# Appendix I: Meeting Materials Only



## City of Santa Cruz

# Final
# Santa Cruz Regional Recycled Water Facilities Planning Study

*June 2018*

**Kennedy/Jenks Consultants**

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**Kennedy/Jenks Consultants**

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# FINAL
# City of Santa Cruz Regional Recycled Water Facilities Planning Study

6 June 2018

Prepared for

**City of Santa Cruz**
212 Locust Street, Suite C
Santa Cruz, CA 95060

K/J Project No. 1668007.00

*Note to Reader:*

*The Draft RWFPS was submitted to the SWRCB in September 2017, representing the City of Santa Cruz's decisions based on the understanding of regional projects, regulatory requirements and water supply conditions at that time. There have been and continue to be developments that influence the City's pursuit of recycled water, such as the Soquel Creek Water District finalizing aspects of their recycled water program and other regulatory milestones related to indirect and direct potable reuse. The City recognizes that some of the information in this document is no longer current, and that as regional projects and regulations evolve, future opportunities for reuse may also evolve. The City is committed to tracking the state of regulations and regional reuse programs in the future.*

# Acknowledgments

Funding for this plan has been provided in full or in part through an agreement with the State Water Resources Control Board. The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.


Prepared by

**Kennedy/Jenks Consultants**

Supported by

Trussell TECHNOLOGIES INC

**Merritt Smith Consulting**

CORONA ENVIRONMENTAL CONSULTING

**Michael R. Welch, Ph.D., P.E.**
**CONSULTING ENGINEER**

GHD

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# Appendix I: Meeting Materials

Agendas and materials from the following meetings, workshops and webinars conducted with project partners during the study are included in this appendix.

| Meeting/Workshop | Date | Focus |
|---|---|---|
| Kick-Off Meeting | 03/30/16 | Define study objectives, scope, roles and responsibilities. |
| Long-List Prelim Screening | 06/28/16 | Align on short-list of alternatives |
| Screening Criteria Webinar | 08/29/16 | Define alternative screening criteria |
| Alternative Webinar Part 1 | 10/18/16 | Non-potable reuse alternative focus |
| Alternative Webinar Part 2 | 12/02/16 | Potable reuse alternative focus (SWA/SFA/DPR) |
| Alternative Webinar Part 3 | 03/01/17 | Beltz Wellfield IPR focus |
| Alternative Webinar Part 4 | 04/27/17 | Regional IPR focus |
| Alternative Scoring and Ranking | 06/01/17 | Scoring and ranking outcomes |
| Recommended Facilities Plan | 07/17/17 | Align on recommended project |

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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Kick-Off Meeting
## 30 March 2016 from 9 am – 11 am

Location: 809 Center St., Santa Cruz, CA 95060
Planning Department Conference Room, Room 107

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**ATTENDEES:**

Kennedy/Jenks - Dawn Taffler, Sachi Itagaki and Melanie Tan
City of Santa Cruz - Heidi Luckenbach, David Kehn, Catherine Borrowman, Anne Hogan, Rosemary Menard, Eileen Cross, Dan Seidel, Mark Dettle, Mike Sanders, Amy Poncato
Soquel Creek WD - Ron Duncan
Scotts Valley WD - Piret Harmon
Santa Cruz County - John Ricker, Kent Edler

**AGENDA:**

1. Introduction and Roles (All)
2. Background (City)
3. Overall project goals and expectations (All)
   a. Meet SWRCB Grant Requirements
   b. Assess beneficial reuse of wastewater from a resource recovery perspective
   c. Evaluate local and regional recycled water projects
   d. Identify near-term, mid-term and long-term projects
   e. Meet schedule for WSAC Outcome Element #3 - Advanced Treated Recycled Water
   f. Initiate strategy for continued outreach related to recycled water
   g. Others?
4. Scope of Work (Tables 1, 2, and 3) (K/J)
5. RWFPS Schedule (Figure 1) (K/J)
6. Data Request (K/J)
7. Open Discussion (All)

**ACTION ITEMS:**

** Regional Recycled Water Study Driving Tour to Follow **

**Table 1: Scope of Work – Tasks and Major Deliverables**

| Task | Regional RWFPS Chapter | Major Deliverables |
|---|---|---|
| Task 1 - Project Management & QA/QC | | Monthly Invoices, Status Reports, Schedule Updates, Project Work Plan |
| Task 2 - Background Information | Chapter 1 – Study Area Characteristics<br>Chapter 2 – Water Supply Characteristics and Facilities | Data Request / Tracking Sheet<br>Summary Tables/Figures |
| Task 3 - RW Market Analysis | Chapter 3 – Wastewater Characteristics and Facilities<br>Chapter 5 – Recycled Water Market | Summary Tables/Figures<br>Market Survey Map<br>TM #1 Groundwater Replenishment<br>TM #2 Surface Water Augmentation<br>TM #3 Streamflow Augmentation<br>TM #4 Direct Potable Reuse |
| Task 4 - Treatment Evaluation / Reg Requirements | Chapter 4 – Treatment Requirements for Discharge and Reuse | Summary Tables/Figures<br>TM #5 Treatment Evaluation |
| Task 5 - Alternatives Analysis | Chapter 6 – Project Alternative Analysis | Summary Tables/Figures<br>Screening Tables, Cost Tables |
| Task 6 – Stakeholder Involvement | Chapter 5 – Recycled Water Market | Materials as requested |
| Task 7 - Recommended Project | Chapter 7 – Recommended Facilities Project Plan | Summary Tables/Figures |
| Task 8 – Financial Analysis | Chapter 8 – Construction Financing Plan and Revenue Program | Summary Tables/Figures |
| Task 9 – Regional RWFPS Report | | Admin Draft, SWRCB Draft, Final |
| Task 10 - Meetings and Workshops | | Meeting Materials |

## Subconsultants

- Merritt Smith Consulting– Regulatory Strategy Support (Tasks 3, 5, 9 & 10)
- Data Instincts – Stakeholder Outreach (Tasks 6 & 10)
- Trussell Technologies – WWTF Facility/Supply Analysis, Treatment Technologies and QA/QC Support (Tasks 3, 4 & 10)
- Stratus Consulting/Abt Associates – Triple Bottom Line Analysis (Tasks 5 & 10)
- GHD Inc. – CEQA/Environmental Compliance Support (Task 5)
- Michael Welch, PhD. – Reservoir Augmentation (Task 3)

## Table 2: Scope of Work – SubTasks and Budgets

| Description | Total Budget |
|---|---|
| **Task 1 – PM & QA/QC** | |
| 1.1 Project Management | $ 20,216 |
| 1.2 Status Calls/Web Meetings | $ 20,655 |
| **Task 2 – Background Info** | |
| 2.1 Data Collection | $ 16,493 |
| 2.2 Background Info | $ 6,508 |
| **Task 3 – Recycled Water Market Analysis** | |
| 3.1 WWTF Facility and Supply Analysis | $ 10,540 |
| 3.2 Non Potable Reuse Market Analysis | $ 15,249 |
| 3.3 Groundwater Recharge Reuse | $ 16,838 |
| 3.4 Reservoir Augmentation | $ 12,055 |
| 3.6 Streamflow Augmentation | $ 8,473 |
| 3.7 Direct Potable Reuse Potential | $ 22,253 |
| **Task 4 – Treatment Evaluation/Regulatory Requirements** | |
| 4.1 Water Quality and Regulatory Requirements | $ 8,660 |
| 4.2 Treatment Evaluation | $ 16,821 |
| **Task 5 – Alternatives Analysis** | |
| 5.1 Refine Long-List of Alternatives | $ 14,610 |
| 5.2 Preliminary Screening | $ 28,477 |
| 5.3 Evaluate Short List of Alternatives | $ 51,091 |
| 5.4 Alternative Capital, O&M and Life Cycle Costs | $ 16,493 |
| **Task 6 – Stakeholder Involvement** | |
| 6.1 Outreach Strategy and Advice | $ 15,325 |
| 6.2 Outreach Materials and Support | $ 14,825 |
| **Task 7 – Recommended Project** | |
| 7.1 Preliminary Facilities Design Criteria | $ 13,648 |
| 7.2 Implementation Plan | $ 7,630 |
| **Task 8 – Financial Analysis** | |
| 8.1 Anticipated Financing Plan | $ 6,161 |
| 8.2 Revenue Projection Program | $ 4,570 |
| **Task 9 – Regional RWFPS Report** | |
| 9.1 Admin Draft for City | $ 33,290 |
| 9.2 SWRCB Draft | $ 22,673 |
| 9.3 Final Report | $ 17,577 |
| **Task 10 - Meetings and Workshops** | |
| 10.1 Face to Face Meetings | $ 24,645 |
| 10.2 Workshops | $ 24,381 |
| 10.3 Presentations | $ 15,845 |
| **Total =** | **$ 486,000** |

**Table 3: Preliminary List of Recycled Water Projects**

| Long-List of Projects | Recycled Water Use | Source Water | Treatment | Project Area(s) |
|---|---|---|---|---|
| **1a** | Industrial Use/ Landscape Irrigation | Santa Cruz WWTP | Tertiary | City, District and County |
| **1b** | | Local Raw Wastewater | MBR Tertiary | UC Santa Cruz |
| **2a** | Irrigation | Santa Cruz WWTP | Tertiary | North Coast Agricultural Irrigation |
| **2b** | | Santa Cruz WWTP -or- SVWD WWTP | Secondary or Tertiary | Pasatiempo + Other Landscape |
| **2c** | | Santa Cruz WWTP | Tertiary | Landscape |
| **3** | Seawater Barrier | Santa Cruz WWTP | Advanced Treatment | Lower Groundwater Basins |
| **4a** | Groundwater Replenishment | Santa Cruz WWTP | Advanced Treatment | Upper/Lower Groundwater Basins |
| **4b** | | Local Raw Wastewater | MBR + Advanced Treatment | |
| **4c** | | Santa Cruz WWTP -and- SVWD WWTP | Advanced Treatment | Santa Margarita GW Basin |
| **5** | Reservoir Augmentation | Santa Cruz WWTP | Advanced Treatment | Loch Lomond Reservoir |
| **6** | Streamflow Augmentation | Santa Cruz WWTP | Tertiary or Advanced Treatment | San Lorenzo River |
| **7** | Direct Potable Reuse | Santa Cruz WWTP | Advanced Treatment | City, District and County |

## Discussion:

## Figure 1: Schedule

| Task and Key Deliverables | | | 2016 | | | | | | | | | | | | 2017 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug |
| *SWRCB Grant Commitment Letter* | ✓ | | | | | | | | | | | | | | | | | | | | | |
| *SWRCB Meeting* | | | | | ✶ | | | | | | | | | | | ⭘ | | | | | | |
| *Notice to Proceed* | | | | ✓ | | | | | | | | | | | | | | | | | | |
| Task 1 – PM & QA/QC | | | | | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ | ❩ |
| Task 2 – Background Info | | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | |
| Task 3 – Recycled Water Market Analysis | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| Task 4 – Treatment Eval/Reg Requirements | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| Task 5 – Alternatives Analysis | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| Task 6 – Stakeholder Involvement | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Task 7 – Recommended Project | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Task 8 – Financial Analysis | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Task 9 – Regional RWFPS Report | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ◆ | ■ | ■ | ◆ | ■ | ✓ | |
| Task 10 - Meetings and Workshops | | | | | 🗋 | ■ | ■ | 🗋 | | | 🗋 | | 🗋 | | | 🗋 | | | 🗋 | | | 🗋 |
| | | | | | *Kickoff* | | | *Long-List* | | | *Short-List* | | *Recommended* | | | *Admin Draft* | | | *Draft* | | | *Final* |
| | | | | | | | | *Prelim Screening* | | | *Ranking* | | *Facilities Plan* | | | | | | | | | |

| | | | |
|---|---|---|---|
| ✶ | SWRCB Scoping Call | 🗋 | F2F Meeting/Workshop |
| ⭘ | SWRCB Meeting | ❩ | Conf Call/Web |
| ◆ | Draft Deliverable | | |
| ✓ | Final Deliverable | | |

## Schedule for Water Supply Advisory Committee (WSAC) Outcome

*Element 3: Advanced Treated Recycled Water or Desalination (from WSAC)*

- **Advanced Treated RW or Desalinated Water =** Supply augmentation plan to use advanced-treated recycled water with desalination as a back-up if advanced-treated recycled water is not feasible. Enacted if Strategy 1 proves insufficient to meet the plan's goals of cost-effectiveness, timeliness or yield.
  - 2016 = Identify RW alternatives, increase understanding of recycled water (regulatory framework, feasibility, funding opportunities, public outreach and education) **** this is the RWFPS (Start in March 2016 – 18 months duration)***
  - 2017 = Complete high level feasibility studies, as-needed demonstration testing and conceptual level designs of alternatives; define CEQA processes and continue public outreach and education. Select preferred approach (i.e. DPR, IPR, desal) **** this is the outcome of the RWFPS (end mid-2017)***
  - 2020 = Preliminary design, CEQA (including preparation of draft EIR) and apply for approvals and permits (except building permit)
  - 2022 = Complete property acquisition, final design , complete CEQA and all permits
  - 2024 = Construction completed: plant start-up, water production begins (milestone)

*Element 2: Aquifer Storage and Recovery (ASR)*

- ASR will be studied in parallel to Element 3, using raw water sources
- ***Nexus with the RWFPS***
  - Using recycled water for ASR may be beneficial if (1) there is not enough supply, (2) if the facilities have to be too large to meet the supply gap during the winter when the water is available or (3) if the ability of the basin to be actively recharged in the winter is insufficient
  - An ASR pilot could also be useful for assessing RW IPR
  - There may be overlap with WQ and geochemical analyses to meet both needs

# City of Santa Cruz Recycled Water Facilities Planning Study

Kick Off Meeting
March 30 2016

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## Agenda

- Introduction and Roles (All)
- Background (City, SqCWD, SVWD)
- Overall project goals and expectations (All)
- Scope of Work (Tables 1, 2, and 3) (K/J)
- RWFPS Schedule (Figure 1) (K/J)
- Data Request (K/J)
- Open Discussion (All)
- Driving Tour

2

# Background – Prior RW Studies

- Fall 2013
  - Contemplated as Regional Project; City and Soquel Creek co-applicants to SWRCB grant
- Early 2014
  - Agencies still thinking of doing joint project as the details of Water Supply Planning for each agency unfolded
- WSAC April 2014 – October 2015
- Late 2014
  - Decided to apply to SWRCB separately
- Early 2015
  - Did similar hiring process, interviewed together, hired different consultants, Soquel Creek nearing completion of their study
- Early 2016 – Hired Kennedy/Jenks
  - Deferred until conclusion of WSAC process

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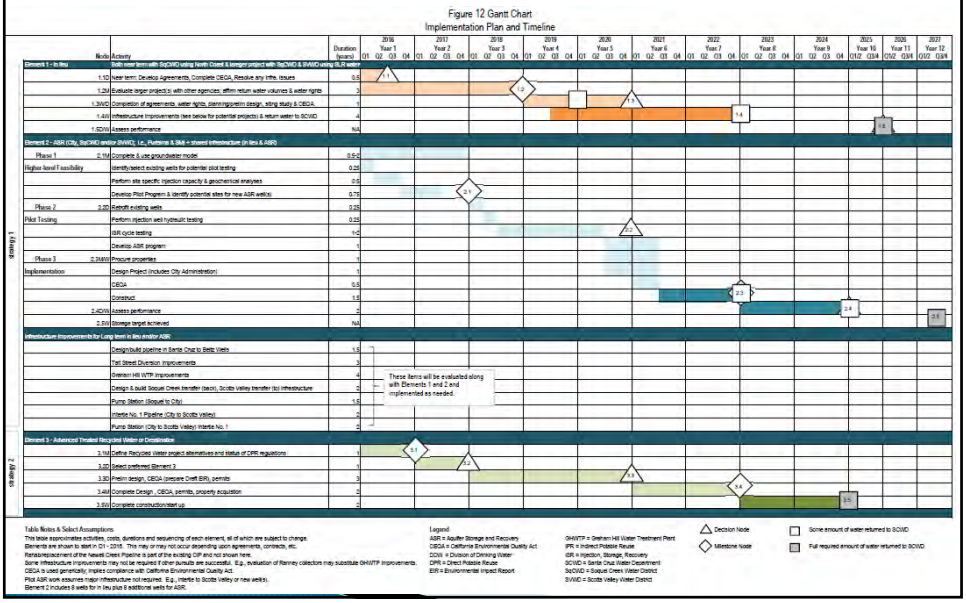
# Background – WSAC Outcome

Figure 12 Gantt Chart
Implementation Plan and Timeline



# Background – Project Participants

- Joint project between Water &Public Works Departments
- Technical Working Group
- Regional Partners – Scotts Valley Water District & Soquel Creek Water District
- Other agency work (Scotts Valley/SqCWD)

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City of Santa Cruz Water System


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# Scotts Valley Water District

Update on Recycled Water Activities

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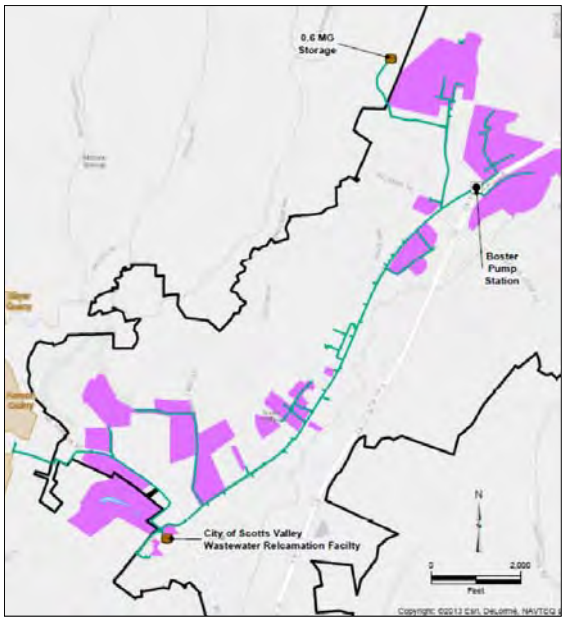
## Existing RW System

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# Groundwater Replenishment


9

# Soquel Creek Water District

Update on Recycled Water Activities

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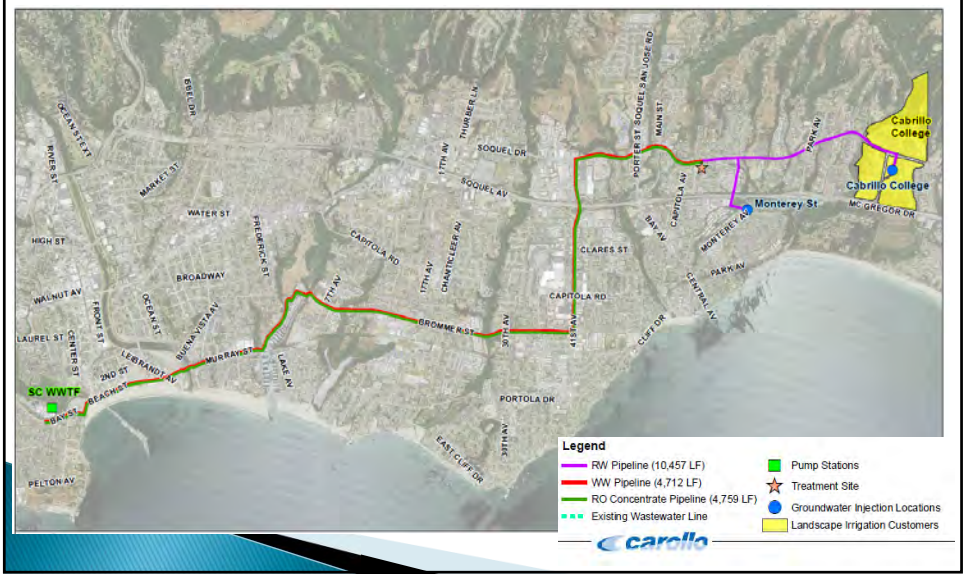
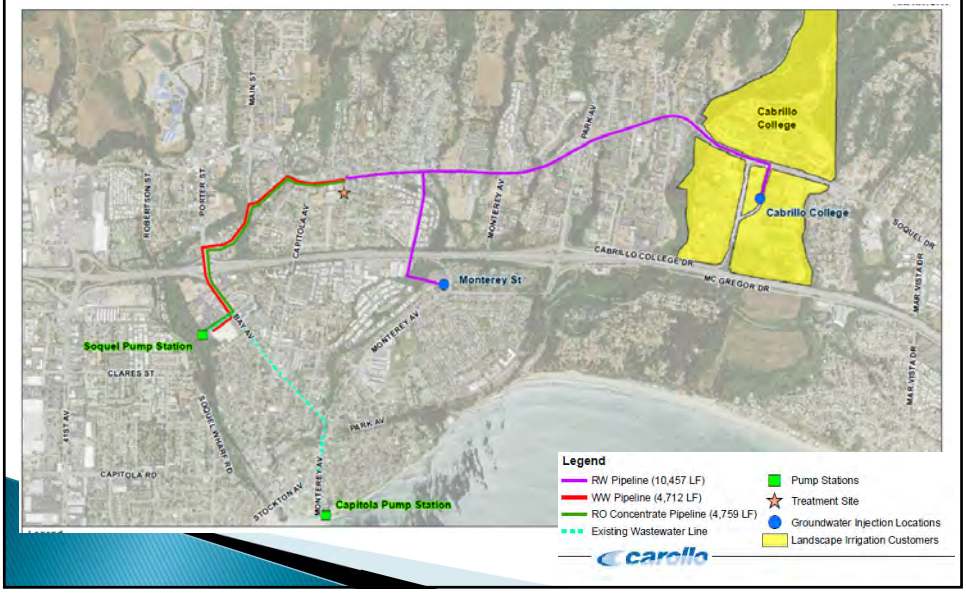
# SqCWD – AWPR at SC WWTF


# SqCWD – AWPR at SqCWD



# SqCWD – MBR at SqCWD




# City of Santa Cruz Recycled Water Facilities Planning Study

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# Overall Project Goals & Expectations

1. Meet SWRCB Grant Requirements
2. Assess beneficial reuse of wastewater from a resource recovery perspective
3. Evaluate local and regional recycled water projects
4. Identify near-term, mid-term and long-term projects
5. Meet schedule for WSAC Outcome Element #3 – Advanced Treated Recycled Water
6. Initiate strategy for continued outreach related to recycled water
7. Others?

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# Scope of Work

| Task | Regional RWFPS Chapter |
|---|---|
| Task 1 – Project Management & QA/QC | |
| Task 2 – Background Information | Chapter 1 – Study Area Characteristics<br>Chapter 2 – Water Supply Characteristics and Facilities |
| Task 3 – RW Market Analysis | Chapter 3 – Wastewater Characteristics and Facilities<br>Chapter 5 – Recycled Water Market |
| Task 4 – Treatment Evaluation / Reg Requirements | Chapter 4 – Treatment Requirements for Discharge and Reuse |
| Task 5 – Alternatives Analysis | Chapter 6 – Project Alternative Analysis |
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| Task 7 – Recommended Project | Chapter 7 – Recommended Facilities Project Plan |
| Task 8 – Financial Analysis | Chapter 8 – Construction Financing Plan and Revenue Program |
| Task 9 – Regional RWFPS Report | |
| Task 10 – Meetings and Workshops | |

RWFPS must meet SWRCB Grant Requirements

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# Major Deliverables & Budget

| Task | Major Deliverables | Total Budget |
|---|---|---|
| Task 1 – Project Management & QA/QC | Monthly Invoices, Status Reports, Schedule Updates, Project Work Plan | $40,871 |
| Task 2 – Background Information | Data Request / Tracking Sheet<br>Summary Tables/Figures | $23,001 |
| Task 3 – RW Market Analysis | Summary Tables/Figures<br>Market Survey Map<br>TM #1 Groundwater Replenishment<br>TM #2 Surface Water Augmentation<br>TM #3 Streamflow Augmentation<br>TM #4 Direct Potable Reuse | $85,408 |
| Task 4 – Treatment Evaluation / Reg Requirements | Summary Tables/Figures<br>TM #5 Treatment Evaluation | $25,481 |
| Task 5 – Alternatives Analysis | Summary Tables/Figures<br>Screening Tables, Cost Tables | $110,672 |
| Task 6 – Stakeholder Involvement | Materials as requested | $30,150 |
| Task 7 – Recommended Project | Summary Tables/Figures | $21,277 |
| Task 8 – Financial Analysis | Summary Tables/Figures | $10,730 |
| Task 9 – Regional RWFPS Report | Admin Draft, SWRCB Draft, Final | $73,539 |
| Task 10 – Meetings and Workshops | Meeting Materials | $64,870 |
| | **Total Budget** | $486,000 |

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# Subconsultant Roles

- **Merritt Smith Consulting**– Regulatory Strategy Support (Tasks 3, 5, 9 & 10)
- **Data Instincts** – Stakeholder Outreach (Tasks 6 & 10)
- **Trussell Technologies** – WWTF Facility/Supply Analysis, Treatment Technologies and QA/QC Support (Tasks 3, 4 & 10)
- **Stratus Consulting/Abt Associates** – Triple Bottom Line Analysis (Tasks 5 & 10)
- **GHD Inc.** – CEQA/Environmental Compliance Support (Task 5)
- **Michael Welch, PhD.** – Reservoir Augmentation (Task 3)

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# Preliminary List of Projects

| Long-List of Projects | Recycled Water Use | Source Water | Treatment | Project Area(s) |
|---|---|---|---|---|
| 1a | Industrial Use/ Landscape Irrigation | Santa Cruz WWTP | Tertiary | City, District and County |
| 1b | | Local Raw Wastewater | MBR Tertiary | UC Santa Cruz |
| 2a | Irrigation | Santa Cruz WWTP | Tertiary | North Coast Agricultural Irrigation |
| 2b | | Santa Cruz WWTP -or- SVWD WWTP | Secondary or Tertiary | Pasatiempo + Other Landscape |
| 2c | | Santa Cruz WWTP | Tertiary | Landscape |
| 3 | Seawater Barrier | Santa Cruz WWTP | Advanced Treatment | Lower Groundwater Basins |
| 4a | Groundwater Replenishment | Santa Cruz WWTP | Advanced Treatment | Upper/Lower Groundwater Basins |
| 4b | | Local Raw Wastewater | MBR + Advanced Treatment | |
| 4c | | Santa Cruz WWTP -and- SVWD WWTP | Advanced Treatment | Santa Margarita GW Basin |
| 5 | Reservoir Augmentation | Santa Cruz WWTP | Advanced Treatment | Loch Lomond Reservoir |
| 6 | Streamflow Augmentation | Santa Cruz WWTP | Tertiary or Advanced Treatment | San Lorenzo River |
| 7 | Direct Potable Reuse | Santa Cruz WWTP | Advanced Treatment | City, District and County |

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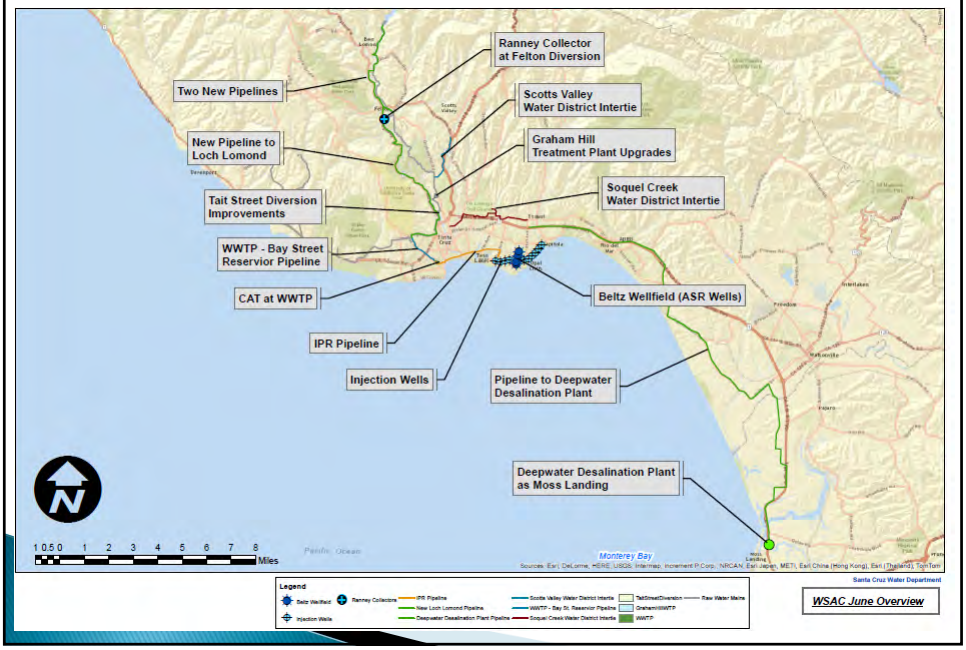
## WSAC June Overview

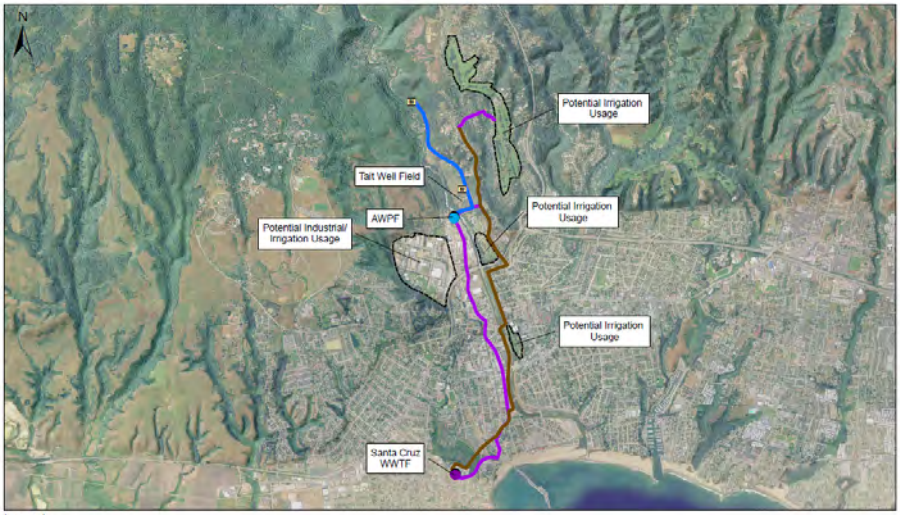


## 2014 Water Reuse Water Supply Convention Maps (City)

Tertiary Treated Recycled Water to North Coast

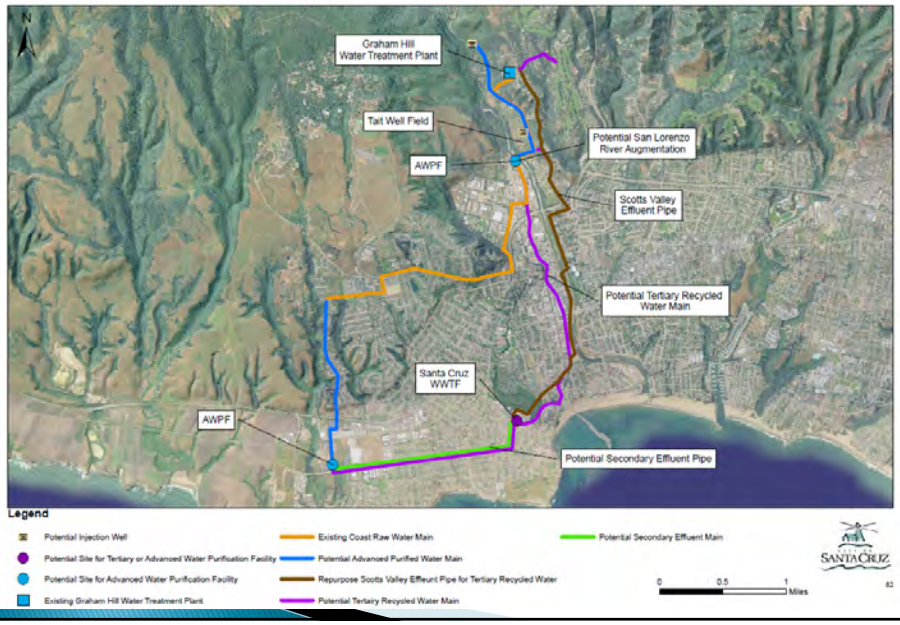

## 2014 Water Reuse Water Supply Convention Maps (City)

Joint Irrigation & Groundwater Replenishment for Tait Well Field



## 2014 Water Reuse Water Supply Convention Maps (City)

Potable Reuse and Groundwater Replenishment for Tait Well Field and River Augmentation




## 2014 Water Reuse Water Supply Convention Maps (City)

Santa Cruz Regional Groundwater Replenishment Project

## 2014 Water Reuse Water Supply Convention Maps (City)

Mid-County Regional Groundwater Replenishment Project


# RWFPS Schedule

| Task and Key Deliverables | 2016 | | | | | | | | | | | | | 2017 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug |
| *SWRCB Grant Commitment Letter* | ✓ | | | | | | | | | | | | | | | | | | | | | |
| *SWRCB Meeting* | | | | | * | | | | | | | | | | | o | | | | | | |
| *Notice to Proceed* | | | | ✓ | | | | | | | | | | | | | | | | | | |
| Task 1 – PM & QA/QC | | | | | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ | ☽ |
| Task 2 – Background Info | | | | | | | | | | | | | | | | | | | | | | |
| Task 3 – Recycled Water Market Analysis | | | | | | | | | | | | | | | | | | | | | | |
| Task 4 – Treatment Eval/Reg Requirements | | | | | | | | | | | | | | | | | | | | | | |
| Task 5 – Alternatives Analysis | | | | | | | | | | | | | | | | | | | | | | |
| Task 6 – Stakeholder Involvement | | | | | | | | | | | | | | | | | | | | | | |
| Task 7 – Recommended Project | | | | | | | | | | | | | | | | | | | | | | |
| Task 8 – Financial Analysis | | | | | | | | | | | | | | | | | | | | | | |
| Task 9 – Regional RWFPS Report | | | | | | | | | | | | | | | | ◆ | | | ◆ | | ✓ | |
| Task 10 - Meetings and Workshops | | | | | 🗋 | | | 🗋 | | | 🗋 | | 🗋 | | | 🗋 | | | 🗋 | | | 🗋 |
| | | | | | *Kickoff* | | | *Long-List Prelim Screening* | | | *Short-List Ranking* | | *Recommended Facilities Plan* | | | *Admin Draft* | | | *Draft* | | | *Final* |

* SWRCB Scoping Call
o SWRCB Meeting
🗋 F2F Meeting/Workshop
☽ Conf Call/Web
◆ Draft Deliverable
✓ Final Deliverable

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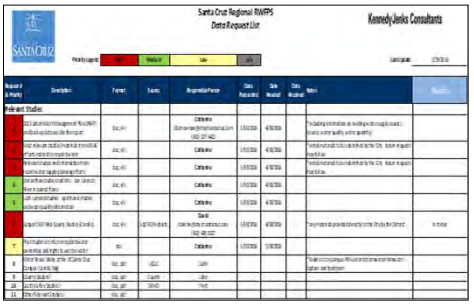
# Data Request

- Relevant Studies
- Demand Data
- WWTP Information
- GIS/Drawings
- Financial Information
- Other Information



Santa Cruz Regional RWFPS
Data Request List

Kennedy/Jenks Consultants

| Request # & Priority | Description | Format | Source | Responsible Person | Date Requested | Date Received | Date Acquired | Notes | Reviewed |
|---|---|---|---|---|---|---|---|---|---|
| Relevant Studies | | | | | | | | | |
| | | | | Catherine | | | | | |
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# Open Discussion

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# Driving Tour

| Estimated Arrival Time | Location | Points of Interest |
|---|---|---|
| 11:00 | City Hall | Kick-Off Meeting (9 am to 10:55 am) |
| 11:10 | Santa Cruz Wastewater Treatment Plant (WWTP) | Santa Cruz WWTP |
| 11:20 | Delaware Ave industrial area, west of WWTP | Potential AWTF Site |
| | | Possible Recycled Water Pipeline alignment |
| | | RW Alignment View |
| 11:30 | Drive north to past potential Industrial and Irrigation Use sites | Possible Irrigation User - UCSC |
| | Drive north along Upper Western Drive | Potential Raw Water tie-in - Bay Street Reservoir |
| | ***Time-Permitting: Potential Viewing Point at UCSC*** | Panoramic View of System |
| 11:45 | Coast Pump Station | Point out Potential AWTF Site |
| | | Point out Tait Well approx location |
| 12:05 | Graham Hill WTP | Location of Graham Hill WTP + Lunch |
| 12:55 | Pasatiempo | Pasatiempo Proposed Recycled Water tank |
| 13:05 | Drive along Highway 1 towards Soquel | Possible Recycled Water Pipeline alignment |
| 13:15 | Beltz Well and nearby City Wells | Beltz 12 WTP |
| 13:35 | Capitola | Oneill Ranch (Proximity of two major wells) |
| 13:45 | | SqCWD Headquarters |
| 14:10 | | Capitola City Hall |
| 14:20 | Beltz Well Field | Beltz WTP |
| 14:30 | | Various Beltz wells |
| 14:40 | Lode Street, Mid-County RAWPF | DA Porath District Pump Station |
| 14:50 | Possible drive along Front Street pipeline alignment | |
| 14:55 | Santa Cruz Water Department | |

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# Driving Tour

# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Alternatives Workshop
## 28 June 2016 from 9 am – 1 pm

**Location:** 110 California Street Santa Cruz 95060

*Come through unlocked gate. Staff will be available to direct traffic.*

*Conference call and Web Meeting info to be provided*

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## AGENDA

**Overall Workshop Objective:** Present approach to identify preliminary alternatives, obtain input from Study Partners and come to alignment on the alternatives to be studied in the Santa Cruz RWFPS.

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**PART I Goal:** Identify alternatives for evaluation in the Santa Cruz RWFPS **9:00 am to 11:00 am**

1. Introduction and Roles
2. Review of Study Objectives
3. Project Component Matrix (Long List)
4. Set Basic Guidelines for Evaluating Project Components
5. Evaluate Project Components
6. Identify Alternatives for Further Evaluation
7. Open Discussion

---------- **BREAK & SNACKS** ----------

**PART II Goal:** Discuss recycled water treatment concepts, siting preferences and relocation considerations for treatment options at the Santa Cruz WWTF. **11:30 am to 12:15 pm**

1. Tertiary Treatment Concepts (process, capacity, footprint)
2. Advanced Water Treatment Concepts (process, capacity, footprint)
3. Siting Preferences and Facility Relocation Considerations
4. Open Discussion

---------- **WWTF TOUR** ----------

**PART III Tour Goal:** Visit identified locations for expanding tertiary treatment, siting advanced water treatment facilities and potential opportunities for relocating displaced facilities on-site. **12:15 pm to 1:00 pm**

# City of Santa Cruz
# Recycled Water Facilities Planning Study

Alternatives Workshop

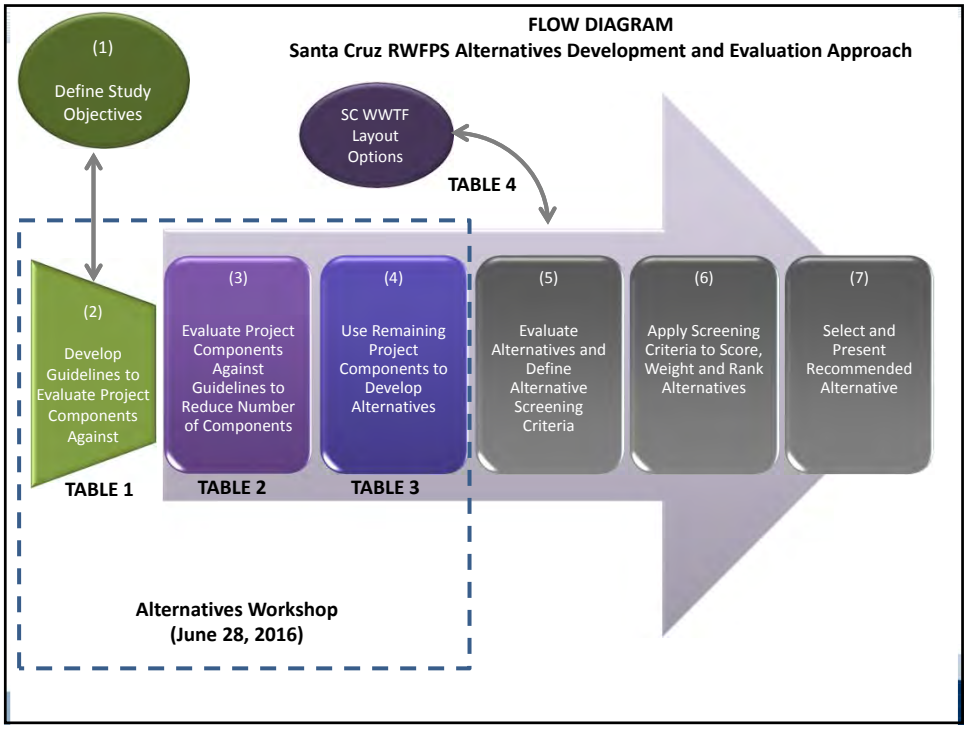
June 28 2016

** Includes amended notes to reflect discussion at workshop*



## Agenda

- Introduction and Roles
- Review of Study Objectives
- Project Component Matrix (Long List)
- Set Basic Guidelines for Evaluating Project Components
- Evaluate Project Components
- Identify Alternatives for Further Evaluation
- Open Discussion




## Review of Study Objectives

**TABLE 1**

| # | Study Objectives | Abbreviated |
|---|---|---|
| 1 | Assess beneficial reuse of wastewater from a resource recovery perspective | Beneficial Reuse |
| 2 | Meet or reduce the water supply gap (1.2 BGY, 3.3 MGD or 3,700 AFY) | Water Supply Gap |
| 3 | Evaluate local and regional recycled water projects | Local and Regional Projects |
| 4 | Identify a phased approach to reuse in Santa Cruz | Phased Approach |
| 5 | Identify potential impacts to WWTF operations | SCWWTF Impacts |
| 6 | Initiate plan for continued recycled water outreach and education | Outreach Plan |
| 7 | Meet SWRCB grant requirements | SWRCB Grant |
| 8 | Meet schedule and intent of WSAC Outcome Element #3 | WSAC Outcome |

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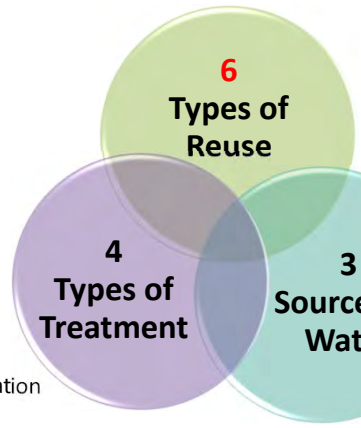
## Project Components




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

- Secondary
- On-Site Filtration
- Tertiary
- Advanced

- Santa Cruz WWTF
- Local Raw Wastewater
- Scotts Valley



## Basic Guidelines for Evaluating Project Components

**TABLE 1**

| # | Basic Guidelines for Evaluation of Project Components | Abbreviated |
|---|---|---|
| A | Project uses Santa Cruz WWTF effluent or wastewater destined for Santa Cruz WWTF | Reuse of Santa Cruz WWTF Effluent |
| B | Project offsets or increases Santa Cruz potable supplies to meet or reduce the Santa Cruz water supply gap | Offset or Increase Potable Supplies |
| C | Non-Potable reuse that is at least tertiary level of treatment; Potable reuse and streamflow augmentation require advanced treatment; Preference is to avoid over-treatment for a given use | Right Treatment for Right Use |
| D | Tertiary treatment is located at SC WWTF; AWTF located at the SC WWTF or GHWTP. | Consolidate Treatment Facilities |
| E | Sewer mining would only be considered at sites with flows > 2 MGD; MBR would only be considered for demands >1 MGD | Sufficient Flows and Demands for MBR |
| F | WWTF impacts to water quantity, water quality, facilities and O&M activities should be minimized | Minimize Impacts to WW collection and treatment |
| G | ASR study will identify potential City GWRR location(s), characteristics and limitations | GWRR at Identified ASR Sites |
| H | Potable Reuse and streamflow augmentation project capacity will be bookended by available space for treatment facilities | AWTF Capacity Limited by Siting |
| I | Projects could involve outside agencies/users and/or have (at least) a preliminary agreement (letter of willingness to pursue) for anticipated use (farmers, UCSC, industry) | Preliminary Agreements Imminent |
| J | RW use is currently approved under existing regulatory conditions or implemented in the USA | Approved/Practiced Reuse |

# Alignment of Objectives and Guidelines

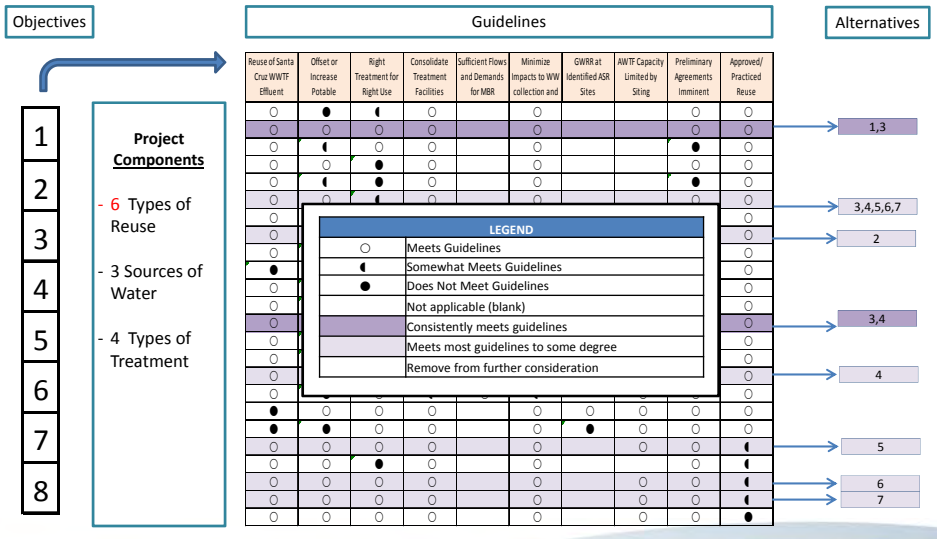
**TABLE 1**

| Basic Guidelines for Evaluation of Project Components | | Primary Alignment of Guidelines with Study Objectives | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | Beneficial Reuse | Water Supply Gap | Local and Regional Projects | Phased Approach | SCWWTF Impacts | Outreach Strategy | SWRCB Grant | WSAC Outcome |
| A | Reuse of Santa Cruz WWTF Effluent | ✓ | | | | | | | |
| B | Offset or Increase Potable Supplies | | ✓ | | | | | | |
| C | Right Treatment for Right Use | | | ✓ | | | | | |
| D | Consolidate Treatment Facilities | | | | | ✓ | | | |
| E | Sufficient Flows and Demands for MBR | | | | | ✓ | | | |
| F | Minimize Impacts to WW collection and treatment | | | | | ✓ | | | |
| G | GWRR at Identified ASR Sites | | | | | | | | ✓ |
| H | AWTF Capacity Limited by Siting | | | | ✓ | | | | |
| I | Preliminary Agreements Imminent | | | | | | | ✓ | |
| J | Approved/Practiced Reuse | | | | | | ✓ | | |

*Intent is to have at least one objective tied to each guideline, though others may apply*



# Flow Diagram - Approach



## Non-Potable Reuse
## Component Evaluation (1 – 10)

**TABLE 2**

| Potential Project Components | Recycled Water Use | Source Water | Treatment | Description | Reuse of Santa Cruz WWTF Effluent | Offset or Increase Potable Supplies | Right Treatment for Right Use | Consolidate Treatment Facilities | Sufficient Flows and Demands for MBR | Minimize Impacts to WW collection and treatment | GWRR at Identified ASR Sites | AWTF Capacity Limited by Siting | Preliminary Agreements Imminent | Approved/ Practiced Reuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Non-Potable Reuse | Santa Cruz WWTF | Secondary | Limited use in Santa Cruz (in-plant, restricted areas, truck filling) | ○ | ● | ◖ | ○ | | ○ | | | ○ | ○ |
| 2 | | | Tertiary | Unrestricted use in Santa Cruz (irrigation, commercial, industrial, truck filling) including UC Santa Cruz | ○ | ○ | ○ | ○ | | ○ | | | ○ | ○ |
| 3 | | | | North Coast Agricultural Irrigation | ○ | ● | ○ | ○ | | ○ | | | ◖ | ○ |
| 4 | | | Advanced Treatment | Unrestricted use in Santa Cruz (irrigation, commercial, industrial, truck filling) including UC Santa Cruz | ○ | ○ | ● | ○ | | ○ | | | ○ | ○ |
| 5 | | | | North Coast Agricultural Irrigation | ○ | ◖ | ● | ○ | | ○ | | | ◖ | ○ |
| 6 | | | | Customers along pipelines alignments to IPR/DPR or streamflow augmentation | ○ | ○ | ◖ | ○ | | ○ | | | ○ | ○ |
| 7 | | Local Raw Wastewater | MBR (Tertiary) | Anchor customers in Santa Cruz (Unrestricted use) | ○ | ○ | ○ | ◖ | ● | ◖ | | | ● | ○ |
| 8 | | | | UC Santa Cruz | ○ | ○ | ○ | ◖ | ◖ | ◖ | | | ○ | ○ |
| 9 | | | | North Coast Agricultural Irrigation | ○ | ● | ○ | ◖ | ● | ● | | | ● | ○ |
| 10 | | Scotts Valley WWTF | Secondary (outfall) | Pasatiempo Golf Course | ● | ○ | ● | ◖ | | ○ | | | ○ | ○ |

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## Non-Potable Reuse:
## Components Removed from Further Consideration

- **Secondary: Limited use in Santa Cruz**
  - Limited uses, minimal benefit to water supply
  - Public acceptance issues
- **Tertiary/AWT: North Coast Agricultural Irrigation**
  - Uncertainty about the quantity, quality and seasonality of water available for exchange
  - Permitting challenges for State Parks
  - Challenge to confirm willingness to use (ag opponents)
  - High cost with minimal incentive to support rates for revenue
- **AWT: Unrestricted use in Santa Cruz**
  - Beyond regulatory requirement for NPR
  - Significantly higher cost/energy
  - Keep as an option for customers along pipeline alignments that carry advanced treated water for potable reuse.

