (2014-2018). PG&E increase in use of green energy sources in the future will reduce or eliminate GHG emissions. GHG emissions from pipelines represent 1-5% of the total emissions, with the rest being emissions due to energy use.

[9] Energy estimates for treatment and conveyance. Unit energy estimated based on beneficial reuse of 1,500 AFY.

Figure 1 - Concept 2 - IPR in the SMGB



Note: Service laterals to individual meters are not shown

Fact Sheet

Description	Develop a new AWTF to treat effluent from the Santa Cruz WWTF and produce purifed water to be blended with raw surface water prior to additional treatment at the GHWTP.
Water Source(s)	4,800 AFY/ 1,600 MGY (4.3 MGD) of Santa Cruz WWTF effluent
Project Yield	3,700 AFY/ 1,200 MGY (3.3 MGD) of purified water
Evaluation Criteria [1]	
Project's supply contribution as a % of worst year supply shortfall	100% of the 1.2 billion gallons per year supply gap [2]
Increases resilience to climate change	Yes; the project would provide a consistent supply of locally produced, purified water to directly supplement the City's potable water system, increasing resilience to drought and the impacts of climate change.
Annualized Cost per million gallons of Average Year Yield (ACAYY) [3]	
Total Annualized Cost [4]	Total Capital Cost: $151.1 Mil Annualized Capital Cost: $6.0 Mil O&M Annual Cost: $ 5.4 Mil Total Unit Cost: $3,200 per AF ($9,500 per MG)
Is understood and accepted by the public and key stakeholders	This project type is generally understood by the public and key stakeholders however no information has been gathered about local understanding and acceptance of this form of wter reuse.
Scalable or can be implemented incrementally or in phases	Yes; the City has adequate source supply and can produce purified water incrementally to fill the water supply gap.
Technical Feasibility	Yes; existing and proven treatment technologies are available to meet the proposed criteria and anticipated regulatory requirements for DPR.
Likelihood project being funded by state or federal grants	Likely; funding from the Bureau of Reclamation and SWRCB is currently available for water reuse and demonstration projects, and additional future funding will likley be made available for DPR once regulations are finalized.
Opportunity for shared funding	No; City does not have a project partner identified and would likely assume all costs; however future purchase agreements may present an opportunity for water transfers and exchanges.
Greenhouse Gas Emissions	840 MT of CO_2 emissions per year [5]
Operational complexity	High; would require operation of a new AWTF and meeting complex regulatory requirements, which are still in development.
Time required for implementation	More than 10 years
Energy Use	5,900,000 KWh/yr [6] 1.6 MWh/AF [6]
Potential impacts for CEQA required mitigations to impact project cost or timeliness	High; short-term construction-related impacts could likely be mitigated through alternative construction techniques, preconstruction surveys and implementation of best management practices.
Adaptable to future regulatory or source water changes	Uncertain, may depend on adopted regulations by the SWRCB Division of Drinking Water, expected by December 2023. Potential opportunities to treat seawater, brackish water, or impaired groundwater at the AWTF could be considered.
Degree of administrative complexity	High; due to complex regulatory requirements.

Evaluation Criteria (cont.) [1]	
Ancillary Benefits	• Reliable source water and finished water supply (known quantity produced) • Independent source from flowing sources (provides portfolio diversification) • Relatively cost-effective compared to $/AF of other alternatives
Ancillary Costs/Risks	• Public acceptance of purified recycled water may be limited, especially for DPR • State regulations not yet in place (pending, anticipated December 2023)
Assumptions	• New AWTF located near the Santa Cruz WWTF with 3,700 AFY (3.3 MGD) purified water treatment capacity. • Assumes consistent production and use of purified water. • Treatment train based on draft DPR criteria but does not include nitrification of City effluent.

NOTES:

[1] Evaluation criteria listed in order of importance as ranked by Commissioners.

[2] As compared with the supply gap identified by Santa Cruz Water Supply Advisory Committee (WSAC).

[3] ACAYY requires information from the water supply model identifying the average use of each supply alternative. This exercise is not yet completed.