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## Seawater Intrusion Barrier Component Evaluation (11 – 12)

**TABLE 2**

| Potential Project Components | Recycled Water Use | Source Water | Treatment | Description | Reuse of Santa Cruz WWTF Effluent | Offset or Increase Potable Supplies | Right Treatment for Right Use | Consolidate Treatment Facilities | Sufficient Flows and Demands for MBR | Minimize Impacts to WW collection and treatment | GWRR at Identified ASR Sites | AWTF Capacity Limited by Siting | Preliminary Agreements Imminent | Approved/ Practiced Reuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | Seawater Intrusion Barrier | Santa Cruz WWTF | Advanced Treatment | Identified groundwater basin subject to seawater intrusion | ○ | ● | ○ | ○ | | ○ | ◖ | ○ | ○ | ○ |
| 12 | | Local Raw Wastewater | MBR + Advanced Treatment | Identified groundwater basin subject to seawater intrusion | ○ | ● | ○ | ◖ | ● | ○ | ◖ | | ○ | ○ |

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## Seawater Intrusion Barrier: Removed from Further Consideration

- Threat to City wells is currently low
- Provides limited water supply
- Very costly "insurance"
  (potential future loss of Beltz coastal wells)
- Potential opportunity for zero discharge study
- MBR has limited available supply

*Seawater intrusion avoidance could be considered a baseline assumption for any groundwater replenishment alternative*

Per City: Seawater intrusion is included in the ASR groundwater modeling scenarios. The intent is to use it more as a barrier, while managing wells for extraction.

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# Groundwater Replenishment Reuse (GWRR) Component Evaluation (13 – 19)

**TABLE 2**

| Potential Project Components | Recycled Water Use | Source Water | Treatment | Description | Reuse of Santa Cruz WWTF Effluent | Offset or Increase Potable Supplies | Right Treatment for Right Use | Consolidate Treatment Facilities | Sufficient Flows and Demands for MBR | Minimize Impacts to WW collection and treatment | GWRR at Identified ASR Sites | AWTF Capacity Limited by Siting | Preliminary Agreements Imminent | Approved/ Practiced Reuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Groundwater Replenishment | Santa Cruz WWTF | Advanced Treatment | Suitable Santa Cruz GWRR site(s) to be defined in the ASR Study | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | ○ |
| 14 | | | | SqCWD GWRR Sites in Aptos/Purisima Basins (per GWRR Feasibility Study) | ○ | ● | ○ | ○ | | ◖ | | ○ | ○ | ○ |
| 15 | | | | Santa Margarita GW Basin | ○ | ● | ○ | ○ | | ○ | ● | ○ | ○ | ○ |
| 16 | | Local Raw Wastewater | MBR + Advanced Treatment | Suitable Santa Cruz GWRR site(s) to be defined in the ASR Study | ○ | ○ | ○ | ◖ | ◖ | ◖ | ○ | ○ | ○ | ○ |
| 17 | | | | SqCWD GWRR Sites in Aptos/Purisima Basins (per GWRR Feasibility Study) | ○ | ● | ○ | ◖ | ○ | ◖ | | ○ | ○ | ○ |
| 18 | | Scotts Valley WWTF or Outfall | Advanced Treatment | Suitable site to be defined in the ASR Study | ● | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | ○ |
| 19 | | | | Santa Margarita GW Basin | ● | ● | ○ | ○ | | ○ | ● | ○ | ○ | ○ |

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## GWRR: Components Removed from Further Consideration

- **SqCWD GWRR Sites in Aptos/Purisima Basins: per GWRR Feasibility Study**
  - No direct augmentation of Santa Cruz potable supplies
  - Indirect access would require complex institutional arrangements and significant new infrastructure
  - Siting challenges for MBR/AWTF

  *Potential to "T" off of conveyance system for NPR or IPR in Santa Cruz is covered under other alternatives*

- **Santa Margarita GW Basin**
  - No direct augmentation of Santa Cruz potable supplies
  - Indirect access would require complex institutional arrangements and significant new infrastructure
  - High cost to treat and pump to this upper basin

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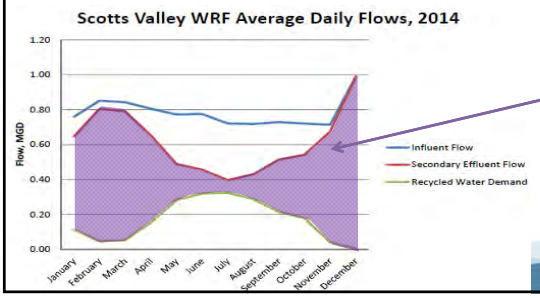
## GWRR: Components Removed from Further Consideration

- **Use of Scotts Valley WWTF or Outfall**
  - Does not use Santa Cruz WW
  - Minimal flow is available in the outfall due to
    - ✓ existing SVWD recycled water program,
    - ✓ planned Pasatiempo use of RW from the outfall and
    - ✓ proposed GWRR currently being explored for SVWD
  - SVWD is already studying this project in a separate RWFPS
  - Use of outfall for conveyance of recycled water from SC WWTF is not viable due to operational concerns if discharge is needed




SVWD RWFPS is looking to use excess available supply for groundwater recharge



## Reservoir Augmentation, Streamflow Augmentation and Direct Potable Reuse Component Evaluation (20 - 24)

**TABLE 2**

| Potential Project Components | Recycled Water Use | Source Water | Treatment | Description | Reuse of Santa Cruz WWTF Effluent | Offset or Increase Potable Supplies | Right Treatment for Right Use | Consolidate Treatment Facilities | Sufficient Flows and Demands for MBR | Minimize Impacts to WW collection and treatment | GWRR at Identified ASR Sites | AWTF Capacity Limited by Siting | Preliminary Agreements Imminent | Approved/ Practiced Reuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Reservoir Augmentation | Santa Cruz WWTF | Advanced Treatment | Loch Lomond Reservoir | ○ | ○ | ○ | ○ | | ○ | | ○ | ○ | ◖ |
| 21 | Streamflow Augmentation | Santa Cruz WWTF | Tertiary | San Lorenzo River (Direct/Indirect Discharge) | ○ | ○ | ● | ○ | | ○ | | | ○ | ◖ |
| 22 | | | Advanced Treatment | San Lorenzo River (Direct/Indirect Discharge) | ○ | ○ | ○ | ○ | | ○ | | ○ | ○ | ◖ |
| 23 | Direct Potable Reuse | Santa Cruz WWTF | Advanced Treatment | Raw Water Blending at Graham Hill WTP (via Coast PS) | ○ | ○ | ○ | ○ | | ○ | | ○ | ○ | ◖ |
| 24 | | | | Pipe to Pipe (Downstream of Graham Hill WTP) | ○ | ○ | ○ | ○ | | ○ | | ○ | ○ | ● |

## Streamflow: Components Removed from Further Consideration

- **Tertiary Treatment**
  - Environmental and habitat concerns related to water quality
  - Proximity to raw water diversion
  - Regulatory and permitting challenges
  - TMDL for Nitrogen would be a limiting factor

*Assume higher level of treatment as the baseline for a streamflow augmentation project*
** An advanced treatment option should consider need for denitrification to minimize nitrogen loading in the basin.*



## DPR: Components Removed from Further Consideration

- **Pipe-to-Pipe: d/s of Graham Hill WTP**
  - Lacks additional treatment, barrier and response time provided by blending prior to a drinking WTP
  - No project of this type is currently or has been permitted in the US
  - Significant public acceptance issues

*Assume source water blending u/s of the WTP as the baseline for a DPR project*

# Alternatives for Further Evaluation

- Alternative 1 – Centralized Non-Potable Reuse
- Alternative 2 – Decentralized Non-Potable Reuse
- Alternative 3 – Santa Cruz Participation in SqCWD-led GWRR Project
- Alternative 4 – Santa Cruz GWRR Project
- Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir
- Alternative 6 – Streamflow Augmentation
- Alternative 7 – Direct Potable Reuse

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# Alternatives 1 & 2: Non-Potable Reuse

TABLE 3

| Alternative | Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|---|
| **Alternative 1 –** Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Phase 2 Project | Santa Cruz WWTF | Tertiary Treatment at SC WWTF | 3° | In-plant uses, truck filling and demonstration site (park near WWTF) |
| | 1b | Maximize tertiary treatment at the SC WWTF | | | 3° | Unrestricted use in Santa Cruz including UC Santa Cruz (Sites TBD) |
| **Alternative 2 –** Decentralized Non-Potable Reuse | 2 | UC Santa Cruz | Local Raw Wastewater (UCSC) | MBR at UCSC | 3° | On campus uses (irrigation, agricultural, cooling towers, dual-plumbed facilities) |

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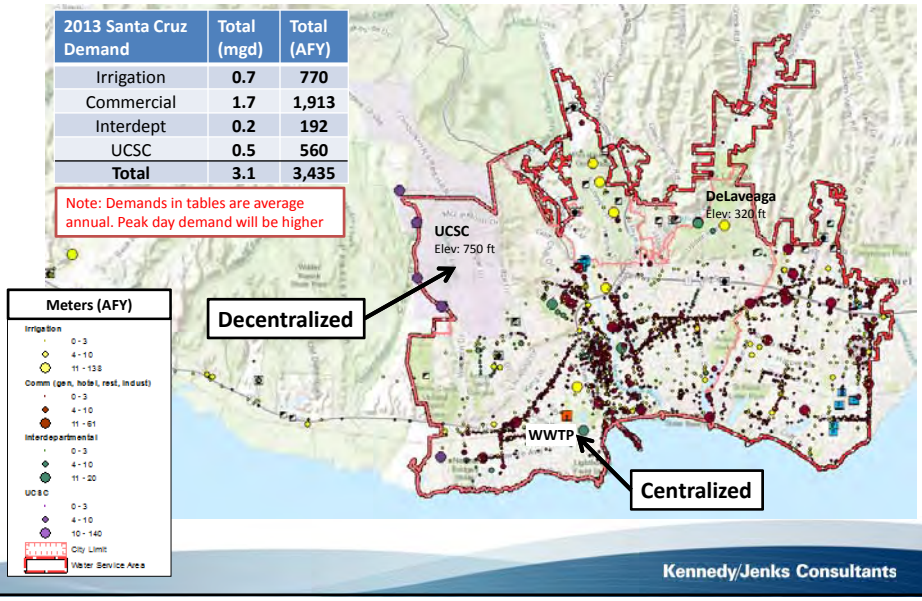
# Alternatives 1 & 2: Non-Potable Reuse

| 2013 Santa Cruz Demand | Total (mgd) | Total (AFY) |
|---|---|---|
| Irrigation | 0.7 | 770 |
| Commercial | 1.7 | 1,913 |
| Interdept | 0.2 | 192 |
| UCSC | 0.5 | 560 |
| **Total** | 3.1 | 3,435 |

Note: Demands in tables are average annual. Peak day demand will be higher

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

TABLE 3

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way) | Santa Cruz WWTF | On-Site Treatment at NPR Customer sites | 2° + filter | NPR Customers along secondary pipelines alignment from SC WWTF to AWTF |
| 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | | Tertiary Treatment at SC WWTF | 3° | NPR Customers along tertiary pipeline alignment from SC WWTF to AWTF |
| 3c (New) | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD WTF to recharge Santa Cruz GWRR | | Advanced Treatment at SqCWD Headquarters | AWT | SqCWD AWTF water delivered to Santa Cruz GWRR injection sites |
| 3d | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | | Advanced Treatment at SC WWTF | AWT | NPR Customers along pipeline alignment from SC WWTF to SqCWD injection sites |
| 3e | Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way) | | | AWT | GWRR in Santa Cruz (Beltz Well Field) and NPR customers along pipeline alignments |
| removed | GWRR in Santa Cruz through an extension from MBR + AWTF at SqCWD | Local Raw Wastewater (SCCSD) | MBR + Advanced Treatment at SqCWD | AWT | GWRR in Santa Cruz (Beltz Well Field) |

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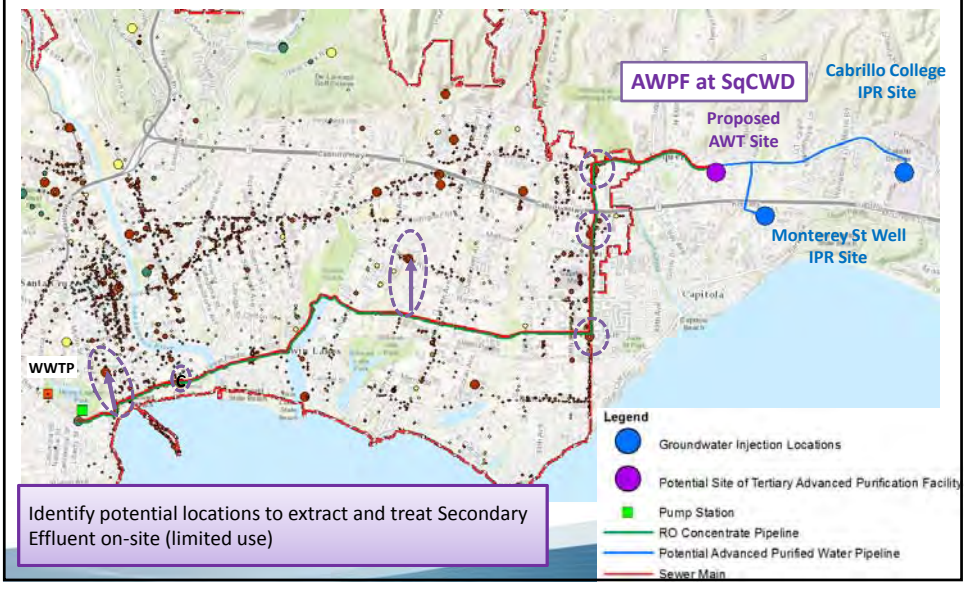
## SqCWD GWRR Feasibility Study Recommended Alternative: AWPF at SqCWD

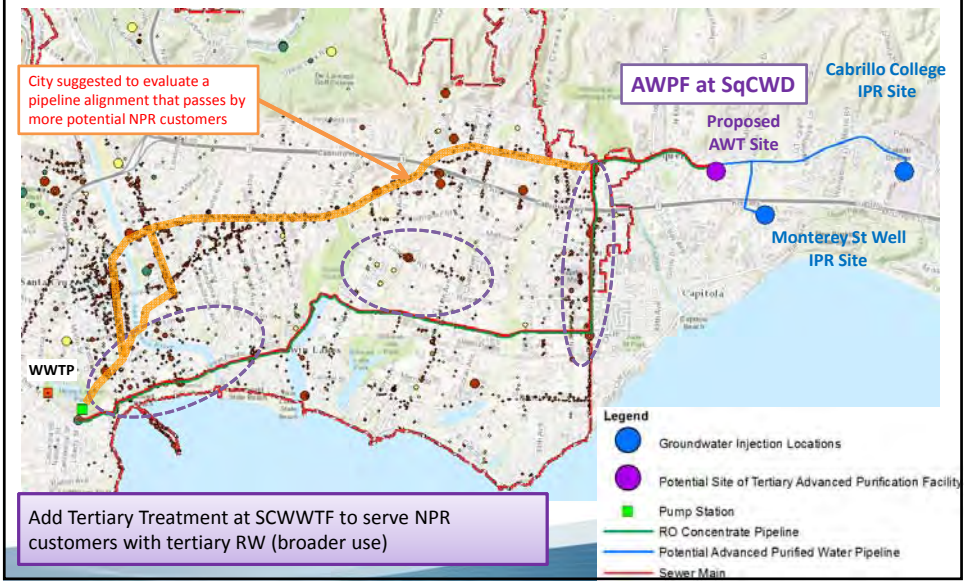

## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project

### 3a: NPR w/ On-Site Treatment of Secondary RW



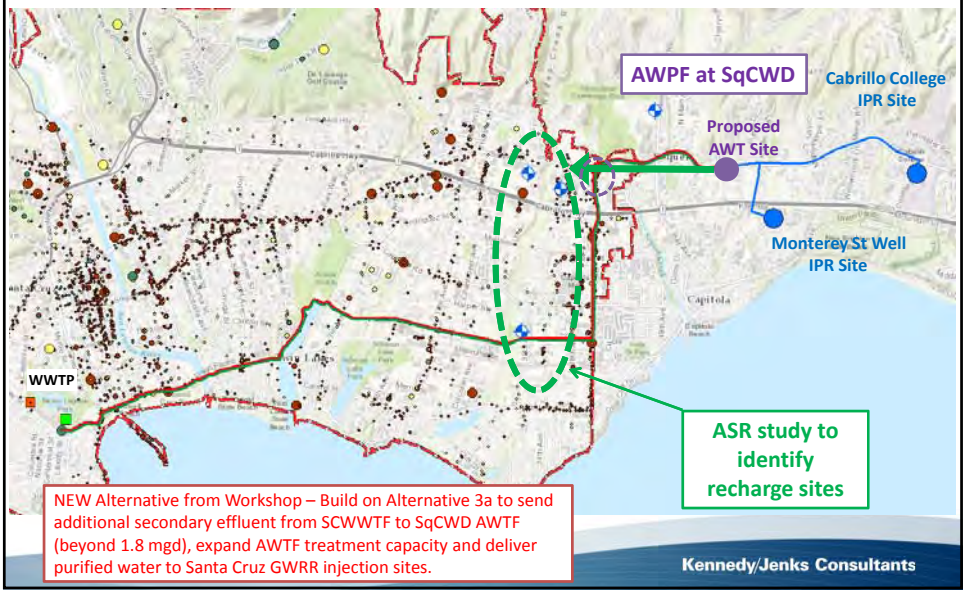

Identify potential locations to extract and treat Secondary Effluent on-site (limited use)

## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project
### 3b: NPR w/ Tertiary RW use at Customer sites




Add Tertiary Treatment at SCWWTF to serve NPR customers with tertiary RW (broader use)

## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project
### 3c: Secondary RW+ Santa Cruz GWRR




NEW Alternative from Workshop – Build on Alternative 3a to send additional secondary effluent from SCWWTF to SqCWD AWTF (beyond 1.8 mgd), expand AWTF treatment capacity and deliver purified water to Santa Cruz GWRR injection sites.

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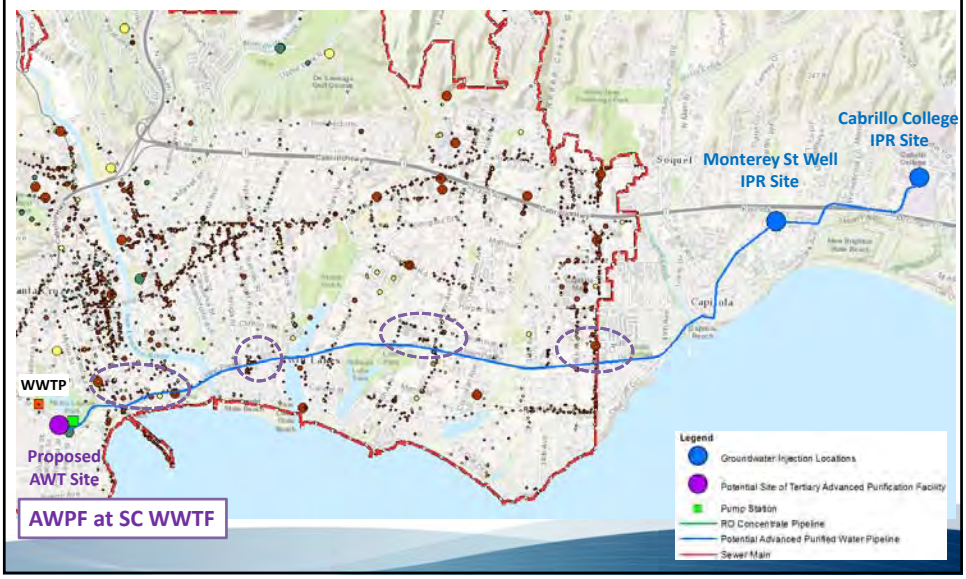
## SqCWD GWRR Feasibility Study Recommended Alternative: AWPF at SC WWTP

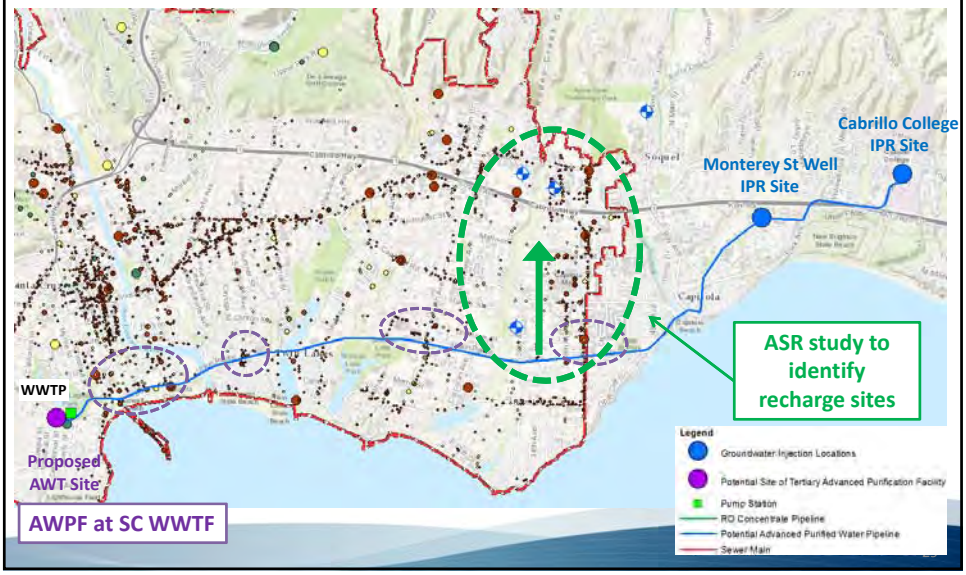

## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project

### 3d: Serve NPR users along the way



## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project

### 3e: GWRR near City wells and serve NPR users along the way

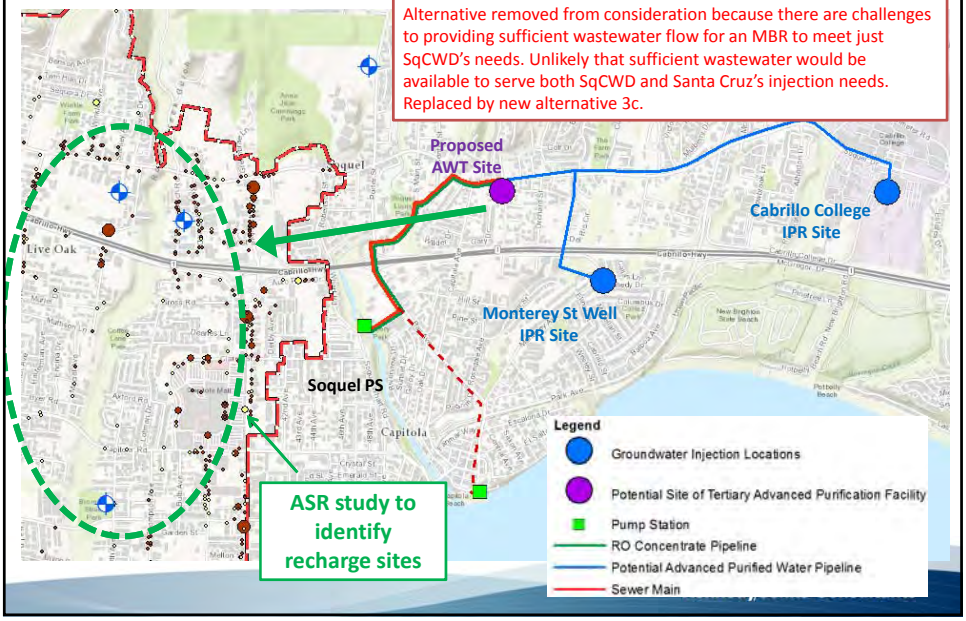



## SqCWD GWRR Feasibility Study Recommended Alternative: MBR at SqCWD

## Alternative 3 – Santa Cruz Participation in SqCWD led GWRR Project

**REMOVED (prior 3e): GWRR near City wells**

Alternative removed from consideration because there are challenges to providing sufficient wastewater flow for an MBR to meet just SqCWD's needs. Unlikely that sufficient wastewater would be available to serve both SqCWD and Santa Cruz's injection needs. Replaced by new alternative 3c.




## Alternative 4: Santa Cruz GWRR

**TABLE 3**

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 4a | Santa Cruz GWRR with AWTF at SC WWTF (serve NPR users along the way) | Santa Cruz WWTF | Advanced Treatment at SC WWTF | AWT | Suitable Santa Cruz GWRR site(s) to be defined in the ASR Study. Once extracted, recharged water would be distributed through the existing potable water distribution system. |
| 4b | Santa Cruz GWRR with AWTF of secondary effluent at off-site location (serve NPR users along the way) | | Advanced Treatment off-site (location TBD) | AWT | |
| 4c | Santa Cruz GWRR with MBR + AWTF at DA Porath PS (serve NPR users along the way) | Local Raw Wastewater (SCCSD) | MBR + Advanced Treatment | AWT | |

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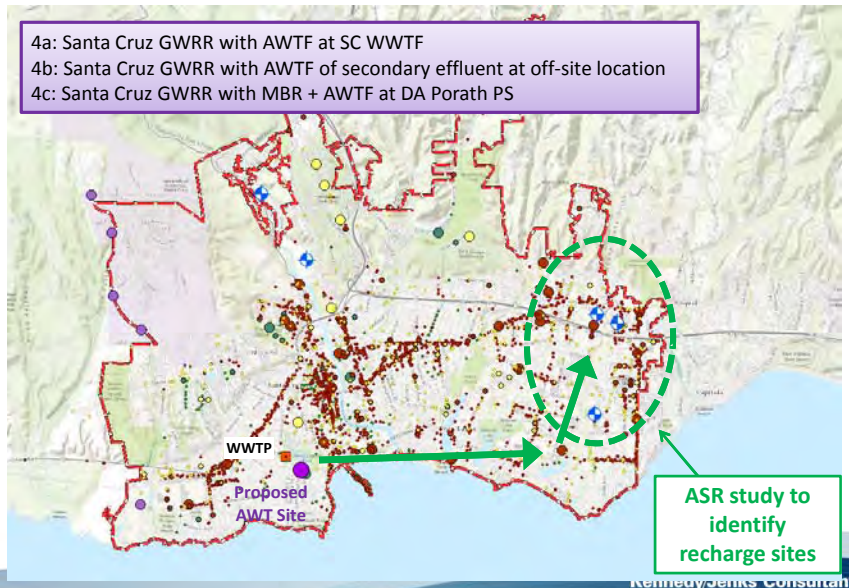
## Alternative 4: Santa Cruz GWRR

4a: Santa Cruz GWRR with AWTF at SC WWTF
4b: Santa Cruz GWRR with AWTF of secondary effluent at off-site location
4c: Santa Cruz GWRR with MBR + AWTF at DA Porath PS

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## Alternative 5: Surface Water Augmentation

TABLE 3

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir | Santa Cruz WWTF | Advanced Treatment at SC WWTF | AWT | Reservoir augmentation in Loch Lomond for blending and storage, to be conveyed to the GHWTP and enter the City's potable water distribution system. |

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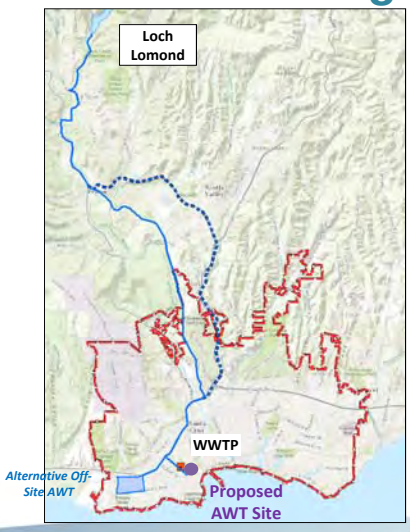
# Alternative 5: Surface Water Augmentation




- RW delivered ~ 3 mgd
  - Based on treating only City of Santa Cruz flows
- Potentially limited by
  - Regulatory requirements (i.e. dilution and retention time)
  - Available AWTF space

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# Alternative 6: Streamflow Augmentation

**TABLE 3**

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 6a | AWTF of secondary effluent with direct discharge to the San Lorenzo River btw Felton and Tait (serve NPR users along the way) | Santa Cruz WWTF | Advanced Treatment at SC WWTF | AWT | Augment San Lorenzo River flows to maintain habitat, meet future fish release requirement, and allow for increased diversions to expand future drinking water supplies. |
| 6b | AWTF of secondary effluent with indirect discharge to the San Lorenzo River d/s of Tait Street Diversion at Tait Well Field (serve NPR users along the way) | | | AWT | |

Key Consideration: Meeting TMDL for Nitrogen in the river

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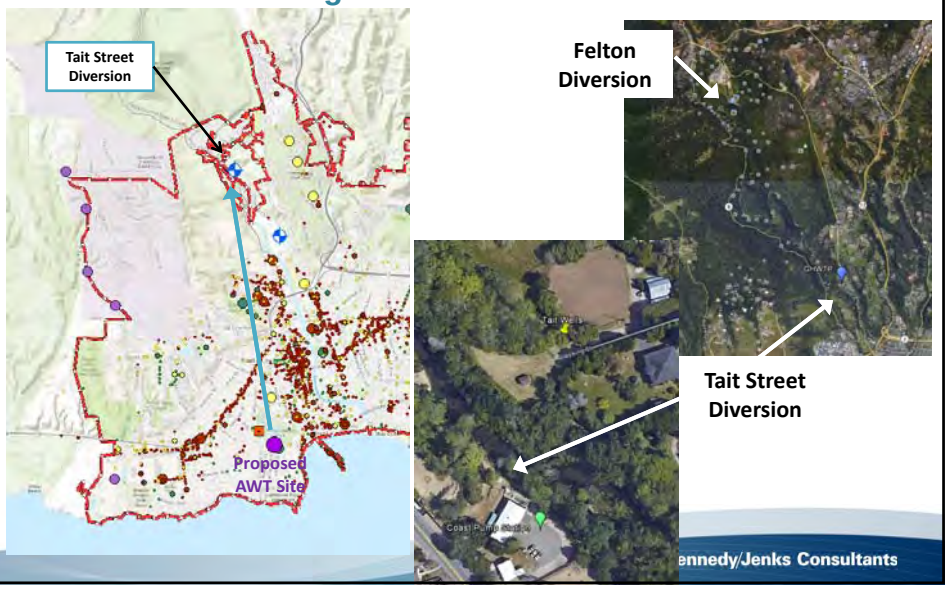
## Alternative 6: Streamflow Augmentation
### 6a: Direct Discharge to San Lorenzo River
### 6b: Indirect Discharge to San Lorenzo River




## Alternative 7: Direct Potable Reuse

TABLE 3

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | Santa Cruz WWTF | Advanced Treatment at SC WWTF | AWT | The advanced treated water would be blended with raw water coming from North Coast sources, the San Lorenzo River, and Loch Lomond water at the Coast Pump Station, and further treated at the GHWTP prior to distribution as finished water, suitable for drinking. |

Additional Consideration: GHWTP source water issues include high turbidity, high TOC, DBPs, solids issues, etc. Consider synergies between GHWTP investments and AWPF when evaluating siting and blending.

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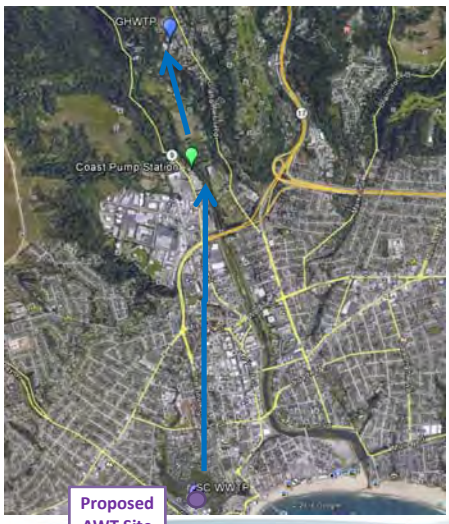
## Alternative 7: DPR with Raw Water Blending at Graham Hill WTP




- **GHWTP** : Treat blended raw water + purified water to produce drinking water
- **Coast Pump Station:** Raw Water
- **SC WWTP + AWPF:** Purified Water

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## OPEN DISCUSSION

* Workshop participants came to alignment on alternatives as developed, upon incorporation of comments from today's workshops.

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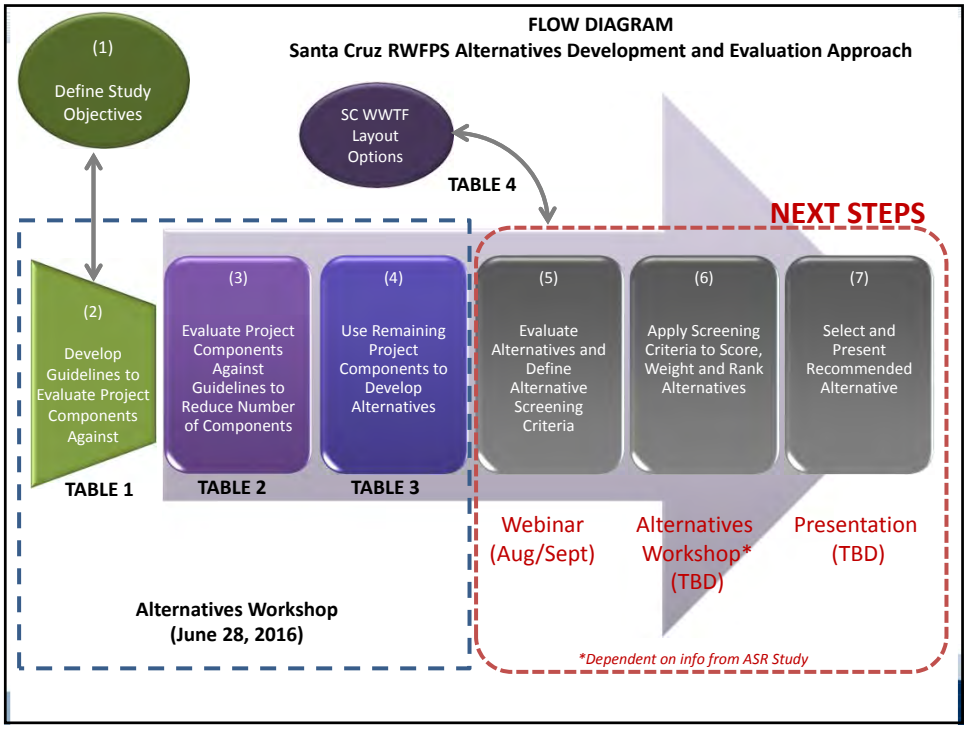
FLOW DIAGRAM
Santa Cruz RWFPS Alternatives Development and Evaluation Approach
(1)
Define Study Objectives
SC WWTF Layout Options
TABLE 4
NEXT STEPS
(2)
Develop Guidelines to Evaluate Project Components Against
TABLE 1
(3)
Evaluate Project Components Against Guidelines to Reduce Number of Components
TABLE 2
(4)
Use Remaining Project Components to Develop Alternatives
TABLE 3
(5)
Evaluate Alternatives and Define Alternative Screening Criteria
(6)
Apply Screening Criteria to Score, Weight and Rank Alternatives
(7)
Select and Present Recommended Alternative
Webinar (Aug/Sept)
Alternatives Workshop* (TBD)
Presentation (TBD)
Alternatives Workshop
(June 28, 2016)
*Dependent on info from ASR Study


QUESTIONS
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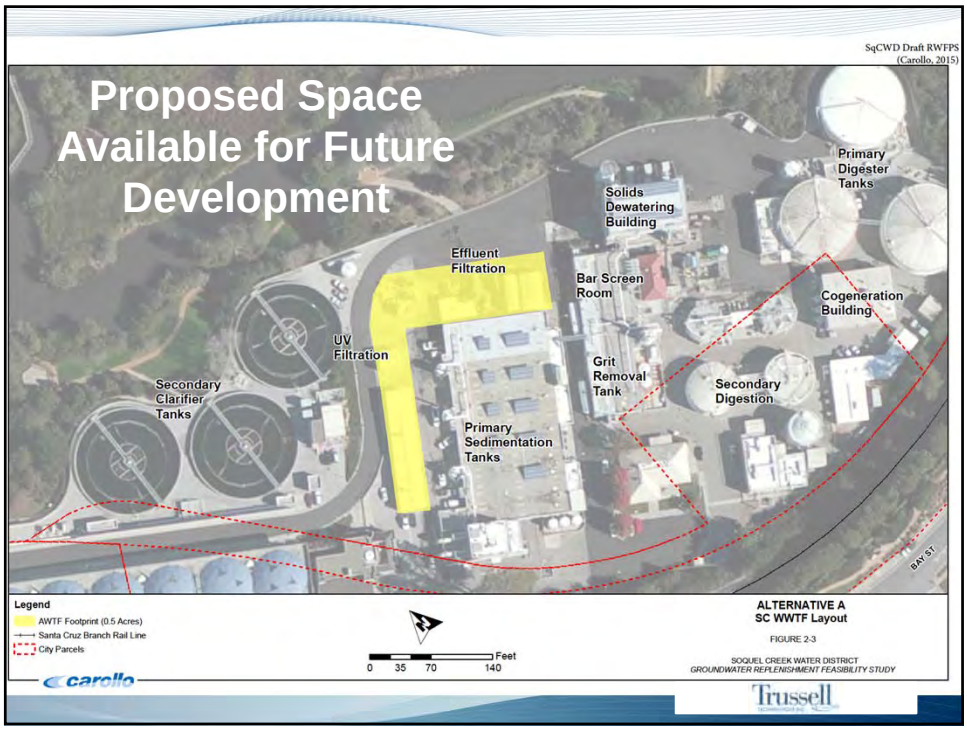
# City of Santa Cruz
# Wastewater Treatment Facility

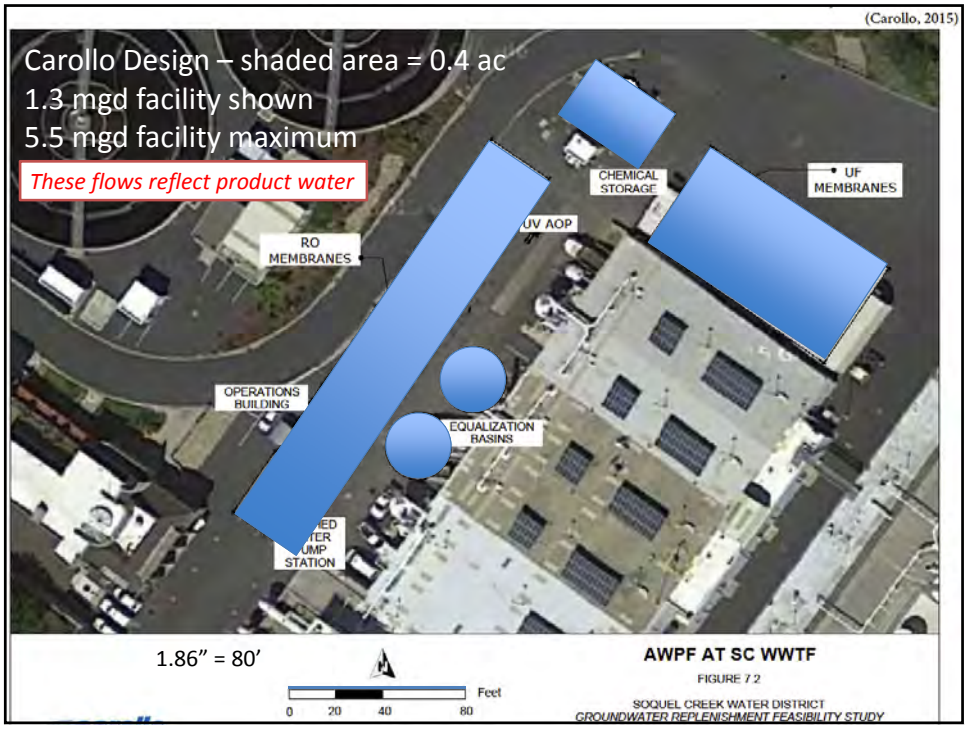
## Future Facility Layout Estimates
## Trussell Technologies, Inc.
## June 28, 2016

** Includes amended notes to reflect decisions at workshop*

Trussell




Trussell

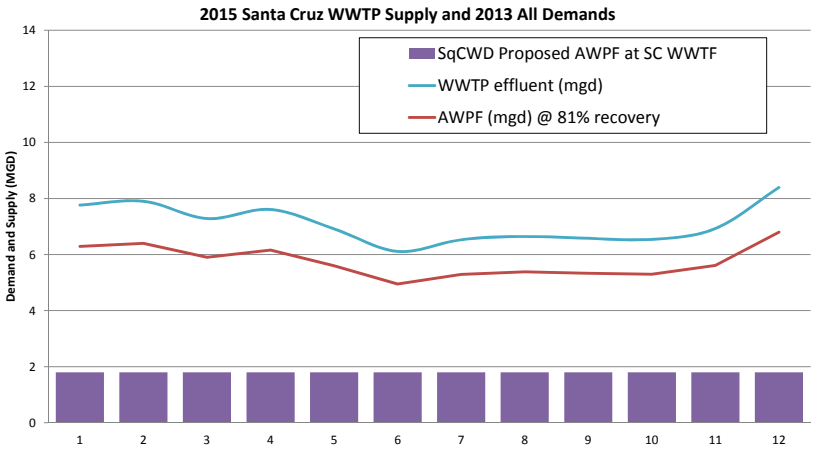



## Layout considerations

- **Goal**: identify space limitations at WWTF
- **Two water quality objectives:**
  - Compatibility with 175 gpm (0.25 mgd) tertiary
  - Tertiary (non-potable):
    - ✓ 1.5 mgd
  - AWPF (advanced treated water):
    - ✓ Scenario 1: 1.3 mgd (based on Soquel RWFPS)
    - ✓ Scenario 2: 5.0 mgd (based on June flow)
- **Siting Considerations:** Potential layout options and relocation of displaced facilities can be discussed at a high-level.

Trussell

# Initial Supply Evaluation




*City PWD noted that these represent drought flows, normal weather flows can range from 8.5 to 9.0 mgd in June*

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# Processes Included in TT Estimate

**AWPF**

- MF (n+1)
  - 20 gfd flux
  - 90% recovery
- RO (n+1)
  - 12 gfd flux
  - 80% recovery
- UV/AOP (n+1)
  - $H_2O_2$
- Chemical Storage
- Not YET included
  - Operations building
  - Post treatment
  - Product water pump station
  - Relocation of facilities

**Tertiary**

- Granular media filtration
  - 5 gpm/sf
- Disinfection
  - Combined chlorine
    - ✓ 80% baffling efficiency CCB
    - ✓ > 90-min modal, 450 CT
  - UV (smaller footprint)
    - ✓ 55% UVT minimum influent possible
- Meets Title-22 requirements
- No product water storage

Trussell

## 0.25 mgd Tertiary Layout (Phase 2 Project)

Trussell

## 0.25 mgd Tertiary Treatment Design

*(Phase 2 Project)*

- Footprint area estimate
  - 0.08 acre
- Uses existing conveyance infrastructure, filters and chemical storage

## Increasing Capacity Beyond 0.25 mgd

**Up to 0.25 mgd Capacity**

- Existing infrastructural limitations:
  - Conveyance piping
  - Conveyance pumps
  - Filter capacity

**Beyond 0.25 mgd Capacity**

- Upgrade conveyance piping and pumps
- Add additional filters
- Add additional disinfection capacity

Trussell

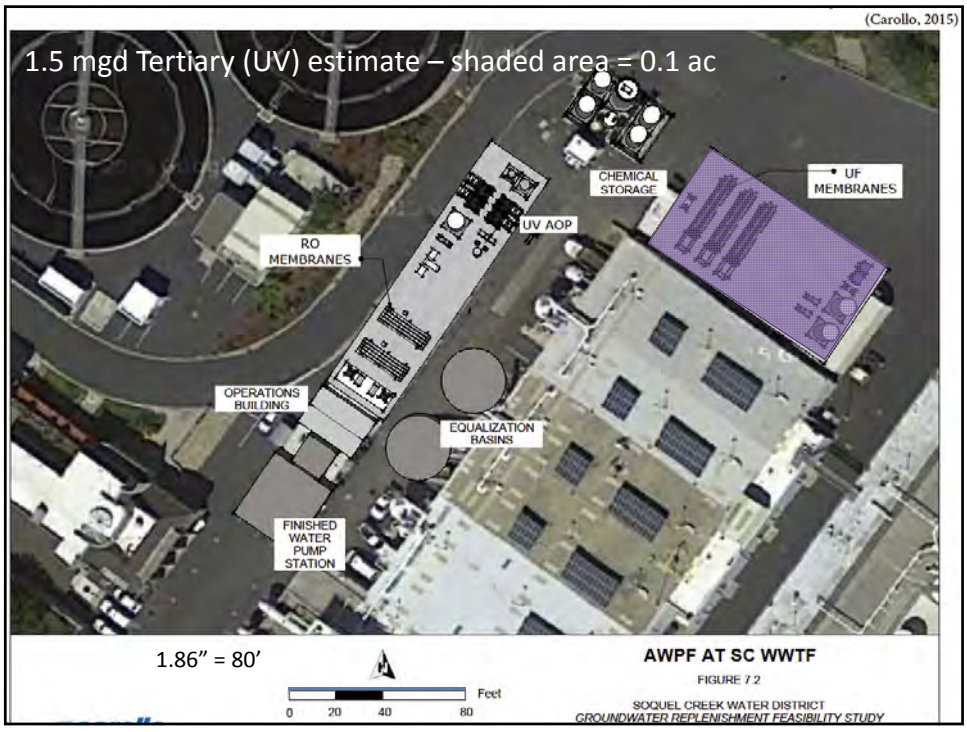
## Flexibility of 0.25 mgd Tertiary Treatment Design

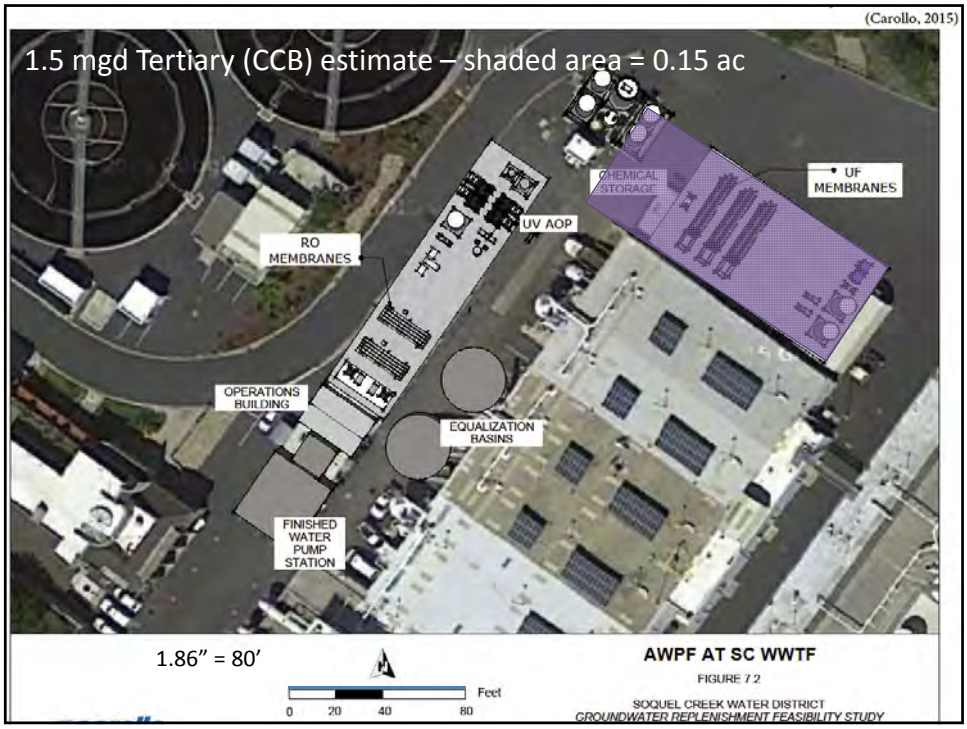
- Allows space for 1.5 mgd tertiary

Trussell

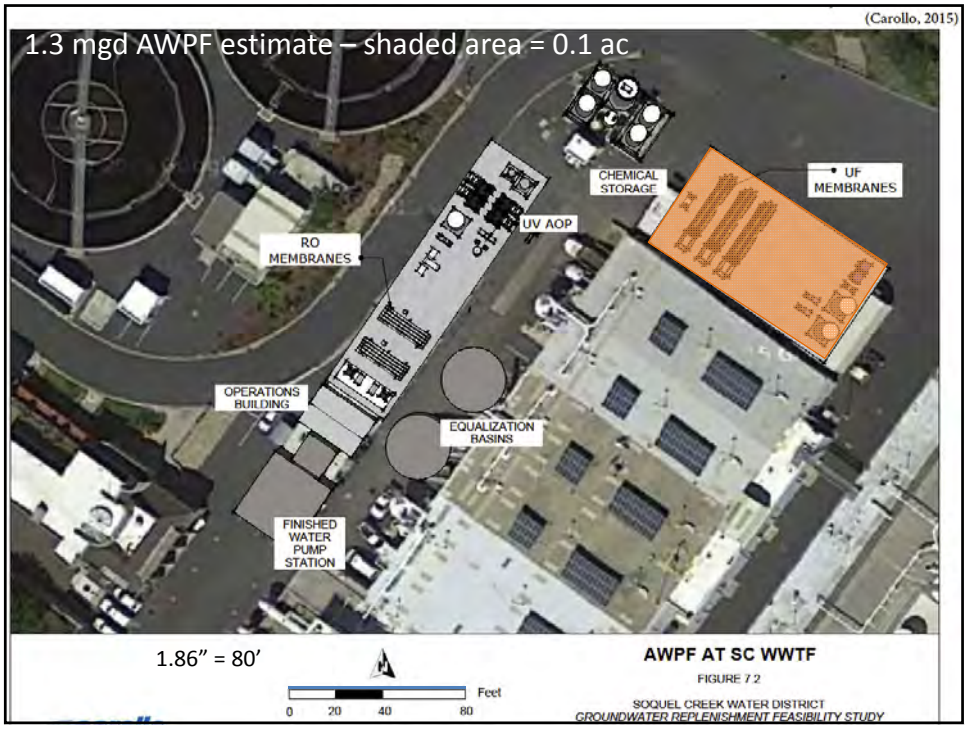
# 1.5 mgd Tertiary Layout

Trussell

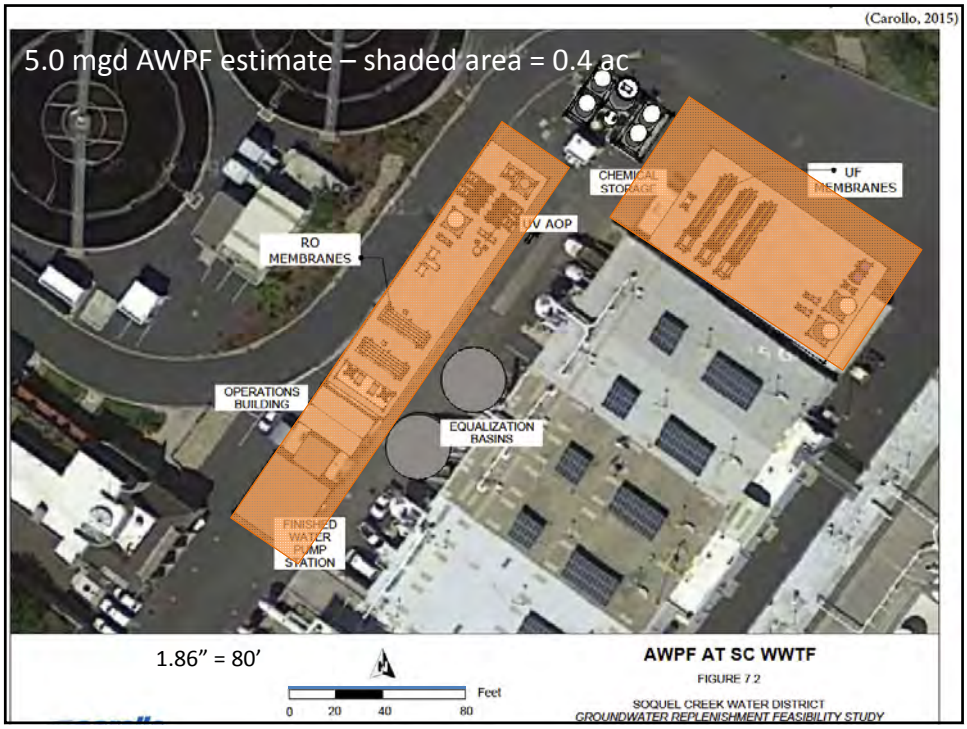





## 1.3 mgd AWPF Layout




## 5.0 mgd AWPF Layout




# Preliminary Site Layout Options Summary

| Treatment Design Options | Flow Rate (mgd) | Footprint Estimate (acre) |
|---|---|---|
| **Phase 2 Tertiary** | 0.25 | 0.08 |
| **Tertiary Alternatives:** | | |
| Chlorine Contact Basin | 1.5 | 0.15 |
| UV Disinfection | 1.5 | 0.10 |
| **AWPF Alternatives** | 1.3<br>5.0 | 0.10<br>0.40 |

*Per discussions during the workshop, the bookends of site layouts for tertiary and AWTF are to be expanded to maximize treatment in the available space.*
*The table on the following page represents the revised layouts to be evaluated.*

Trussell

# Revised Site Layout Options (to be evaluated)

| Treatment Design Options | Min Flow Rate (mgd) | Min Footprint Estimate (acre) | Max Flow Rate (mgd) | Max Footprint Estimate (acre) |
|---|---|---|---|---|
| **Phase 2 Title 22 Tertiary Project** | 0.25 | 0.08 | same | same |
| **Tertiary Alternatives:** | | | | |
| Media Filtration + Chlorine Disinfection | 1.5 | 0.15 | 5.5 | TBD |
| Media Filtration + UV Disinfection | 1.5 | 0.10 | 5.5 | TBD |
| MF Filtration + UV Disinfection | 1.5 | 0.10 | 9.5 | TBD |
| **AWTF Alternatives:** | | | | |
| AWTF Alternative for IPR | 1.3 | 0.10 | 5.5 | 0.40 |
| AWTF Alternative for DPR | 5.5 | 0.40 | 9.5 | TBD |

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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Screening Webinar
## 29 Aug 2016 from 1 to 3 pm

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

---

## AGENDA

**Overall Webinar Objective:** Present approach for screening alternatives. Discuss and seek input on screening categories, criteria, guidelines for scoring and weighting to compare alternative projects in the Santa Cruz RWFPS.

**Action Item:** Project Partners to fill out and submit weighting table following the workshop.

---

1. Introduction and Roles
2. Overview of Today's Workshop
3. Overall Alternatives Evaluation Approach (Figure 1)
4. Alternatives Screening Approach (Figures 2 & 3)
5. Screening Criteria and Guidance for Scoring (Table 5)
6. Weighting for Screening Criteria (Table 6)
7. Method to Score and Weight Alternative Projects (Table 7)
8. Ranking and Sensitivity Analysis (Table 8)
9. Open Discussion
10. Next Steps

# City of Santa Cruz Recycled Water Facilities Planning Study

Screening Criteria Workshop

August 29, 2016

Kennedy/Jenks Consultants

## Agenda

- Introduction and Roles
- Today's Workshop
- Overall Alternatives Evaluation Approach (Figure 1)
- Alternatives Screening Approach (Figures 2 & 3)
- Screening Criteria and Guidance for Scoring (Table 5)
- Weighting for Screening Criteria (Table 6)
- Method to Score and Weight Alternative Projects (Table 7)
- Ranking and Sensitivity Analysis (Table 8)
- Open Discussion
- Next Steps

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## Today's Workshop

- **Objective:** Present approach for screening alternatives.
- **Goal:** Discuss and seek input on screening categories, criteria and guidelines for scoring and weighting alternative projects.
- **Action Items:** Project Partners to fill out and submit weighting table following the workshop.

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## Overall Approach Flow Diagram

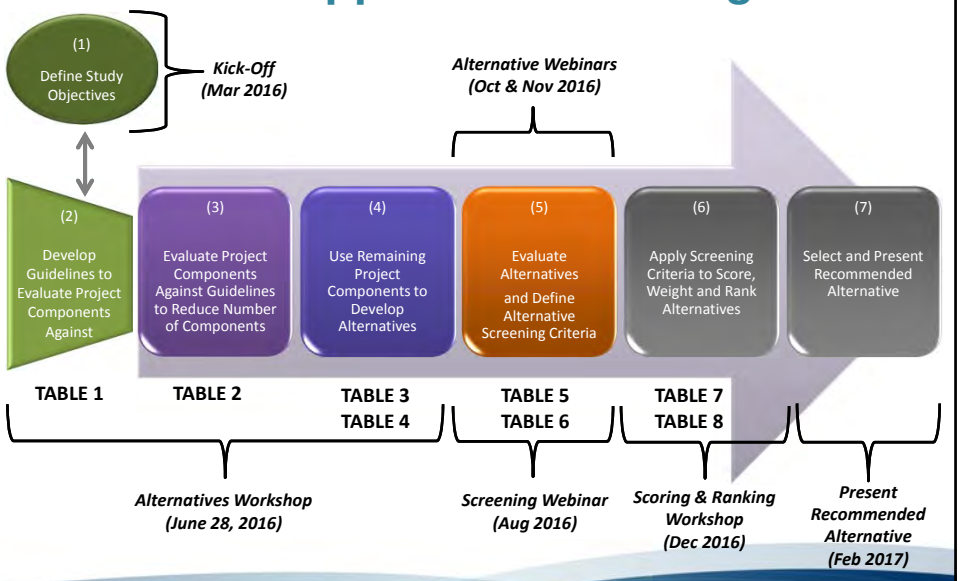


FIGURE 1

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## Overall Approach - Meetings

- Mar-2016 Kickoff
- Jun-2016 Alternatives Workshop
- Aug-2016 Screening Webinar **(TODAY)**
- Oct-2016 Alternative Webinar – Part I
- Nov-2016 Alternative Webinar – Part II
- Dec-2016 Scoring and Ranking Workshop
- Feb-2017 Present Recommended Alternatives

FIGURE 1 (Table at Bottom)

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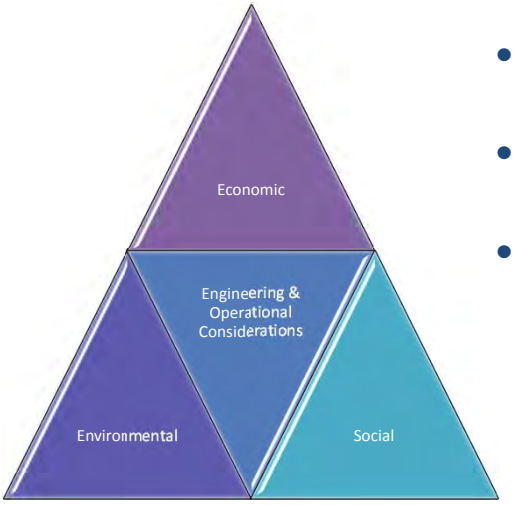
## Alternatives Screening Categories




- Four categories to compare alternatives
- Triple Bottom Line (TBL) approach
- Integrates engineering and operational considerations

FIGURE 2

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## Quantitative Results and Qualitative Screening Criteria

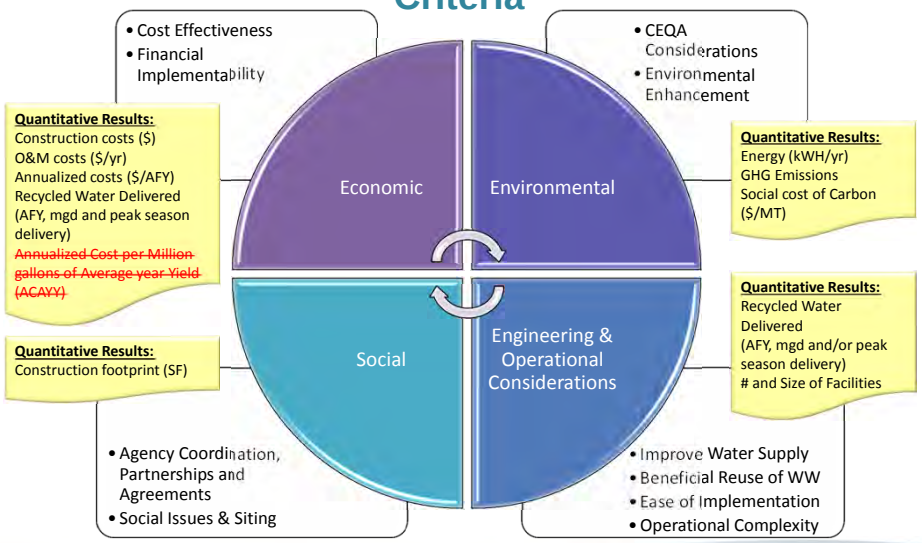


FIGURE 3 Kennedy/Jenks Consultants

## QUANTITATIVE Results from Alternatives Evaluation

| Recycled Water Delivered: | Costs: | Energy / Other: |
|---|---|---|
| Annual Volume (AFY) | Construction Costs ($) | Energy (kWH/AF) of RW Delivered |
| Average Annual Flow (mgd) | O&M Costs ($/yr) | GHG emissions (MT of $CO_2e$ per year) |
| Peak Season Deliveries (AF Summer) | Life Cycle Costs ($/AFY) | Social Cost of Carbon ($/MT) |
| Peak Flow (mgd) | ~~Annualized Cost per Million gallons of Average year Yield (ACAYY)~~ | Construction Footprint (SF) |
| ~~Average year Yield (MG)~~ | | # and Size of Facilities |

**QUANTITATIVE results will be provided for each alternative and used to inform qualitative scoring**

*AF = acre-feet*
*AFY = acre-feet per year*
*MG = million gallons*
*mgd = million gallons per day*
*kWH = kilowatt hour*
*MT = metric ton*
*$CO_2e$ = carbon dioxide equivalent*
*SF = square feet*

TABLE 5 Kennedy/Jenks Consultants

# QUALITATIVE Criteria for Comparing Alternatives

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

**QUANTITATIVE results and other considerations are used to guide scoring for each QUALITATIVE screening criteria**

TABLE 5

# Scoring for QUALITATIVE Criteria

| Scoring Legend: | Score |
|---|---|
| Fully ~~Exceeds~~ Meets Criteria | 5 |
| Mostly ~~Exceeds~~ Meets Criteria | 4 |
| Generally Meets Criteria | 3 |
| Somewhat Meets Criteria | 2 |
| Unable to Meet Criteria | 1 |

**Scores are assigned based on the range of QUANTITATIVE results and relative findings from the QUALITATIVE assessment**

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## Engineering and Operational Considerations

- Water Supply Gap = 1.2 BGY, 3.3 mgd or 3,700 AFY
  - Quantitative Results = RW Delivered annually and during peak season (mgd or AF).
  - Qualitative Assessment = How often and to what level can project fill the City water supply gap. Considers potential excess supply to fill Regional water supply gap
- Construction Challenges
  - Quantitative Results = Number and size of facilities.
  - Qualitative Assessment = How much anticipated disturbance and likely construction complexity.

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## Engineering and Operational Considerations

- Source of WW and Type of Treatment
  - Quantitative Results = Flow variation and source water quality.
  - Qualitative Assessment = Level of complexity for treatment processes and related operations.
- Siting new Treatment Facilities
  - Quantitative Results = Number and size of facilities and construction footprint.
  - Qualitative Assessment = Impact of relocation of existing facilities or disruption due to off-site operations.

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## Economic

- Economic Feasibility / Cost Effectiveness
  - Quantitative Results = Capital, O&M and life cycle unit costs and ~~Annualized Cost per Million gallons of Average year Yield (ACAYY)*~~.
  - Qualitative Assessment = Comparison to baseline and avoided baseline costs.

** The WSAC defined ACAYY as a cost metric to evaluate the cost-effectiveness of different water supply projects using the Confluence Model to estimate yield. A similar approach will be used to the yield of each recycled water alternative to allow for comparison btw alternatives and with other water supply options (i.e. ASR Study). The RWFPS will provide the data to calculate the ACAYY for others to use in the comparison of priority RW projects with other WSAC projects; however, the ACAYY will not be used in the evaluation of RW alternatives in the RWFPS.*

- Financially implementable project
  - Quantitative Results = Capital costs.
  - Qualitative Assessment = Need to issue debt, potential impact on rates and required tradeoffs (i.e. the ability to implement other water supply projects.)

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## Environmental

- CEQA Considerations
  - Quantitative Results = Need for MND vs. EIR.
  - Qualitative Assessment = Complexity of CEQA and permitting process; extent of mitigation required, especially if on-going effects on O&M.

*Note: City will strive to offset energy requirement of any project(s) with green power. Other environmental impacts may include construction, noise, brine discharge, etc.*

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## Environmental

- Enhance Ecosystems
  - Quantitative Results = Not available.
  - Qualitative Assessment = Contributes significant, some or minimal benefit to enhancing the environment.
- Contribution to global warming
  - Quantitative Results = GHG emissions (Metric Tons of CO2e per year) based on energy (kWH/AF) of RW delivered and social cost of carbon ($/MT).
  - Qualitative Assessment = Relative social cost of carbon compared to other projects and sources.

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## Social

- Level of Coordination and Partnership
  - Quantitative Results = Not available.
  - Qualitative Assessment = Level of City control and current interest from partners in agreements and cost sharing.
- Perceived Public Acceptance
  - Quantitative Results = Not available.
  - Qualitative Assessment = Supportive to opposed.
- Local Disruption
  - Quantitative Results = Construction footprint.
  - Qualitative Assessment = Challenges with land acquisition and opposition to on-going O&M activities.

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# Weighting for Screening Criteria

| Categories | Alternatives Screening Criteria | Example % Weighting | What's YOUR Weighting? |
|---|---|---|---|
| ENGINEERING & OPERATIONAL CONSIDERATIONS | Improve Regional Water Supply | 20% | |
| | Ease of Implementation | 15% | |
| | Operational Complexity | 10% | |
| ECONOMIC | Cost Effectiveness | 12% | |
| | Financial Implementability | 12% | |
| ENVIRONMENTAL | CEQA Considerations | 8% | |
| | Environmental Enhancement | 8% | |
| SOCIAL | Agency Coordination, Partnerships and Agreements | 10% | |
| | Social Issues & Siting | 5% | |
| | TOTAL | 100% | |

Consultant Team
City Water Team
City PW Team
SqCWD Team*
SVWD Team*
Santa Cruz County Team*

**Each team provides a unique point of view.**
** Integration of non-financial partner weighting in ranking to be determined .*

TABLE 6

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# Alternative Project Scoring and Weighting Evaluation

TABLE 7

| Categories | | | ENGINEERING & OPERATIONAL CONSIDERATIONS | | | | | | | | | | ECONOMIC | | | ENVIRONMENTAL | | | | SOCIAL | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alternatives Screening Criteria | | | Improve Water Supply | | Maximize Beneficial Reuse | | Ease of Implementation | | | Operational Complexity | | | Cost Effectiveness | Financial Implementability | | CEQA Considerations 4 | Environmental Enhancement | | | Agency Coordination, Partnerships and Agreements | Social Issues & Siting | | | Total Weighted Score (max 100) |
| | | | Supply Gap | Timeline | Maximize Use Now | Future Expansion | Permitability | Construction | Expansion | Treatment | Siting | | Unit Costs | Capital | | Impact/ Mitigation | Enhance | GHG | | Level/ Willingness | Public Acceptance | Local Disruption | | |
| RECOMMENDED Weighting based on input from Project Partners | | | 10.4 | | 4.6 | | 13.9 | | | 16.1 | | 45.1 | 15.0 | 10.6 | 25.6 | 6.8 | 6.4 | | 13.2 | 10.6 | 5.0 | | 15.6 | 100 |
| Alternative | Sub-Alt # | Description | | | | | | | | | | | | | | | | | | | | | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Phase 2 Project | 3 | 4 | 3 | 3 | 4 | 5 | 4 | 5 | 5 | 38.2 | 4 | 5 | 22.6 | 5 | 4 | 4 | 11.9 | 5 | 5 | 5 | 15.6 | 88.4 |
| | 1b | Maximize tertiary treatment at the SC WWTF | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 5 | 5 | 38.1 | 4 | 4 | 20.5 | 5 | 4 | 4 | 11.9 | 5 | 5 | 4 | 15.1 | 85.6 |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz | 1 | 1 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 27.9 | 3 | 4 | 17.5 | 5 | 4 | 4 | 11.9 | 4 | 5 | 4 | 13.0 | 70.3 |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GWRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way) | 1 | 1 | 3 | 3 | 5 | 5 | 2 | 5 | 5 | 32.1 | 5 | 5 | 25.6 | 5 | 4 | 4 | 11.9 | 5 | 5 | 4 | 15.1 | 84.7 |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 2 | 2 | 3 | 3 | 5 | 5 | 3 | 5 | 5 | 36.6 | 5 | 4 | 25.6 | 4 | 4 | 4 | 11.9 | 5 | 4 | 4 | 15.1 | 88.7 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF o recharge Santa Cruz GWRR | 5 | 5 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 37.2 | 4 | 4 | 20.5 | 4 | 4 | 4 | 10.5 | 4 | 3 | 4 | 12.0 | 80.3 |
| | 3d | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 32.1 | 5 | 5 | 25.6 | 5 | 4 | 4 | 11.9 | 5 | 5 | 4 | 15.1 | 85.9 |
| | 3e | Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way) | 5 | 5 | 3 | 3 | [illegible] | 4 | 4 | 4 | 4 | 37.2 | 4 | 4 | 20.5 | 4 | 4 | 4 | 10.6 | 4 | 3 | 4 | 12.0 | 80.3 |
| Alternative 4 – Santa Cruz GWRR Project | 4a | Santa Cruz GWRR withAWTF at SC WWTF (DO NOT serve NPR users along the way) | 5 | 5 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 32.1 | 4 | 3 | 18.4 | 4 | 4 | 4 | 10.6 | 4 | 3 | 3 | 11.5 | 72.6 |
| | 4b | Santa Cruz GWRR with AWTF of secondary effluent at off-site location (DO NOT serve NPR users along the way) | d/or supp | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 29.6 | 4 | 3 | 18.4 | 3 | 4 | 4 | 9.2 | 4 | 3 | 3 | 11.5 | 68.7 |
| | 4c | Santa Cruz GWRR with MBR + AWTF at DA Porath PS (DO NOT serve NPR users along the way) | 4 | 4 | 3 | 3 | 2 | 2 | 1 | 3 | 3 | 25.4 | 3 | 3 | 15.4 | 3 | 4 | 2 | 7.9 | 4 | 3 | 3 | 11.5 | 60.2 |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir (DO NOT serve NPR users along the way) | 5 | 5 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 27.1 | 4 | 2 | 16.3 | 3 | 3 | 1 | 6.6 | 2 | 2 | 2 | 6.3 | 56.2 |
| Alternative 6 – Streamflow Augmentation | 6a | AWTF of secondary effluent with direct discharge to the San Lorenzo River btw Felton and Tait (DO NOT serve NPR users along the way) | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 2 | 2 | 19.9 | 2 | 2 | 10.3 | 1 | 3 | 2 | 4.6 | 2 | 3 | 3 | 7.3 | 41.9 |
| | 6b | AWTF of secondary effluent with indirect discharge to the San Lorenzo River d/s of T ait Street Diversion at Tait Well Field (DO NOT serve NPR users along the way) | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 2 | 2 | 19.9 | 2 | 2 | 10.3 | 1 | 3 | 2 | 4.6 | 2 | 3 | 3 | 7.3 | 41.9 |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 2 | 2 | 29.8 | 4 | 2 | 16.3 | 3 | 2 | 2 | 6.6 | 4 | 2 | 3 | 11.0 | 63.7 |

PLACEHOLDER SCORES/WEIGHTING FOR EXAMPLE ONLY

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# Alternative Project Ranking

**TABLE 8**

| Alternative | Sub-Alt # | Description | SCORING for each Weighted Category: ENGINEERING & OPERATIONAL CONSIDERATIONS | ECONOMIC | ENVIRONMENTAL | SOCIAL | Total Score | RANKING for each Weighted Category: ENGINEERING & OPERATIONAL CONSIDERATIONS | ECONOMIC | ENVIRONMENTAL | SOCIAL | Total Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | AVE WEIGHTED RANKING | | | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Phase 2 Project | 35.7 | 22.6 | 13.9 | 17.2 | 89.5 | 1 | 1 | 1 | 1 | 1 |
| | 1b | Maximize tertiary treatment at the SC WWTF | 35.2 | 20.5 | 13.9 | 16.6 | 86.2 | 1 | 2 | 1 | 2 | 3 |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz | 23.9 | 17.5 | 13.9 | 14.4 | 69.8 | 1 | 6 | 1 | 6 | 10 |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GWRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way) | 27.6 | 25.6 | 13.9 | 16.6 | 83.8 | 1 | 2 | 1 | 2 | 5 |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 32.3 | 25.6 | 13.9 | 16.6 | 88.5 | 1 | 2 | 1 | 2 | 2 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF o recharge Santa Cruz GWRR | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 3d | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 3e | Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Alternative 4 – Santa Cruz GWRR Project | 4a | Santa Cruz GWRR withAWTF at SC WWTF (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 4b | Santa Cruz GWRR with AWTF of secondary effluent at off-site location (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 4c | Santa Cruz GWRR with MBR + AWTF at DA Porath PS (serve NPR users along the way) | 24.4 | 15.4 | 9.3 | 12.6 | 61.6 | 11 | 9 | 11 | 9 | 12 |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir | 27.2 | 16.3 | 7.7 | 6.9 | 58.1 | 12 | 15 | 12 | 15 | 13 |
| Alternative 6 – Streamflow Augmentation | 6a | AWTF of secondary effluent with direct discharge to the San Lorenzo River btw Felton and Tait(serve NPR users along the way) | 17.7 | 10.3 | 5.4 | 8.1 | 41.4 | 14 | 13 | 14 | 13 | 14 |
| | 6b | AWTF of secondary effluent with indirect discharge to the San Lorenzo River d/s of Tait Street Diversion at Tait Well Field (serve NPR users along the way) | 17.7 | 10.3 | 5.4 | 8.1 | 41.4 | 14 | 13 | 14 | 13 | 14 |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | 29.9 | 16.3 | 7.7 | 11.9 | 65.9 | 12 | 12 | 12 | 12 | 11 |

PLACEHOLDER SCORES/RANKING FOR EXAMPLE ONLY

Ranking Legend: Categories

| |
|---|
| Highest Ranked |
| Lowest Ranked |



# Sensitivity Analysis

**TABLE 8**

| Alternative | Sub-Alt # | Description | RANKING for each Weighted Category: ENGINEERING & OPERATIONAL CONSIDERATIONS | ECONOMIC | ENVIRONMENTAL | SOCIAL | Total Score | RANKING for Sensitivity Analysis: Agency Weighted Objective Score | Maximize Water Supply | Most Financially Viable | Maximize Environmental Benefits | Average Ranking (overall Sensitivity scenarios) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AVE WEIGHTED RANKING | | | | | SENSITIVITY RANKING | | | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Phase 2 Project | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 1 | 2 |
| | 1b | Maximize tertiary treatment at the SC WWTF | 1 | 2 | 1 | 2 | 3 | 3 | 3 | 5 | 3 | 4 |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz | 1 | 6 | 1 | 6 | 10 | 10 | 12 | 10 | 8 | 10 |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GWRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way) | 1 | 2 | 1 | 2 | 5 | 5 | 8 | 3 | 5 | 5 |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 1 | 2 | 1 | 2 | 2 | 2 | 5 | 1 | 2 | 3 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF o recharge Santa Cruz GWRR | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 3d | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 3e | Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Alternative 4 – Santa Cruz GWRR Project | 4a | Santa Cruz GWRR withAWTF at SC WWTF (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 4b | Santa Cruz GWRR with AWTF of secondary effluent at off-site location (serve NPR users along the way) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | 4c | Santa Cruz GWRR with MBR + AWTF at DA Porath PS (serve NPR users along the way) | 11 | 9 | 11 | 9 | 12 | 12 | 13 | 13 | 11 | 12 |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir | 12 | 15 | 12 | 15 | 13 | 13 | 11 | | | |
| Alternative 6 – Streamflow Augmentation | 6a | AWTF of secondary effluent with direct discharge to the San Lorenzo River btw Felton and Tait(serve NPR users along the way) | 14 | 13 | 14 | 13 | 14 | 14 | 14 | | | |
| | 6b | AWTF of secondary effluent with indirect discharge to the San Lorenzo River d/s of Tait Street Diversion at Tait Well Field (serve NPR users along the way) | 14 | 13 | 14 | 13 | 14 | 14 | 14 | | | |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | 12 | 12 | 12 | 12 | 11 | 11 | 10 | | | |

PLACEHOLDER SCORES/RANKING FOR EXAMPLE ONLY

Sensitivity Analysis Weighting Factors

| |
|---|
| Equal Weighted (average of participant weighting factors) |
| Maximizing Water Supply |
| Lower Cost |
| Maximize Environmental Benefits |
| Average Project Partner Weighting Factors |

# OPEN DISCUSSION

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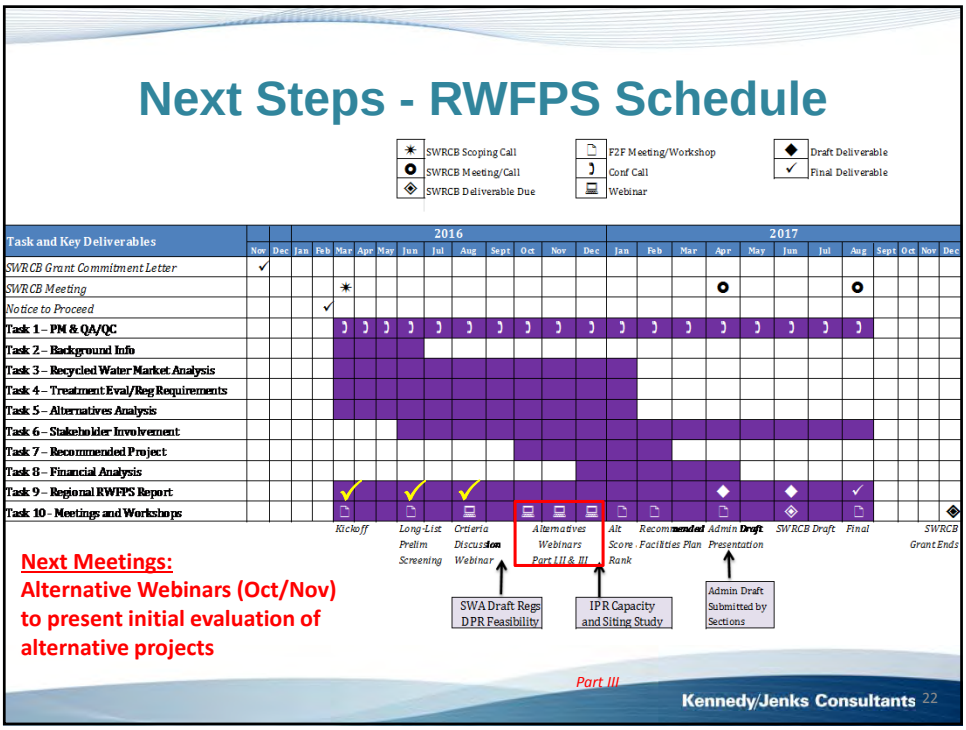
# Next Steps - RWFPS Schedule




**Next Meetings:**
**Alternative Webinars (Oct/Nov) to present initial evaluation of alternative projects**

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## Next Steps

- Alternative Webinar - Part I (Oct 2016)
  - **Objective:** Present evaluation for 1st set of Alternatives
    - ✓ Preliminary maps, facilities, costs, etc.
    - ✓ Alt 1&2 (NPR), Alt 3 (NPR only)
  - **Goal:** Obtain input and clarify assumptions
  - **Action Items:** Response to specific requests for information

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## Next Steps

- Alternative Webinar - Part II (Nov 2016)
  - Present evaluation for 2nd set of Alternatives
    - ✓ Preliminary maps, facilities, costs, etc.
    - ✓ Alt 5 (SWA), Alt 6 (SFA) and Alt 7 (DPR)
- Alternative Webinar - Part III (Dec 2016/Jan 2017)
  - Present evaluation for 3rd set of Alternatives
    - ✓ Preliminary maps, facilities, costs, etc.
    - ✓ Alt 3 & 4 (GWRR)

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# Next Steps

- Scoring & Ranking Workshop (Dec 2016)
  - **Objective:** Overview of Alternatives, Discuss Prelim Scoring and Ranking
  - **Goal:** Identify Recommended Alternative (or Phased Projects) for further development
  - **Action Items:** Input from each project partner on scoring and ranking tables.

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# Homework

| Categories | Alternatives Screening Criteria | Considerations for Assessing Project based on Criteria | TEAM: / Individual: |
|---|---|---|---|
| ENGINEERING & OPERATIONAL CONSIDERATIONS | Improve Water Supply | - Ability to fill City supply gap (1.2 BGY or 3,700 AFY), supplement peak season supply with a new source or offset and/or contribute to regional supply<br>- Ability to implement Project, with supplies available in a timely manner | |
| | Maximize Beneficial Reuse | - Maximizes reuse of wastewater effluent now | |
| | Ease of Implementation | - Regulatory viability and ability to obtain a recycled water permit<br>- Current (DDW and RWQCB) regulatory pathway/approved use<br>- Potential construction challenges (#/size of facilities, ROW, utilities, terrain, disturbed/undisturbed area, seismic/sea level rise vulnerability, etc.)<br>- Flexibility for phasing and opportunities to expand/transition to a higher yield and/or treatment level. | |
| | Operational Complexity | - Source of wastewater and/or type treatment required for beneficial reuse minimizes impacts to wastewater collection and/or WWTF operations<br>- Siting new treatment facilities minimize short-term impacts on SC WWTF operations (during construction) and long-term impacts (related to facility relocation, off-site location and/or interference with O&M activities). | |
| ECONOMIC | Cost Effectiveness | - Economically feasible or cost effective project (relative life cycle unit costs) | |
| | Financial Implementability | - Financially implementable project (capital investment does not limit ability to implement other water projects and program) | |
| ENVIRONMENTAL | CEQA Considerations | - Potential environmental impacts and mitigation requirements | |
| | Financial Implementability | - Enhance local and regional ecosystems and environments including rivers, groundwater basins<br>- Social cost of carbon compared to other projects and supplies; Relative contribution to global warming (based on GHG emissions) | |
| SOCIAL | Agency Coordination, Partnerships and Agreements | - Level of cooperation and coordination required between multiple outside agencies/users<br>- Willingness and interest of anticipated users/partners for cost-sharing | |
| | Social Issues & Siting | - Perceived public acceptance and comfort with level of public health and safety associated with reuse<br>- Level of impact on local residents for new construction and ongoing maintenance<br>- land acquisition requirements (property not currently owned by the City) | |
| | | | 0% |

**Please fill out and submit your proposed weightings for each of the screening criteria by Friday, Sept 2nd**

* Percentages must add up to 100%

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# QUESTIONS


| | | |
|---|---|---|
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| | Melanie Tan | MelanieTan@KennedyJenks.com |
| Abt Associates: | Bob Raucher | Bob_Raucher@abtassoc.com |
| | Jim Henderson | Jim_Henderson@abtassoc.com |
| GHD: | Pat Collins | Pat.Collins@ghd.com |




# THANK YOU

# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Alternatives Webinar – Part 1
## 18 October 2016 from 9 am to 11 am

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Webinar Objective:** Present preliminary evaluation for non-potable reuse (NPR) alternatives using preliminary maps, tables and figures to illustrate facility locations, capacities and costs.

**Goal:** Discuss and seek input on assumptions, facility locations and other project components.

**Action Items:** Respond to specific requests for information, update alternatives (as-needed) and memorialize discussion points to support scoring of alternative projects.

---

1. Recycled Water Supply
2. NPR Market Assessment and Demand
3. NPR Treatment Requirements
4. NPR Alternatives
    a. Alternative 1: Centralized
    b. Alternative 2: Decentralized
    c. Alternative 3: Santa Cruz Participation in SqCWD-led GWRR Project (NPR uses only)
5. Quantitative Results
6. Cost Comparison
7. Qualitative Considerations
8. Next Steps

# City of Santa Cruz
# Recycled Water Facilities Planning Study

## Alternatives Webinar Part I

October 18, 2016

** Includes amended notes to reflect discussion at workshop*



## Agenda

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

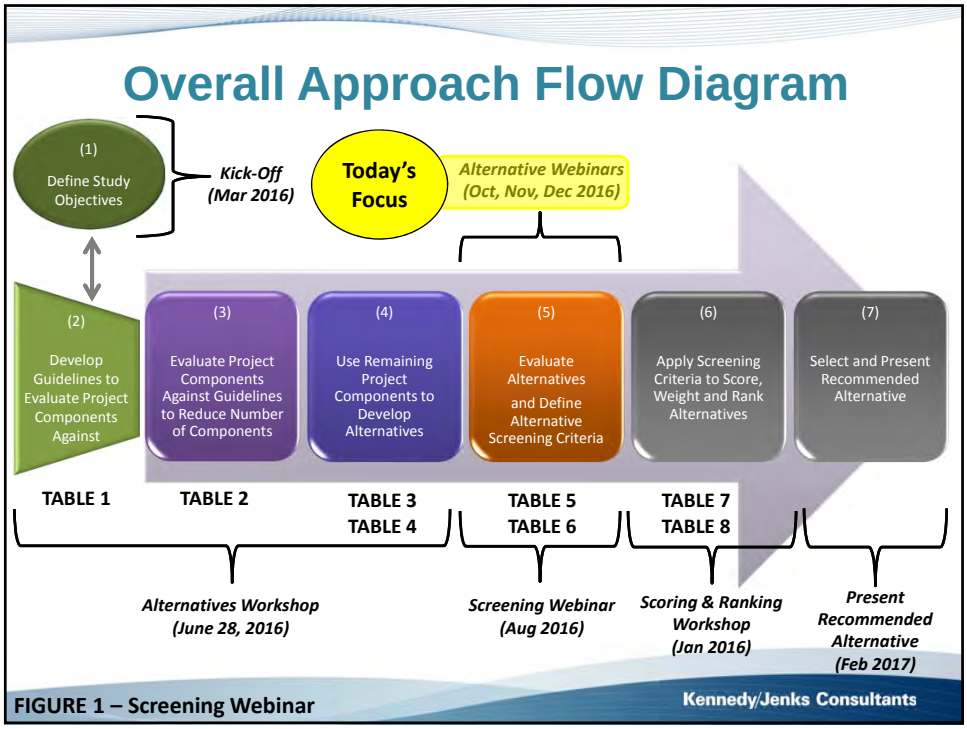


FIGURE 1 – Screening Webinar

## Alternatives Webinar Objective

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

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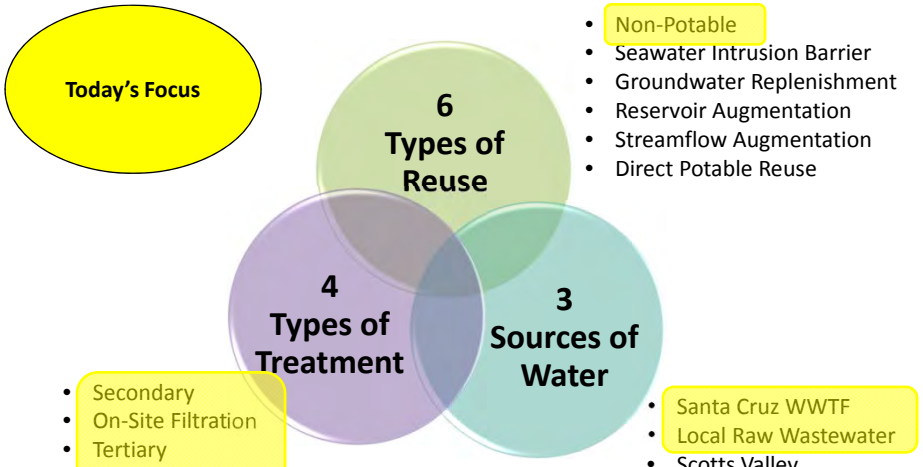
## Project Components

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## Recycled Water Supply

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

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

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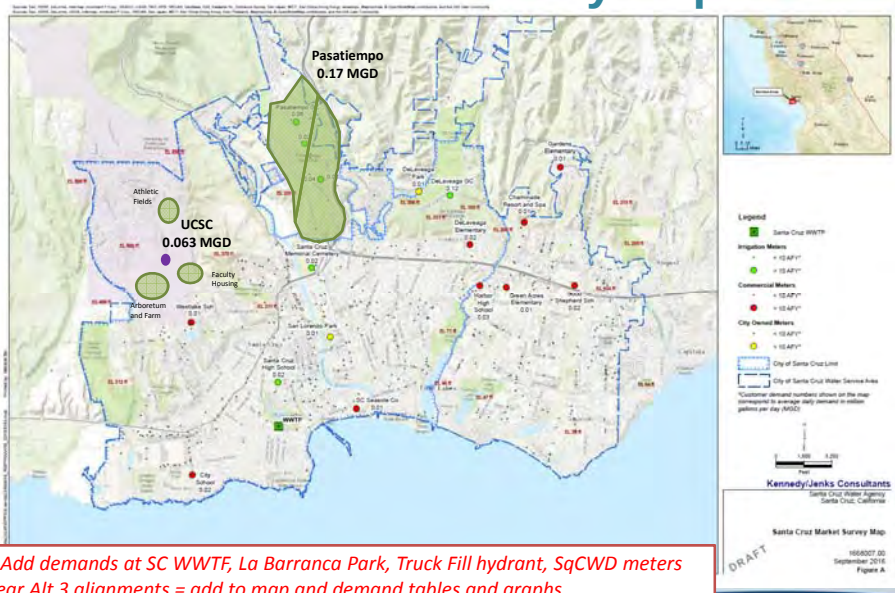
# NPR Market Survey Map




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

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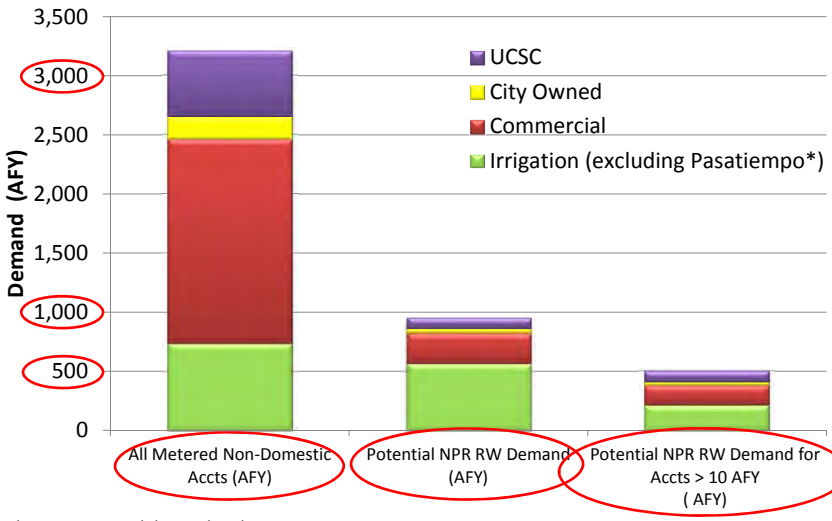
# Estimated NPR RW Demand




Typical Santa Cruz total demand is about 7,500 AFY

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

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# Estimated NPR RW Demand

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

~50% of annual potable water demand

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

About half of the demand is from very small users

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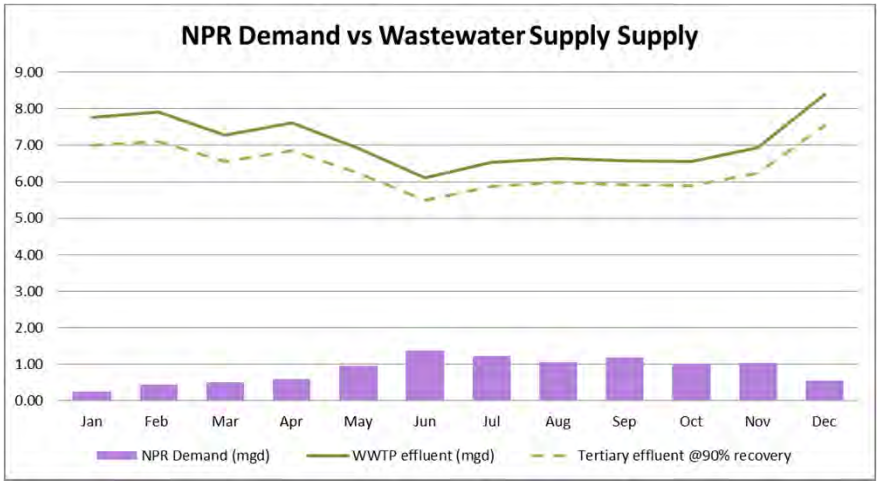
# Supply and Demand




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

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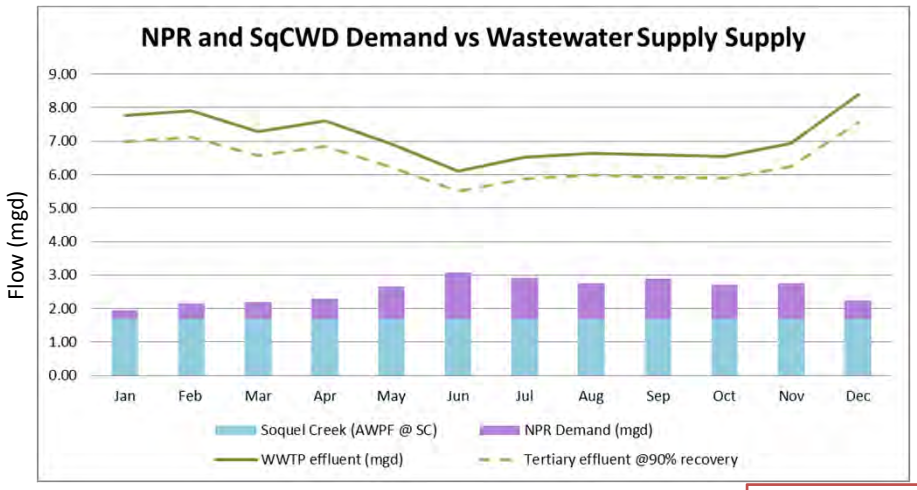
# Supply and Demand




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

*To be updated with added demands*

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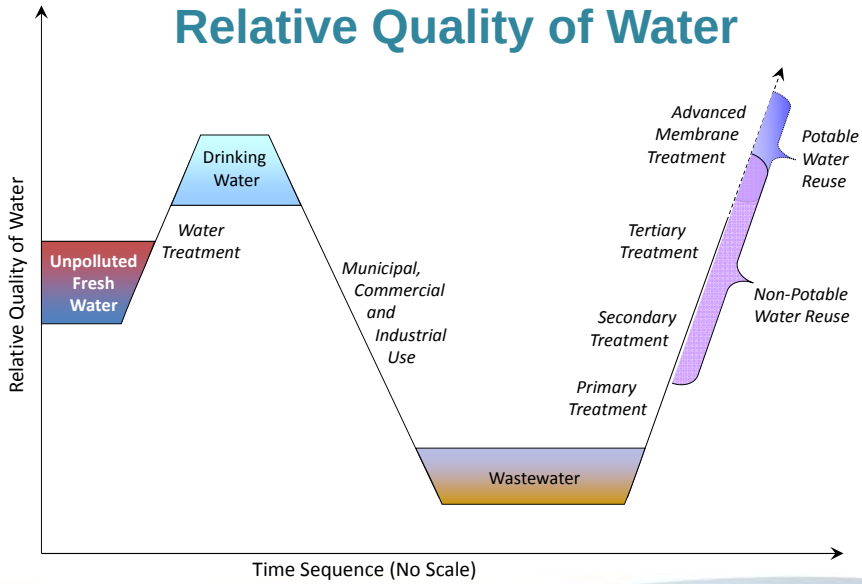
# Relative Quality of Water

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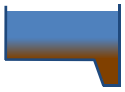
# Treatment Evaluation for NPR of *- Secondary Effluent -*

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

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

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

*Graphics by Trussell*

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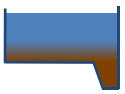
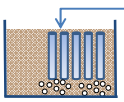
# Treatment Evaluation for NPR of *- Tertiary Effluent -*

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

*Graphics by Trussell*

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# Satellite Treatment of Secondary Effluent