[4] Costs are estimated at an AACE Class 5 level with -/+50% cost variation. Costs include: new AWTF, conveyance to raw water blending station, and additional facility costs. Costs also include markups, mobilization, contractor overhead, and a 30% estimate contingency. Costs based on Recycled Water Facilities Planning Study RWFPS (KJ, 2018), escalated to 2022.

[5] Based on average emission rates for PG&E (2014-2018). PG&E increase in use of green energy sources in the future will reduce or eliminate GHG emissions. GHG emissions from pipelines represent 1-5% of the total emissions, with the rest being emissions due to energy use.

[6] Energy estimates for treatment and conveyance, based on RWFPS (KJ, 2018). Unit energy estimated based on treatment of 4,800 AFY for a yield of approximately 3,700 AFY.

Figure 2 - Concept 3 - DPR with Raw Water Augmentation

Legend

- PS Pump Station
- Santa Cruz AWTF
- Drinking Water Treatment Plant
- AWT Pipeline
- City of Santa Cruz Water Service Area
- City of Santa Cruz Limit

**Additional hydraulic evaluation to be conducted as part of future alignment study to determine if booster pumps and storage would be needed*

**Customer demand numbers shown on the map correspond to average daily demand in million gallons per day (MGD)*

N

0 1,400 2,800
Feet

Kennedy/Jenks Consultants

Santa Cruz Water Department
Santa Cruz, California

Direct Potable Reuse

1668007.00/01

February 2018, Revised May 2022

Fact Sheet

Description	Construct a new, local seawater desalination facility and ocean intake (3 options considered).
Water Source(s)	7,400 AFY of seawater from Monterey Bay
Project Yield	3,700 AFY / 1,200 MGY (3.3 MGD) of desalinated water.
Evaluation Criteria [1]	
Project's supply contribution as a % of worst year supply shortfall	100% of the 1.2 billion gallons per year supply gap [2]
Increases resilience to climate change	Yes; project would provide a consistent supply of locally produced potable water to directly supplement the City's potable water system, increasing resilience to drought and the impacts of climate change. The location of the seawater desalination facility would consider sea-level rise.
Annualized Cost per million gallons of Average Year Yield (ACAYY) [3]	
Total Annualized Cost [4]	Total Capital Cost: $258.6 - $395 Mil Annualized Capital Cost: $11.5 - $21.3 Mil O&M Annual Cost: $ 6.9 - $7.2 Mil Total Unit Cost: $5,100 - $7,800 per AF ($15,500 - $23,700 per MG)
Is understood and accepted by the public and key stakeholders	This project is generally understood by the public and key stakeholders. While desalination is recognized as a potential supply alternative, broad acceptance is unknown.
Scalable or can be implemented incrementally or in phases	Yes; the desalination plant could be designed to be scalable to incrementally fill the water supply gap.
Technical Feasibility	Yes; though challenging to permit, desalination is technically feasible as demonstrated by projects implemented in the state of California and elsewhere.
Likelihood project being funded by state or federal grants	Likely; funding from the Bureau of Reclamation is available for desalination projects that have an approved Title XVI feasibility study. Additional future funding from the SWRCB could be available if drought persists.
Opportunity for shared funding	No; City has not identified a project partner and would likely assume all costs; however future purchase agreements may present an opportunity for water transfers and exchanges.
Greenhouse Gas Emissions	2,500 MT of CO_2 emissions per year [5]
Time required for implementation	More than 10 years
Operational complexity	High; would require operation of a new desalination facility; balancing cost to operate versus ramping down or shutting down the plant in favor of less costly supplies
Energy Use	17,500,000 KWh/yr [6] 4.7 MWh/AF [6]
Potential impacts for CEQA required mitigations to impact project cost or timeliness	High; in addition to short-term mitigations, desalination projects may result in additional required mitigations to protect marine life in Monterey Bay and the complex permitting process would impact timeline for construction.
Adaptable to future regulatory or source water changes	Potentially; though no current example exists in California, ocean water could potentially be blended with effluent from the Santa Cruz WWTF at the desalination plant to produced purified water to augment the potable water system; or the desalination plant could be converted to a DPR facility once DPR regulations are finalized.
Degree of administrative complexity	High, due to complexity of regulations and permitting requirements.