(Photo: Waterworks Engineers)

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



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

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

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

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

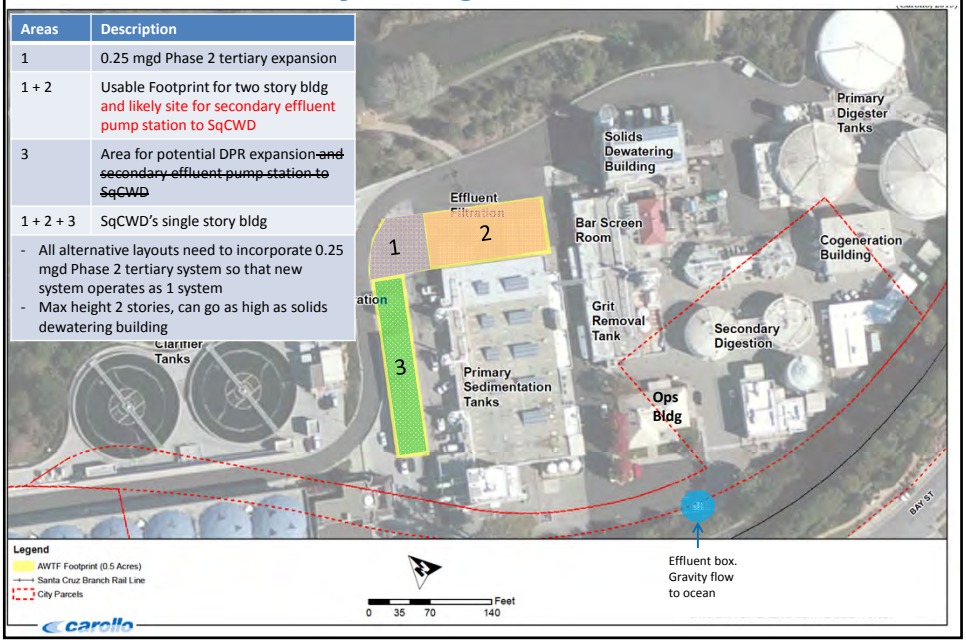
**Based on the proposed treatment train for the SqCWD GRRP Feasibility Study.*

***Graphics by Trussell***

## Treatment Facility Siting at the Santa Cruz WWTF

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

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




## Alternatives for Further Evaluation

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

** NPR projects only*

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

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## Preliminary capital & annualized costs

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

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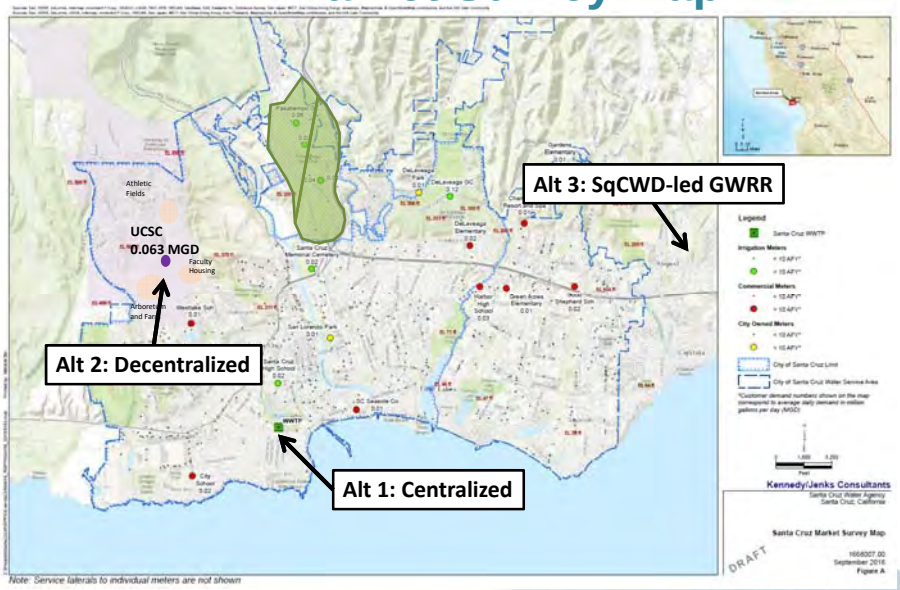
## NPR Market Survey Map

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# Alternatives 1: Centralized Non-Potable Reuse

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

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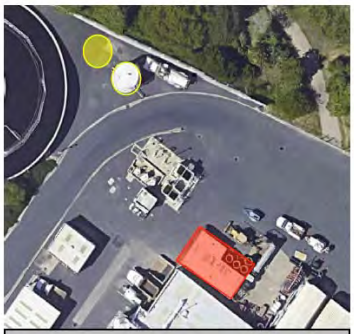
# Alternative 1A: Santa Cruz PWD Phase 2 Project




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

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

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# Alternative 1A: Santa Cruz PWD Phase 2 Project

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

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

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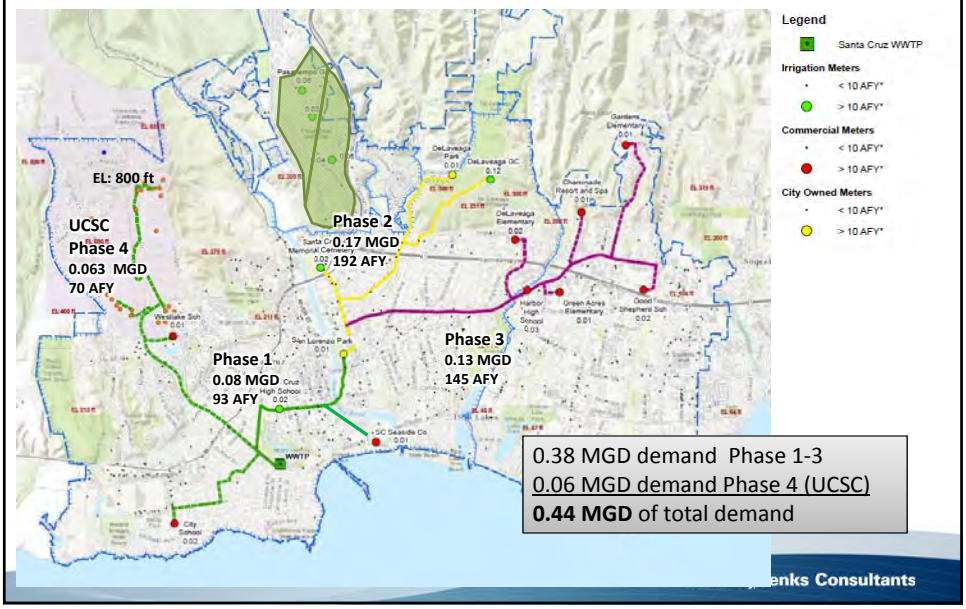
# Alternative 1B: Maximize tertiary treatment at the SC WWTF




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

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# Alternative 1B: Maximize tertiary treatment at the SC WWTF

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

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

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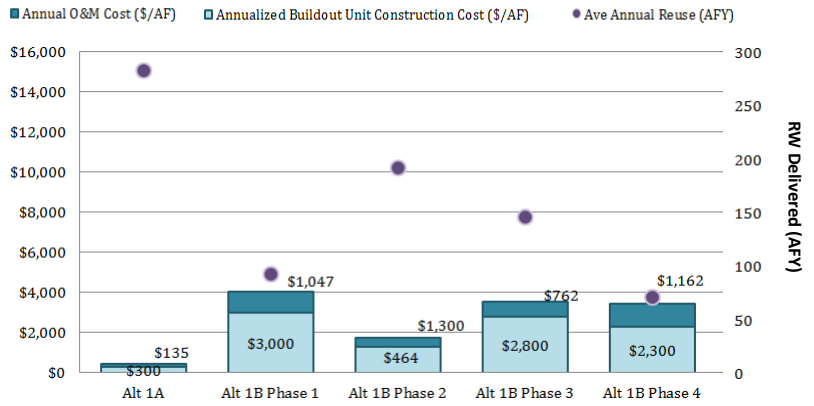
# Alternative 1A and 1B




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

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# Alternatives 2: Decentralized Non-Potable Reuse

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

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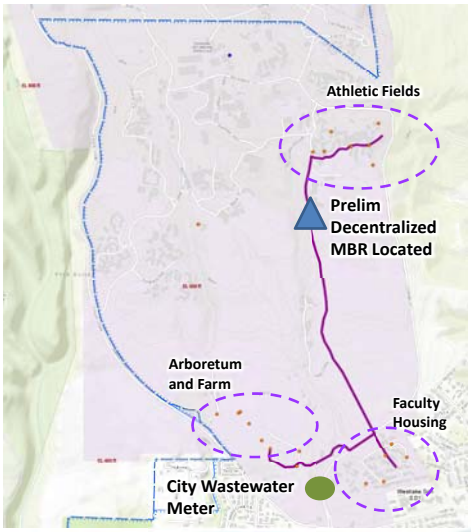
# Alternatives 2: Decentralized Non-Potable Reuse at UCSC




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

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

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# Alternatives 2: Decentralized Non-Potable Reuse at UCSC

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

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

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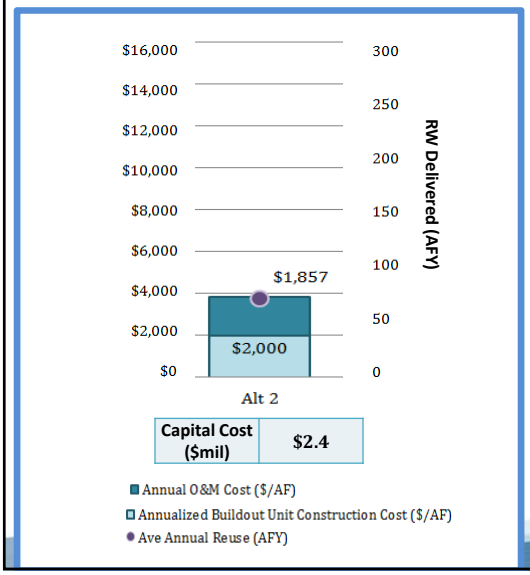
# Alternatives 2: Decentralized Non-Potable Reuse at UCSC




Preliminary capital & annualized costs

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

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

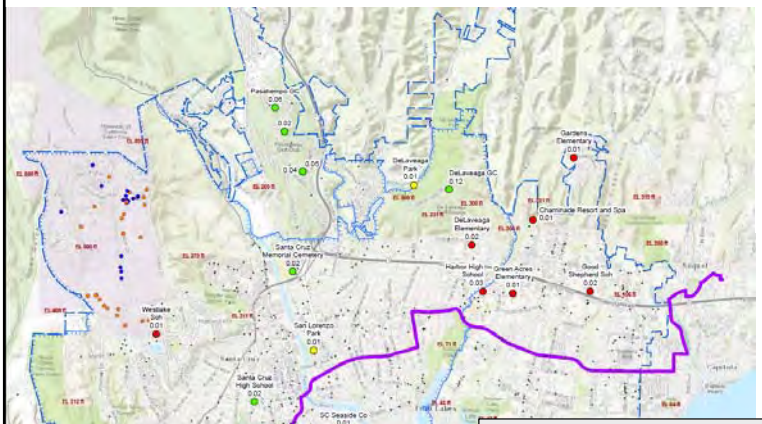
TABLE 3

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (serve NPR users along the way) | Santa Cruz WWTF | On-Site Treatment at NPR Customer sites | 2° + filter | NPR Customers along secondary pipelines alignment from SC WWTF to AWTF |
| 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | | Tertiary Treatment at SC WWTF | 3° | NPR Customers along tertiary pipeline alignment from SC WWTF to AWTF |
| 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD WTF to recharge Santa Cruz GWRR | | Advanced Treatment at SqCWD Headquarters | AWT | SqCWD AWTF water delivered to Santa Cruz GWRR injection sites |
| 3d | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | | Advanced Treatment at SC WWTF | AWT | NPR Customers along pipeline alignment from SC WWTF to SqCWD injection sites |
| 3e | Send advanced treated RW from SCWWTF to SqCWD, (GWRR and NPR along the way) | | | AWT | GWRR in Santa Cruz (Beltz Well Field) and NPR customers along pipeline alignments |

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

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

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




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

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

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

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

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

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

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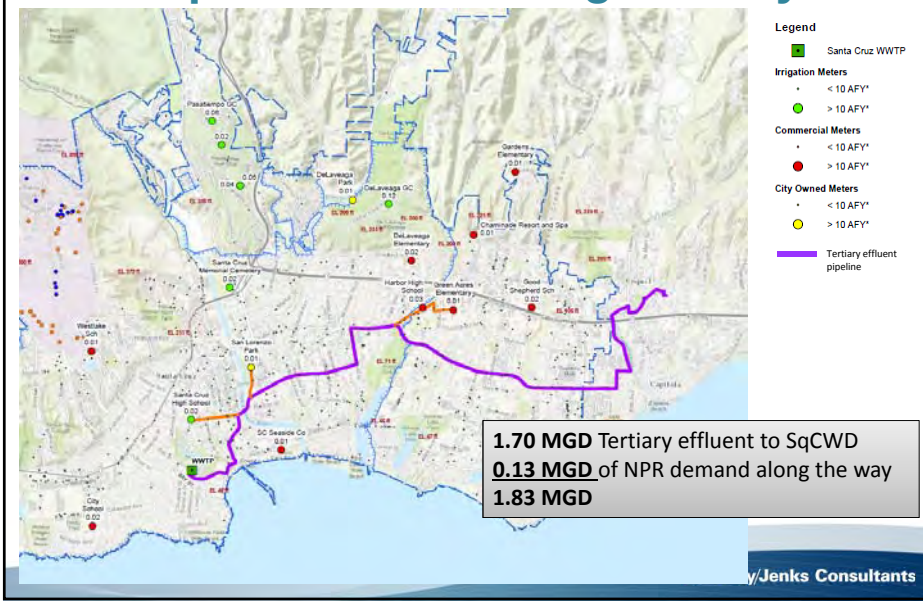
# Alternative 3B.1: Tertiary Effluent to SqCWD + NPR along the way




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

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

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

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

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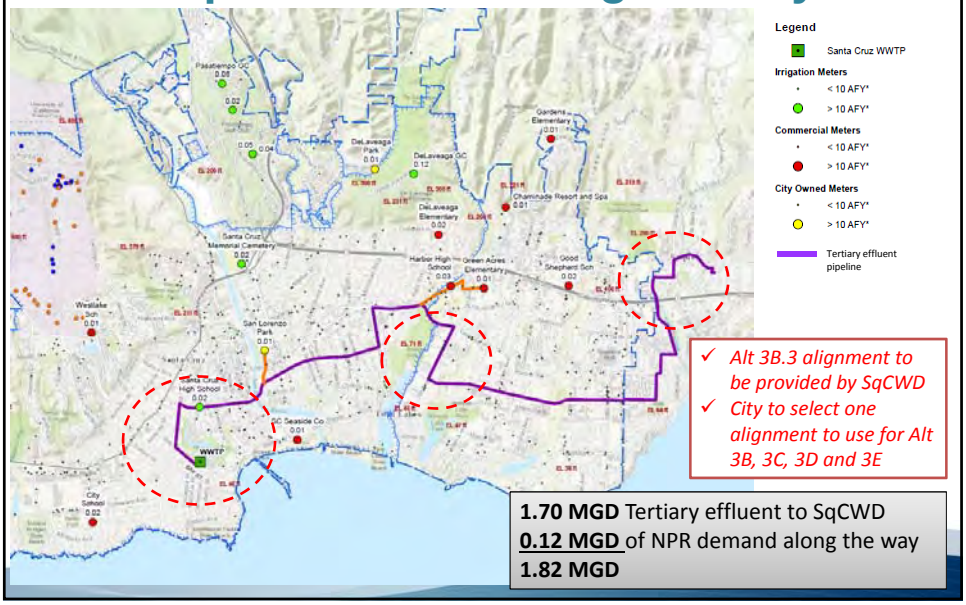
# Alternative 3B.2: Tertiary Effluent to SqCWD + NPR along the way




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

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

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

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

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

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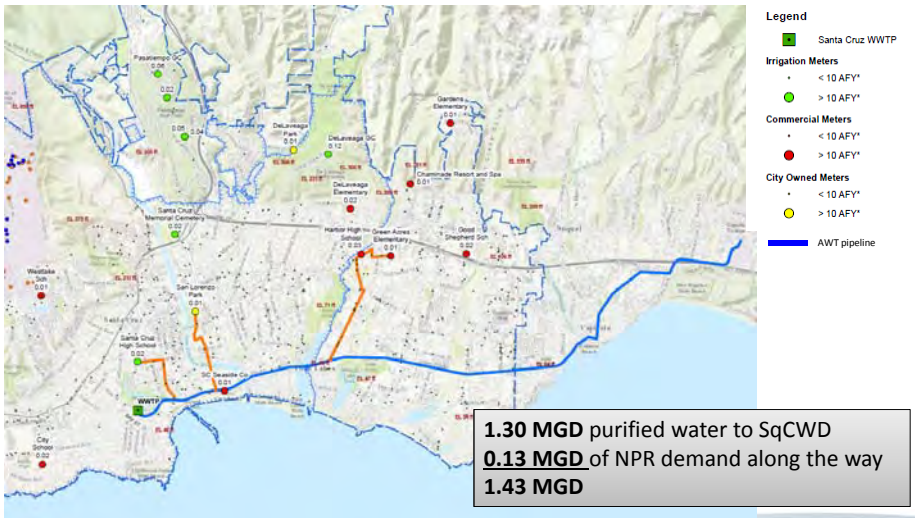
# Alternative 3D: AWT @ SC WWTF send to SqCWD + NPR along the way




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

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

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

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

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

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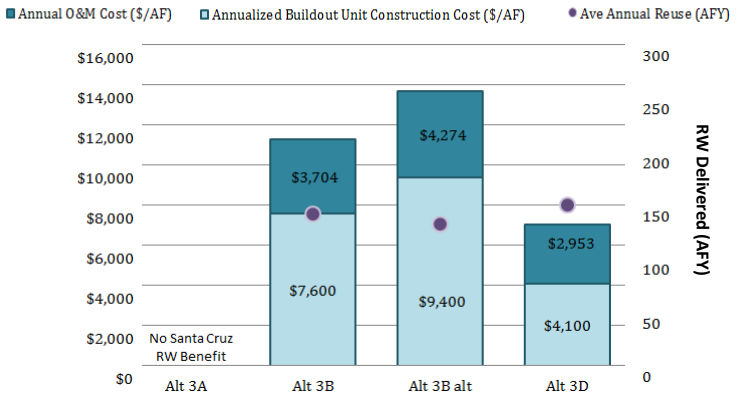
# Alternative 3A, 3B.1, 3B.2 and 3D




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

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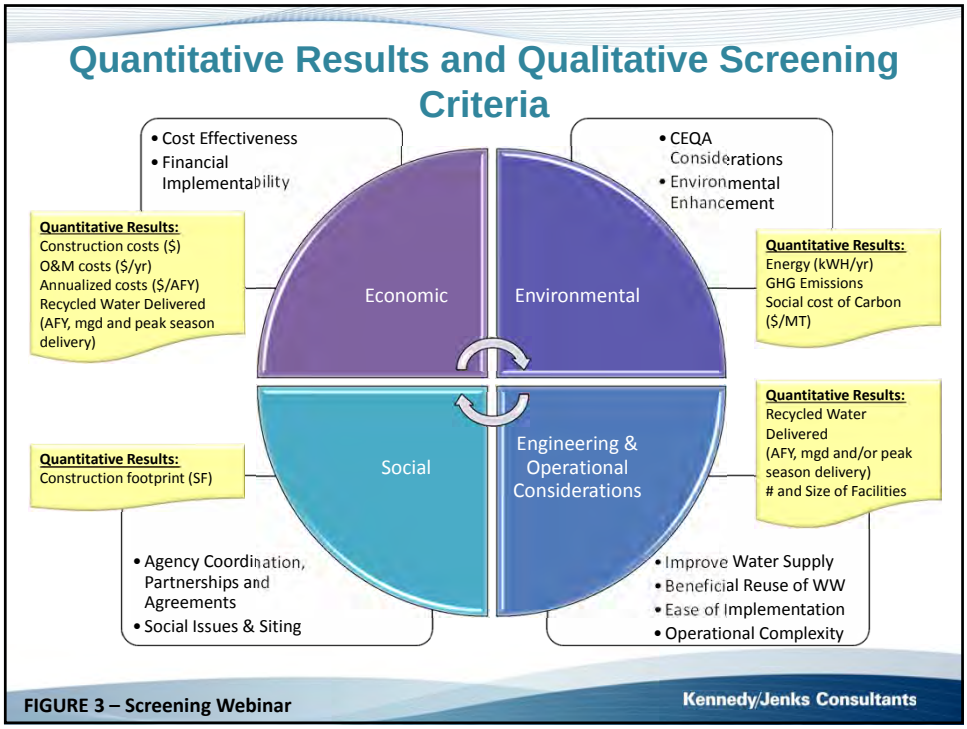
Quantitative Results and Qualitative Screening Criteria
• Cost Effectiveness
• Financial Implementability
• CEQA Considerations
• Environmental Enhancement
Quantitative Results:
Construction costs ($)
O&M costs ($/yr)
Annualized costs ($/AFY)
Recycled Water Delivered (AFY, mgd and peak season delivery)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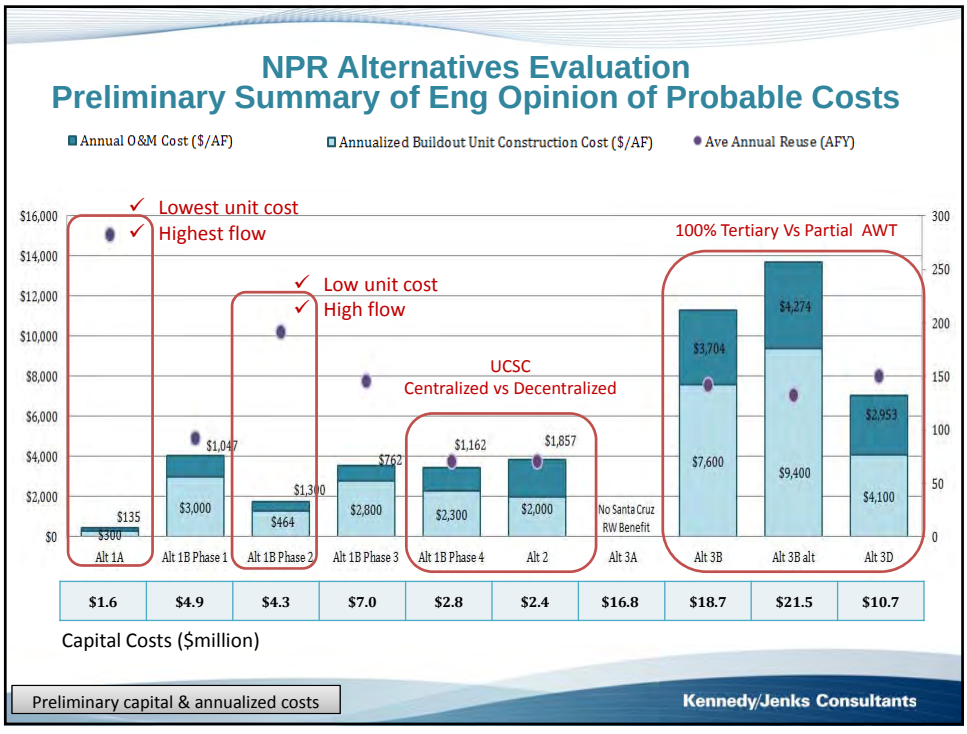
NPR Alternatives Evaluation
Preliminary Summary of Eng Opinion of Probable Costs
Annual O&M Cost ($/AF)
Annualized Buildout Unit Construction Cost ($/AF)
Ave Annual Reuse (AFY)
✓ Lowest unit cost
✓ Highest flow
✓ Low unit cost
✓ High flow
UCSC
Centralized vs Decentralized
100% Tertiary Vs Partial AWT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

# NPR Alternatives Evaluation
# Summary of QUANTITATIVE Results

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

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# NPR Alternatives Evaluation
# QUALITATIVE Considerations

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

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# OPEN DISCUSSION

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## Next Steps

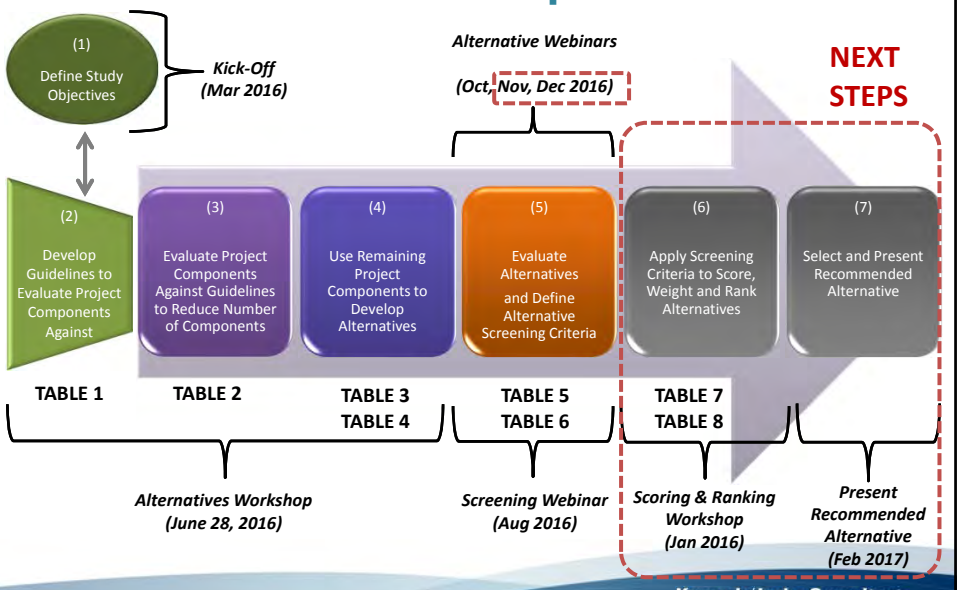


FIGURE 1 – Screening Webinar

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# QUESTIONS


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


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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Alternatives Webinar – Part 2
## 02 December 2016 from 9 am to 11 am

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Webinar Objective:** Present preliminary evaluation for surface water augmentation (SWA), streamflow augmentation and direct potable reuse (DPR) alternatives using preliminary maps, tables and figures to illustrate facility locations, capacities and costs.

**Goal:** Discuss and seek input on assumptions, facility locations and other project components.

**Action Items:** Respond to specific requests for information, update alternatives (as-needed) and memorialize discussion points to support scoring of alternative projects.

---

1. Approach & Objective
2. Recycled Water Supply
3. Market Assessment for Potable Reuse
4. Treatment Requirements
5. SWA Alternative
6. Streamflow Augmentation Alternative
7. Direct Potable Reuse Alternative
8. Cost Comparison
9. Next Steps

# City of Santa Cruz
# Recycled Water Facilities Planning Study

## Alternatives Webinar Part 2

December 02, 2016

** Includes amended notes to reflect discussion at workshop*



## Agenda

- Approach & Objective
- Recycled Water Supply
- Market Assessment for Potable Reuse
- Treatment Requirements
- Alternatives Analysis
  - Surface Water Augmentation
  - Streamflow Augmentation
  - Direct Potable Reuse
- Cost Comparison
- Open Discussion

Facilities
Quantitative Results
Qualitative Considerations

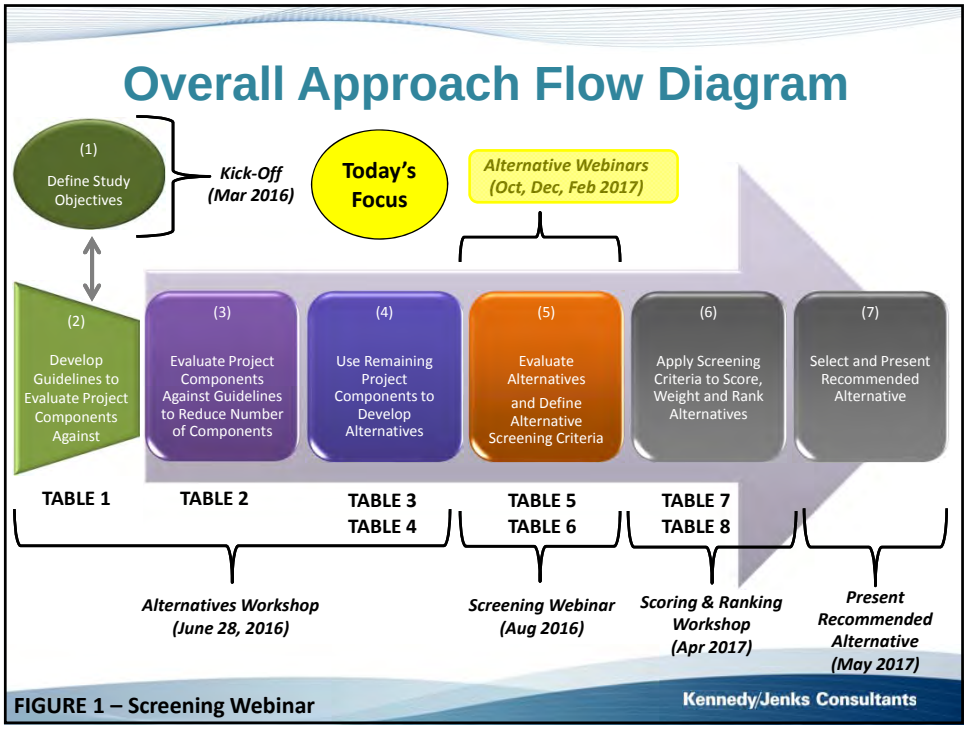


FIGURE 1 – Screening Webinar

## Alternatives Webinar Objective

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

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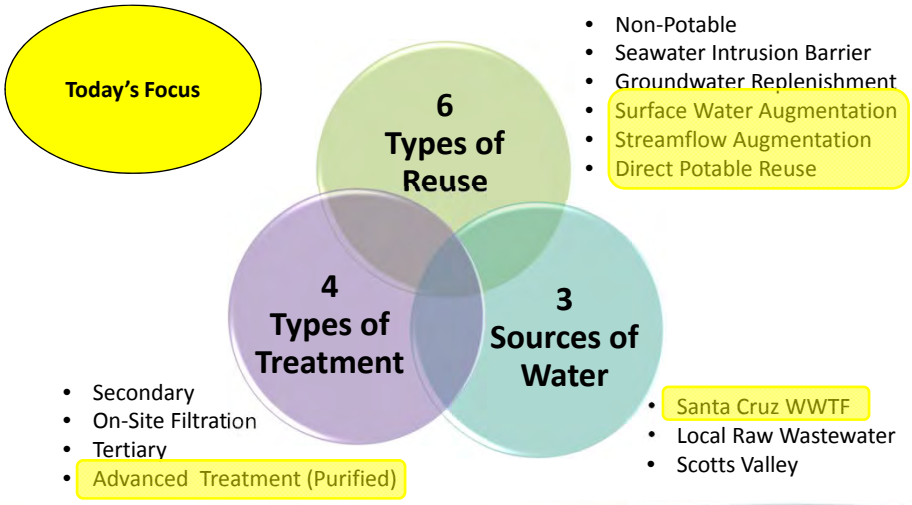
## Project Components

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## Total Available Effluent Supply

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

- 2015 dry weather flow data is used to estimate the amount of effluent that would be consistently available for potable reuse

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# Purified Water Supply for Potable Reuse Alternatives

| Total WW Supply | | SC WWTF In-Plant Demand | | SqCWD GWRR Demand | | Secondary Effluent Available | Purified Water Produced |
|---|---|---|---|---|---|---|---|
| Average Daily Dry Weather Flow[1] (mgd) | – | Year-Round Internal Use + La Barranca Park[2] (mgd) | – | Year-Round Secondary Effluent (mgd) | = | after meeting other Demands (mgd) | Based on assumed AWPF Recovery Rate[3] |
| 6.1 | – | 0.25 | – | 1.7 | = | 4.16 → | 3.2 |

[1] Based on June 2015 flow data
[2] Assumes no additional NPR demands in Santa Cruz will be served
[3] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

Brine

Discussion that there may be an interest in serving NPR demands along a purified water alignment even if these demands were small. Review of potential customers only identified ~ 0.02 mgd of demand along the purified water alignments. These customers could be added later but recommendation was not to complicate the potable reuse alternatives .

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# Market Assessment for Potable Reuse

- Includes indirect and direct potable reuse opportunities
- Not associated with meters
- Focus is a more holistic approach to beneficially reuse the recycled water for potable uses, directly or indirectly, to fill the Santa Cruz region water supply gaps

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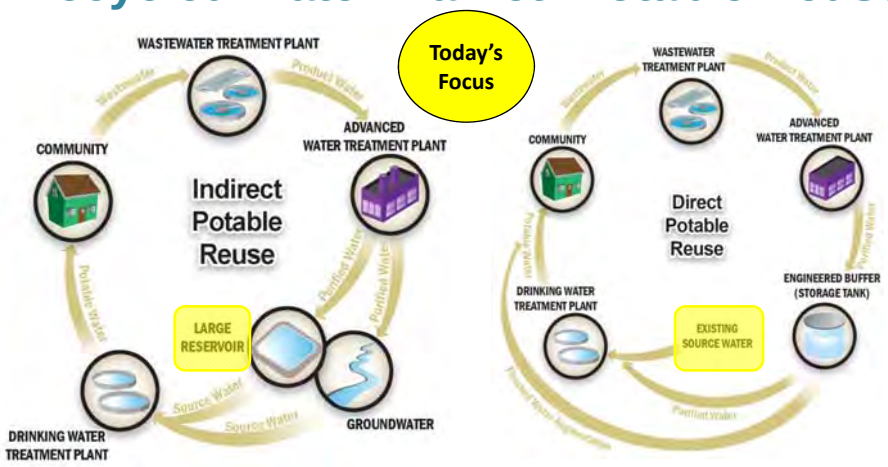
# Recycled Water Market: Potable Reuse




GWRR = Groundwater Replenishment Reuse
SWA = Surface Water Augmentation

DPR = Direct Potable Reuse

* Streamflow Augmentation

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# Recycled Water Market: Potable Reuse

| Potable Reuse | Available Supply mgd (AFY) | Demand mgd (AFY) | Use Limited by |
|---|---|---|---|
| Groundwater Recharge * | 3.2 mgd (3,600 AFY) | TBD* | • Summer wastewater generation<br>• GRR Regulations<br>• Groundwater Basin Capacity<br>• Travel time from injection to extraction |
| Surface Water Augmentation | 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• SWA Regulations<br>• Operation of Loch Lomond Reservoir |
| Streamflow Augmentation | 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• TMDL for Nitrate<br>• Basin Plan requirements for Temperature and Dissolved Oxygen |
| Direct Potable Reuse | 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• GHWTP Treatment Capacity<br>• Coast Pump Station Capacity<br>• Pending DPR Regulations |

** The demand for a GRRP will be evaluated based on the capacity of the groundwater aquifer to receive recycled water and meet GRR regulatory criteria.*

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## Recycled Water Market: Potable Reuse

**Potential Benefits**

- Develop a local, drought-proof and sustainable water supply
- Use of available recycled water flows in the winter and off-peak irrigation months
- Recharge groundwater basin(s) (via groundwater recharge)
- Maintain lake levels (via surface water augmentation)
- Supplement in-stream flows to maintain habitat and fisheries
- Provide an integrated approach solving multiple issues related to regional water supplies, which could bring together a number of stakeholders in the Santa Cruz Region

**Potential Challenges**

- Higher costs associated with advanced treatment
- Higher costs associated with pumping and conveyance (for GRR and SWA projects)
- Additional regulatory requirements (i.e. permitting, monitoring, and reporting)
- Public acceptance
- Development of partnerships and agreements (between regional partners)
- Regulatory uncertainty related to SWA and DPR requirements

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## Market Assessment: Surface Water Augmentation

- No SWA projects currently exist in California
  - 2 moving forward
- Draft Uniform SWA criteria anticipated by end of 2016 and finalized in early 2017.
- Two key permits
  - City DDW drinking water supply permit
  - NPDES permit by RWQCB on behalf of EPA

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## Market Assessment: Surface Water Augmentation

- Minimum Retention Time of 4 to 6 months (TBD)
- Dilution and Mixing Options:
  - 100-to-1 dilution, or
  - 10-to-1 dilution with additional 1-log treatment
- Other Considerations
  - Source control
  - Reservoir O&M
  - Reliability, redundancy and response to failure
  - Reservoir dilution, retention, tracer studies and monitoring, and
  - public comment and notification

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## Market Assessment: Surface Water Augmentation

- RWFPS Concept
  - Augment Loch Lomond Reservoir
  - Surface water impoundment used for drinking water
  - GHWTP provides additional treatment prior to potable distribution
- Market Limited by:
  - Wastewater generation
  - SWA Regulations


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## Market Assessment: Streamflow Augmentation

- Currently no regulatory requirements and/or criteria for the beneficial use of recycled water for streamflow augmentation
  - Wastewater discharge is regulated by WDRs and NPDES permits
- Considerations
  - Water quality objectives in receiving water
  - Ecological risks
  - Public acceptance

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## Market Assessment: Streamflow Augmentation

- San Lorenzo River & Lagoon
  - 1.5 mg/L nitrate TMDL
  - Temp and Dissolved Oxygen (DO) Objectives
  - Eutrophication issues, morphology
- RWFPS Concept
  - Discharge purified water d/s of Tait Street Diversion
  - Maximize diversions within existing water rights
  - Reduce peak water supply shortage in dry years
- Market Limited by:
  - Wastewater generation
  - TMDL
  - Temperature and DO WQOs


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## Market Assessment: Direct Potable Reuse

- Loss of Environmental Buffer
  - For treatment
  - For response time
- Treatment Robustness and Reliability
  - Assurance of meeting microbial pathogen and chemical risk
- Other Considerations
  - Source Control
  - Coordination btw WWTF and DWTF
  - Public Perception
- Research needs to fill knowledge gaps

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## Market Assessment: Direct Potable Reuse

- RWFPS Concept
  - Provide highest level of advanced treatment
  - Blend with other raw water supplies entering the GHWTP
  - Utilize existing potable water distribution system.
- Market limited by
  - Wastewater generation
  - GHWTP Treatment Capacity
  - Coast Pump Station Capacity

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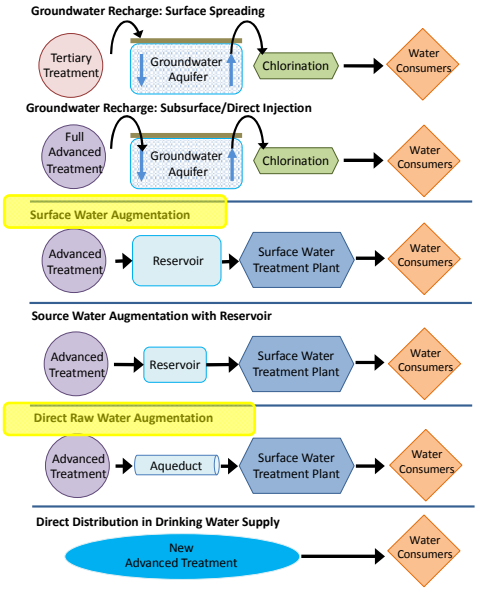
# Types of Potable Reuse




**Today's Focus**

*Graphics by Trussell*

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# Typical Log Inactivation Requirements

Groundwater Replenishment Reuse (GRR)


Virus: 12-log removal — 99.9999999999%


Giardia: 10-log removal — 99.99999999%


Crypto: 10-log removal — 99.99999999%

or more for SWA or DPR

Virus: 13-log removal — 99.99999999999%

Giardia: 11-log removal — 99.999999999%

Crypto: 11-log removal — 99.999999999%

Also referred to as:

- Log Removal Value (LRV) for Virus/Giardia/Crypto (V/G/C)
- For example - 12/10/10 or 13/11/11

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# Treatment Criteria - SWA

- Pathogen credits to be achieved at both the AWTF and the Drinking Water Treatment Facility
- Log reduction of V/G/C* depends on:
  - Amount of dilution in the reservoir
  - Amount of residence time in reservoir

| Dilution | Total log reduction | DWTF log reduction | AWTF log reduction (min) |
|---|---|---|---|
| 100-to-1 | 12/10/10 | 4/3/2 | 8/7/8 |
| 10-to-1 | 13/11/11 | 4/3/2 | 9/8/9 |

*V/G/C = virus, *Giardia,* and *Cryptosporidium*

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# Advanced Treatment Process - SWA

**Reuse Type**

**Potable Reuse**
With Nitrified Secondary Feedwater

**Potential Treatment Train***


Membrane Filtration


Reverse Osmosis


Ultraviolet Light/Advanced Oxidation


Free Chlorine

**Uses**

- Potable and non-potable applications

| Log Removal | MF | RO | UV/AOP | Free Chl. | Total |
|---|---|---|---|---|---|
| Virus | 0 | 1.5 – 2 | 6 | 6 | 13.5 – 14 |
| *Giardia* | 4 | 1.5 – 2 | 6 | 0-1 | 11.5 – 13 |
| *Cryptosporidium* | 4 | 1.5 – 2 | 6 | 0 | 11.5 – 12 |

**Assumes conservative reservoir operation with V/Q > 6 months and > 10:1 dilution*

Discussion about need for denitrification at the WWTF and whether to include a placeholder cost

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# Treatment Criteria – Streamflow Augmentation

- Not defined in Title 22
- Likely site specific based on discharge requirements
- San Lorenzo River/Lagoon Considerations
  - Nutrients (nitrate TMDL)
  - Temperature
  - Dissolved Oxygen

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# Market Assessment: Streamflow Augmentation

- Nitrate Mass Target in SLR at Felton = 3,728 lbs nitrate per month
- Nitrate Concentration Target = 1.5 mg/L

| | Units | Secondary Effluent | Tertiary Effluent | Full Advanced Treatment | |
|---|---|---|---|---|---|
| Recycled Water Discharged | mgd | 3.0 | 3.0 | 3.0 | |
| | Nitrate concentration (as mg nitrate/L) | 79 | 44 | 16 | 4 |
| Nitrate Mass | lbs nitrate / month (as nitrate) | 61,100 | 34,500 | 12,400 | 3,500 |
| | Percent of Target load at Felton | 1600% | 930% | 330% | 90% |

Comment that there is already an existing nitrate load of 3,600 lbs/month in the watershed so adding 3,500 from purified water would exceed the mass target.

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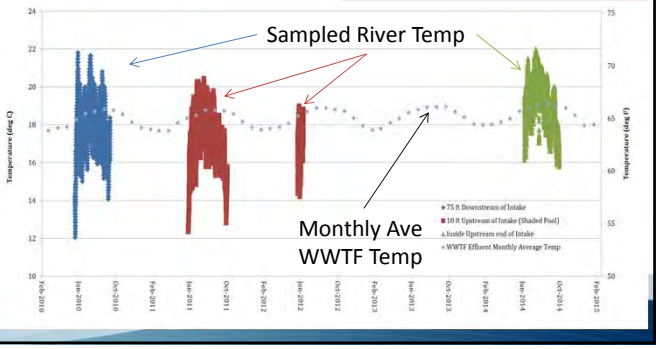
# Market Assessment: Streamflow Augmentation

- Temperature Objective per Basin Plan
  - Discharge < 5 deg F diff from ambient or no change
- DO Objective per Basin Plan
  - Discharge > 7.0 mg/L or > 5 mg/L

Comment that a 303D list may come out next week that will further address temperature

Ave monthly WWTF Temp
- Ave monthly River Temp
1.2 to 1.5 deg F;

Max monthly WWTF Temp
- Min monthly River Temp
6.5 to 17 deg F.




# Treatment Criteria – Streamflow Augmentation

- Assume same criteria as for SWA
  - 13/11/11 log reduction of V/G/C*
- Additional treatment may be required for
  - Temperature reduction
  - Denitrification

Discussion about need for denitrification at the WWTF and whether to include a placeholder cost. Similarly, need and cost for temperature reducing facility (i.e. cooling tower) and whether to include a placeholder cost.

*V/G/C = virus, *Giardia,* and *Cryptosporidium*

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## Market Assessment: Direct Potable Reuse

- Per the Water Code, DPR comprises the
  - "planned introduction of recycled water either directly into a public water system…or into a raw water supply immediately upstream of a water treatment plant."
- No DPR projects currently exist in California
- Draft DPR Feasibility Report recognized phased implementation of three types of DPR projects
  1. Source water Augmentation
  2. Direct Raw water Augmentation
  3. Direct Distribution in Drinking Water Supply
- Primary challenge is to ensure public health is reliably protected

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## Treatment Criteria - DPR

- No existing regulations or applications in California
- No specific LRV requirements for DPR
  - Bookend the range of likely value
  - Assume more stringent than SWA b/c no env buffer

| DPR | Total log reduction | DWTF log reduction | AWTF log reduction (min) | |
|---|---|---|---|---|
| Source Water Blending | 14/12/12 to 20/19/16 | 4/3/2 | 10/9/10 to 16/16/14 | |
| Pipe-to-Pipe | 13/11/11 to 20/19/16 | 0/0/0 | 13/11/11 to 20/19/16 | Not included in RWFPS Alternatives |

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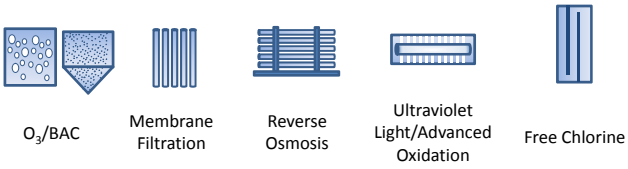
# Advanced Treatment Process - DPR

**Reuse Type** | **Potential DPR Treatment*** | **Uses**

**Potable Reuse** With Nitrified, Filtered Feedwater



$O_3$/BAC | Membrane Filtration | Reverse Osmosis | Ultraviolet Light/Advanced Oxidation | Free Chlorine

- Potable and non-potable applications

| Log Removal | $O_3$/BAC | MF | RO | UV/AOP | Free Chl. | Total |
|---|---|---|---|---|---|---|
| Virus | 6 | 0 | 1.5 – 2 | 6 | 6 | 19.5 – 20 |
| *Giardia* | 6 | 4 | 1.5 – 2 | 6 | 0-1 | 17.5 – 19 |
| *Cryptosporidium* | 1-2 | 4 | 1.5 – 2 | 6 | 0 | 12.5 – 14 |

**Based on treatment train studied in WRRF 14-12 and evaluated by State DPR Expert Panel*

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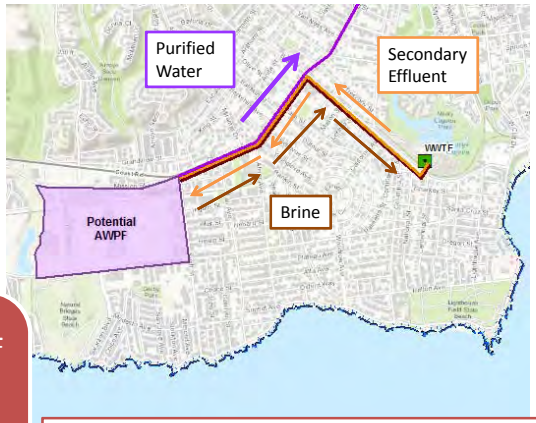
# Treatment Facility Siting

- Santa Cruz WWTF
- Delaware Industrial Site
- Other locations




For Potable Reuse Alternatives: assume AWTF at the industrial site with caveat that the facility could be located at the SC WWTF or another site to be determined.

Discussion about benefits of keeping AWTF at the WWTF to address prior concerns by public. Challenge is space, competing projects and need to relocate facilities.
City to reconsider decision on whether Alts 5-7 should show AWTF at WWTF

## Brine Discharge

- Potential Concerns
  - TDS
    - ✓ No TDS limit – exception because of TDS of marine waters exceed 3,000 mg/L
    - ✓ Brine likely around 6,000 – 7,000 mg/L, 25% of ocean TDS
  - Toxicity
    - ✓ Discharge mixing nozzle can be added

City's existing outfall has a diffuser at the end.

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## Alternatives for Further Evaluation

- Alternative 1 – Centralized Non-Potable Reuse
- Alternative 2 – Decentralized Non-Potable Reuse
- Alternative 3 – Santa Cruz Participation in SqCWD-led GWRR Project
- Alternative 4 – Santa Cruz GWRR Project
- Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir
- Alternative 6 – Streamflow Augmentation (SFA)
- Alternative 7 – Direct Potable Reuse (DPR)

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## Preliminary capital & annualized costs

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

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## Alternative 5: Surface Water Augmentation

TABLE 3

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir | Santa Cruz WWTF | Advanced Treatment at SC WWTF *(or Offsite?)* | AWT | Reservoir augmentation in Loch Lomond for blending and storage, to be conveyed to the GHWTP and enter the City's potable water distribution system. |

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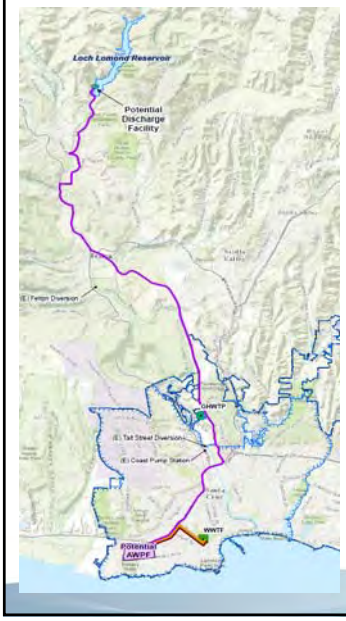
# Alternative 5: Surface Water Augmentation




- AWTF capacity 3.2 mgd
- Brine to existing ocean outfall
- Conveyance to Loch Lomond
- Point of discharge TBD
- Other uses – not included in costs
  - 0.25 MGD Phase 2
  - 1.70 MGD Secondary to SqCWD

3.2 MGD Purified water to Loch Lomond

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# Suitability of SWA at Loch Lomond

## Reservoir Dilution

- ✓ Purified water discharged during any 24-hour period must achieve a minimum 10:1 dilution into water that has been previously discharged into the reservoir
- ✓ Dilution must be verified by modeling and tracer studies
- ✓ The reservoir can theoretically be 100% comprised of purified water, as purified water that has been in the reservoir longer than a day can be used to meet the 10:1 dilution requirement
- ✓ The 3.2 mgd Loch Lomond purified discharge will be small compared to reservoir volume
- ✓ 10:1 dilution should be achievable even if the AWPF discharge point is near the withdrawal point
- ✓ It may be possible to achieve a 100:1 dilution of a 24-hour discharge with an appropriately engineered outfall/diffuser system

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# Suitability of SWA at Loch Lomond

## Computed Monthly Hydraulic Detention Time

| Total Monthly Reservoir Withdrawals (Q) (water supply plus fish releases) | | | Computed Hydraulic Detention Time, V/Q (months)[1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reservoir volume (V) at the end of the month (% capacity and acre-feet) | | | | | | | | |
| | | | 95% | 90% | 85% | 80% | 75% | 70% | 65% | 60% | 55% |
| mgd | MG/month | AF/month | 8,541 | 8,092 | 7,642 | 7,193 | 6,743 | 6,294 | 5,844 | 5,395 | 4,945 |
| 3.2 | 99 | 304 | 28.1 | 26.6 | 25.1 | 23.6 | 22.2 | 20.7 | 19.2 | 17.7 | 16.2 |
| 3.6 | 112 | 342 | 24.9 | 23.6 | 22.3 | 21.0 | 19.7 | 18.4 | 17.1 | 15.8 | 14.4 |
| 4.0 | 124 | 381 | 22.4 | 21.3 | 20.1 | 18.9 | 17.7 | 16.5 | 15.4 | 14.2 | 13.0 |
| 4.4 | 136 | 419 | 20.4 | 19.3 | 18.3 | 17.2 | 16.1 | 15.0 | 14.0 | 12.9 | 11.8 |
| 4.8 | 149 | 457 | 18.7 | 17.7 | 16.7 | 15.8 | 14.8 | 13.8 | 12.8 | 11.8 | 10.8 |
| 5.2 | 161 | 495 | 17.3 | 16.4 | 15.4 | 14.5 | 13.6 | 12.7 | 11.8 | 10.9 | 10.0 |
| 5.6 | 174 | 533 | 16.0 | 15.2 | 14.3 | 13.5 | 12.7 | 11.8 | 11.0 | 10.1 | 9.3 |
| 6.0 | 186 | 571 | 15.0 | 14.2 | 13.4 | 12.6 | 11.8 | 11.0 | 10.2 | 9.5 | 8.7 |
| 6.4 | 198 | 609 | 14.0 | 13.3 | 12.6 | 11.8 | 11.1 | 10.3 | 9.6 | 8.9 | 8.1 |
| 6.8 | 211 | 647 | 13.2 | 12.5 | 11.8 | 11.1 | 10.4 | 9.7 | 9.0 | 8.3 | 7.6 |
| 7.2 | 223 | 685 | 12.5 | 11.8 | 11.2 | 10.5 | 9.8 | 9.2 | 8.5 | 7.9 | 7.2 |
| 7.6 | 236 | 723 | 11.8 | 11.2 | 10.6 | 9.9 | 9.3 | 8.7 | 8.1 | 7.5 | 6.8 |
| 8.0 | 248 | 761 | 11.2 | 10.6 | 10.0 | 9.5 | 8.9 | 8.3 | 7.7 | 7.1 | 6.5 |
| 8.4 | 260 | 799 | 10.7 | 10.1 | 9.6 | 9.0 | 8.4 | 7.9 | 7.3 | 6.8 | 6.2 |
| 8.8 | 273 | 837 | 10.2 | 9.7 | 9.1 | 8.6 | 8.1 | 7.5 | 7.0 | 6.4 | 5.9 |
| 9.2 | 285 | 875 | 9.8 | 9.2 | 8.7 | 8.2 | 7.7 | 7.2 | 6.7 | 6.2 | 5.6 |
| 9.6 | 298 | 913 | 9.4 | 8.9 | 8.4 | 7.9 | 7.4 | 6.9 | 6.4 | 5.9 | 5.4 |
| 10.0 | 310 | 951 | 9.0 | 8.5 | 8.0 | 7.6 | 7.1 | 6.6 | 6.1 | 5.7 | 5.2 |
| 10.4 | 322 | 989 | 8.6 | 8.2 | 7.7 | 7.3 | 6.8 | 6.4 | 5.9 | 5.7 | 5.2 |
| 10.65[2] | 330 | 1013 | 8.4 | 8.0 | 7.5 | 7.1 | 6.7 | 6.2 | 5.8 | 5.3 | 4.9 |

**Key Take Aways:**

- ✓ Monthly detention times (V/Q) > 6 months when reservoir volume > 6,000 AF
- ✓ The addition of 3,600 AF of purified water (3.2 mgd) would likely maintain storage above 6,500 AF
- ✓ SWA criteria may allow for as low as 4 months detention time

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# Other SWA Considerations

- Biostimulation: controlling concentrations of nitrogen and phosphorus
  - ✓ Potential to comply with Basin Plan Objective through phosphorus-limited approach
  - ✓ Requires coordination with regulatory agencies
- Compliance with Drinking Water Standards
  - ✓ AWPF will comply with drinking water standards and exceed existing reservoir water quality
  - ✓ To be confirmed with pilot testing

Discussion about SLR as a nitrogen limited system due to the naturally occurring loads of phosphorus in the river. Emphasis that modeling and monitoring phosphorus will be critical to validate.

## Other SWA Considerations

- Toxics Rule Compliance
  - ✓AWPF likley to comply with most CTR standards for aquatic habitat
  - ✓Compliance with NDMA and NDPA CTR standards may require special monitoring and analysis
  - ✓Additional data is needed
- Hydrodynamic reservoir modeling and tracer studies
  - ✓Required to confirm initial and 24-hour dilution

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## Alternative 5: Surface Water Augmentation

| | Loch Lomond Reservoir Augmentation |
|---|---|
| NPR Demand | No new customers added |
| AWPF Capacity | 3.2 MGD |
| Pipelines | ~13.0 miles of 14" pipeline (to Loch Lomond)<br>~1.3 miles of 16" pipeline (to AWT)<br>~1.3 miles of 8" pipeline (brine line) |
| Pump Stations | 2,222 gpm (3.2 mgd)<br>412 TDH; 1,400 HP |
| Discharge Facility | 3.2 MGD |

✓Assumes that Phase 2 is implemented (does not include assoc. facilities and costs)
✓Assumes that secondary effluent is delivered for the SqCWD GWRR Project (does not include assoc. facilities and costs)
✓Treatment capacity = produced flow (based on available summer flows)
✓Pipeline and pump station sizing based on average daily flow

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# Alternative 5: Surface Water Augmentation


| Capital Cost ($mil) | $116 |
|---|---|

- Annual O&M Cost ($/AF)
- Annualized Buildout Unit Construction Cost ($/AF)
- Ave Annual Reuse (AFY)

## Qualitative Considerations

- Maximizes beneficial reuse of wastewater in summer
- Environmental benefits to maintaining lake levels
- Challenging but viable regulatory requirements
- Operational flexibility for reservoir operations
- Operational complexity for treatment
- Significant energy for treatment and conveyance
- Public acceptance uncertain

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# Alternative 6: Streamflow Augmentation

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 6 | AWTF of secondary effluent with direct discharge to the San Lorenzo River ~~(serve NPR users along the way)~~ | Santa Cruz WWTF | Advanced Treatment at SC WWTF *(or Offsite?)* | AWT | Augment San Lorenzo River flows to allow for increased diversions to expand future drinking water supplies, while maintaining habitat, and meeting fishery flow requirements. |

- All purified water is delivered to the stream due to limitation of summer effluent.
- Removed sub-alternative for discharge near felton due to potential for classification as a direct potable reuse Project.

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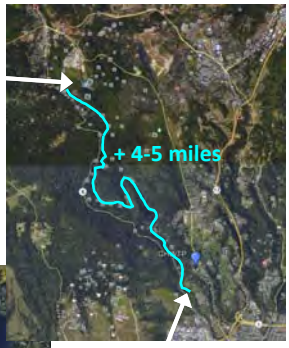
## Alternative 6: Streamflow Augmentation
## Direct Discharge to San Lorenzo River


Felton Diversion

Tait Street Diversion

Coast Pump Station

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## Streamflow Augmentation

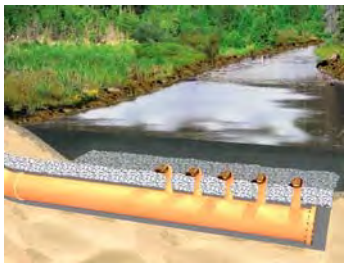
Tait Street Diversion:
- Concrete box with circular screened intake
- 6 - 7 mgd capacity
- Cleared in low season when top exposed
- Flows into a sump that blends raw water supplies from north coast, Lidel springs, major diversions, Laguna and SLR
- Pumped to GHWTP

Key Considerations:
- Meeting TMDL for Nitrogen in the river
- Temperature/DO of discharge flow
- Eutrophication in the Lagoon
- Proximity of point of discharge to Tait Street Diversion

The Confluence Model shows that:
- ✓ 5 cfs (3.2 mgd) of streamflow augmentation could
- ✓ reduce a worst year peak season shortage by 500 mg/year, or

K/J to work with City/Gary Fiske to confirm the assumed reasonable annual descharge volume for streamflow augmentation – 3.2 mgd max in summer but the annual average discharge would be less to recognize that the augmentation would only occur primarily in the summer (Confluence Model based on 181 days) and likely not in winter.

## Streamflow Augmentation



Discharge Facility Concept:
- Multi-port diffuser
- Maximize rapid and complete dispersion
- Minimize disruption to receiving water
- Maintain separation from Tait Street diversion

*Santa Rosa Diffuser*
- *48 mgd capacity,*
- *48"-dia pipeline,*
- *40 ft-long diffuser,*
- *11, 24"-dia duckbill valves*
- *Above ground steel tee with manway access and air event*

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## Alternative 6: Streamflow Augmentation

| | Direct Discharge |
|---|---|
| NPR Demand | No new customers added |
| AWPF Capacity | 3.2 MGD |
| Pipelines | ~2.6 miles of 14" pipeline (to discharge)<br>~1.3 miles of 16" pipeline (to AWT)<br>~1.3 miles of 8" pipeline (brine line) |
| Pump Stations | 2,222 gpm (3.2 mgd)<br>50 TDH; 170 HP |
| Discharge Facility | 3.2 MGD |

✓Assumes that Phase 2 is implemented (does not include assoc. facilities and costs)
✓Assumes that secondary effluent is delivered for the SqCWD GWRR Project (does not include assoc. facilities and costs)
✓Treatment capacity = produced flow (based on available summer flows)
✓Pipeline and pump station sizing based on average daily flow

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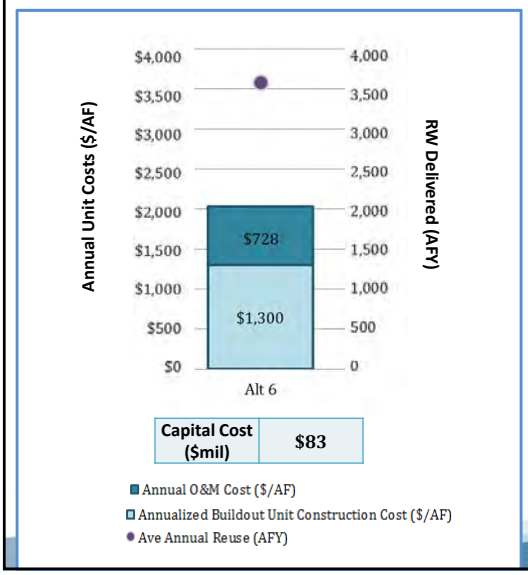
# Alternative 6: Streamflow Augmentation




## Qualitative Considerations?

- Potential to maximize beneficial reuse of wastewater in summer
- Benefits to providing fishery flows
- Regulatory viability is highly uncertain (TMDL/WQOs)
- Operational complexity for treatment
- High energy/GHG emissions for treatment
- Public acceptance uncertain

Based on Demand identified from Confluence Model, the RW delivered over the entire year will decrease and annual unit capital costs will increase

# Alternative 7: Direct Potable Reuse

**TABLE 3**

| Sub Alt | Description | Source Water | Treatment | | Use |
|---|---|---|---|---|---|
| 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | Santa Cruz WWTF | Advanced Treatment at SC WWTF *(or Offsite?)* | AWT | The advanced treated water would be blended with raw water coming from North Coast sources, the San Lorenzo River, and Loch Lomond water at the Coast Pump Station, and further treated at the GHWTP prior to distribution as finished water, suitable for drinking. |

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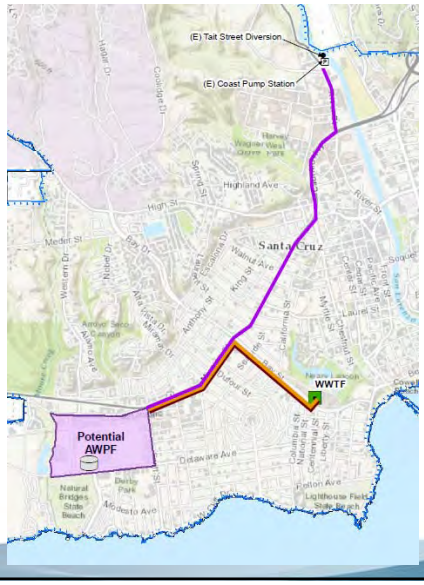
## Alternative 7: DPR with Raw Water Blending at Graham Hill WTP




- **GHWTP** : Treat blended raw water + purified water to produce drinking water
- **Coast Pump Station:** Raw Water
- **SC WWTP + AWPF:** Purified Water

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## Alternative 7: DPR with Raw Water Blending at Graham Hill WTP

| | Direct Discharge |
|---|---|
| NPR Demand | No new customers added |
| AWPF Capacity | 3.2 MGD |
| Pipelines | ~2.6 miles of 14" pipeline (to Coast PS)<br>~1.3 miles of 16" pipeline (to AWT)<br>~1.3 miles of 8" pipeline (brine line) |
| Pump Stations | 2,222 gpm (3.2 mgd)<br>85 TDH; 280 HP |
| Mixing (?) – check with Todd | 3.2 MGD |
| Storage | Engineered Storage Buffer |

✓Assumes that Phase 2 is implemented (does not include assoc. facilities and costs)
✓Assumes that secondary effluent is delivered for the SqCWD GWRR Project (does not include assoc. facilities and costs)
✓Treatment capacity = produced flow (based on available summer flows)
✓Pipeline and pump station sizing based on average daily flow

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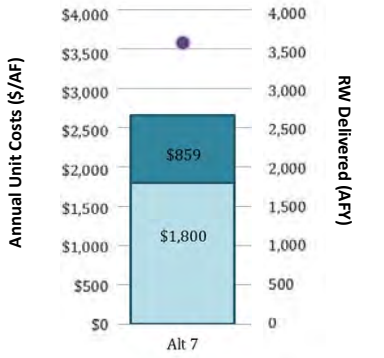
# Alternative 7: DPR with Raw Water Blending at Graham Hill WTP




| Capital Cost ($mil) | $113 |
|---|---|

- Annual O&M Cost ($/AF)
- Annualized Buildout Unit Construction Cost ($/AF)
- Ave Annual Reuse (AFY)

## Qualitative Considerations?

- Potential to maximize beneficial reuse of wastewater in summer
- Existing regulations have not been developed
- Operational complexity for treatment
- Impact on GHWTP source water issues (i.e. high turbidity, high TOC, DBPs, solids, etc)
- High energy/GHG emissions for treatment
- Public acceptance uncertain

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# Alternatives 5, 6 and 7 Evaluation Preliminary Summary of Eng Opinion of Probable Costs

- Annual O&M Cost ($/AF)
- Annualized Buildout Unit Construction Cost ($/AF)
- Ave Annual Reuse (AFY)

✓ 60% of Capital Cost is for Treatment
✓ 40% of Capital Cost is for Conveyance
✓ 40% of O&M Cost is for Energy


| $116 | $83 | $113 |
|---|---|---|

Capital Costs ($million)

✓ 80% of Capital Cost is for Treatment
✓ 20% of Capital Cost is for Conveyance
✓ 34% of O&M Cost is for Energy

Preliminary capital & annualized costs

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## Comparison of Alternatives 1, 2, 3, 5, 6 and 7 Evaluation
## Preliminary Summary of Eng Opinion of Probable Costs


## NPR Alternatives Evaluation
## Summary of QUANTITATIVE Results

| | | | | Recycled Water Delivered | | | | Estimated Costs | | | Energy / Others | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alternative | Sub Alt | Description | Treatment Level | Ave Annual Reuse (AFY) | Average Annual Flow (MGD) | Peak Season Deliveries (AF in Summer - June) | Peak Hourly Flow (MGD) | Estimated Construction Cost ($mil) | Annual O&M Cost ($mil/yr) | Total Annual Cost ($/AF) | Unit Energy of RW Delivered (KWH/AF) | GHG Emissions (MTCO2/yr) | Social Cost of Carbon ($) | Footprint (SF) | Number and Size of Facilities |
| Non Potable Reuse | Alt 1A | Centralized Non-Potable Reuse - Santa Cruz PWD Phase 2 Project | 3° | 282 | 0.25 | 32 | 1.04 | $2 | $0.0 | $545 | TBD | TBD | TBD | TBD | TBD |
| | Alt 1B | Centralized Non-Potable Reuse - Maximize tertiary treatment at the SC WWTF | 3° | 866 | 0.77 | 67 | 2.16 | | | | TBD | TBD | TBD | TBD | TBD |
| | | Phase 1 | | 340 | 0.30 | 32 | 1.04 | $6 | $0.1 | $8,311 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 2 | | 27 | 0.02 | 4 | 0.14 | $4 | $0.1 | $10,696 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 3 | | 146 | 0.13 | 23 | 0.74 | $8 | $0.1 | $955 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 4 | | 71 | 0.06 | 11 | 0.36 | $5 | $0.1 | $1,290 | TBD | TBD | TBD | TBD | TBD |
| | Alt 2 | Decentralized Non-Potable Reuse | 3° | 71 | 0.06 | 11 | 0.12 | $3 | $0.1 | $4,641 | TBD | TBD | TBD | TBD | TBD |
| SqCWD Led GWRR | Alt 3A | Secondary Effluent to SqCWD + NPR along the way | 2° + filter | 1,903 | 1.70 | 219 | 2.35 | $20 | $0.6 | $891 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3B | Tertiary Effluent to SqCWD + NPR along the way | 3° | 545 | 0.49 | 293 | 3.14 | $27 | $0.7 | $4,099 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3C | Secondary Effluent to SqCWD + SC GWRR (AWT @ SqCWD) | AWT | 0 | 0.00 | 0 | 0.00 | #N/A | #N/A | #N/A | TBD | TBD | TBD | TBD | TBD |
| | Alt 3D | AWT @ SC WWTF sent to SqCWD + NPR along the way | AWT | 82 | 0.07 | 13 | 0.42 | $12 | $0.6 | $15,237 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3E | AWT @ SC WWTF sent to SqCWD + NPR along the way + SC GWRR | AWT | 0 | 0.00 | $0.0 | $0 | #N/A | #N/A | #N/A | TBD | TBD | TBD | TBD | TBD |
| SC GWRR | Alt 4A | Santa Cruz GWRR Project - Advanced treatment at SCWWTF | 2° | 0 | 0.00 | 0.00 | $0 | #N/A | #N/A | #N/A | TBD | TBD | TBD | TBD | TBD |
| | Alt 4B | Santa Cruz GWRR Project - Advanced treatment at off-site | 2° | 0 | 0.00 | 0.00 | $0 | #N/A | #N/A | #N/A | TBD | TBD | TBD | TBD | TBD |
| | Alt 4C | Santa Cruz GWRR Project - MBR + AWPF at DA Porath | AWT | 0 | 0.00 | 0.00 | $0 | #N/A | #N/A | #N/A | TBD | TBD | TBD | TBD | TBD |
| SWA | Alt 5 | Surface Water Augmentation (SWA) in Loch Lomond Reservoir | AWT | 3,584 | 3.20 | 412.16 | $4 | $116 | $4 | $3,118 | TBD | TBD | TBD | TBD | TBD |
| Stream Aug | Alt 6 | Streamflow Augmentation | AWT | 3,584 | 3.20 | 412.16 | $4 | $83 | $3 | $2,028 | TBD | TBD | TBD | TBD | TBD |
| DPR | Alt 7 | Direct Potable Reuse | AWT | 3,584 | 3.20 | 412.16 | $4 | $113 | $3 | $2,659 | TBD | TBD | TBD | TBD | TBD |

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# OPEN DISCUSSION

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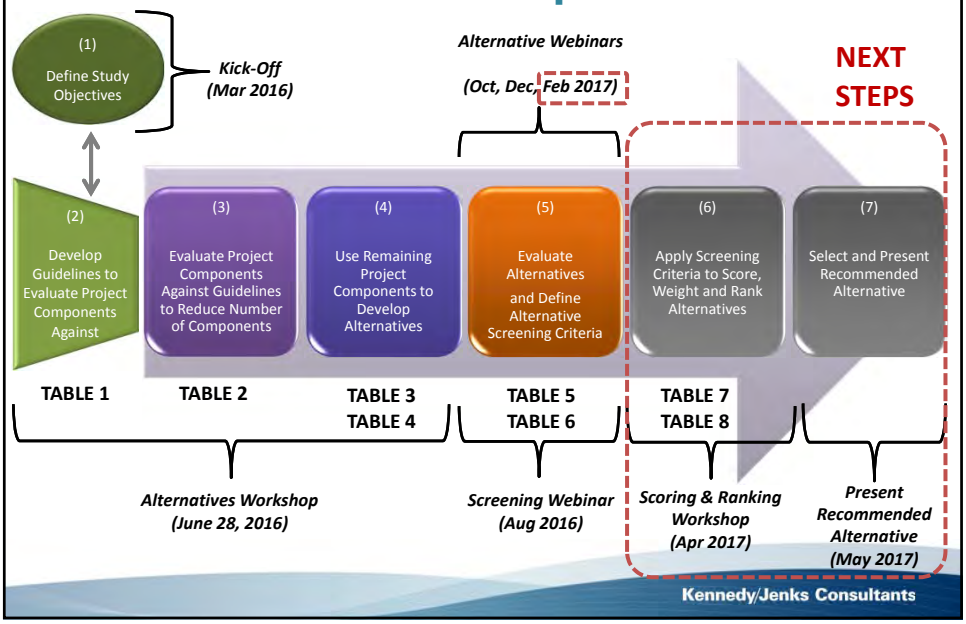
# Next Steps

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# QUESTIONS


| | | |
|---|---|---|
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| Trussell Tech: | Brian Pecson | brianp@trusselltech.com |


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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Alternatives Webinar – Part 3
## 01 March 2017 from 9 am to 10:30 am

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Webinar Objective:** Present preliminary evaluation for groundwater replenishment reuse alternatives within the City's boundaries using preliminary maps, tables and figures to illustrate facility locations, capacities and costs.

**Goal:** Discuss and seek input on assumptions, facility locations and other project components.

**Action Items:** Respond to specific requests for information, update alternatives (as-needed) and memorialize discussion points to support scoring of alternative projects.

---

1. Approach & Objective
2. Recycled Water Supply
3. Market for Groundwater Replenishment Reuse (GRR)
4. GRR Treatment Requirements
5. Beltz Wellfield Injection Capacity and Siting Study
6. Alternatives Analysis
    a. Alternative 3 – Santa Cruz Participation in SqCWD-led GWRR Project
    b. Alternative 4 – Santa Cruz GRR Project
7. Cost Comparison
8. Open Discussion
9. Next Steps

# City of Santa Cruz Recycled Water Facilities Planning Study

## Alternatives Webinar Part 3

March 1, 2017

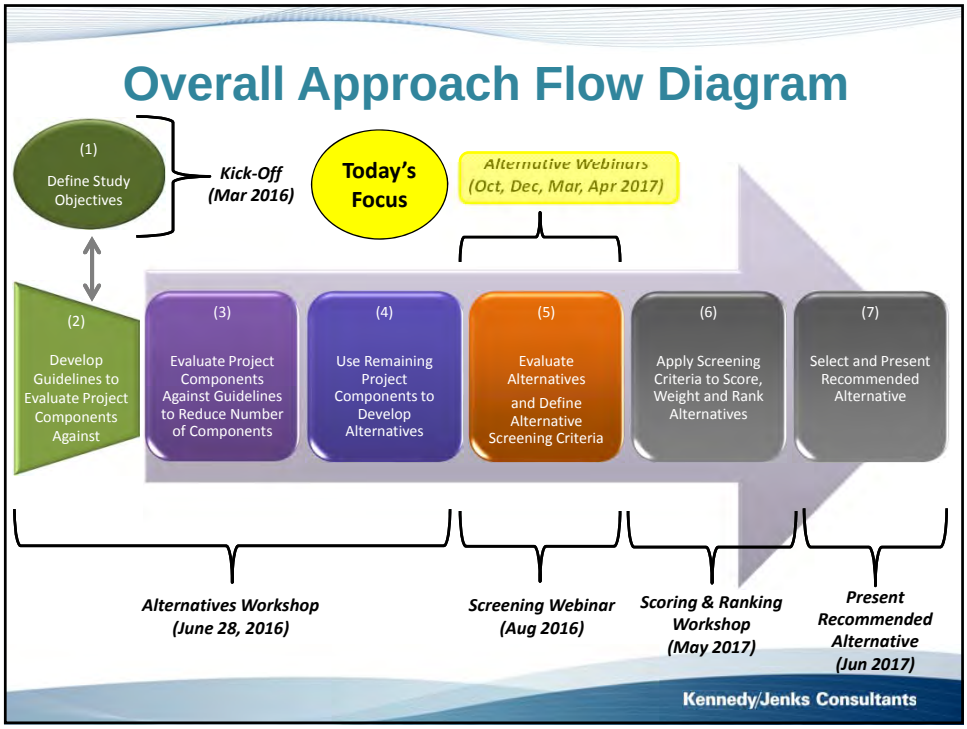
** Includes amended notes to reflect discussion at workshop*



## Agenda

- Approach & Objective
- Recycled Water Supply
- Market for Groundwater Replenishment Reuse (GRR)
- GRR Treatment Requirements
- Beltz Wellfield Injection Capacity and Siting Study
- Alternatives Analysis
  - Alternative 3 – Santa Cruz Participation in SqCWD-led GWRR Project
  - Alternative 4 – Santa Cruz GRR Project
- Cost Comparison
- Open Discussion

Facilities
Quantitative Results
Qualitative Considerations




## Alternatives Webinar Objective

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

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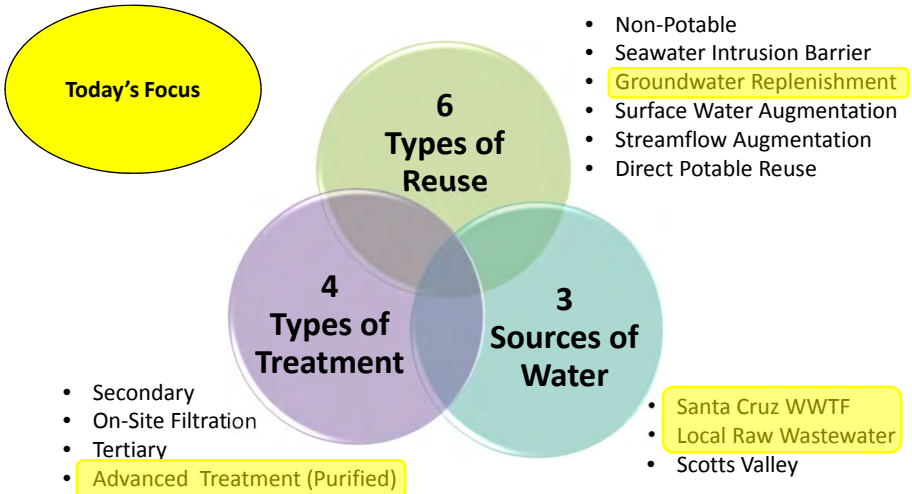
# Project Components

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# Santa Cruz WWTF Supply for GRRP Alternatives

| Total SC WWTF Supply | | SC WWTF In-Plant Demand | | SqCWD GWRR Demand | | Secondary Effluent Available | Purified Water Produced |
|---|---|---|---|---|---|---|---|
| Average Daily Dry Weather Flow[1] (mgd) | | Year-Round Internal Use + La Barranca Park[2] (mgd) | | Year-Round Secondary Effluent (mgd) | | after meeting other Demands (mgd) | Based on assumed AWPF Recovery Rate[3] |
| 6.1 | − | 0.25 | − | 1.7 | = | 4.16 → | 3.2 |

[1] Based on June 2015 flow data
[2] Assumes no additional NPR demands in Santa Cruz will be served
[3] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

Brine

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# Local Raw WW Supply for GRRP Alternatives

## D.A. Porath Pump Station

- Operated by the Santa Cruz County Sanitation District
- Main raw wastewater PS along the sewer transmission main
- Average Flow = 3.6 mgd (2014)
- Diurnal and seasonal flow patterns would need to be further evaluated
- Assumed Recovery rates
  - MBR (90% recovery)
  - RO/UV-AOP (85% recovery)
- Assuming no bypass and ability to treat average annual flow
- Max production of purified water would be 2.75 mgd


Source: SqCWD GW Replenishment Feasibility Study, 2015

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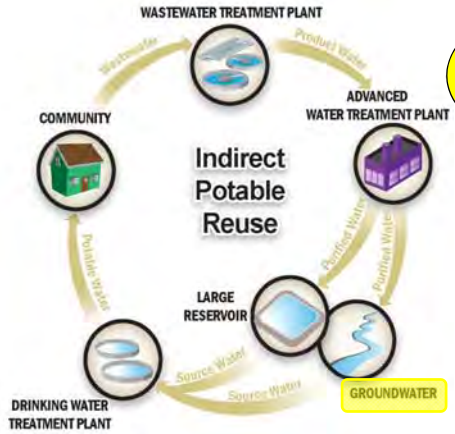
# Recycled Water Market: Indirect Potable Reuse




GRR = Groundwater Replenishment Reuse

Today's Focus

- Exploring GRR in two basins
  - Santa Cruz Mid County Basin
  - Santa Margarita

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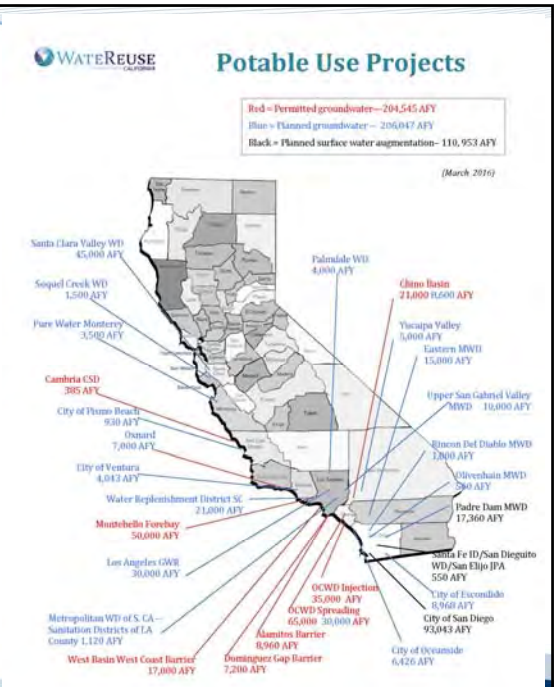
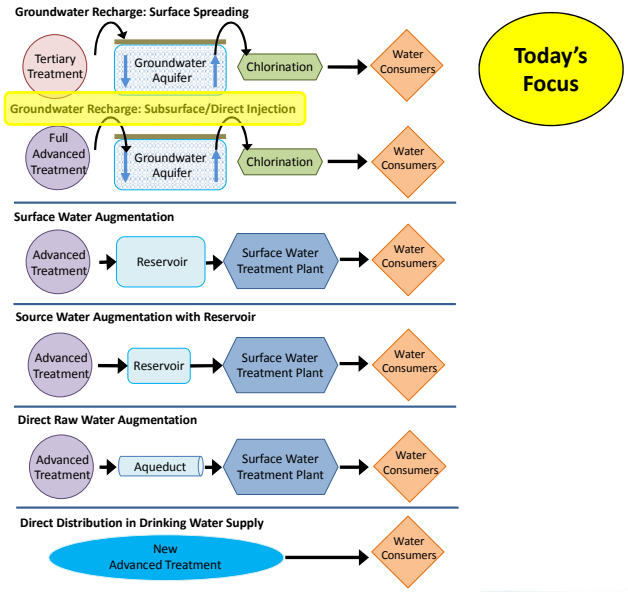
# Market Assessment: GRRP

- Decades of GRRP in California
- 8 permitted projects
- Many more being planned




# Types of Potable Reuse




**Today's Focus**

*Graphics by Trussell*

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## GRR Treatment Requirements Direct Injection

- IPR regulations were finalized June 18, 2014
  - Reduction Credits = 12/10/10 microorganism removal,
  - Response Time = ≥ 2 months
  - Recycled Water Contribution ~ 100%
- Treatment
  - Credits from raw sewage to finished water
  - Min 2 separate treatment processes (max 6 LRV each)
  - Requires Full Advanced Treatment (RO + AOP)
  - 1-log virus reduction credit per month of subsurface retention

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## GRR Treatment Requirements Direct Injection

- Other Requirements
  - Total N ≤ 10 mg-N/L; TOC ≤ 0.5/RWC
  - Nitrogen = GW Quality Objectives, Basin Plan
- Compliance with regulated compounds
  - NDMA ~ 10 ng/L California notification limit
  - Other Chemicals of Emerging Concern (CECs) with regulatory notification limits
  - Title 22 drinking water primary and secondary MCL's
  - Disinfection Byproducts – i.e. HAAs, THMs, chlorite
- Challenges: costs, brine disposal, siting
- Benefits: no diluent water required, less space

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# GRRP Treatment Train

**Potable Reuse**
Secondary or Tertiary Effluent

Membrane Filtration

Reverse Osmosis

Ultraviolet Light/Advanced Oxidation

Aquifer Retention Time

Free Chlorine
Could add 6/1/0

| Log Removal | MF | RO | UV/AOP | RT | Total |
|---|---|---|---|---|---|
| Virus | 0 | 1.5 – 2 | 6 | 4 - 6 | 11.5 – 13.5 |
| *Giardia* | 4 | 1.5 – 2 | 6 | 0 | 11.5 – 12 |
| *Cryptosporidium* | 4 | 1.5 – 2 | 6 | 0 | 11.5 – 12 |

[1] Based on June 2015 flow data
[2] Assumes no additional NPR demands in Santa Cruz will be served
[3] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

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# Membrane BioReactors (MBR)

MBR
*Bioreactor + Membrane Filtration*

Reverse Osmosis

Ultraviolet Light/Advanced Oxidation

Aquifer Retention Time

Free Chlorine
Could add 6/1/0

| Log Removal | MBR | RO | UV/AOP | RT | Total (without MBR credit) |
|---|---|---|---|---|---|
| Virus | TBD | 1.5 – 2 | 6 | 4 - 6 | 11.5 – 13.5 |
| *Giardia* | TBD | 1.5 – 2 | 6 | 0 | 7.5 – 8 |
| *Cryptosporidium* | TBD | 1.5 – 2 | 6 | 0 | 7.5 – 8 |

Can we get similar pathogen credits for MBR if it replaces MF/UF in a potable reuse train? To Be Determined (TBD)

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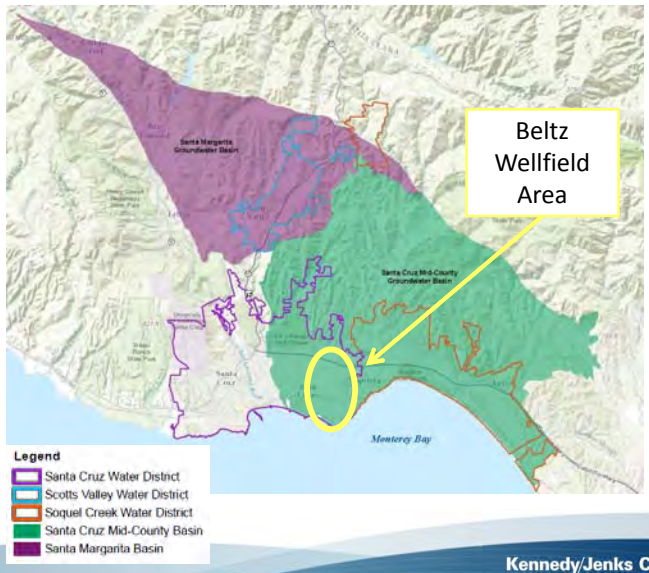
## Groundwater Basins

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## Beltz Wellfield Injection Capacity and Siting Study

- Perform a conceptual-level analysis of injection well capacity and siting for a GRRP at the Beltz Wellfield
  - Utilizing production and specific capacity data from Beltz Wells #8, #9, #10 and #12
  - Identify potential sites using prior siting studies
  - Estimate injection rate and travel time to extraction
  - Meet minimum of 6-month travel time

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## Beltz Wellfield
## Injection Capacity and Siting Study

- Approach
  - Injection rate is assumed to be 50% to 70% of extraction rate from existing wells
  - Utilized Darcy's Law
  - Utilized Simple MODFLOW/MODPATH Model
  - Proposed Injection Well Locations Based on Previous Siting Studies and Communication with City Staff

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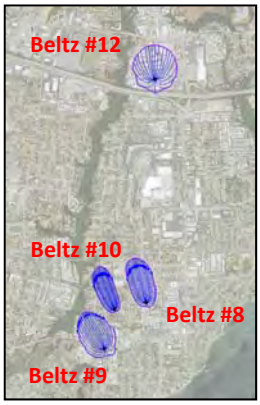
## Beltz Wellfield
## Existing Production Wells

ROI – Radius of Influence – 1000'

- Est. time a particle/drop of water 1,000' away would take 5 years to reach the production well)
- ROI is not symmetrical as approach accounts for regional groundwater gradient and groundwater pumping

← Flow direction path = how a drop of water moves in the subsurface

● Approx. **EXISTING** Production Well Location(s)

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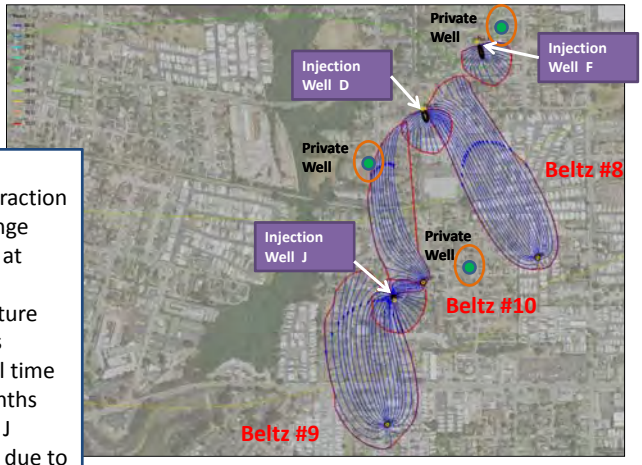
# Injection Sites near Beltz Wells #8, #9 and #10




RESULTS:
- This shows how the extraction well capture zones change upon 0.5 mgd injection at each location
- The extraction well capture zone represents 5 years
- The injection well travel time shape represents 6 months
- Based on initial results, J would be less desirable due to travel time at or near 6 months

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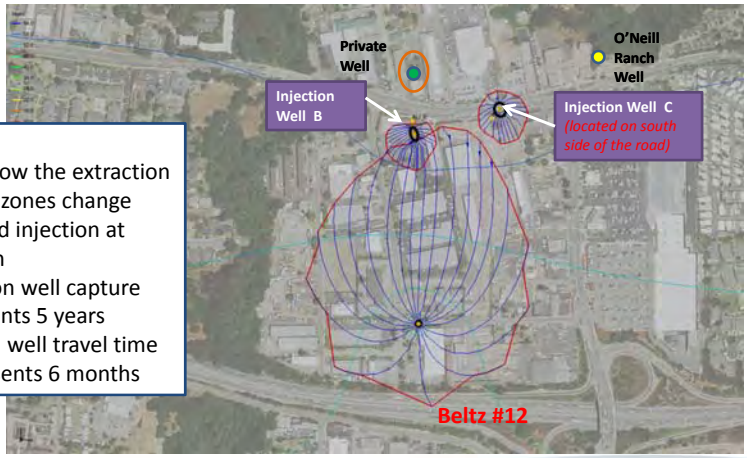
# Injection Sites near Beltz Well #12




RESULTS:
- This shows how the extraction well capture zones change upon 0.5 mgd injection at each location
- The extraction well capture zone represents 5 years
- The injection well travel time shape represents 6 months

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# Beltz Wellfield
# Injection Capacity and Siting Study

- Recycled Injection Potential = 2 MGD
  - Beltz Well No's 8, 9 and 10 Sites
    - ✓Injection Rate = Approx. 0.5 MGD per well location
    - ✓Two Wells= 1.0 MGD
      - *Potential to do three wells if another viable site is identified.*
      - *Additional production wells may also need to be considered*
  - Beltz Well No. 12 Site
    - ✓Injection Rate = Approx. 0.5 MGD per well
    - ✓Two Wells = 1.0 MGD

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# Recycled Water Market: Potable Reuse

| Potable Reuse | Available Supply mgd (AFY) | Demand mgd (AFY) | Use Limited by |
|---|---|---|---|
| Groundwater Recharge – Beltz Wellfield | *SC WWTF Effluent* 3.2 mgd (3,600 AFY) | 2.0 (2,200 AFY) | • Groundwater basin capacity<br>• Injection well siting<br>• Travel time from injection to extraction |
| Groundwater Recharge – Beltz Wellfield | *Local Raw WW* 2.75 mgd (3,080 AFY) | 2.0 (2,200 AFY) | • Groundwater basin capacity<br>• Injection well siting<br>• Travel time from injection to extraction |
| Groundwater Recharge – Santa Margarita Basin | *SC WWTF Effluent* 3.2 mgd (3,600 AFY) | TBD* | • Regional wastewater generation<br>• Groundwater basin capacity<br>• Travel time from injection to extraction |
| Surface Water Augmentation | *SC WWTF Effluent* 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• SWA Regulations<br>• Operation of Loch Lomond Reservoir |
| Streamflow Augmentation | *SC WWTF Effluent* 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• TMDL for Nitrate<br>• Basin Plan requirements for Temperature and Dissolved Oxygen |
| Direct Potable Reuse | *SC WWTF Effluent* 3.2 mgd (3,600 AFY) | 3.2 mgd (3,600 AFY) | • Summer wastewater generation<br>• GHWTP Treatment Capacity<br>• Coast Pump Station Capacity<br>• Pending DPR Regulations |

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## Alternatives for Further Evaluation

- Alternative 1 – Centralized Non-Potable Reuse
- Alternative 2 – Decentralized Non-Potable Reuse
- Alternative 3 – Santa Cruz Participation in SqCWD-led GRR Project
- Alternative 4 – Santa Cruz GRR Project
- Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir
- Alternative 6 – Streamflow Augmentation (SFA)
- Alternative 7 – Direct Potable Reuse (DPR)

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## Preliminary capital & annualized costs

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

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# Alt 3 - Santa Cruz Participation in a SqCWD-led GRR

- **AWPF @ SqCWD Headquarters** **(3 Sub-alternatives)**
  - Alt 3a - Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin
    - ✓ *Baseline – no use in Santa Cruz
  - Alt 3b - Send tertiary effluent from SCWWTF to SqCWD
    - ✓ Serve tertiary RW to NPR users along the way
  - Alt 3c - Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF
    - ✓ Recharge advanced treated RW in Santa Cruz GW basin
    - ✓ Serve advanced treated RW to NPR users along the way to SC GW basin
- **AWPF @ Santa Cruz WWTF** **(2 Sub-alternatives)**
  - Alt 3d - Send advanced treated RW from SCWWTF to SqCWD
    - ✓ Serve advanced treated RW to NPR users along the way
  - Alt 3e - Send advanced treated RW from SCWWTF to SqCWD
    - ✓ Serve advanced treated RW to NPR users along the way
    - ✓ Recharge advanced treated RW in Santa Cruz GW Basin

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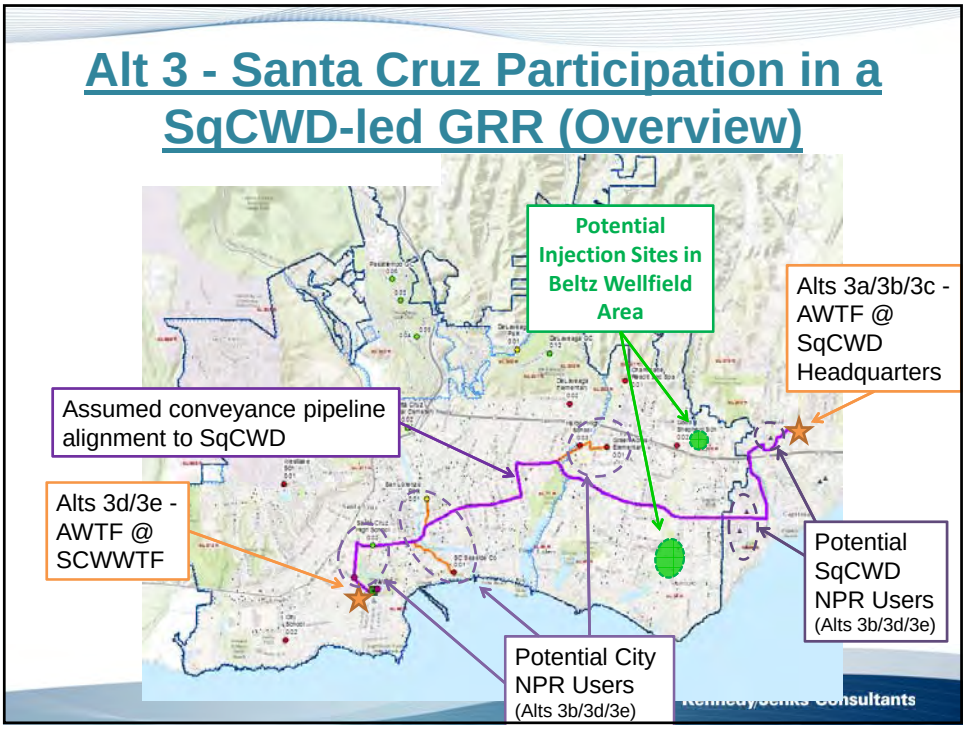
# Alt 3 - Santa Cruz Participation in a SqCWD-led GRR

| | Alt | Delivery to SqCWD | Use in Santa Cruz | Major Facilities in Santa Cruz |
|---|---|---|---|---|
| AWTF @ SqCWD Headquarters | 3a | 1.7 mgd secondary | None | Pump Station (PS) at SCWWTF, pipeline to SqCWD, brine line to SCWWTF |
| | 3b | 1.7 mgd tertiary | 0.12 mgd NPR (~30 sites) | Tertiary Treatment and PS at SCWWTF, pipeline to SqCWD, brine line to SCWWTF, distribution pipelines to customer sites |
| | 3c | 4.3 mgd secondary | ~2.0 mgd for GRR + 0.01 mgd NPR | PS at SCWWTF, pipeline to SqCWD, brine line to SCWWTF, pipeline from SqCWD to GW injection sites, GW injection wells |
| AWTF @ SCWWTF | 3d | 1.3 mgd purified | 0.12 mgd NPR | AWTF and PS at SCWWTF, pipeline to SqCWD, distribution pipelines to customer sites |
| | 3e | 1.3 mgd purified * | 0.15 mgd NPR + 2.0 mgd for GRR | AWTF and PS at SCWWTF, pipeline to SqCWD, distribution pipelines to customer sites and GW injection sites, GW injection wells |

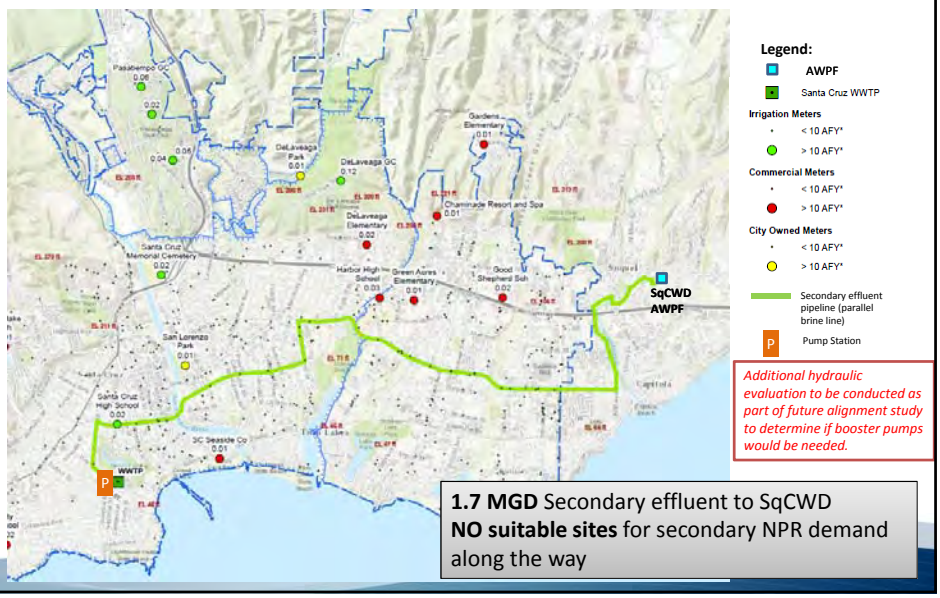
* Pipeline to injection wells in Santa Cruz is sized to convey 3.3 mgd.