Evaluation Criteria (cont.) [1]	
Ancillary Benefits	• Reliable source water and finished water supply (known quantity produced) • Independent source from surface sources (provides portfolio diversification) • Potentially expandable if/as future needs arise
Ancillary Costs/Risks	• Regulatory permitting unlikely in any timely manner (unless significant change in state permitting). • Public acceptance of desal questionable (given past experience in Santa Cruz) • Potential risk of energy dependence and sea level rise. • Visual and other impacts to local coastline, beaches, neighborhoods
Assumptions	• Construction of desalination plant and facilities to provide 3.3 MGD of potable water. • Desalination treatment recovery of 50% (50% reject through membranes) • Energy use estimated previously was for a smaller size (2.5 mgd) desalination plant. Energy consumption was estimated to be increased for treatment capacity of 3.3 mgd.

NOTES:

[1] Evaluation criteria listed in order of importance as ranked by Commissioners.

[2] As compared with the supply gap identified by Santa Cruz Water Supply Advisory Committee (WSAC).

[3] ACAYY requires information from the water supply model identifying the average use of each supply alternative. This exercise is not yet completed.

[4] Costs are estimated at an AACE Class 5 level with -/+50% cost variation. Cost range is based on 3 different Alternatives for ocean intake, SI-1, SI-2, and SI-3, per Desalination Feasibility Study by Dudek (August 2018).

[5] Based on average emission rates for PG&E (2014-2018). PG&E increase in use of green energy sources in the future will reduce or eliminate GHG emissions. GHG emissions from pipelines represent 1-5% of the total emissions, with the rest being emissions due to energy use.

[6] Energy estimates based on SCWD Regional Desalination Plant Phase I Preliminary Design Report-Volume 1 Draft Report (2012, CDM Smith). Unit energy estimated based on volume of water treated.

Figure 3 - Concept 4 - Seawater Desalination

SOURCE: URS 2013; Updated by Dudek in 2017, Bing 2017

DUDEK 0 750 1,500 Feet

FIGURE 4

Updated Seawater Desalination Project Overview

City of Santa Cruz Seawater Desalination Project

ATTACHMENT D

DRAFT RESOLUTION

SECURING OUR WATER FUTURE

WHEREAS, for more than 100 years the Santa Cruz water system has been providing residents and businesses in the City of Santa Cruz with drinking water and fire protection services; and

WHEREAS, in 1960 the water system was modified by the addition of raw water storage for seasonal supply by the construction Newell Creek Dam that created Loch Lomond Reservoir specifically to respond to the area's Mediterranean climate that is characterized by a late fall, winter and early spring wet season and late spring, summer, early fall dry season and that requires a source of stored water to meet much of the dry season's customer demand; and

WHEREAS, in designing the sizing and siting Newell Creek Dam, historic weather conditions influenced assumptions about how much storage was needed and how the storage would be operated, including assumptions about how historic precipitation levels would allow for the annual replenishment of reservoir levels and, even in those occasional years when precipitation was lower than normal, would provide enough year-to-year carry-over supply to meet customer demand during drought conditions; and

WHEREAS, in the 60 years since the construction of Loch Lomond reservoir, multi-year droughts in 1976-1977, 1987- 1991, 2014-2015, and 2020-2021 have shown that, even with significant achievements by customers in adopting highly efficient water use practices, the amount of water storage in the system is inadequate to assure that all existing water system customers have reliable access to water during drought conditions; and

WHEREAS, in 2014 the Santa Cruz City Council addressed community concerns about the need for and advisability of constructing a desalination plant in partnership with the Soquel Creek Water District (District) to allow the City and the District to provide drought supply and an alternate source of water that would, among other goals, allow the district to reduce pumping in and therefore protect what is now called the Santa Cruz Mid-County Groundwater Basin from sea-water intrusion by appointing a diverse community group to evaluate the City's water supply situation, including defining the problem to be solved, identifying and evaluating alternative solutions and developing recommendations to the Council on water supply augmentation actions to be pursued; and

WHEREAS, the City Council appoint group that became known as the Water Supply Advisory Committee (WSAC) worked together between April 2014 and October 2015 and produced a set of agreements and recommendations to the Council including, in Section 3.08 of its 2015 Final Report on Agreements and Recommendations (add link?) a Problem Statement that includes the following language (emphasis added):

> *"Santa Cruz's water supply reliability issue is the result of having only* ***a marginally adequate amount of storage to serve demand during dry and critically dry years*** *when*

the system's reservoir doesn't fill completely. Both expected requirements for fish flow releases and anticipated impacts of climate change will turn a marginally adequate situation into a seriously inadequate one in the coming years.