*Additional hydraulic evaluation to be conducted as part of future alignment study to determine if booster pumps would be needed along transmission main.*

# Alt 3 - Santa Cruz Participation in a SqCWD-led GRR (Overview)




# Alternative 3a: Secondary Effluent to SqCWD + NO NPR along the way (BASELINE)




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

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

# Alternative 3a: Secondary Effluent to SqCWD + NO NPR and NO GRR in the City along the way (BASELINE)

| | Facilities |
|---|---|
| NPR Demand | 0 |
| SqCWD Demand | 1.7 MGD Effluent (Constant Demand) |
| City GRR Demand | 0 |
| Treatment Capacity | No additional treatment required |
| Pipelines | 8.4 miles – 14" |
| Pump Stations | WWTP PS – 2 nos: 670 gpm, 75 HP *(booster pump station if needed)* |
| Storage | None |
| Customer Sites | 0 |

No NPR demand and No SC GRR along the way.

All 1.7 mgd secondary delivered is going to SqCWD

No peak factor was used to size pipeline and pump station since it is a constant demand.

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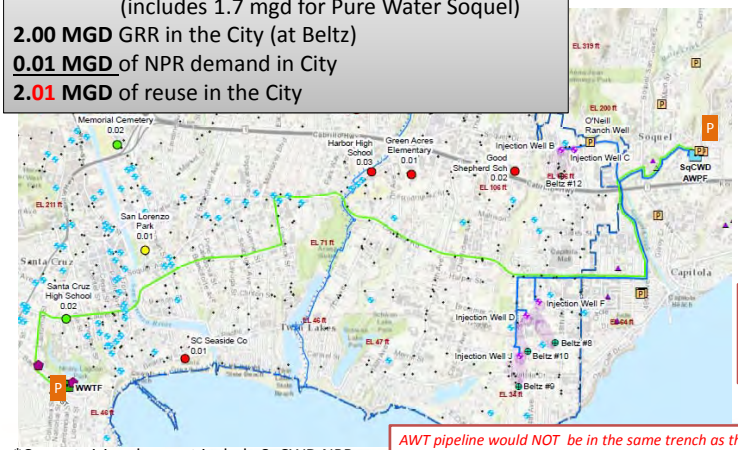
# Alternative 3c: Secondary Effluent to SqCWD AWPF + Purified Water for NPR + GRR in the City

**4.44 MGD** Secondary effluent to SqCWD (includes 1.7 mgd for Pure Water Soquel)
**2.00 MGD** GRR in the City (at Beltz)
**0.01 MGD** of NPR demand in City
**2.01 MGD** of reuse in the City




Legend:
- AWPF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- Secondary effluent pipeline (parallel brine line)
- AWT pipeline
- Pump Station
- SqCWD Production Well

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

*Current sizing does not include SqCWD NPR use in SqCWD

*AWT pipeline would NOT be in the same trench as the secondary pipeline due to separation requirements. Shown in same alignment to reduce community disruption if installed at same time. Future alignment study to evaluation further.*

## **Alternative 3c:** Secondary Effluent to SqCWD AWPF + Purified Water for NPR + GRR in the City

| | Facilities |
|---|---|
| NPR Demand | 0.01 MGD |
| SqCWD Demand | 1.7 MGD Effluent |
| City GRR Demand | 2.0 MGD AWT Product Water |
| AWPF Treatment Capacity | 3.3 MGD |
| Pipelines | 8.4 miles – 20" (transmission – 6" larger than baseline Alt 3A)<br>4.35 miles – 10" and 8" (to injection wells) |
| Pump Stations | WWTP PS – 2,720 gpm, 140 HP<br>*(booster pump station if needed)* |
| Wells | 5 injection wells (+ 1 backup); 5 monitoring wells |
| Customer Sites | 11 |

Treatment capacity at SqCWD based on constant flow of 3.3 mgd (1.3 mgd SqCWD GRR and 2 mgd SC GRR) and summer peak month flow factor of 1.87 applied to NPR demands (0.01 mgd).
For pipeline capacity, peak hour factor (assuming 8 hours of irrigation) only applied to NPR demand

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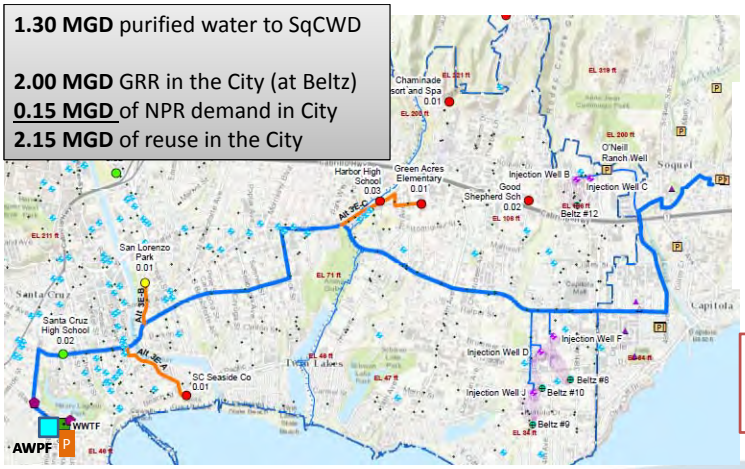
## **Alternative 3e:** AWPF @ SC WWTF, use purified water for NPR + GRR in the City + SqCWD GRR

**1.30 MGD** purified water to SqCWD

**2.00 MGD** GRR in the City (at Beltz)
**0.15 MGD** of NPR demand in City
**2.15 MGD** of reuse in the City




**Legend:**
- AWPF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- AWT pipeline
- Pump Station

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

SqCWD Production Well

*Current sizing does not include SqCWD NPR use

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## **Alternative 3e:** AWPF @ SC WWTF, use purified water for NPR + GRR in the City + SqCWD GRR

| | Facilities |
|---|---|
| NPR Demand | 0.15 MGD |
| SqCWD Demand | 1.3 MGD AWT Product Water |
| City GRR Demand | 2.0 MGD AWT Product Water |
| Treatment Capacity | 3.45 MGD |
| Pipelines | 8.4 miles – 16" (transmission – 2" larger than baseline Alt 3A)<br>3.1 miles – 6" and 8 "(to injection wells) |
| Pump Stations | WWTP PS – 2,720 gpm, 140 HP<br>*(booster pump station if needed)* |
| Wells | 5 injection wells (+ 1 backup); 5 monitoring wells |
| Customer Sites | 41 |

Treatment capacity at SqCWD based on constant flow of 3.3 mgd (1.3 mgd SqCWD GRR and 2 mgd SC GRR) and summer peak month flow factor of 1.87 applied to NPR demands (0.15 mgd).
For pipeline capacity, peak hour factor (assuming 8 hours of irrigation) only applied to NPR demand

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## Alternative 3a, 3b, 3c, 3d and 3e

| Facility Capital Costs | | | | | |
|---|---|---|---|---|---|
| **1.0** | **Treatment** | | | | **1,729,866** |
| 1.1 | Microfiltration | 1.7 | MGD | 2,250,000 | 3,805,096 |
| 1.2 | Reverse Osmosis | 1.4 | MGD | 3,308,000 | 4,755,187 |
| 1.3 | UV/AOP | 1.4 | MGD | 125,000 | 179,685 |
| 1.4 | Free Chlorine | 1.4 | MGD | 575,000 | 826,551 |
| 1.5 | Post Treatment and Chemical Handling | 1.4 | MGD | 923,000 | 1,326,795 |
| 1.6 | Building | 1.4 | MGD | 1,250,000 | 1,796,851 |
| 1.7 | Remove SqCWD portion of treatment | 1.30 | MGD | 8,431,000 | (10,960,300) |
| **2.0** | **Pipelines** | | | | **1,179,947** |
| 2.1 | Purified Water Pipeline from SCWWTP to SqCWD, serving NPR along the way | | | | |
| | Alt3D_A | 3,177 | LF | 72.00 | 228,769 |
| | Alt3D_B | 1,529 | LF | 72.00 | 110,099 |
| | Alt3D_C | 1,697 | LF | 72.00 | 122,182 |
| | Alt3D_D | 2,047 | LF | 72.00 | 147,359 |
| | Alt3D_Main | 44,106 | LF | 210.00 | 9,262,260 |
| | Alt3D_A | 3,222 | LF | 72 | 231,989 |
| | Alt3D_B | 1,529 | LF | 72 | 110,099 |
| | Alt3D_C | 1,697 | LF | 72 | 122,182 |
| | Pipeline Constructability (Along Roads) | | | 10% | 1,033,494 |
| | Microtunneling (Trenchless) | 800 | LF | 700.00 | 560,000 |
| 2.2 | Remove Baseline Pipeline Cost for Alt3A | 1 | LS | (10,748,486) | (10,748,486) |
| **3.0** | **Pump Stations** | | | | **430,000** |
| 3.1 | From WWTP to SqCWD, serving NPR along the way | | LS | | 1,740,000 |
| 3.2 | Remove Baseline Pump Station Cost for Alt3A | 1 | LS | (1,310,000) | (1,310,000) |

Alt 3A baseline costs removed from cost of Alts 3B, 3C, 3D and 3E

- ✓ Treatment
- ✓ Pipelines
- ✓ Pump Station

*Alternative approach to distribute pipeline and PS costs by flow (rather than taking out baseline cost from 3A) will also be looked at.*

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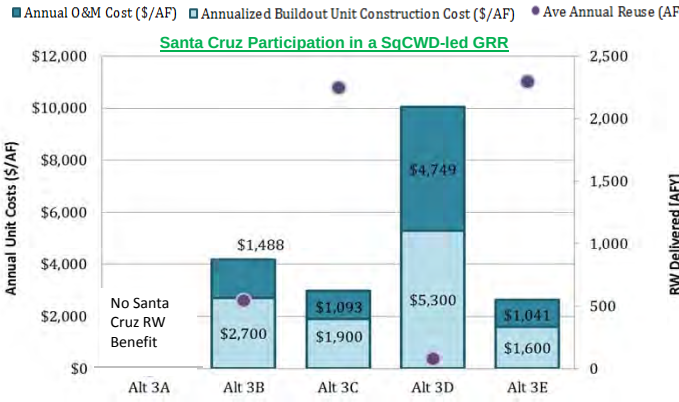
# Alternative 3a, 3b, 3c, 3d and 3e




| | AWPF @ SqCWD Headquarters | | | AWPF @ SC WWTF | |
|---|---|---|---|---|---|
| | No Reuse | NPR only | NPR + IPR | NPR only | NPR + IPR |
| Capital Cost ($mil) | Not incl* ~~$20~~ | $25.9 | $68.6 | $7.6 | $60.5 |

**Other GRRP Considerations**

- Maximizes beneficial reuse of wastewater in summer
- Maintains GW levels
- Operational complexity and energy for treatment
- Public acceptance uncertain
- Additional studies needed to confirm assumptions

*Alt 3A baseline costs removed from cost of Alts 3B, 3C, 3D and 3E

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# Alt 4 - Santa Cruz GWRR

- **AWPF @ Santa Cruz WWTF**
  - Alt 4a - Send advanced treated RW from SCWWTF to SC GRR
    - ✓ Serve advanced treated RW to NPR users along the way to injection wells (more customers compared to Alt 4b)
    - ✓ Recharge advanced treated RW in Santa Cruz GW Basin
- **MBR + AWPF @ DA Porath**
  - Alt 4b - Send advanced treated RW from DA Porath (MBR + AWPF) to SC GRR
    - ✓ Serve advanced treated RW to NPR users along the way to injection wells
    - ✓ Recharge advanced treated RW in Santa Cruz GW Basin

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# Alt 4 - Santa Cruz Led GRRP

| | Alt | Delivery to SqCWD | Use in Santa Cruz | Major Facilities in Santa Cruz |
|---|---|---|---|---|
| AWTF @ SCWWTF | 4a | 1.7 mgd secondary | 0.13 mgd NPR + 2.0 mgd for GRR | AWPF and PS at SCWWTF, distribution pipelines to customer sites and GW injection sites, GW injection wells |
| MBR + AWTF @ DA Porath | 4b | 1.7 mgd secondary | 0.01 mgd NPR + 2.0 mgd for GRR | MBR and AWPF at DA Porath, PS at SCWWTF, DA Porath, pump station, short brine line, distribution pipelines to customer sites and GW injection sites, GW injection wells |

*Facilities and cost of conveying secondary effluent to SqCWD not included as part of Alt 4

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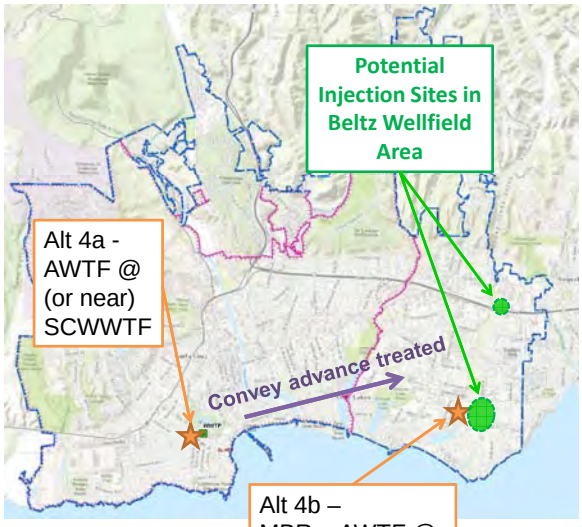
# Alt 4 - Santa Cruz Led GRRP




**Other Considerations**

- Maximizes beneficial reuse of wastewater in summer
- Maintaining GW levels
- Siting issues for MBR
- Operational complexity and energy for treatment
- Public acceptance uncertain
- Additional studies needed to confirm assumptions

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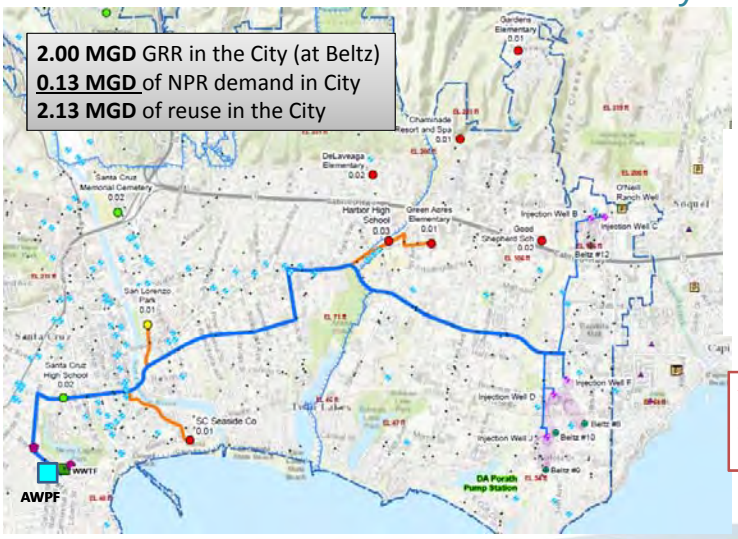
## **Alternative 4a:** Send advanced treated RW from SCWWTF to GRR in the City

**2.00 MGD** GRR in the City (at Beltz)
**0.13 MGD** of NPR demand in City
**2.13 MGD** of reuse in the City

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## **Alternative 4a:** Send advanced treated RW from SCWWTF to GRR in the City

| | Facilities |
|---|---|
| NPR Demand | 0.13 MGD |
| SqCWD Demand | Facilities and cost of conveying secondary effluent to SqCWD not included as part of Alt 4 |
| City GRR Demand | 2.0 MGD AWT Product Water |
| Treatment Capacity | 2.25 MGD |
| Pipelines | 5.1 miles – 12" (transmission)<br>3.6 miles – 6" and 10" (distribution to injection wells) |
| Pump Stations | WWTP PS – 2 nos: 670 gpm, 75 HP<br>*(booster pump station if needed)* |
| Wells | 5 injection wells (+ 1 backup); 5 monitoring wells |
| Customer Sites | 37 |

Treatment capacity at SqCWD based on constant flow of 3.3 mgd (1.3 mgd SqCWD GRR and 2 mgd SC GRR) and summer peak month flow factor of 1.87 applied to NPR demands (0.15 mgd).
For pipeline capacity, peak hour factor (assuming 8 hours of irrigation) only applied to NPR demand

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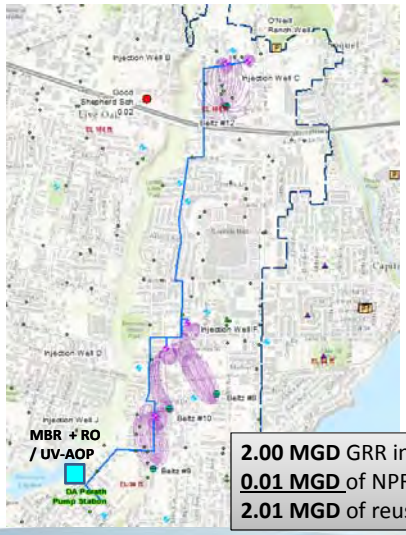
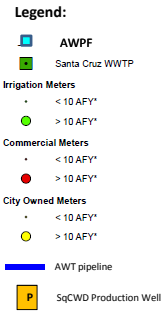
## **Alternative 4b:** Send advanced treated RW from DA Porath (MBR + AWPF) to GRR in the City




**2.00 MGD** GRR in the City (at Beltz)
**0.01 MGD** of NPR demand in City
**2.01 MGD** of reuse in the City

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## **Alternative 4b:** Send advanced treated RW from DA Porath (MBR + AWPF) to GRR in the City

| | Facilities |
|---|---|
| NPR Demand | 0.01 MGD |
| SqCWD Demand | Facilities and cost of conveying secondary effluent to SqCWD not included as part of Alt 4 |
| City GRR Demand | 2.0 MGD AWT Product Water |
| Treatment Capacity | 2.02 MGD |
| Pipelines | 2.7 miles – 6" and 8" (distribution to injection wells), short brine line for disposal back to sewer |
| Pump Stations | DA Porath Pump Station – 1,400 gpm, 190 HP |
| Wells | 5 injection wells (+ 1 backup); 5 monitoring wells |
| Customer Sites | 11 |

Treatment capacity at SqCWD based on constant flow of 3.3 mgd (1.3 mgd SqCWD GRR and 2 mgd SC GRR) and summer peak month flow factor of 1.87 applied to NPR demands (0.15 mgd).
For pipeline capacity, peak hour factor (assuming 8 hours of irrigation) only applied to NPR demand

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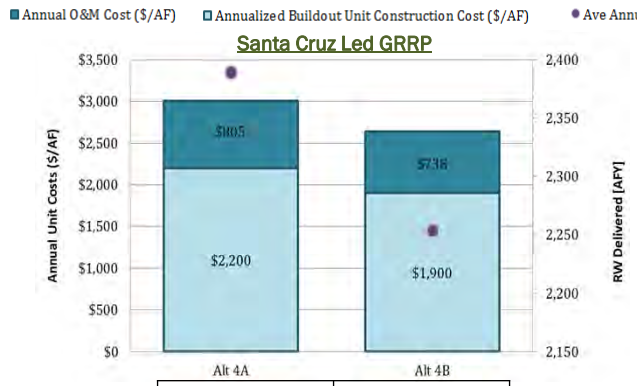
# Alternative 4a and 4b




| | AWPF @ SC WWTF | MBR-AWPF |
|---|---|---|
| | NPR + IPR | NPR + IPR |
| Capital Cost ($mil) | $85.1 | $74.0 |

**Other GRRP Considerations**

- Maximizes beneficial reuse of wastewater in summer
- Maintains GW levels
- Operational complexity and energy for treatment
- Public acceptance uncertain
- Additional studies needed to confirm assumptions
- Siting issues for MBR at DA Porath PS (monarch ubutterfies, coastal commission zone, cultural and biological resources)

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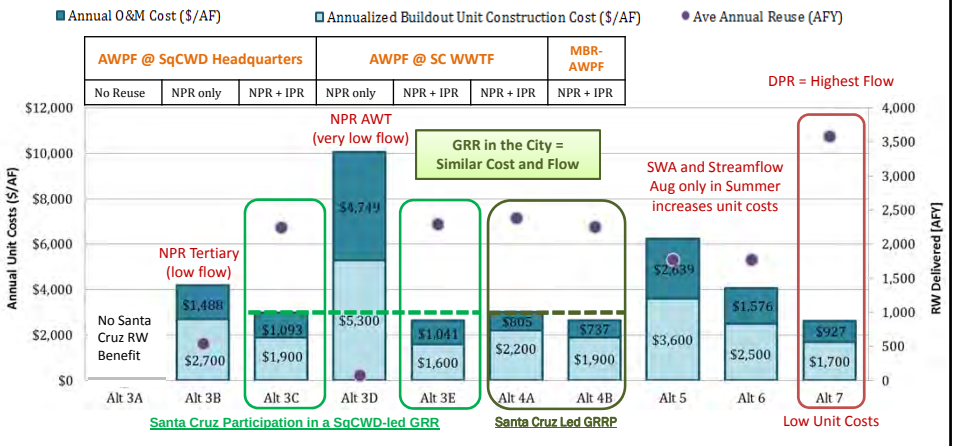
# Alternatives 3 & 4 Evaluation
# Preliminary Summary of Eng Opinion of Probable Costs




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Capital Cost ($mil) | Not incl ~~$20~~ | $25.9 | $68.6 | $7.6 | $60.5 | $85.1 | $74.0 | $111.2 | $77.7 | $107.6 |

Preliminary capital & annualized costs

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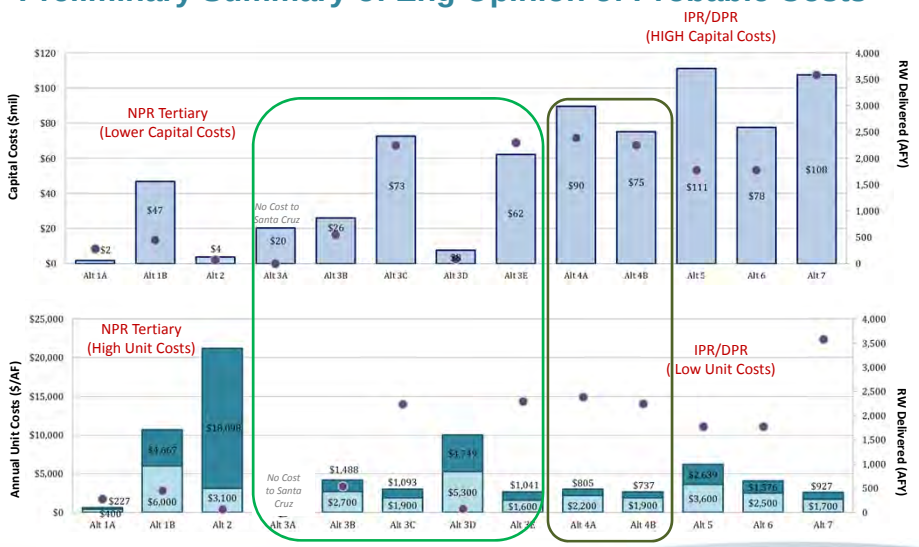
## Comparison of Alternatives 1 to 7 Evaluation
## Preliminary Summary of Eng Opinion of Probable Costs

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## NPR Alternatives Evaluation
## Summary of QUANTITATIVE Results

| | | | | Recycled Water Delivered | | | | | | Estimated Costs | | | Energy / Others | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alternative | Sub Alt | Description | Treatment Level | Regional Ave Annual Reuse (AFY) | Regional Average Annual Flow (MGD) | RW Use in Santa Cruz (AFY) | RW Use in Santa Cruz (MGD) | Peak Season Deliveries (AF in Summer - June) | Peak Hourly Flow (MGD) | Estimated Construction Cost ($mil) | Annual O&M Cost ($mil/yr) | Total Annual Cost ($/AF) | Unit Energy of RW Delivered (KWH/AF) | GHG Emissions (MTCO2/yr) | Social Cost of Carbon ($) | Footprint ($F) | Number and Size of Facilities |
| Non Potable Reuse | Alt 1A | Centralized Non-Potable Reuse - Santa Cruz PWD Phase 2 Project | 3° | 282 | 0.25 | 282 | 0.25 | 44 | 1.41 | $2 | $0.1 | $627 | TBD | TBD | TBD | TBD | TBD |
| | Alt 1B | Centralized Non-Potable Reuse - Maximize tertiary treatment at the SC WWTF | 3° | 807 | 0.72 | 807 | 0.72 | 126 | 4.04 | | | | TBD | TBD | TBD | TBD | TBD |
| | | Phase 1 | | 340 | 0.30 | 340 | 0.30 | 44 | 1.40 | $20 | $1.2 | $40,124 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 2 | | 176 | 0.16 | 176 | 0.16 | 51 | 1.65 | $6 | $0.2 | $2,819 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 3 | | 146 | 0.13 | 146 | 0.13 | 42 | 1.36 | $15 | $0.6 | $4,210 | TBD | TBD | TBD | TBD | TBD |
| | | Phase 4 | | 146 | 0.13 | 146 | 0.13 | 42 | 1.36 | $6 | $0.2 | $2,268 | TBD | TBD | TBD | TBD | TBD |
| | Alt 2 | Decentralized Non-Potable Reuse | 3° | 71 | 0.06 | 71 | 0.06 | 20 | 0.21 | $4 | $1.3 | $21,198 | TBD | TBD | TBD | TBD | TBD |
| SqCWD Led GWRR | Alt 3A | Secondary Effluent to SqCWD + NPR along the way | 2° + filter | 1,903 | 1.70 | 0.00 | 0.00 | 297 | 3.18 | $20 | $0.8 | #DIV/0! | TBD | TBD | TBD | TBD | TBD |
| | Alt 3B | Tertiary Effluent to SqCWD + NPR along the way | 3° | 2,448 | 2.19 | 545 | 0.49 | 417 | 4.47 | $26 | $0.8 | $4,188 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3C | Secondary Effluent to SqCWD + SC GWRR (AWT @ SqCWD) + NPR along the way back | AWT | 3,704 | 3.31 | 2,248 | 2.01 | 577 | 6.18 | $73 | $2.5 | $2,993 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3D | AWT @ SC WWTF sent to SqCWD + NPR along the way | AWT | 1,538 | 1.37 | 82 | 0.07 | 295 | 9.49 | $8 | $0.4 | $10,049 | TBD | TBD | TBD | TBD | TBD |
| | Alt 3E | AWT @ SC WWTF sent to SqCWD + NPR along the way + SC GWRR | AWT | 3,755 | 3.35 | 2,299 | 2.05 | 585 | $6 | $62 | $2 | $2,641 | TBD | TBD | TBD | TBD | TBD |
| SC GWRR | Alt 4A | Santa Cruz GWRR Project - Advanced treatment at SCWWTF + NPR along the way | AWT | 2,389 | 2.13 | 2,389 | 2.13 | 372 | $4 | $90 | $2 | $3,005 | TBD | TBD | TBD | TBD | TBD |
| | Alt 4B | Santa Cruz GWRR Project - MBR + AWPF at DA Porath + NPR along the way | AWT | 2,254 | 2.01 | 2,254 | 2.01 | 351 | $4 | $75 | $2 | $2,637 | TBD | TBD | TBD | TBD | TBD |
| SWA | Alt 5 | Surface Water Augmentation (SWA) in Loch Lomond Reservoir | AWT | 1,777 | 3.20 | 1,777 | 3.20 | 558.51 | $6 | $111 | $5 | $6,239 | TBD | TBD | TBD | TBD | TBD |
| Stream Aug | Alt 6 | Streamflow Augmentation | AWT | 1,777 | 3.20 | 1,777 | 3.20 | 558.51 | $6 | $78 | $3 | $4,076 | TBD | TBD | TBD | TBD | TBD |
| DPR | Alt 7 | Direct Potable Reuse | AWT | 3,584 | 3.20 | 3,584 | 3.20 | 558.51 | $6 | $108 | $3 | $2,627 | TBD | TBD | TBD | TBD | TBD |
| Regional GRR | Alt 8a | With SqCWD | AWT | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD |
| | Alt 8b | Without SqCWD | AWT | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD |

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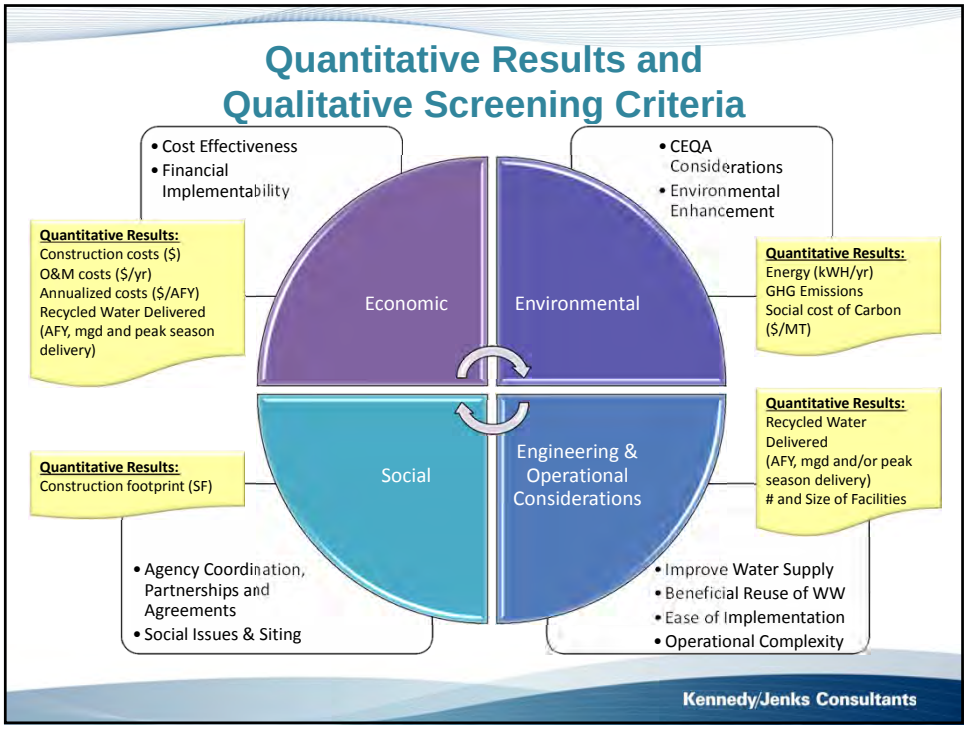
Quantitative Results and Qualitative Screening Criteria
• Cost Effectiveness
• Financial Implementability
Quantitative Results:
Construction costs ($)
O&M costs ($/yr)
Annualized costs ($/AFY)
Recycled Water Delivered (AFY, mgd and peak season delivery)
Economic
Environmental
• CEQA Considerations
• Environmental Enhancement
Quantitative Results:
Energy (kWH/yr)
GHG Emissions
Social cost of Carbon ($/MT)
Quantitative Results:
Construction footprint (SF)
Social
Engineering & Operational Considerations
Quantitative Results:
Recycled Water Delivered (AFY, mgd and/or peak season delivery)
# and Size of Facilities
• Agency Coordination, Partnerships and Agreements
• Social Issues & Siting
• Improve Water Supply
• Beneficial Reuse of WW
• Ease of Implementation
• Operational Complexity
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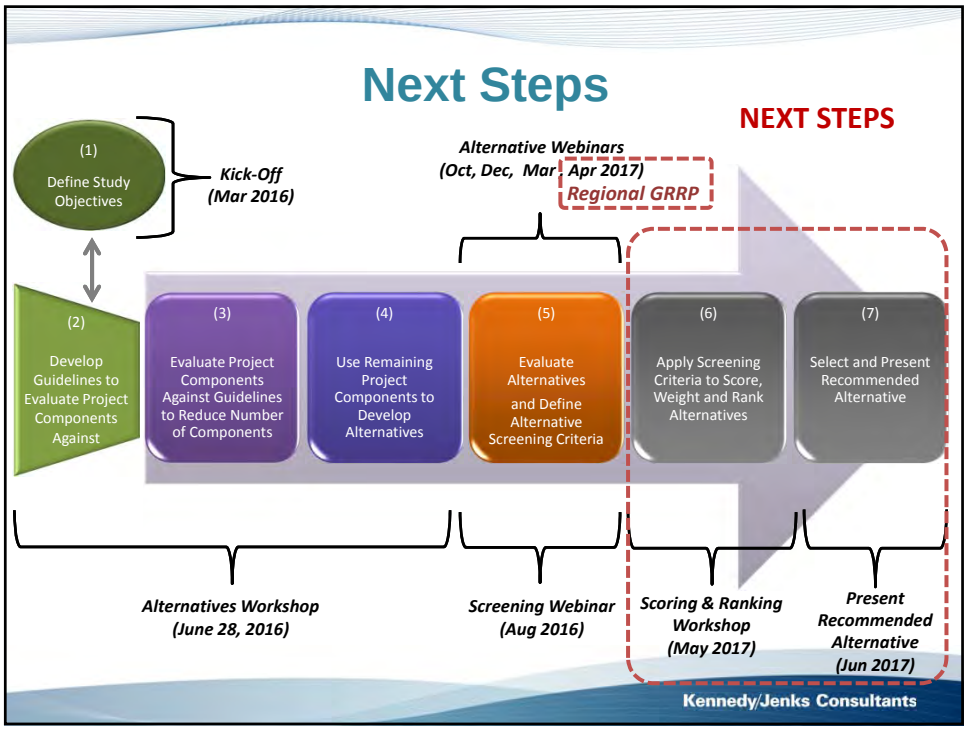
Next Steps
NEXT STEPS
(1) Define Study Objectives
Kick-Off (Mar 2016)
Alternative Webinars (Oct, Dec, Mar - Apr 2017)
Regional GRRP
(2) Develop Guidelines to Evaluate Project Components Against
(3) Evaluate Project Components Against Guidelines to Reduce Number of Components
(4) Use Remaining Project Components to Develop Alternatives
(5) Evaluate Alternatives and Define Alternative Screening Criteria
(6) Apply Screening Criteria to Score, Weight and Rank Alternatives
(7) Select and Present Recommended Alternative
Alternatives Workshop (June 28, 2016)
Screening Webinar (Aug 2016)
Scoring & Ranking Workshop (May 2017)
Present Recommended Alternative (Jun 2017)
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# QUESTIONS


| | | |
|---|---|---|
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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## Alternatives Webinar – Part 4
## 27 April 2017 from 9 am to 11:00 am

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Webinar Objective:** Present preliminary evaluation for regional groundwater replenishment reuse alternatives in the Santa Margarita Groundwater Basin using preliminary maps, tables and figures to illustrate facility locations, capacities and costs.

**Goal:** Discuss and seek input on assumptions, preliminary model results, facility locations and other project components.

**Action Items:** Respond to specific requests for information, update alternatives (as-needed) and memorialize discussion points to support scoring of alternative projects.

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1. Approach & Objective
2. Regional Recycled Water Supply
3. Santa Margarita Groundwater Basin (SMGB) Initial Injection Capacity and Siting Study Results
4. GRR Treatment Requirements and Regional Considerations
5. Alternatives Analysis
    a. Alternative 8a – 4-Way Regional GRR Project (to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley)
    b. Alternative 8b – 3-Way GWRR Project (to serve the City, Scotts Valley, and San Lorenzo Valley)
6. Preliminary Cost Comparison
7. Open Discussion
8. Scoring and Weighting Discussion
9. Next Steps

# City of Santa Cruz
# Recycled Water Facilities Planning Study

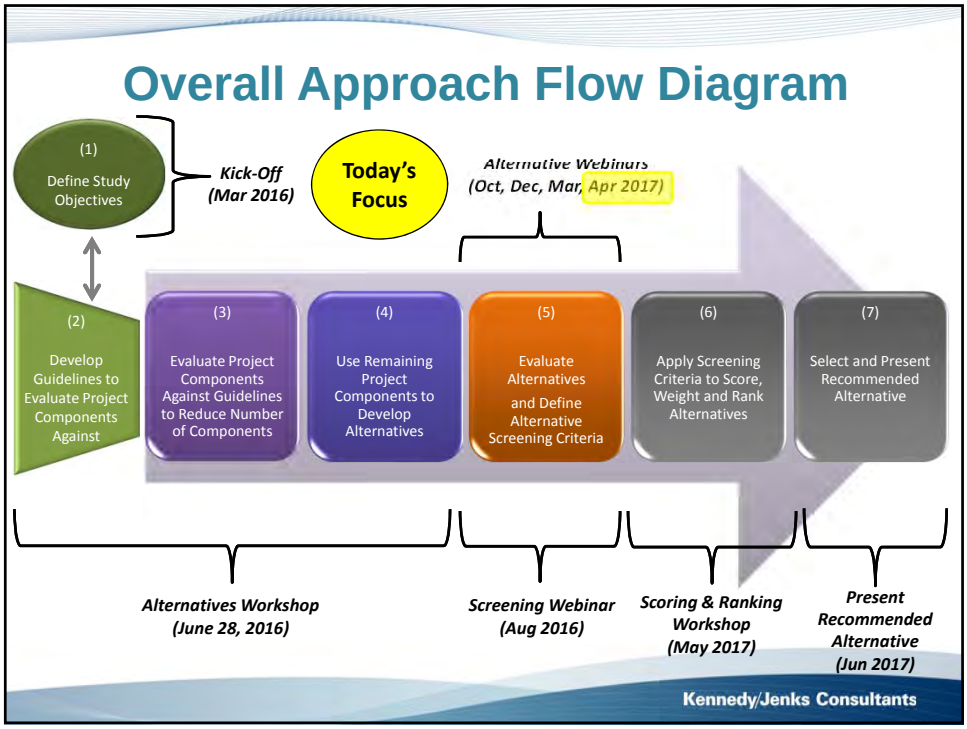
Alternatives Webinar Part 4

April 27, 2017



## Agenda

- Approach & Objective
- Regional GRRP Concept
- Regional Recycled Water Supply
- GRR Treatment Requirements and Regional Considerations
- Santa Margarita Groundwater Basin (SMGB)
  - Initial Injection Capacity and Siting Study Results
- Alternative 8a/8b Analysis
- Preliminary Cost Comparison
- Open Discussion
- Scoring and Weighting Discussion




## Alternatives Webinar Objective

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

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## Project Components

Today's Focus

6 Types of Reuse

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

4 Types of Treatment

- Secondary
- On-Site Filtration
- Tertiary
- Advanced Treatment (Purified)

3 Sources of Water

- Santa Cruz WWTF
- Local Raw Wastewater
- Scotts Valley

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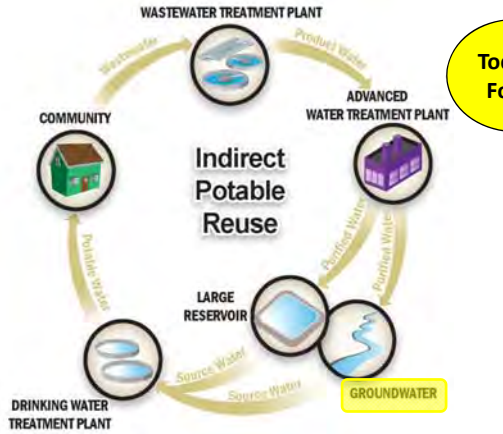
## Recycled Water Market: Indirect Potable Reuse




GRR = Groundwater Replenishment Reuse

Today's Focus

- Exploring GRR in two basins
  - Santa Cruz Mid County Basin
  - Santa Margarita

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# Regional GRR Concept

- **Description:** Regional AWTF to produce purified water for groundwater replenishment in the Santa Margarita Groundwater Basin. Utilize existing or new production wells to serve Santa Cruz, SVWD, SLVWD and SqCWD (or in parallel to an independent SqCWD GRRP)
- **Source:** Santa Cruz WWTF + Scotts Valley WRF
- **Project Size:** Groundwater recharge based on injection and extraction capacity
- **Uses:** Groundwater recharge only
- **Major Facilities:** AWTF, conveyance and distribution pipelines, pump stations, injection wells, production wells, brine line

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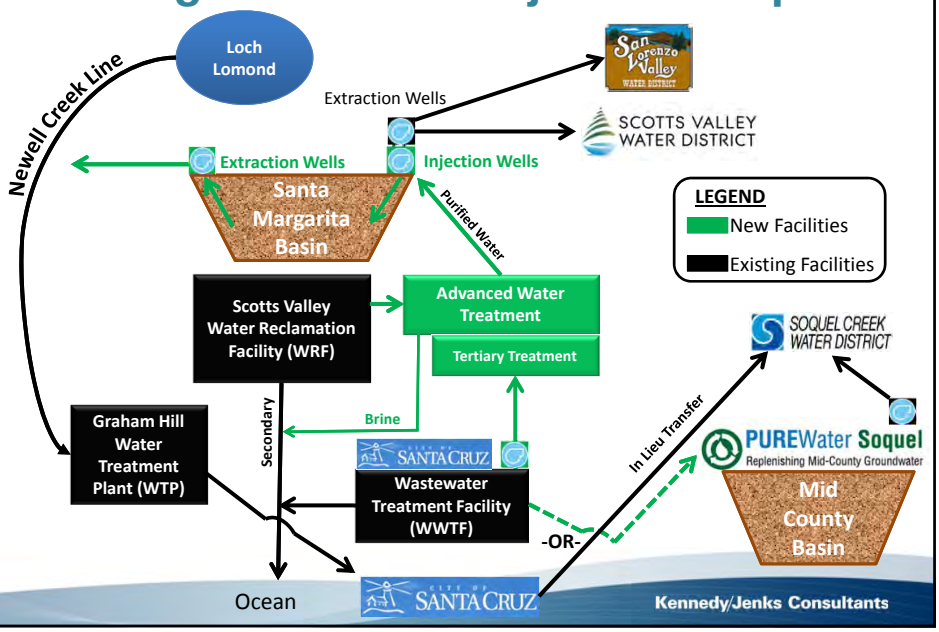
# Regional GRR Project Concept

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# City WWTF Supply for a Regional GRRP

*(assuming independent SqCWD GRRP)*

| Total SC WWTF Supply | | SC WWTF In-Plant Demand | | SqCWD GRRP Demand | | Secondary Effluent Available | Purified Water Produced |
|---|---|---|---|---|---|---|---|
| Average Daily Dry Weather Flow[1] (mgd) | | Year-Round In-plant Use + La Barranca [2] (mgd) | | Year-Round Secondary Effluent (mgd) | | after meeting other Demands (mgd) | Based on assumed AWPF Recovery Rate[3] |
| 6.1 | − | 0.25 | − | 1.7 | = | 4.2 → | 3.2 |

Brine

[1] Based on June 2015 flow data
[2] Assumes no additional NPR demands in Santa Cruz will be served
[3] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

Same as assumed Available City WWTF for Alts 3 through 7 (IPR/DPR)

# City WWTF Supply for a Regional GRRP

*(assuming no SqCWD GRRP)*

| Total SC WWTF Supply | | SC WWTF In-Plant Demand | | SqCWD GRRP Demand | | Secondary Effluent Available | Purified Water Produced |
|---|---|---|---|---|---|---|---|
| Average Daily Dry Weather Flow[1] (mgd) | | Year-Round In-plant Use + La Barranca [2] (mgd) | | Year-Round Secondary Effluent (mgd) | | after meeting other Demands (mgd) | Based on assumed AWPF Recovery Rate[3] |
| 6.1 | − | 0.25 | − | 0 | = | 5.9 → | 4.5 |

Brine

[1] Based on June 2015 flow data
[2] Assumes no additional NPR demands in Santa Cruz will be served
[3] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

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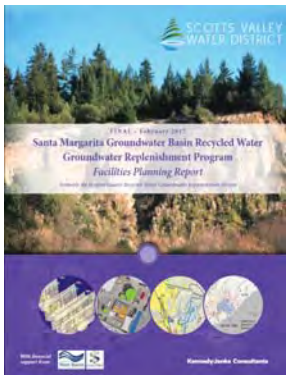
## SVWD WWTF Supply for a Regional GRRP

- Per the SVWD Facilities Planning Report (K/J 2017)
  - AWPF Treatment design capacity = 1.0 mgd for peak month
  - Average annual flow of product (purified water) = 0.5 mgd
  - After meeting existing RW demand + Pasatiempo GC secondary effluent needs there is little available supply in the summer
  - Winter supply is greater, thus the AWPF is sized to meet winter flows

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## Regional AWPF Capacity GRRP Alternatives

| Treatment Design Capacity | Alt 8a Regional *(no SqCWD GRRP)* | Alt 8b Regional *(independent SqCWD GRRP)* | Assumptions |
|---|---|---|---|
| From Santa Cruz WWTF Secondary Flow | 4.5 | 3.2 | Based on available secondary effluent with assumed AWPF Recovery Rate[1] |
| From Scott Valley WRF Tertiary Flow | 1.0 | 1.0 | Based on peak month treatment capacity in winter months when NPR demand is low. |
| **Treatment Production at Regional AWPF** | **5.5** | **4.2** | This will be the aver annual volume recharged into the groundwater basin (assuming adequate available capacity in the SMGB). |

Regional Alternatives: Alt 8a Alt 8b

[1] Assumes MF/UF recover rate of 90% and RO recovery rate of 85%

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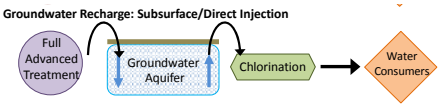
# GRR Treatment Requirements Direct Injection

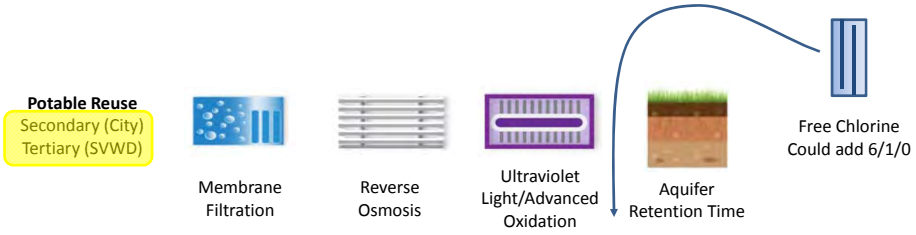
- IPR regulations were finalized June 18, 2014
  - Reduction Credits = 12/10/10 microorganism removal,
  - Response Retention Time = ≥ 2 months
  - Recycled Water Contribution ~ 100%
- Requires Full Advanced Treatment (RO + AOP)




- Other requirements (Total N, TOC, NDMA, CECs, and other GW water quality objectives from Basin Plan)

Summary of requirements for Alts 3 & 4; presented in Webinar Part 3

# GRRP Treatment Train

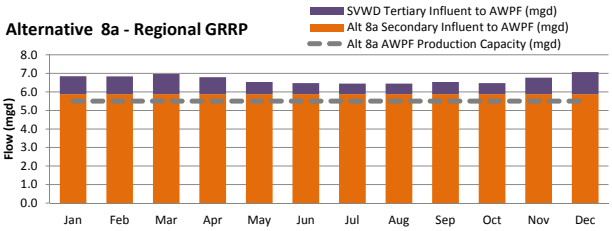



| Log Removal | MF | RO | UV/AOP | RT | Total |
|---|---|---|---|---|---|
| Virus | 0 | 1.5 – 2 | 6 | 4 - 6 | 11.5 – 13.5 |
| *Giardia* | 4 | 1.5 – 2 | 6 | 0 | 11.5 – 12 |
| *Cryptosporidium* | 4 | 1.5 – 2 | 6 | 0 | 11.5 – 12 |

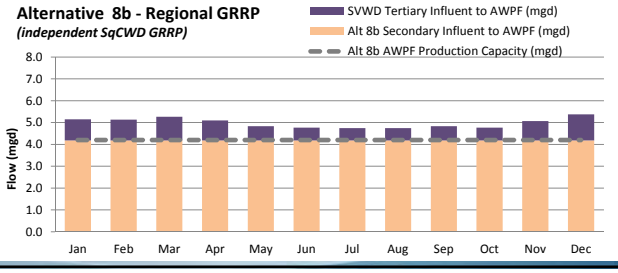
Summary of Treatment Train for Alts 3 & 4; presented in Webinar Part 3

# Regional Treatment Considerations

- Influent to the AWPF is combination of secondary (City) and tertiary (SVWD)




Tertiary Effluent from SVWD is ~ 12% of the inflow to the AWPF




Tertiary Effluent from SVWD is ~ 16% of the inflow to the AWPF

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# Regional Treatment Considerations

- Tertiary effluent comprising 12-16% of Inflow
  - No change to treatment processes
  - Potential for reduced fouling of membranes
    - ✓ lower energy requirements
    - ✓ reduced membrane replacement
- Increased AWPF production capacity
  - Benefit from economy of scale to bring capital cost down
    - ✓ Reduced duplication of facilities
    - ✓ Regional distribution of site development costs
    - ✓ Reduced building costs, also distributed regionally (i.e. admin, controls, etc)

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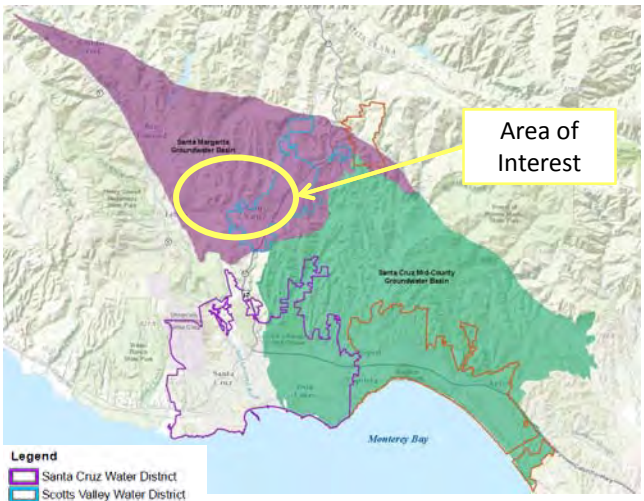
# Groundwater Basins

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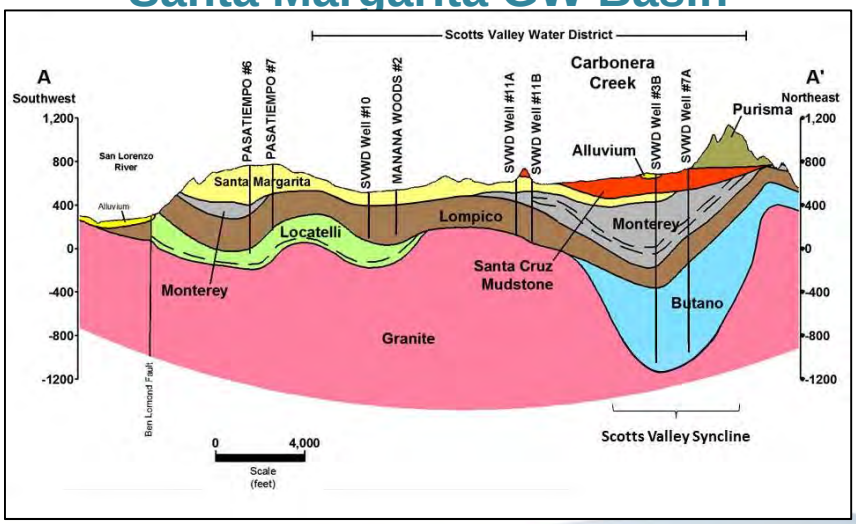
# Recharge the Lompico Aquifer of the Santa Margarita GW Basin

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## SMGB Injection Capacity and Siting Study Approach

- Perform a conceptual-level analysis of injection well capacity and siting for a GRRP in the SMGB
- Utilize existing MODFLOW Model of SMGB
- Methodology for estimate production and specific capacity
- Identify potential sites for injection and extraction
- Estimate injection rate and travel time to extraction
- Meet minimum of 6-month travel time from injection and extraction wells

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## SMGB Well Siting Study

- Proposed Well Locations Based on Preliminary Siting Study from Pueblo


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# SMGB Hydrogeology Assumptions

- Injection/Extraction Rates based on preliminary estimates from Pueblo (**Scenario 1**)

| Potential NEW Well Sites | Est Injection Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| SV1 | 150 | 0.22 |
| SV2 | 205 | 0.30 |
| SV3 | 200 | 0.29 |
| SV4 | 430 | 0.62 |
| SV5 | 250 | 0.36 |
| SV6 | 190 | 0.27 |
| SV7 | 205 | 0.30 |
| SV8 | 50 | 0.07 |
| SV9 | 207 | 0.30 |
| **Total** | **1,887** | **2.72** |

| Potential SVWD FPS Well Sites | Est Injection Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| INJ Well #3 | 120 | 0.2 |
| 11A | 120 | 0.2 |
| 11B | 120 | 0.2 |
| **Total** | **360** | **0.6** |

Based on SMGB Prior Model Runs for SVWD FPS for 1.0 mgd purified water production capacity

Insufficient to meet remaining purified water production of 4.5 mgd or 3.2 mgd

# SMGB Hydrogeology Assumptions

- Injection/Extraction Rates based on injection rate on percentage of production – 25% (**Scenario 2**)

| Potential NEW Well Sites | Est Injection Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| SV1 | 328 | 0.47 |
| SV2 | 422 | 0.61 |
| SV3 | 235 | 0.34 |
| SV4 | 250 | 0.36 |
| SV5 | 390 | 0.56 |
| SV6 | 390 | 0.57 |
| SV7 | 300 | 0.43 |
| SV8 | 438 | 0.63 |
| SV9 | 218 | 0.32 |
| **Total** | **11,890** | **4.28** |

| Potential SVWD FPS Well Sites | Est Injection Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| INJ Well 3 | 120 | 0.2 |
| 11A | 120 | 0.2 |
| 11B | 120 | 0.2 |
| **Total** | **360** | **0.6** |

Based on SMGB Prior Model Runs for SVWD FPS for 1.0 mgd purified water production capacity

sufficient to meet remaining purified water production of 4.5 mgd or 3.2 mgd

# SMGB Hydrogeology Assumptions

- Injection/Extraction Rates based on injection rate on percentage of production of 25% and added 5 new production wells (**Scenario 3**)

| Potential NEW Well Sites | Est Injection Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| SV1 | 328 | 0.47 |
| SV2 | 422 | 0.61 |
| SV3 | 235 | 0.34 |
| SV4 | 250 | 0.36 |
| SV5 | 390 | 0.56 |
| SV6 | 390 | 0.57 |
| SV7 | 300 | 0.43 |
| SV8 | 438 | 0.63 |
| SV9 | 218 | 0.32 |
| **Total** | **11,890** | **4.28** |

| Potential SVWD FPS Well Sites | Est Extraction Flow Rate (GPM) | Est Injection Flow Rate (MGD) |
|---|---|---|
| 5 Wells | 594 | 0.86 |
| **Total** | **360** | **4.28** |

New Extraction Rates = Proposed Injection Rates (SV-1 through SV-9)

sufficient to meet remaining purified water production of 4.5 mgd or 3.2 mgd

# SMGB
# Injection and Production Wells

ROI – Radius of Influence

- Est. time a particle/drop of water would take 6 months to travel from Injection Well

ROI – Radius of Influence

- Est. time a particle/drop of water would take 6 months to travel from Existing Production Well

ROI – Radius of Influence

- Est. time a particle/drop of water would take 6 months to travel from Proposed Production Well

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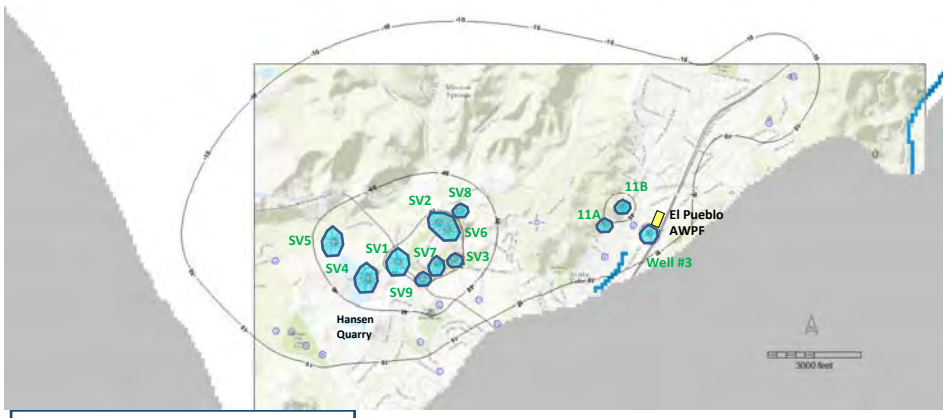
# Preliminary "Scenario 1" Results for ALL Sites Considered




RESULTS:
- The injection well travel time shape represents 6 months

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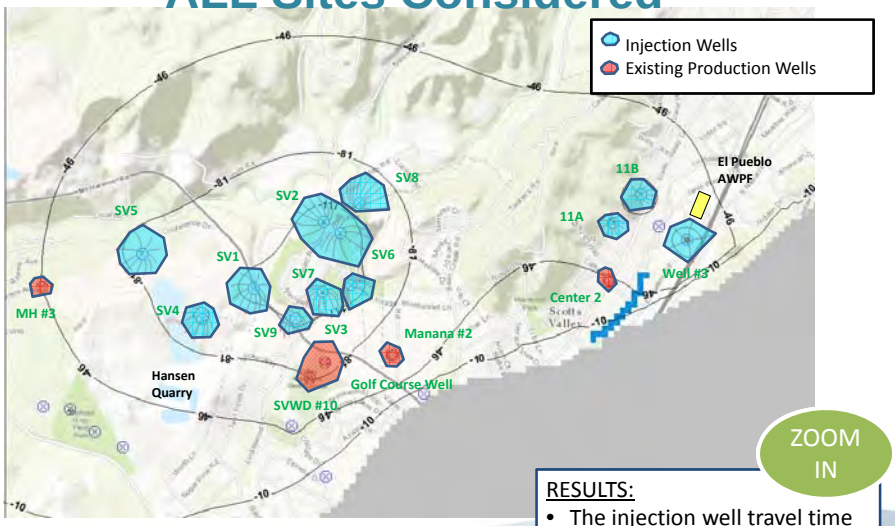
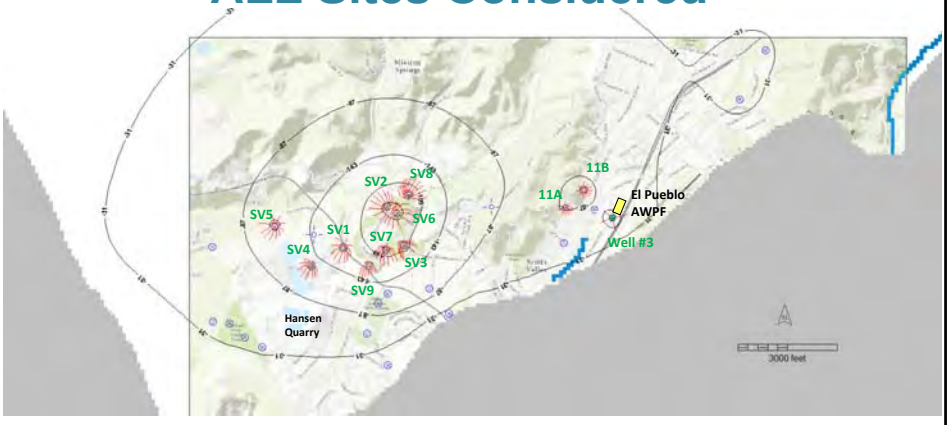
# Preliminary "Scenario 1" Results for ALL Sites Considered




ZOOM IN

RESULTS:
- The injection well travel time shape represents 6 months

# Preliminary "Scenario 2" Results for ALL Sites Considered




RESULTS:
- The injection well travel time shape represents 6 months

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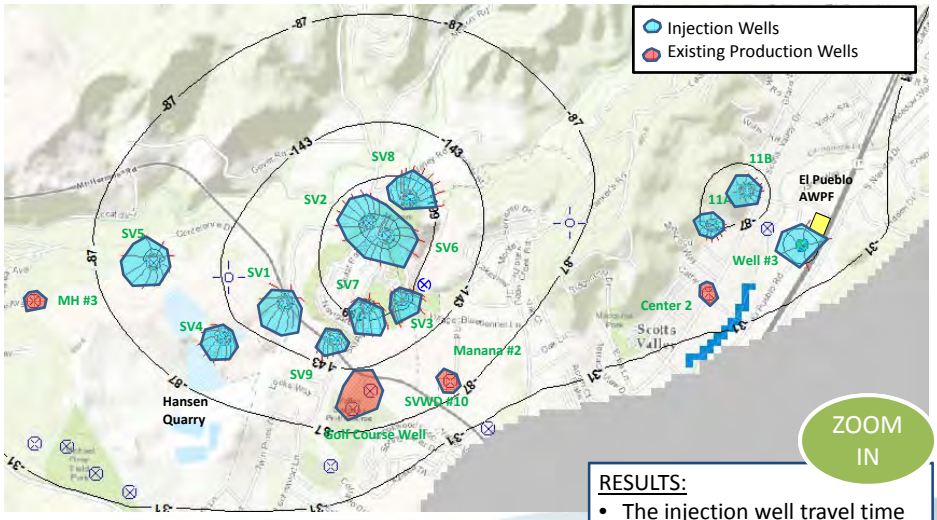
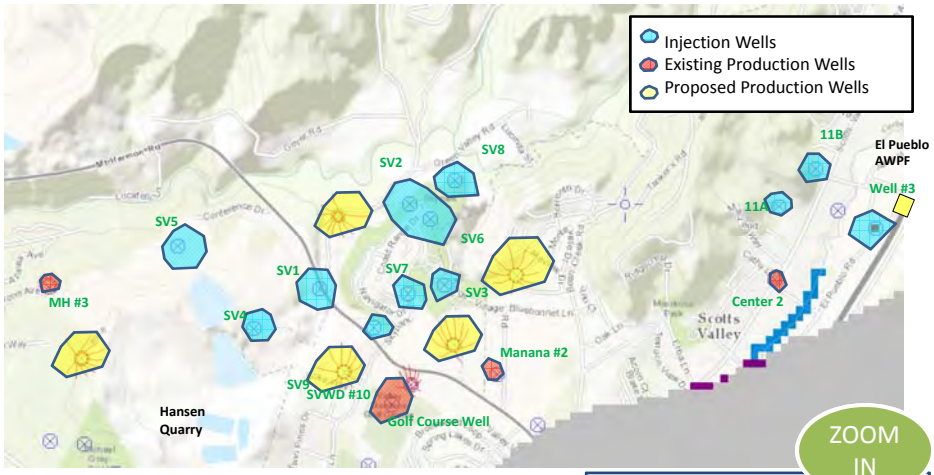
# Preliminary "Scenario 2" Results for ALL Sites Considered




ZOOM IN

RESULTS:
- The injection well travel time shape represents 6 months

# Preliminary "Scenario 3" Results for ALL Sites Considered




RESULTS:

- The injection well travel time shape represents 6 months

# SMGB
# Injection Capacity and Siting Study

- SVWD FPS – Repurpose Existing Wells for Injection
  - 11A/B + Inj Well #3 (Recommended Project)
  - 3 Wells = 0.6 mgd
- New Injection Wells to Serve City + SqCWD
  - SV1 – SV9 (Siting Study Identified by Pueblo)
  - Scenario 1 Injection Rate = Approx. 0.3 mgd per well location
    - ✓ 9 Wells = 2.72 mgd
    - ✓ 2 to 6 additional sites needed to utilize Alt 8a and 8b Purified Water Supply
  - Scenario 2 Injection Rate = Approx. 0.5 mgd per well location
    - ✓ 9 Wells = 4.28 mgd
  - Scenario 3 Injection Rate
    - ✓ 9 Injection Wells = 4.28 mgd (0.48 mgd/well)
    - ✓ 5 Extraction Wells = 4.28 mgd (0.86 mgd/well)

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# SMGB
# Production Capacity and Siting Study

- SVWD FPS
  - Utilize existing production wells to capture replenished purified water
- Existing Production Wells
  - Next model run simulate interaction btw injection and extraction
- New Production Wells to Serve City (+ SqCWD)
  - Extraction Rate = Approx. 0.86 mgd per well location
  - Alt 8a (4.5 mgd supply) = Need 5 NEW well sites
  - Alt 8b (3.2 mgd supply) = Need 4 NEW well sites

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# El Pueblo Treatment Site

Facilities shown are for a 1 mgd AWPF


SVWD Facilities Planning Report (K/J 2017)

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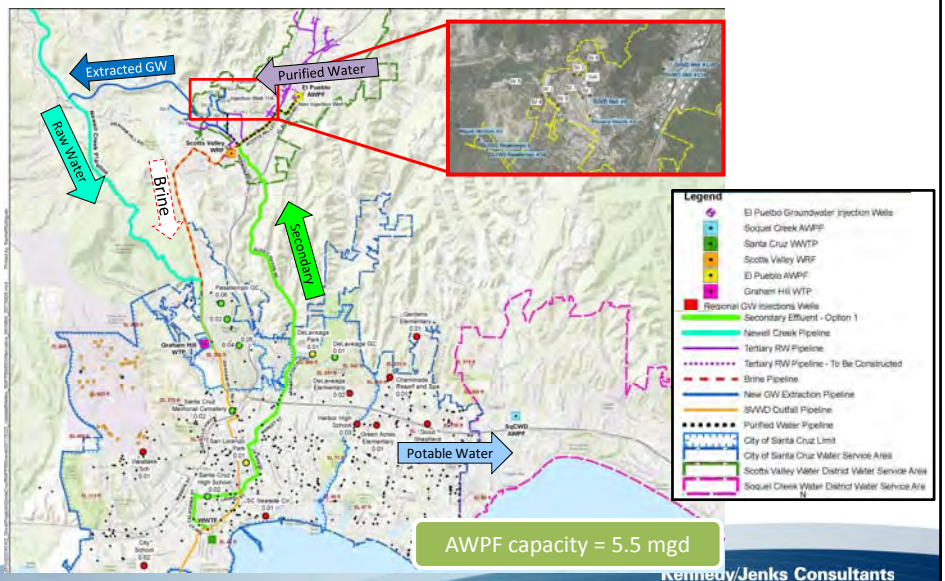
## Alternative 8a: 4-Way Regional GRR Project

### (to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley)




AWPF capacity = 5.5 mgd

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## Alternative 8a: 4-Way Regional GRR Project

### (to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley)

| | Facilities |
|---|---|
| NPR Demand | 0 MGD |
| City Demand | 3.2 MGD AWT Product Water |
| SqCWD Demand | 1.3 MGD AWT Product Water |
| SVWD Demand | 1.0 MGD AWT Product Water Capacity (0.5 mgd ave annual) |
| Treatment Capacity | 5.5 MGD |
| Pipelines | 8.7 miles – 16” (secondary to El Pueblo)<br>6.7 miles – 16” (purified to injection and from extraction)<br>4.5 miles – 8” (brine to SVWD outfall at Pasatiempo) |
| Pump Stations | WWTP PS – 4,100 gpm, 2,300 HP<br>GW PS from Production Wells to Newell Crk – 3,200 gpm, 800HP |
| New Wells | 9 injection (+ 2 backup); 11 monitoring; 5 production |
| Customer Sites | 0 |

For pipeline capacity, no peak hour factor applied.

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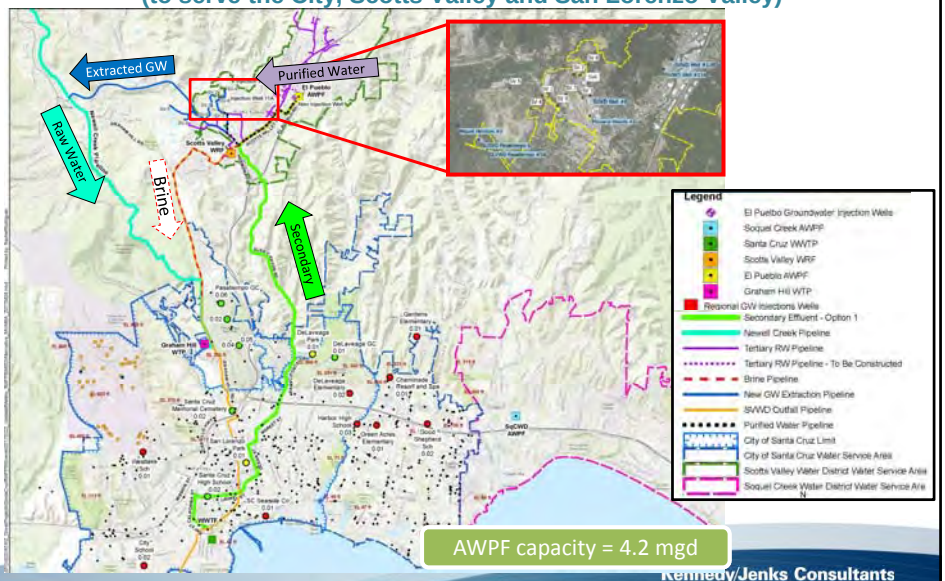
## Alternative 8b: 3-Way Regional GRR Project

(to serve the City, Scotts Valley and San Lorenzo Valley)




AWPF capacity = 4.2 mgd

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## Alternative 8b: 3-Way Regional GRR Project

(to serve the City, Scotts Valley and San Lorenzo Valley)

| | Facilities |
|---|---|
| NPR Demand | 0 MGD |
| City Demand | 3.2 MGD AWT Product Water |
| SqCWD Demand | 0 MGD AWT Product Water |
| SVWD Demand | 1.0 MGD AWT Product Water Capacity (0.5 mgd ave annual) |
| Treatment Capacity | 4.2 MGD |
| Pipelines | 8.7 miles – 18" (secondary to El Pueblo)<br>6.7 miles – 14" (purified to injection and from extraction)<br>4.5 miles – 6" (brine to SVWD outfall at Pasatiempo) |
| Pump Stations | WWTP PS – 2,900 gpm, 710 HP<br>GW PS from Production Wells to Newell Crk – 2,300 gpm, 260HP<br>No Brine PS at El Pueblo AWPF needed |
| New Wells | 7 injection (+ 2 backup); 9 monitoring; 4 production |
| Customer Sites | 0 |

For pipeline capacity, no peak hour factor applied.

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# Alternative 8a and 8b

| Item No. | Description | Qty | Units | Total Costs $/Unit | Total Costs Total Capital Cost |
|---|---|---|---|---|---|
| **Facility Capital Costs** | | | | | |
| 1.0 | Treatment | | | | 20,974,852 |
| 1.1 | Microfiltration | 6.5 | MGD | 1,575,000 | 10,191,176 |
| 1.2 | Reverse Osmosis | 5.5 | MGD | 2,315,600 | 12,735,800 |
| 1.3 | UV/AOP | 5.5 | MGD | 87,500 | 481,250 |
| 1.4 | Free Chlorine | 5.5 | MGD | 402,500 | 2,213,750 |
| 1.5 | Post Treatment and Chemical Handling | 5.5 | MGD | 646,100 | 3,553,550 |
| 1.6 | Building | 5.5 | MGD | 1,250,000 | 6,875,000 |
| 1.7 | Remove SqCWD's portion of treatment | 1.30 | MGD | (8,954,641) | (8,521,044) |
| 1.8 | Remove SVWD's portion of treatment | 1.00 | MGD | (10,954,641) | (10,954,641) |

Proportional Cost Sharing
- ✓ Treatment
- ✓ Pipelines
- ✓ Pump Station
- ✓ Wells

| Project Partner | FPR AWPF Alternative Costs ($mil) | Santa Cruz FPR AWPF Unit Cost ($mil) | Santa Cruz FPR AWPF Flow Based Cost ($mil) | Based on AWPF Capacity (mgd) |
|---|---|---|---|---|
| SqCWD | $6.9 - $8.8 | $9.3 | $8.5 | 1.3 mgd |
| SVWD | $6.9 - $7.6 | $7.2 | $6.6 | 1.0 mgd |

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# Alternative 8a and 8b

| Item No. | Description | Qty | Units | Total Costs $/Unit | Total Costs Total Capital Cost |
|---|---|---|---|---|---|
| 2.0 | Pipelines | | | | 18,058,441 |
| 2.1 | Secondary Effluent Pipeline from SC WWTP to El Pueblo AWPF | 45,792 | LF | 270 | 12,363,840 |
| | Pipeline Constructability (Along Roads) | | | 10% | 1,236,384 |
| | Microtunneling (Trenchless) | 0 | LF | 700 | 0 |
| | Major Intersections | 0 | LF | 713 | 0 |
| 2.2 | Purified Water Pipeline from El Pueblo AWPF to Regional GW Injection Wells | 10,100 | LF | 240 | 2,424,000 |
| | Pipeline Constructability (Along Roads) | | | 10% | 242,400 |
| | Microtunneling (Trenchless) | 0 | LF | 700 | 0 |
| 2.3 | Extracted GW Pipeline from Regional GW Injection Wells to Existing Newell Creek Pipeline | 25,538 | LF | 240 | 6,127,920 |
| | Pipeline Constructability (Along Roads) | | | 10% | 612,792 |
| | Microtunneling (Trenchless) | 0 | LF | 700 | 0 |
| | Major Intersections | 0 | LF | 634 | 0 |
| 2.4 | Brine pipeline from El Pueblo AWPF to SVWD outfall pipeline at Pasatiempo Golfcourse | 23,684 | LF | 112 | 2,652,608 |
| | Pipeline Constructability (Along Roads) | | | 10% | 265,261 |
| | Microtunneling (Trenchless) | 0 | LF | 700 | 0 |
| | Major Intersections | 0 | LF | 317 | 0 |
| 2.5 | Remove SqCWD's share of pipeline costs | | | | |
| | Secondary + Purified + Extracted GW | 1.30 | MGD | (5,112,741) | (6,646,563) |
| | Drinking Water Pipeline | | | | 0 |
| | Brine Pipeline | 1.30 | MGD | (530,521) | (689,678) |
| 2.6 | Remove SVWD's share of pipeline costs | | | | |
| | Brine Pipeline | 1.00 | MGD | (530,521) | (530,521) |

Proportional Cost Sharing
- ✓ Treatment
- ✓ Pipelines
- ✓ Pump Station
- ✓ Wells

Remove Flow Based Proportional Costs

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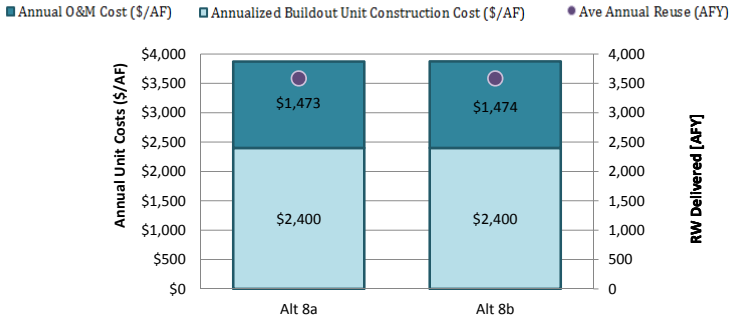
# Alternative 8a and 8b




| | 4-way GRRP | 3-way GRRP |
|---|---|---|
| SqCWD's Share ($mil) | $18.6 | $0 |
| SVWD's Share($mil) | $7.2 | $7.2 |
| **Santa Cruz's Share ($mil)** | **$150.6** | **$146.1** |

SqCWD Proportional Cost Sharing includes: Treatment, Pipelines (2o, purified, GW and brine), Pump Stations, and Wells based on 1.3 mgd

SVWD Proportional Cost Sharing includes: Treatment and Brine based on 1.0 mgd

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# Alt 8 – Regional GRR Project

**Other Considerations**

- Maximizes beneficial reuse of wastewater in the Region
- Operational complexity for treatment
- Significant energy for treatment and conveyance
- Level of cooperation and coordination required between multiple agencies
- Interagency infrastructure challenges (ownership, operations, construction, etc)
- Potential for cost-sharing and pursuing funding as a Region
- Water rights and transfer agreements
- Future studies needed

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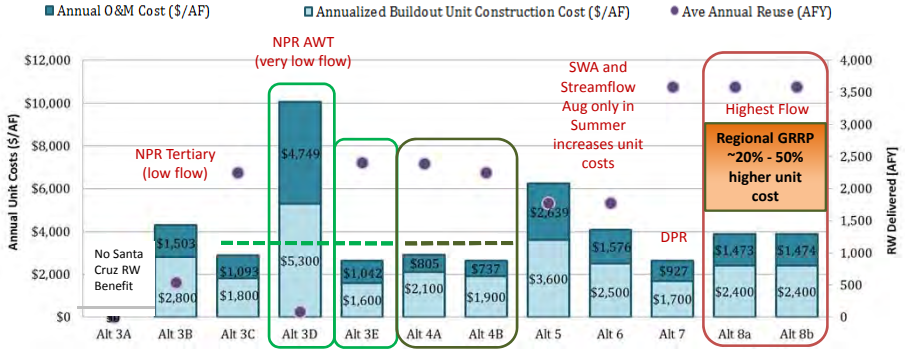
## Alternative 8 Evaluation
## Preliminary Summary of Eng Opinion of Probable Costs




Santa Cruz Participation in a SqCWD-led GRR | Santa Cruz Led GRRP | SWA, SDA, DPR | Regional GRRP

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Capital Cost ($mil) | Not incl ~~$20~~ | $25.9 | $68.6 | $7.6 | $60.5 | $85.1 | $74.0 | $111.2 | $77.7 | $107.6 | $150.2 | $146.1 |

Preliminary capital & annualized costs

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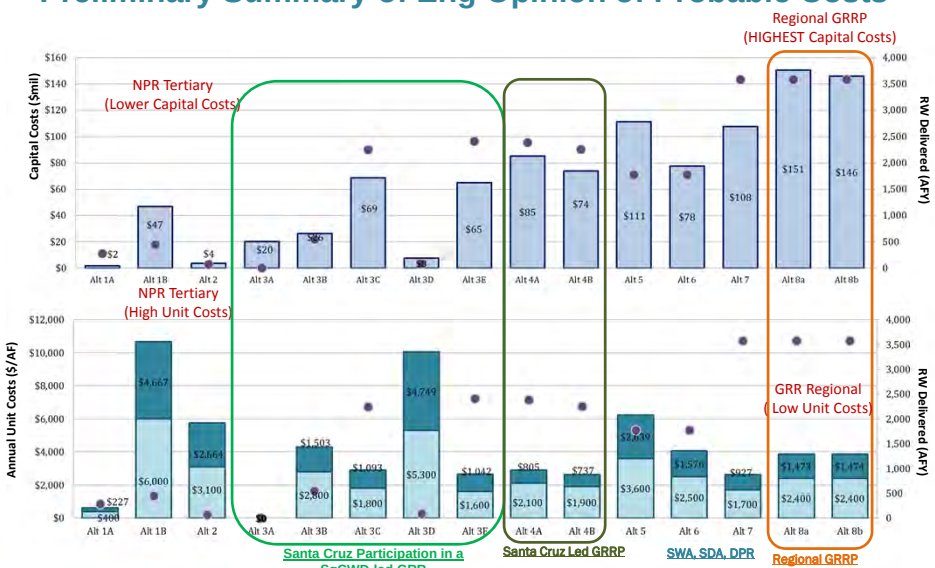
## Comparison of Alternatives 1 to 8 Evaluation
## Preliminary Summary of Eng Opinion of Probable Costs




Santa Cruz Participation in a SqCWD-led GRR | Santa Cruz Led GRRP | SWA, SDA, DPR | Regional GRRP

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# NPR Alternatives Evaluation
# Summary of QUANTITATIVE Results

| Alternative | | Sub Alt | Description | Treatment Level | Recycled Water Delivered | | | | | | Estimated Costs | | | Energy / Others | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regional Ave Annual Reuse (AFY) | Regional Average Annual Flow (MGD) | RW Use in Santa Cruz (AFY) | RW Use in Santa Cruz (MGD) | Peak Season Deliveries (AF in Summer - June) | Peak Hourly Flow (MGD) | Estimated Construction Cost ($mil) | Annual O&M Cost ($mil/yr) | Total Annual Cost ($/AF) | Unit Energy of RW Delivered (KWH/AF) | Est O&M GHG Emissions (MTCO2/yr) | Total Pipeline Length (ft) | Total Pipeline Length (miles) | Pipeline GHG Emissions (MTCO2) | # of Non-Pipeline Facility Sites (#) | Est Non-Pipeline Footprint (SF) |
| Non Potable Reuse | Alternative 1 – Centralized Non-Potable Reuse | Alt 1A | Santa Cruz PWD Phase 2 Project | 3° | 282 | 0.25 | 282 | 0.25 | 44 | 1.4 | $2 | $0.1 | $627 | 733 | 39 | 2,429 | 0 | 0.93 | 2 | 2,100 |
| | | Alt 1B | Maximize tertiary treatment at the SC WWTF | 3° | 807 | 0.72 | 807 | 0.72 | 126 | 4.0 | $47 | $2.1 | $49,421 | 12,104 | 1,867 | 89,466 | 17 | 34 | 4 | 4,600 |
| | | | Phase 1 | | 340 | 0.30 | 340 | 0.30 | 44 | 1.4 | $20 | $1.2 | $40,124 | 8,219 | 534 | 16,103 | 3 | 6 | 1 | 1,533 |
| | | | Phase 2 | | 176 | 0.16 | 176 | 0.16 | 51 | 1.7 | $6 | $0.2 | $2,819 | 76 | 3 | 19,934 | 4 | 8 | 0 | 1,533 |
| | | | Phase 3 | | 146 | 0.13 | 146 | 0.13 | 42 | 1.4 | $15 | $0.6 | $4,210 | 3,746 | 104 | 30,749 | 6 | 12 | 1 | 1,533 |
| | | | Phase 4 | | 146 | 0.13 | 146 | 0.13 | 42 | 1.4 | $6 | $0.2 | $2,268 | 63 | 2 | 22,680 | 4 | 9 | 1 | 1,533 |
| | Alternative 2 – Decentralized Non-Potable Reuse | Alt 2 | UC Santa Cruz | 3° | 71 | 0.06 | 71 | 0.06 | 20 | 0.2 | $4 | $0.2 | $5,764 | 1,040 | 14 | 10,160 | 2 | 4 | 3 | 4,920 |
| SqCWD Led GRRP | Alternative 3 – Santa Cruz Participation in SqCWD led GRRP | Alt 3A | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (DO NOT serve NPR users along the way) | 2° + filter | 1,903 | 1.70 | 0.00 | 0.00 | 297 | 3.2 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| | | Alt 3B | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 3° | 2,448 | 2.19 | 545 | 0.49 | 417 | 4.5 | $26 | $0.8 | $4,303 | 1,367 | 142 | 52,601 | 10 | 20 | 5 | 3,520 |
| | | Alt 3C | Send additional secondary effluent from SCWWTF to SqCWD AWTF (DO NOT serve NPR users along the way) and deliver purified water from SqCWD AWTF to recharge Santa Cruz GWRB (serve NPR users along the way back) | AWT | 3,704 | 3.31 | 2,248 | 2.01 | 577 | 6.2 | $69 | $2.5 | $2,893 | 1,991 | 855 | 66,921 | 13 | 26 | 17 | 17,100 |
| | | Alt 3D | Send advanced treated RW from SCWWTF to SqCWD, (serve NPR users along the way) | AWT | 1,538 | 1.37 | 82 | 0.07 | 295 | 9.5 | $8 | $0.4 | $10,049 | 2,507 | 39 | 59,004 | 11 | 23 | 3 | 440 |
| | | Alt 3E | Send advanced treated RW from SCWWTF to SqCWD, (GWRB, and NPR along the way) | AWT | 3,866 | 3.45 | 2,410 | 2.15 | 602 | 6.5 | $65 | $3 | $2,642 | 2,073 | 954 | 60,477 | 11 | 23 | 16 | 16,000 |
| City Led GRRP | Alternative 4 – Santa Cruz GRRP | Alt 4A | Santa Cruz GWRB with AWTF at SCWWTF (Serve NPR users along the way) | AWT | 2,389 | 2.13 | 2,389 | 2.13 | 372 | 4.0 | $85 | $2 | $2,905 | 1,370 | 625 | 45,421 | 9 | 17 | 14 | 14,680 |
| | | Alt 4B | Santa Cruz GWRB with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | AWT | 2,254 | 2.01 | 2,254 | 2.01 | 351 | 3.8 | $74 | $2 | $2,637 | 1,260 | 543 | 14,096 | 3 | 5 | 13 | 13,510 |
| SWA | Alternative 5 – Surface Water Augmentation ( SWA) in Loch Lomond Reservoir | Alt 5 | Advanced treatment of Santa Cruz effluent for bending in Loch Lomond Reservoir (DO NOT serve NPR users along the way) | AWT | 1,777 | 3.20 | 1,777 | 3.20 | 559 | 6.0 | $111 | $5 | $6,239 | 8,385 | 2,839 | 67,903 | 13 | 26 | 3 | 19,300 |
| Stream Aug | Alternative 6 – Streamflow Augmentation | Alt 6 | AWTF of secondary effluent with discharge to the San Lorenzo River d/s of Tait Street Diversion (DO NOT serve NPR users along the way) | AWT | 1,777 | 3.20 | 1,777 | 3.20 | 559 | 6.0 | $78 | $3 | $4,076 | 2,682 | 910 | 13,482 | 3 | 5 | 3 | 19,300 |
| DPR | Alternative 7 – Direct Potable Reuse | Alt 7 | Raw Water Blending at Graham Hill WTP (via Coast PS) | AWT | 3,584 | 3.20 | 3,584 | 3.20 | 559 | 6.0 | $108 | $3 | $2,627 | 2,121 | 1,452 | 3 | 6 | 12 | 6 | 136,800 |
| Regional GRR | Alternative 8 – Regional GWRR Project | Alt 8a | Regional GRRP to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | AWT | 5,600 | 5.00 | 3,584 | 3.20 | 559 | 6.0 | 108 | 5 | 3,873 | 2,799 | 1,916 | 105,109 | 20 | 40 | 31 | 25,900 |
| | | Alt 8b | Regional GRRP to serve the City, Scotts Valley and San Lorenzo Valley | AWT | 4,144 | 3.70 | 3,584 | 3.20 | 559 | 6.0 | 146 | 5 | 3,874 | 3,584 | 2,453 | 105,109 | 20 | 40 | 26 | 24,500 |

The Quantitative Results will be used to inform the Qualitative Metrics for Screening, Scoring and Ranking Alternative Projects

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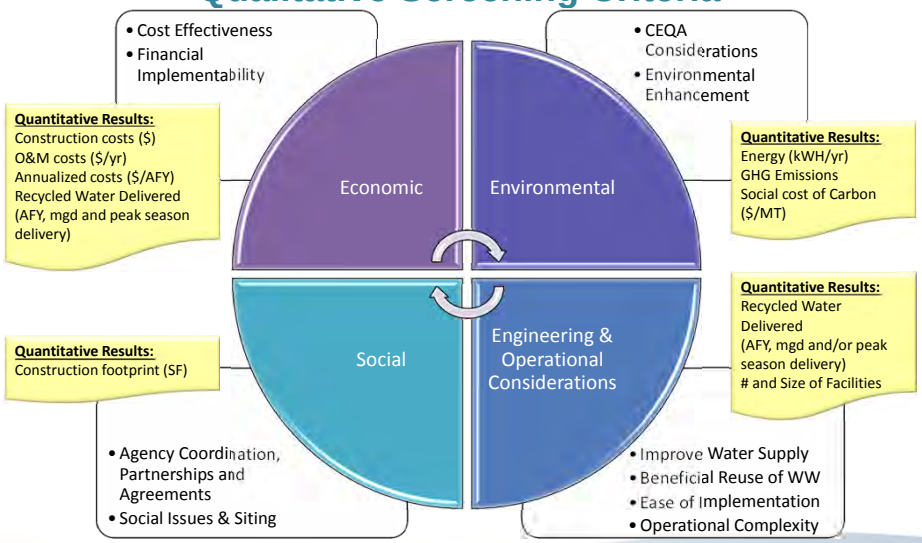
# Quantitative Results and Qualitative Screening Criteria

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## Scoring, Weighting & Ranking Approach

- Alternative projects will be **scored** from 1 to 5 for each criteria
  - ✓ Score = 5 Fully Meets Criteria
  - ✓ Score = 4 Mostly Meets Criteria
  - ✓ Score = 3 Partially Meets Criteria
  - ✓ Score = 2 Somewhat Meets Criteria
  - ✓ Score = 1 Unable to Meet Criteria
- Scores will be **weighted** to provide a preliminary ranking of alternative projects
  - ✓ Weighting for Screening Criteria provided by SCWD and SCPWD
  - ✓ SCWD and SCPWD to provide input on initial scoring
  - ✓ Initial scores to be sent out prior to the next workshop
- Sensitivity Analysis will be performed to explore how **ranking** changes with different weightings

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| Categories | Screening Criteria | Considerations for Assessing Project based on Criteria |
|---|---|---|
| ENGINEERING & OPERATIONAL CONSIDERATIONS | Improve Water Supply | - Ability to fill City supply gap (1.2 BGY or 3,700 AFY), supplement peak season supply with a new source or offset and/or contribute to regional supply |
| | | - Ability to implement Project, with supplies available in a timely manner |
| | Maximize Beneficial Reuse | - Maximizes reuse of wastewater effluent |
| | | - Does not limit future options at the WWTF to fully utilize wastewater effluent |
| | Ease of Implementation | - Regulatory viability and ability to obtain a recycled water permit<br>- Current (DDW and RWQCB) regulatory pathway/approved use |
| | | - Potential construction challenges (#/size of facilities, ROW, utilities, terrain, disturbed/undisturbed area, seismic/sea level rise vulnerability, etc.) |
| | | - Flexibility for phasing and opportunities to expand/transition to a higher yield and/or treatment level. |
| | Operational Complexity | - Source of wastewater and/or type of treatment required for beneficial reuse minimizes impacts to wastewater collections and/or WWTF operations |
| | | - Siting new treatment facilities minimizes short-term impacts on SC WWTF operations (during construction) and long-term impacts (related to facility relocation, off-site location and/or interference with O&M activities) |
| ECONOMIC | Cost Effectiveness | - Economically feasible or cost effective project (relative life cycle unit costs) |
| | Financial Implementability | - Financially implementable project (capital investment does not limit ability to implement other water projects and program) |
| ENVIRONMENTAL | CEQA Considerations | - Potential environmental impacts and mitigation requirements |
| | Environmental Enhancement | - Enhance local and regional ecosystems and environments including rivers, groundwater basins |
| | | - Social cost of carbon compared to other projects and supplies; Relative contribution to climate change (based on GHG emissions) |
| SOCIAL | Agency Coordination, Partnerships and Agreements | - Level of cooperation and coordination required between multiple outside agencies/users<br>- Willingness and interest of anticipated users/partners for cost-sharing |
| | Social Issues & Siting | - Perceived public acceptance and comfort with level of public health and safety associated with reuse |
| | | - Level of impact on local residents for new construction and ongoing maintenance<br>- Land acquisition requirements (property not currently owned by the City) |

# Input on Approach for Scoring

- Solicit SqCWD experience with criteria being scrutinized
- Discuss public perception of scoring by project team
- How to address **Social Issues & Siting** category
  - Perceived public acceptance and comfort with level of public health and safety associated with reuse
  - Level of impact on local residents for new construction and ongoing maintenance
  - Land acquisition requirements (property not currently owned by the City)

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# Sensitivity Analysis

- Use of sensitivity analysis to address variation in different perceptive by artificially increasing weighting for certain categories
- Discuss Weighting Scenarios such as …
  - ✓ Maximize Water Supply & Beneficial Reuse
  - ✓ Minimize Costs
  - ✓ Minimize Implementation Challenges & Minimize Operational Complexity
  - ✓ Maximize Environmental Benefits and Minimize Environmental Impacts
  - ✓ Strive for a Regional Solution

RANKING for Sensitivity Analysis

| Project Partner Weighting | Maximize Water Supply & Beneficial Use | Minimize Implementation Challenges & Operational Complexity | Strive for a Regional Solution |
|---|---|---|---|
| SENSITIVITY RANKING | | | |
| 1 | 2 | 3 | 6 |
| 2 | 1 | 4 | 1 |
| 8 | 5 | 7 | 2 |
| 6 | 7 | 2 | 3 |
| 5 | 8 | 1 | 4 |
| 3 | 3 | 5 | 5 |
| 4 | 4 | 6 | 7 |
| 7 | 5 | 8 | 8 |

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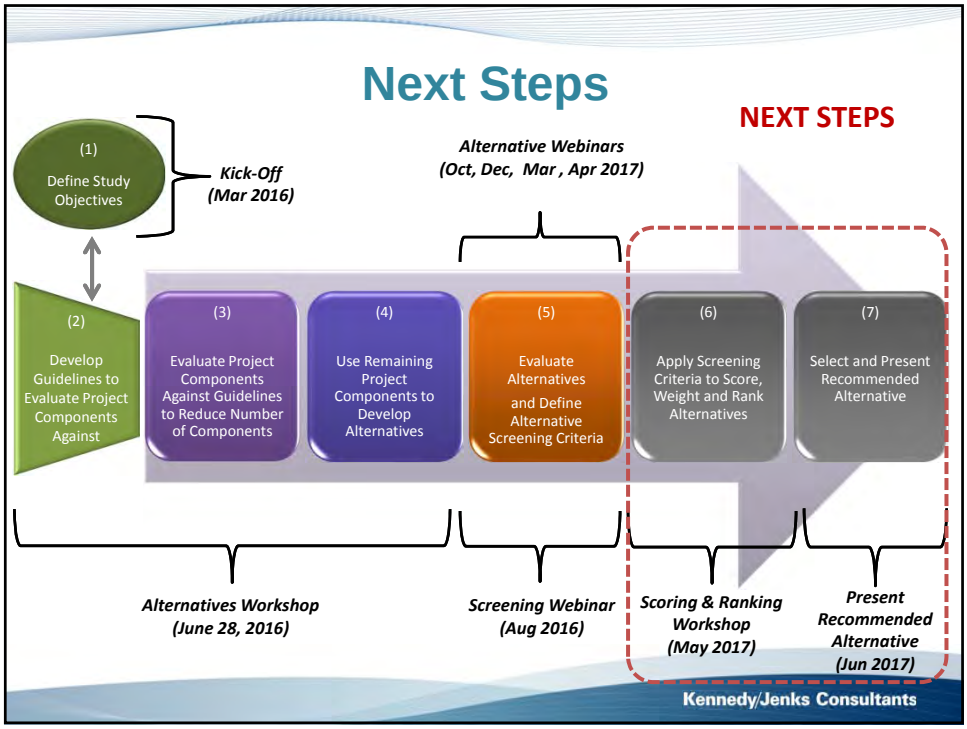


# QUESTIONS


| | | |
|---|---|---|
| Speakers: | Dawn Taffler | DawnTaffler@KennedyJenks.com |
| | Brian Pecson | brianp@trusselltech.com |
| | Eddy Teasdale | EddyTeasdale@KennedyJenks.com |
| | Melanie Tan | MelanieTan@KennedyJenks.com |


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## Santa Cruz Regional
## Recycled Water Facilities Planning Study (RWFPS)

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# Scoring and Ranking Workshop
# 1 June 2017 from 10 am – 12:30 pm

**Location:** 809 Center Street California Street Santa Cruz 95060
*Public Work Conference Room (aka Temp in Finance Room 100)*
*Conf Call - (855) 813-2486 Code – 2484*
Desktop Sharing - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Workshop Objective:** Review alternatives, discuss preliminiminary scoring and ranking, obtain consensus on recommended alternative (or Phased Projects) for further development.

---

**PART I: Overview of Alternatives and Screening Approach** **10:00 am to 10:45 am**

1. High Level Review of Alternatives (maps, facilities and costs) (K/J)
2. Review of Screening Criteria & Guidance (K/J)
3. Approach to Scoring, Weighting and Ranking (adjustments made to Criteria) (K/J)

**PART II: Discuss Preliminary Results and Solicit Input** **10:45 am to 12:30 pm**

4. Discuss Outcome of Sensitivity Analysis (K/J)
    a. Projects that consistently rose to the top and why
    b. Projects that fell to the bottom and why
    c. Criteria most influenced by weighting

5. Finalizing RWFPS (City/All)
    a. Putting sensitivity analysis into perspective when selecting project
    b. Discuss and select what projects will be evaluated in Financial Analysis Phase 1.
    c. Discuss how project alternative section will frame the next steps with regard to further financial analysis, potential to phase projects, potential for other (not selected) projects to be part of a water supply portfolio

6. Next Steps Beyond the RWFPS (City/All)
    a. Parallel projects pursued by different departments/regional entities
    b. Near-term vs Long-term pursuits
    c. Nexus with WSAC Work (Phase 2 work for Corona and Raftelis is creating water supply portfolio(s))

# City of Santa Cruz Recycled Water Facilities Planning Study

## Scoring and Ranking Workshop

## June 1, 2017

Meeting Location: 809 Center Street California Street
Santa Cruz 95060
Conf Call: *(855) 813-2486 Code – 2484*
Desktop Sharing: http://conf.kennedyjenks.com/conference/2484

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## Agenda

- **Today's Workshop**
- **PART I: Overview of Alternatives and Screening Approach**
- **PART II: Discuss Preliminary Results and Solicit Input**

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## Today's Workshop

- **Objective:** Present an overview of alternatives, discuss preliminary scoring and ranking and identify recommended alternative for further development.
- **Goal:** Obtain consensus on recommended alternative (or Phased Projects) for further development.