Santa Cruz's lack of storage makes it particularly vulnerable to multi-year droughts*. The key management strategy currently available for dealing with this vulnerability is to very conservatively manage available storage. This strategy typically results in regular calls for annual curtailments of demand that may lead to modest, significant, or even critical requirements for reduction. In addition, the Santa Cruz supply lacks diversity, thereby further increasing the system's vulnerability to drought conditions and other risks.*

The projected worst-year gap between peak-season available supply and demand during an extended drought is about 1.2 billion gallons. *While aggressive implementation of conservation programs will help reduce this gap,* **conservation alone cannot close this gap***. The Committee's goal is to establish a reasonable level of reliability for Santa Cruz water customers by substantially decreasing this worst-year gap while also reducing the frequency of shortages in less extreme years.";* and

WHEREAS, circumstances since the completion of the WSAC's work continues to support the WSAC's Problem Statement as an accurate assessment of the water system's water supply reliability challenges, even in the face of the substantial long-term demand reduction by existing customers through adoption of water use efficiency practices; and

WHEREAS, the WSAC's work also considered the implications climate change on water system reliability and included in its analyses a climate change scenario that would result from increasing temperatures and changing precipitation patterns; and

WHEREAS, the climate change assessments and actual experiences indicate that climate change effects that include increasingly variable and extreme weather conditions are already being experienced and that extreme wet weather conditions associated with atmospheric rivers threaten key water system infrastructure and more frequent dry winters, particularly those that occur across multiple back-to-back winters, are serious threats to the water system and its ability to provide a reliable supply for today's customers as well as those of tomorrow; and

WHEREAS, circumstances experienced internationally, nationally, and at the state, regional and local level during the COVID 19 pandemic beginning in March 2020 have demonstrated the serious threat to local economic sustainability and quality of life that can result from the failure of a major community institution or critical infrastructure that provides or supports basic services, and the water system, while often taken for granted and not recognized as such, is a primary example of critical infrastructure that, if unable to provide adequate supply, would seriously negatively affect every aspect of our community, including threating public health and fire safety; and

WHEREAS, as part of the its recommendations to the Council, which the Council unanimously accepted in November 2015, the WSAC recommended that the Water Department be directed to prepare information about a range of water supply augmentation projects that would allow the projects to be compared to each other and that would support data-driven decision-making about which options or portfolio of options to pursue to address the water system's water supply reliability issues; and

WHEREAS, the WSAC's recommended alternatives to be further considered included the following:

> "Ultimately the Committee selected two basic strategies to pursue, in addition to demand management (Element 0):
>
> 1. **Strategy One**: Development of groundwater storage using a combination of both passive and active recharge approaches and available surface water flows during the rainy season; and
> 2. **Strategy Two**: Development of advanced treated recycled water or desalinated water if and as needed to address any remaining supply-demand gap.
>
> **Strategy One** includes the following Elements:
>
> - **Element 1 –** in lieu, passive recharge of the groundwater aquifers with either or both the Scotts Valley Water District and the Soquel Creek Water District; and
> - **Element 2 –** aquifer storage and recovery, active recharge of the groundwater aquifers, with or without regional partners in regional aquifers.
>
> **Strategy Two** includes the following Elements:
>
> - **Element 3 –** advanced treated recycled water to be used in either an indirect potable reuse or a direct potable reuse application, as the initial focus of Strategy Two approaches. In the event advanced treated recycled water is eliminated from consideration, desalination would then become Element 3."; and

WHEREAS beginning late 2015 and the present, Water Department staff implemented the Water Supply Augmentation Strategy (WSAS) envisioned by WSAC, including conducting follow up technical studies and feasibility analyses, conducting detailed assessments of system irrigation demand and opportunities for developing recycled water as a source of supply, conducting pilot testing for water transfers with the Soquel Creek Water District, and conducting pilot testing of aquifer storage and recovery technology at Beltz 8 and Beltz 12, and environmental analyses and cost information on a wide range of supply alternatives, and has provided detailed reports to the Water Commission on a quarterly basis on its progress; and

WHEREAS, in parallel with the work on the WSAS other related work, such as preparing and submitting to the State Water Resources Control Board proposed water rights change petitions that would all it to deliver treated water to other regional providers as part of water transfer or exchanges and also extend the time limit for the development of water allocated to the City under its Felton Permits, including adding a point of diversion for water under the Felton Permits at the City's Tait Street diversion, which would substantially increase the City's ability to use this water in the future while still protecting flows in the Felton to Tait reach of the San Lorenzo

River to support recovery of threatened coho salmon and threatened steelhead trout, has been completed; and

WHEREAS, in beginning in early 2022 Water Department staff worked with the City Council appointed Santa Cruz Water Commission to design and implement a process to complete the side-by-side comparison of the four main water supply augmentation strategies that have the potential to make a substantial contribution to improving the reliability of Santa Cruz's supply reliability, with the planned side-by-side comparison using a specific project that is an example of each type of augmentation strategy; and

WHEREAS, Water Commissioners and Water Department staff developed and agreed upon a diverse set of evaluation criteria for use in the side-by-side comparison of augmentation projects and that includes and builds upon the WSAC's key decision criteria of cost, yield and timeliness and includes both quantitative and qualitative criteria that have been identified through the work completed following the WSAC process in 2015; and

WHEREAS, working with Professor Casey Brown of the University of Massachusetts Department of Civil Engineering, the Water Department developed new water system modeling tools that allowed it to challenge the water system with over 8000 potentially plausible climate change scenarios and assess system's vulnerability to the climate change and the temperature and precipitation changes that are projected to result from increasing greenhouse gases; and

WHEREAS, the results of the vulnerability analyses, particularly as it relates to the availability and reliability of "wet season" water for development and use in developing drought supply for Santa Cruz using aquifer storage and recovery, which diverts wet season water, treats it to drinking water levels, and injects it into local groundwater aquifers for recovery during the annual dry season or during drought events, was specifically evaluated using the Water Department's new modeling tools; and

WHEREAS, following consideration of all the relevant information developed by staff and presented to and discussed with Water Commissioners through an iterative process of publicly noticed meetings occurring beginning in the spring of 2022, recommendations for the policy proposed in this resolution and the accompanying report on summarizing the work done in to develop those recommendations were unanimously approved for submittal to the City Council for its review and action at the Commission's October 3, 2022 meeting;

NOW THEREFORE, BE IT RESOLVED that the City of Santa Cruz's policy for Securing Our Water Future includes the following findings and actions:

1. Statement of Findings – list to include statements related to urgency of need, threat of climate change, importance of prompt action and adaptive management, recognition that further long-term demand management cannot solve the problem, but acknowledgement that the community's commitment to efficient water use is part of the community's identity and aligned with the community's strong values and commitment to an environmentally responsible and sustainable way of life;
2. Statement of Water Supply Reliability Goal (e.g., the City's goal for its water system is to be able to provide an adequate supply to its customers without needing to institute

curtailments or temporary demand reduction actions in all situations except for the worst-case water shortage as defined and intermittently updated by the water system climate modeling tools – need to clean this up and/or revise as needed, but you get the idea)

3. Supply Portfolio – the following sources of supply are included in the portfolio (list) and supply augmentation projects will be developed and incrementally implemented as needed to meet the supply reliability goal
4. WSAIP – description of this product/CEQA
5. Considerations In Developing Water Supply Augmentation Projects – criteria, other values, adaptive management strategies
6. Direction to Establish this Policy as a Council Policy Statement to be incorporated into the Council's Handbook in Section 34, as policy 34.6, Securing Our Water Future
7. Anything else????