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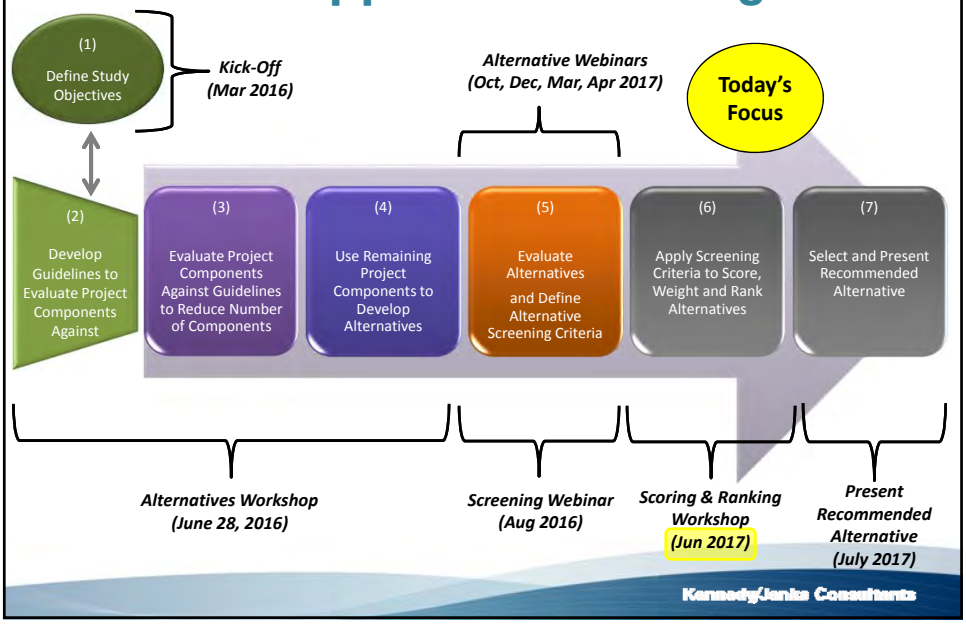
## Overall Approach Flow Diagram

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# PART I:
# Overview of Alternatives and Screening Approach

1. High Level Review of Alternatives
2. Review of Screening Criteria & Guidance
3. Approach to Scoring, Weighting and Ranking



## 1. High Level Review of Alternatives

NPR
- Alternative 1 – Centralized Non-Potable Reuse
- Alternative 2 – Decentralized Non-Potable Reuse

IPR
- Alternative 3 – Santa Cruz Participation in SqCWD-led GRR Project
- Alternative 4 – Santa Cruz GRR Project
- Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir
- Alternative 6 – Streamflow Augmentation

DPR
- Alternative 7 – Direct Potable Reuse

IPR
- Alternative 8 – Regional GRR Project

# Alt 1 - Centralized Non-Potable Reuse

## Alt 1a – PWD Title 22 Upgrade


25,000 gal New CCB
25,000 gal Existing CCB
Up to 142,000 gal Storage

*CCB = Chlorine Contact Basin*

**Description:** Title 22 upgrades at SC WWTF

- **Demand:** 0.25 mgd (280 AFY)
- **Use:** NPR In-plant, truck fill & La Barranca Park
- **Major Facilities:** at SC WWT

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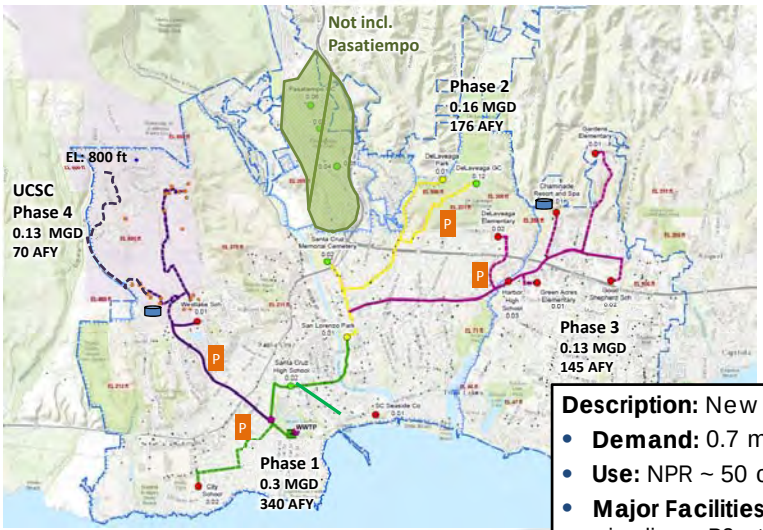
# Alt 1 - Centralized Non-Potable Reuse

## Alt 1b – Maximize Tertiary Treatment

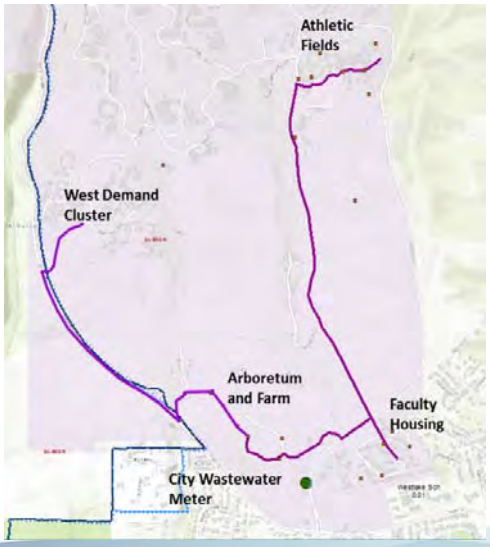



**Description:** New Title 22

- **Demand:** 0.7 mgd (800 AFY)
- **Use:** NPR ~ 50 customer sites
- **Major Facilities:** treatment, pipelines, PS, storage

# Alt 2 - Decentralized Non-Potable Reuse

## UC Santa Cruz




Legend
Santa Cruz WWTP
Irrigation Meters
< 10 AFY*
> 10 AFY*
Commercial Meters
< 10 AFY*
> 10 AFY*
City Owned Meters
< 10 AFY*
> 10 AFY*
Storage Tank

**Description:**

- Satellite MBR at UCSC
- **Demand:** 0.12 mgd (140 AFY)
- **Use:** NPR ~ 42 customer sites
- **Major Facilities:** treatment, pipelines, PS, storage

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# Alt 3 - Santa Cruz Participation in a SqCWD-led GWRR

- **AWTF @ SqCWD Headquarters** **(3 Sub-alternatives)**
  - Alt 3a - Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin
  - Alt 3b - Send tertiary effluent from SCWWTF to SqCWD
  - Alt 3c - Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF
- **AWTF @ Santa Cruz WWTF** **(2 Sub-alternatives)**
  - Alt 3d - Send advanced treated RW from SCWWTF to SqCWD
  - Alt 3e - Send advanced treated RW from SCWWTF to SqCWD,

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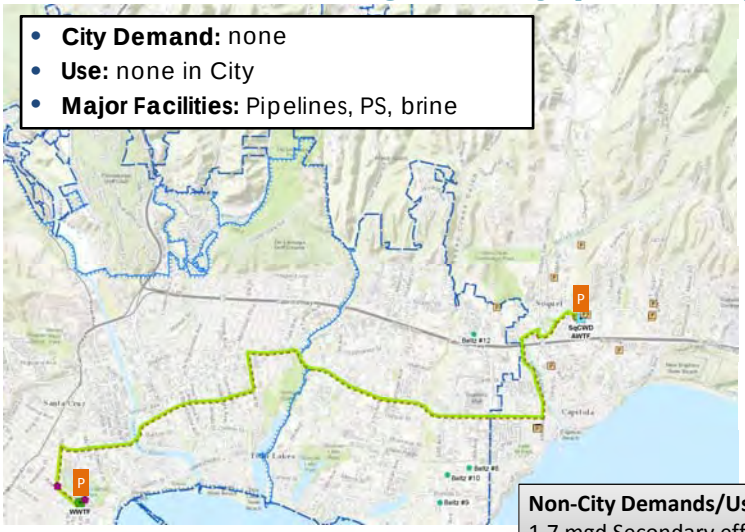
## Alternative 3a: Secondary Effluent to SqCWD + NO NPR along the way (BASELINE)

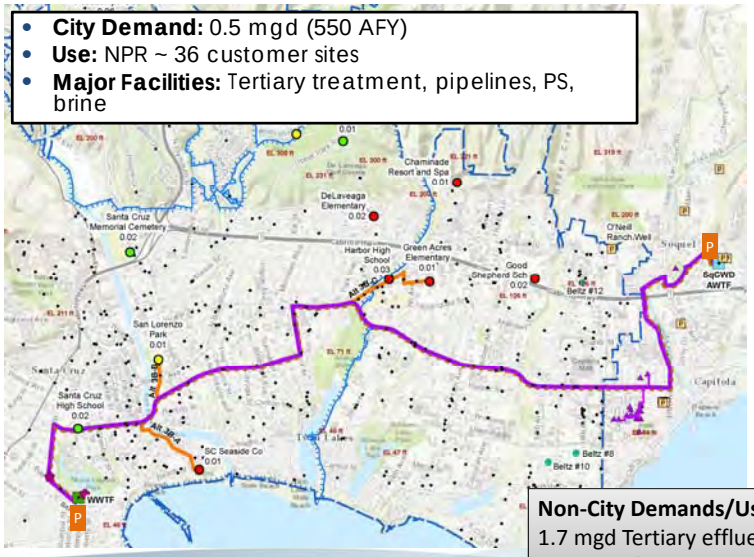
- **City Demand:** none
- **Use:** none in City
- **Major Facilities:** Pipelines, PS, brine




**Non-City Demands/Uses:**
1.7 mgd Secondary effluent to SqCWD (for a 1.3 MGD GRRP)

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

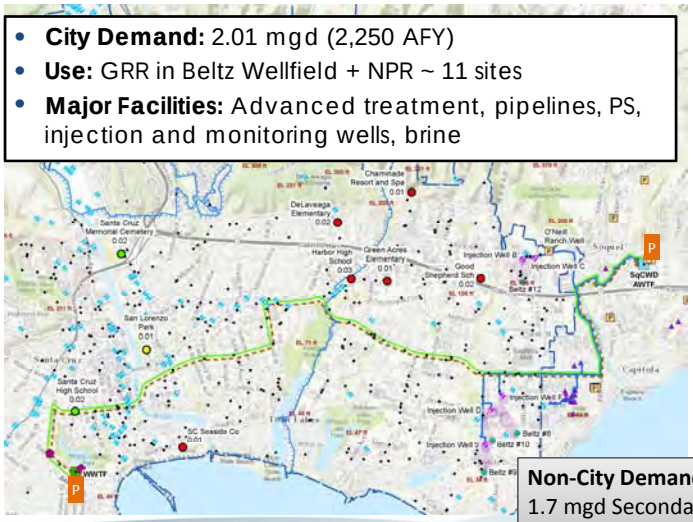
- **City Demand:** 0.5 mgd (550 AFY)
- **Use:** NPR ~ 36 customer sites
- **Major Facilities:** Tertiary treatment, pipelines, PS, brine




**Non-City Demands/Uses:**
1.7 mgd Tertiary effluent to SqCWD
0.005 mgd SqCWD NPR along the way

## Alternative 3c: Secondary Effluent to SqCWD AWPF + Purified Water for NPR + GRR in the City

- **City Demand:** 2.01 mgd (2,250 AFY)
- **Use:** GRR in Beltz Wellfield + NPR ~ 11 sites
- **Major Facilities:** Advanced treatment, pipelines, PS, injection and monitoring wells, brine



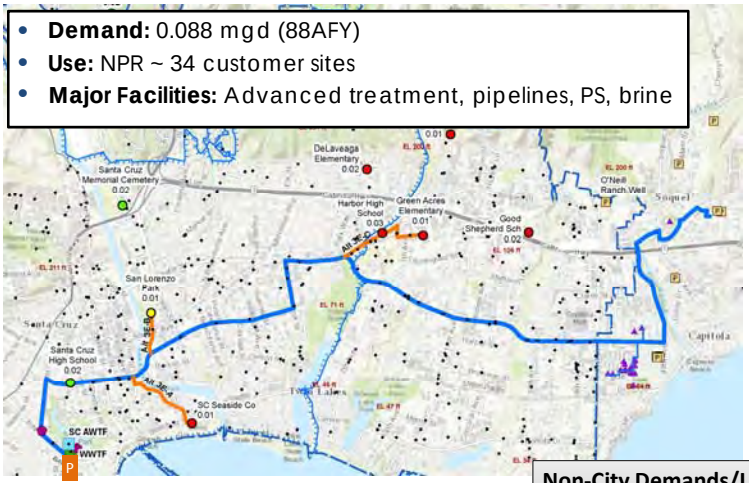

Legend:
- AWTF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- SqCWD NPR Sites
- Secondary effluent pipeline (parallel brine line)
- AWT pipeline
- Injection well
- Pump Station
- SqCWD Production Well

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

**Non-City Demands/Uses:**
1.7 mgd Secondary effluent to SqCWD
0.005 mgd SqCWD NPR along the way

## Alternative 3d: Advanced treated RW to SqCWD + NPR along the way

- **Demand:** 0.088 mgd (88AFY)
- **Use:** NPR ~ 34 customer sites
- **Major Facilities:** Advanced treatment, pipelines, PS, brine



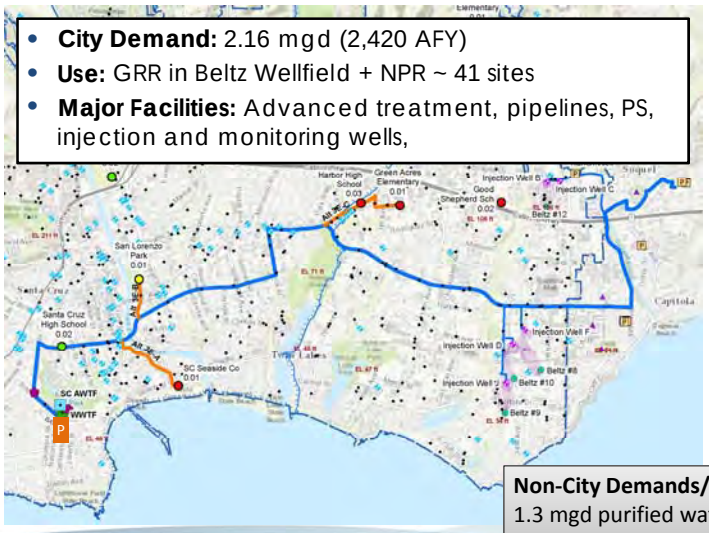

Legend:
- AWTF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- SqCWD NPR Sites
- AWT Pipeline
- NPR Distrib. Pipeline
- Pump Station
- SqCWD Production Well

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

**Non-City Demands/Uses:**
1.3 mgd purified water to SqCWD
0.005 mgd SqCWD NPR along the way

## Alternative 3e: AWPF @ SC WWTF, use purified water for NPR + GRR in the City + SqCWD GRR

- **City Demand:** 2.16 mgd (2,420 AFY)
- **Use:** GRR in Beltz Wellfield + NPR ~ 41 sites
- **Major Facilities:** Advanced treatment, pipelines, PS, injection and monitoring wells,




Legend:
- AWTF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- AWT pipeline
- NPR Distrib. Pipeline
- Injection well
- Pump Station
- SqCWD Production Well

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

**Non-City Demands/Uses:**
1.3 mgd purified water to SqCWD
0.005 mgd SqCWD NPR along the way

## Alt 4 - Santa Cruz GRRP

### Alt 4a – Santa Cruz Centralized GRRP

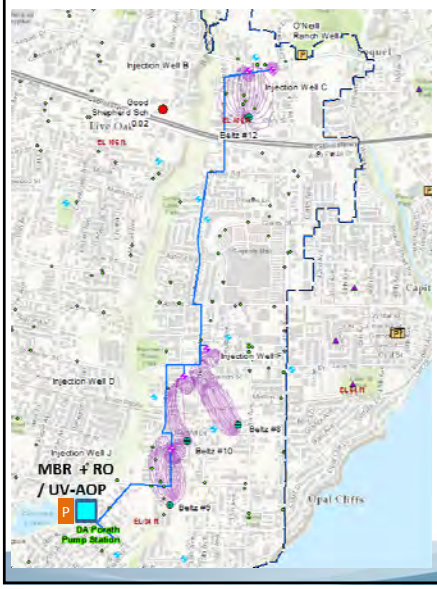

Legend:
- AWTF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- AWT pipeline
- NPR Distrib. Pipeline
- Injection well
- Pump Station
- SqCWD Production Well

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

- **Description:** independent GRRP in Purisma (Beltz Wellfield area)
- **Project Size:** 2.13 mgd (2,400 AFY)
- **Uses:** GRR in Beltz Wellfield + NPR ~37 customers sites
- **Major Facilities:** AWTF, pipelines, PS, injection and monitoring wells, brine discharge

# Alt 4 - Santa Cruz GRRP

## Alt 4b - Santa Cruz Decentralized GRRP




Legend:
- AWTF
- Santa Cruz WWTP
- Irrigation Meters: < 10 AFY*, > 10 AFY*
- Commercial Meters: < 10 AFY*, > 10 AFY*
- City Owned Meters: < 10 AFY*, > 10 AFY*
- AWT pipeline
- Injection well
- Pump Station
- SqCWD Production Well

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

- **Description:** independent GRRP in Purisma (Beltz Wellfield area)
- **Demand:** 2.01 mgd (2,250 AFY)
- **Uses:** GRR + NPR ~ 11 customers sites
- **Major Facilities:** MBR/AWTF, pipelines, PS, injection and monitoring wells, brine discharge

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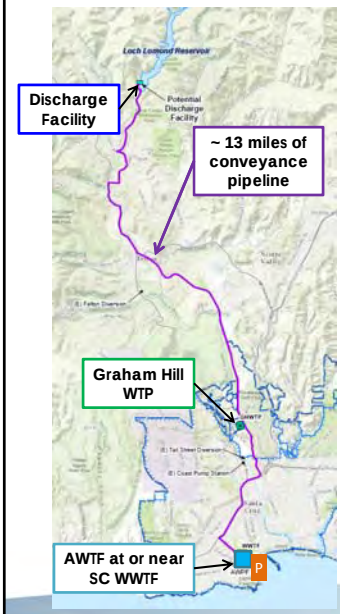
# Alt 5 - Surface Water Augmentation (SWA)

## Loch Lomond Reservoir




- **Description:** Augment Loch Lomond in summer months with purified water
- **AWTF:** 3.2 mgd production capacity
- **Annual Reuse:** 1.6 mgd (1,800 AFY)
- **Uses:** SWA
- **Major Facilities:** AWTF, pipelines, PS, discharge facility at reservoir, brine discharge

- AWT pipeline
- Pump Station
- AWTF
- Drinking Water Treatment Plant

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

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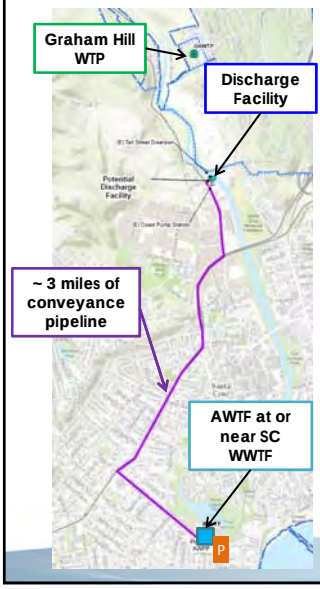
# Alt 6 - Streamflow Augmentation

## Direct Discharge to San Lorenzo River




- **Description:** Augment San Lorenzo River d/s of Tait Street Diversion in summer months with purified water
- **AWTF:** 3.2 mgd production capacity
- **Annual Reuse:** 1.6 mgd (1,800 AFY)
- **Uses:** Streamflow Augmentation
- **Major Facilities:** AWTF, pipelines, PS, discharge facility, brine discharge

AWT pipeline
P Pump Station
AWTF
Drinking Water Treatment Plant

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

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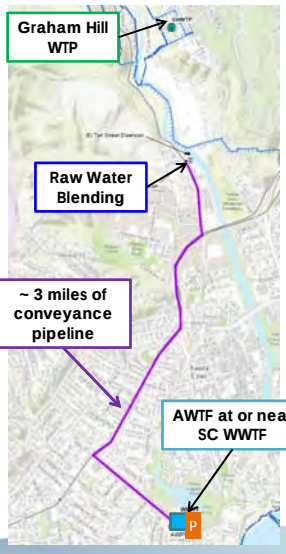
# Alt 7 – Direct Potable Reuse

## Raw Water Blending at Graham Hill WTP




- **Description:** Blend purified water with raw water coming from city's other flowing sources for further treatment at the GHWTP prior to distribution as finished water
- **AWTF:** 3.2 mgd production capacity
- **Annual Reuse:** 3.2mgd (3,600 AFY)
- **Uses:** Augment potable supplies
- **Major Facilities:** AWTF, pipelines, PS, brine discharge

AWT pipeline
P Pump Station
AWTF
Drinking Water Treatment Plant

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

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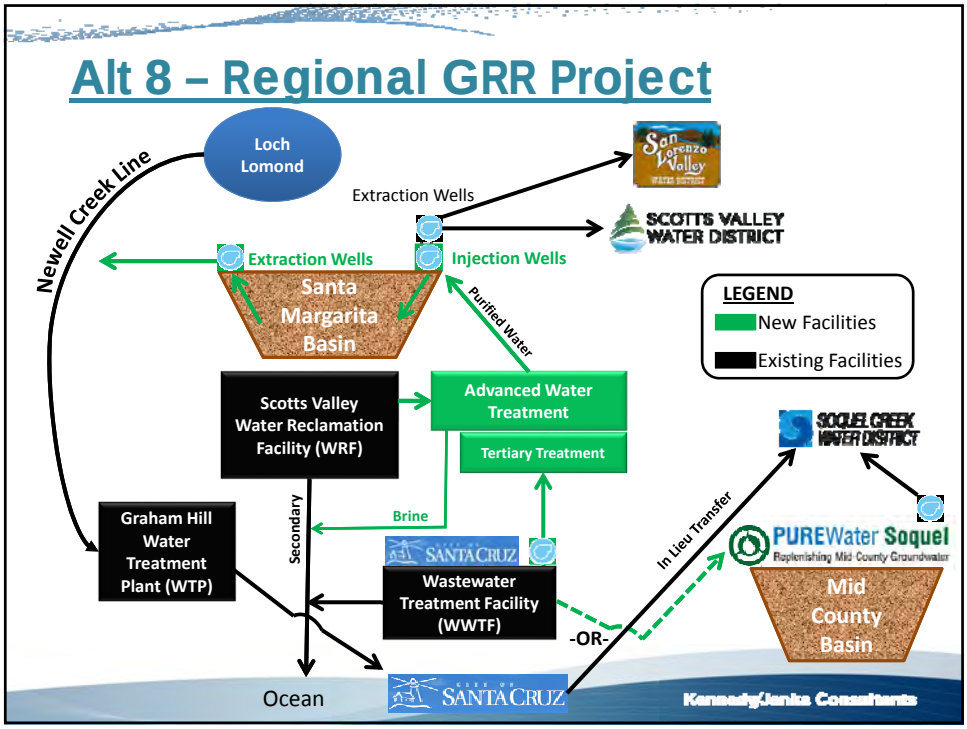
Alt 8 – Regional GRR Project
Loch Lomond
Newell Creek Line
Extraction Wells
San Lorenzo Valley Water District
SCOTTS VALLEY WATER DISTRICT
Extraction Wells
Injection Wells
Santa Margarita Basin
Purified Water
LEGEND
New Facilities
Existing Facilities
Scotts Valley Water Reclamation Facility (WRF)
Advanced Water Treatment
Tertiary Treatment
SOQUEL CREEK WATER DISTRICT
Graham Hill Water Treatment Plant (WTP)
Secondary
Brine
SANTA CRUZ
In Lieu Transfer
PUREWater Soquel
Replenishing Mid-County Groundwater
Wastewater Treatment Facility (WWTF)
-OR-
Mid County Basin
Ocean
SANTA CRUZ
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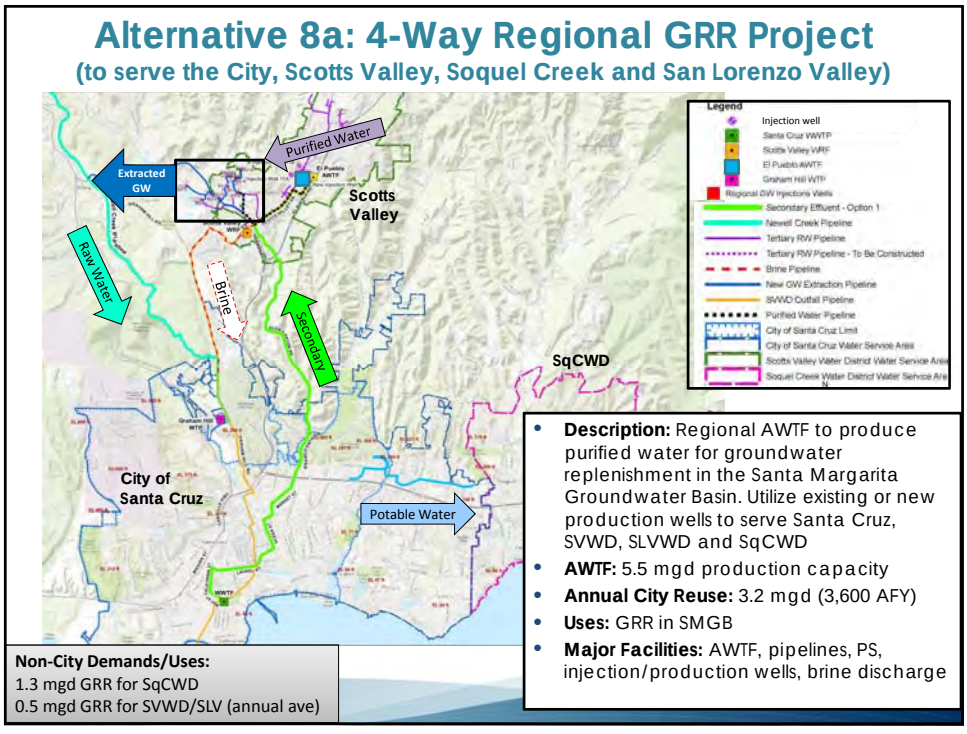
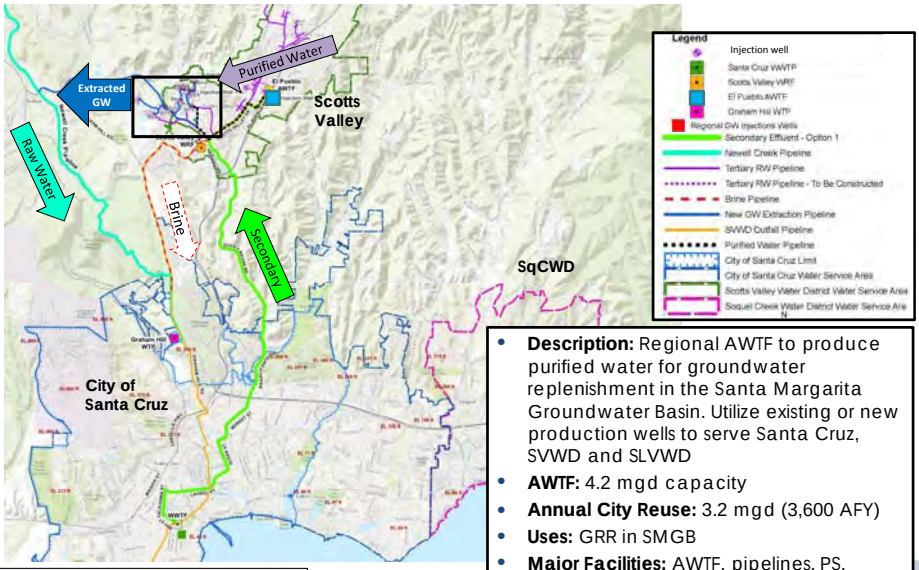

Alternative 8a: 4-Way Regional GRR Project
(to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley)
Purified Water
Extracted GW
Scotts Valley
Raw Water
Brine
Secondary
SqCWD
City of Santa Cruz
Potable Water
Legend
Injection well
Santa Cruz WWTP
Scotts Valley WRF
El Pueblo AWTF
Graham Hill WTP
Regional GW Injections Wells
Secondary Effluent - Option 1
Newell Creek Pipeline
Tertiary RW Pipeline
Tertiary RW Pipeline - To Be Constructed
Brine Pipeline
New GW Extraction Pipeline
SVWD Outfall Pipeline
Purified Water Pipeline
City of Santa Cruz Limit
City of Santa Cruz Water Service Area
Scotts Valley Water District Water Service Area
Soquel Creek Water District Water Service Area
Description: Regional AWTF to produce purified water for groundwater replenishment in the Santa Margarita Groundwater Basin. Utilize existing or new production wells to serve Santa Cruz, SVWD, SLVWD and SqCWD
AWTF: 5.5 mgd production capacity
Annual City Reuse: 3.2 mgd (3,600 AFY)
Uses: GRR in SMGB
Major Facilities: AWTF, pipelines, PS, injection/production wells, brine discharge
Non-City Demands/Uses:
1.3 mgd GRR for SqCWD
0.5 mgd GRR for SVWD/SLV (annual ave)

# Alternative 8b: 3-Way Regional GRR Project

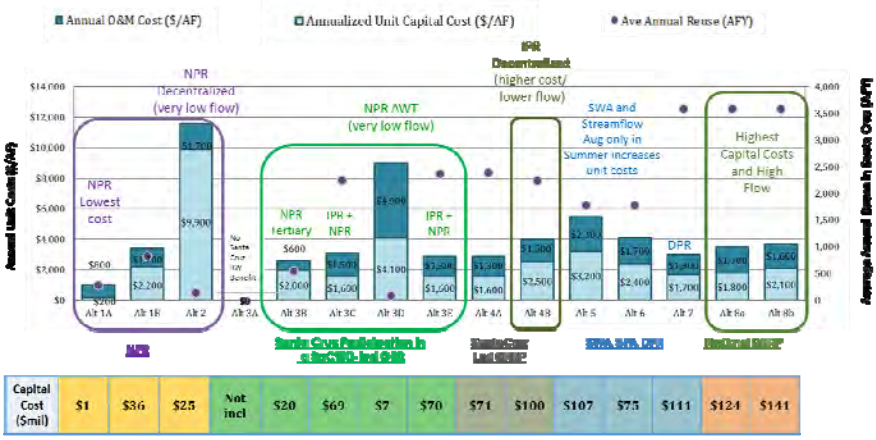
## (to serve the City, Scotts Valley and San Lorenzo Valley)




- **Description:** Regional AWTF to produce purified water for groundwater replenishment in the Santa Margarita Groundwater Basin. Utilize existing or new production wells to serve Santa Cruz, SVWD and SLVWD
- **AWTF:** 4.2 mgd capacity
- **Annual City Reuse:** 3.2 mgd (3,600 AFY)
- **Uses:** GRR in SMGB
- **Major Facilities:** AWTF, pipelines, PS, injection/production wells, brine discharge

**Non-City Demands/Uses:**
0.5 mgd GRR for SVWD/SLV (annual ave)

# Summary of Engineers Opinion of Probable Costs




Notes: The stacked bars represent the life cycle unit cost for each project (left y-axis).
The purple dots represent the average annual reuse in SCWD's service area.
All costs represent City facilities or the City's proportional share of regional facilities based on flow.

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## 2. Review of Screening Criteria & Guidance

- Screening Categories
- Quantitative Results from Alternative Evaluation
- Guidance for Qualitative Screening Criteria

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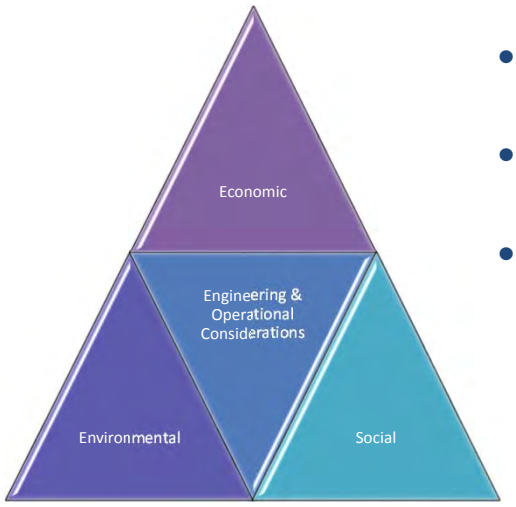
## Screening Categories




- Four categories to compare alternatives
- Triple Bottom Line (TBL) approach
- Integrates engineering and operational considerations

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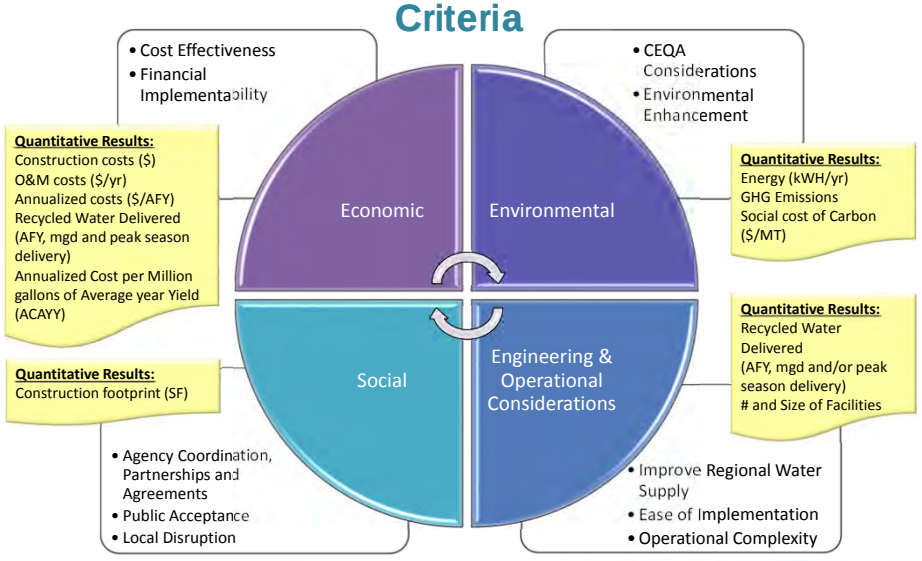
## Quantitative Results and Qualitative Screening Criteria



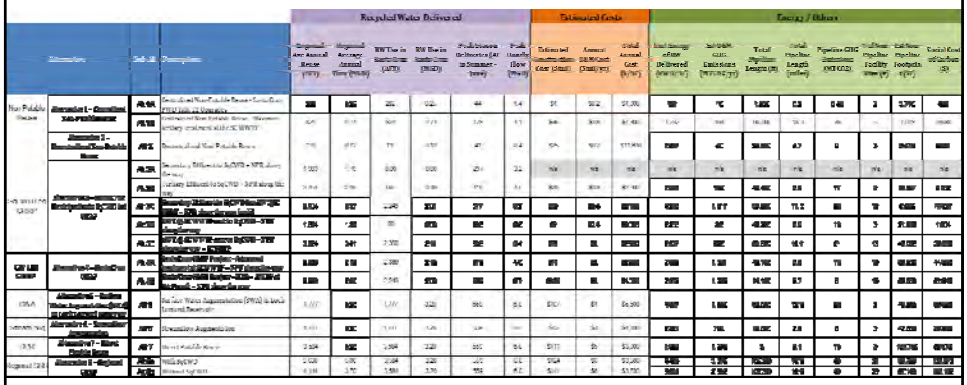

## QUANTITATIVE Results from Alternatives Evaluation

| Recycled Water Delivered: | Costs: | Energy / Other: |
|---|---|---|
| Annual Volume (AFY) | Construction Costs ($) | Energy (kWH/AF) of RW Delivered |
| Average Annual Flow (mgd) | O&M Costs ($/yr) | GHG emissions (MT of $CO_2e$ per year) |
| Peak Season Deliveries (AF Summer) | Life Cycle Costs ($/AFY) | Social Cost of Carbon ($/MT) |
| Peak Flow (mgd) | Annualized Cost per Million gallons of Average year Yield (ACAYY) | Construction Footprint (SF) |
| Average year Yield (MG) | | # and Size of Facilities |

**QUANTITATIVE results were provided for each alternative (Alt Webinars Part 1-4) and used to inform qualitative scoring**

*AF = acre-feet*
*AFY = acre-feet per year*
*MG = million gallons*
*mgd = million gallons per day*
*kWH = kilowatt hour*
*MT = metric ton*
*$CO_2e$ = carbon dioxide equivalent*
*SF = square feet*

# Summary of QUANTITATIVE Results



The Quantitative Results are used to inform the Qualitative Metrics for Screening, Scoring and Ranking Alternative Projects

# QUALITATIVE Criteria for Comparing Alternatives

| Categories | Alternatives Screening Criteria | Considerations for Assessing Project based on Criteria |
|---|---|---|
| **ENGINEERING & OPERATIONAL CONSIDERATIONS** | Improve Regional Water Supply | Ability to fill water supply gap, supplement supply in peak season, timeline for implementation |
| | Ease of Implementation | Permitability, construction complexity, flexibility for phasing and potential for expansion |
| | Operational Complexity | Treatment requirements and impacts to WWTF, ~~facility siting~~ and potential impacts to Water Department operations |
| **ECONOMIC** | Cost Effectiveness | Relative unit costs |
| | Financial Implementability | Relative capital costs and tradeoffs |
| **ENVIRONMENTAL** | CEQA Considerations | Potential impacts and mitigation requirements |
| | Potential for Environmental Enhancement | Potential to enhance ecosystem and social cost of carbon (GHG emissions) |
| **SOCIAL** | Agency Coordination, Partnerships and Agreements | Level of effort and willingness to work together |
| | Public acceptance | ~~Perceived public acceptance~~ |
| | Local disruption | During construction and ongoing maintenance |

The City recognizes the importance of public acceptance and will include it in the next analysis of water supply alternatives when more information can be drawn from the community in terms of their preferences and acceptance of the different types of beneficial reuse.

# 3. Approach to Scoring, Weighting & Ranking

- Alternative projects will be **scored** from 1 to 5 for each criteria
  - ✓ Score = 5 Fully Meets Criteria
  - ✓ Score = 4 Mostly Meets Criteria
  - ✓ Score = 3 Partially Meets Criteria
  - ✓ Score = 2 Somewhat Meets Criteria
  - ✓ Score = 1 Unable to Meet Criteria
- Scores are **weighted** to provide ranking of alternative projects by themes
- Sensitivity Analysis explores how **ranking** changes with different weighting themes



# Weighting Screening Criteria

| Categories | Alternatives Screening Criteria | Baseline (Balanced) | Maximize Water Supply | WSAC Criteria | WSAC Values | Maximize Beneficial Reuse | Maximizing Engineering & Operational Considerations | Low Cost | Minimize Local Impacts |
|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING & OPERATIONAL CONSIDERATIONS | Improve Water Supply | 15% | 40% | 70% | 55% | 10% | 5% | 10% | 10% |
| | Maximize Beneficial Reuse | 10% | 5% | 0% | 0% | 30% | 10% | 5% | 5% |
| | Ease of Implementation | 10% | 10% | 0% | 0% | 10% | 5% | 10% | 5% |
| | Operational Complexity | 10% | 5% | 0% | 0% | 15% | 45% | 5% | 5% |
| ECONOMIC | Cost Effectiveness | 15% | 5% | 15% | 15% | 5% | 5% | 30% | 5% |
| | Financial Implementability | 15% | 10% | 15% | 15% | 5% | 5% | 30% | 5% |
| ENVIRON MENTAL | CEQA Considerations | 10% | 10% | 0% | 5% | 5% | 5% | 3% | 20% |
| | Potential for Environmental Enhancement | 5% | 5% | 0% | 5% | 10% | 10% | 2% | 20% |
| SOCIAL | Agency Coordination, Partnerships and Agreements | 5% | 5% | 0% | 5% | 5% | 5% | 3% | 5% |
| | Local Disruption | 5% | 5% | 0% | 0% | 5% | 5% | 2% | 20% |
| | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

**"THEMES" Developed to support a sensitivity analysis to see how weighting criteria impacts ranking**

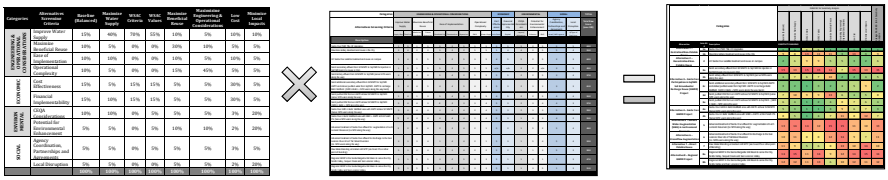
# Alternative Project Raw Scores

| Categories | | | ENGINEERING & OPERATIONAL CONSIDERATIONS | | | | | | | | | ECONOMIC | | ENVIRONMENTAL | | | SOCIAL | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alternatives Screening Criteria | | | Improve Water Supply | Maximize Beneficial Reuse | | Ease of Implementation | | | Operational Complexity | | | Cost Effectiveness | Financial Implementability | CEQA Considerations | Potential for Environmental Enhancement | | Agency Coordination, Partnerships and Agreements | Local Disruption | Total Raw Score (max 100) |
| | | | Supply Gap | Timeline | Maximize use Now | Future Expansion | Permittability | Construction | Expansion | PWD | Water Dept. | Unit Costs | Capital | Impact/ Mitigation | Enhance | GHG | Level/ Willingness | #/Type of Facilities | |
| **Alternative** | **Sub-Alt #** | **Description** | | | | | | | | | | | | | | | | | |
| **Alternative 1 – Centralized Non-Potable Reuse** | 1a | Santa Cruz PWD Title 22 Upgrades | 1 | 5 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 5 | 5 | 5 | 69.0 |
| | 1b | Maximize tertiary treatment and reuse in the City | 2 | 4 | 2 | 3 | 5 | 3 | 3 | 5 | 5 | 2 | 4 | 4 | 2 | 5 | 5 | 4 | 58.0 |
| **Alternative 2 – Decentralized Non-Potable Reuse** | 2 | UC Santa Cruz satellite treatment and reuse on campus | 1 | 4 | 1 | 5 | 5 | 5 | 3 | 3 | 5 | 2 | 5 | 5 | 2 | 5 | 2 | 3 | 56.0 |
| **Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GRR) Project** | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (no reuse in City) | Not analyzed because it provides no water to the City and would have no value in the ranking exercise | | | | | | | | | | | | | | | | |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 2 | 4 | 2 | 2 | 5 | 4 | 3 | 5 | 5 | 4 | 5 | 2 | 2 | 5 | 3 | 4 | 57.0 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF to recharge Beltz Wellfield (GRR in Beltz + NPR users along the way back) | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 57.0 |
| | 3d | Send purified RW from an AWTF atnear SCWWTF to SqCWD (serve NPR users along the way) | 1 | 4 | 1 | 3 | 5 | 4 | 3 | 3 | 5 | 3 | 5 | 2 | 2 | 5 | 4 | 4 | 54.0 |
| | 3e | Send purified RW from an AWTF atnear SCWWTF to SqCWD (GRR in Beltz + NPR along the way) | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 2 | 3 | 4 | 4 | 3 | 56.0 |
| **Alternative 4 – Santa Cruz GRRP** | 4a | Santa Cruz GRR in Beltz Wellfield area with AWTF atnear SCWWTF (Serve NPR users along the way) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 3 | 2 | 3 | 4 | 5 | 3 | 58.0 |
| | 4b | Santa Cruz in Beltz Wellfield area with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 1 | 4 | 4 | 3 | 1 | 3 | 3 | 4 | 2 | 50.0 |
| **Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir** | 5 | Advanced treatment of Santa Cruz effluent for augmentation of Loch Lomond Reservoir (no NPR along the way) | 4 | 2 | 3 | 4 | 2 | 3 | 4 | 2 | 1 | 3 | 2 | 1 | 5 | 3 | 5 | 3 | 47.0 |
| **Alternative 6 – Streamflow Augmentation** | 6 | Advanced treatment of Santa Cruz effluent for discharge to the San Lorenzo River d/s of Tait Street Diversion (no NPR users along the way) | 3 | 2 | 3 | 4 | 1 | 4 | 4 | 2 | 1 | 4 | 2 | 1 | 5 | 4 | 5 | 4 | 49.0 |
| **Alternative 7 – Direct Potable Reuse** | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS or other point of blending) | 5 | 1 | 5 | 4 | 2 | 3 | 4 | 2 | 2 | 5 | 2 | 1 | 1 | 3 | 5 | 3 | 48.0 |
| **Alternative 8 – Regional GRRP** | 8a | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | 4 | 1 | 5 | 5 | 3 | 2 | 5 | 4 | 3 | 4 | 2 | 1 | 3 | 1 | 4 | 3 | 50.0 |
| | 8b | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley and San Lorenzo Valley | 4 | 1 | 5 | 5 | 3 | 2 | 5 | 4 | 3 | 4 | 2 | 1 | 3 | 2 | 4 | 3 | 51.0 |



# Sensitivity Analysis

- Addresses variation in different perspectives by artificially increasing weighting for certain categories or criteria.
- Multiple percentages from Weighting Themes by Alternative Project Raw Scores
- Conditional shading shows GREEN as top scoring/top ranking and RED as bottom scoring/bottom ranking of all projects.



# BREAK

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# PART II:
# Overview of Alternatives and Screening Approach

4. Discuss Outcome of Sensitivity Analysis
5. Finalizing the RWFPS
6. Next Steps Beyond the RWFPS

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# 4. Outcome of Sensitivity Analysis

a. Projects that consistently rose to the top
b. Projects that fell to the bottom
c. Criteria most influenced by weighting

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## Outcome of Ranking and Sensitivity Analysis

| Summary of Alternative Project Ranking and Sensitivity Analysis | | | Baseline (Balanced) | Maximize Water Supply | WSAC Criteria | WSAC Values | Maximize Beneficial Reuse | Maximizing Engineering & Operational Considerations | Low Cost | Minimize Local Impacts |
|---|---|---|---|---|---|---|---|---|---|---|
| **Alternative** | **Sub-Alt #** | **Description** | **SENSITIVITY RANKING** | | | | | | | |
| **Alternative 1 – Centralized Non-Potable Reuse** | **1a** | Santa Cruz PWD Title 22 Upgrades | 1 | 1 | 4 | 1 | 1 | 1 | 1 | 1 |
| | **1b** | Maximize tertiary treatment and reuse in the City | 4 | 5 | 8 | 7 | 7 | 2 | 10 | 2 |
| **Alternative 2 – Decentralized Non-Potable Reuse** | **2** | UC Santa Cruz satellite treatment and reuse on campus | 5 | 7 | 11 | 11 | 8 | 5 | 6 | 3 |
| **Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GRR) Project** | **3a** | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (no reuse in City) | *Not Analyzed* | | | | | | | |
| | **3b** | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 2 | 6 | 6 | 5 | 9 | 3 | 2 | 4 |
| | **3c** | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF to recharge Beltz Wellfield (GRR in Beltz + NPR users along the way back) | 7 | 4 | 3 | 4 | 2 | 4 | 9 | 9 |
| | **3d** | Send purified RW from an AWTF at/near SCWWTF to SqCWD (serve NPR users along the way) | 8 | 8 | 9 | 9 | 12 | 6 | 3 | 5 |
| | **3e** | Send purified RW from an AWTF at/near SCWWTF to SqCWD (GRR in Beltz + NPR along the way) | 6 | 3 | 1 | 3 | 6 | 7 | 5 | 7 |
| **Alternative 4 – Santa Cruz GRRP** | **4a** | Santa Cruz GRR in Beltz Wellfield area with AWTF at/near SCWWTF (Serve NPR users along the way) | 3 | 2 | 1 | 2 | 3 | 8 | 4 | 5 |
| | **4b** | Santa Cruz in Beltz Wellfield area with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | 9 | 9 | 5 | 6 | 10 | 11 | 7 | 12 |
| **Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir** | **5** | Advanced treatment of Santa Cruz effluent for augmentation of Loch Lomond Reservoir (no NPR along the way) | 14 | 11 | 10 | 10 | 14 | 14 | 14 | 10 |
| **Alternative 6 – Streamflow Augmentation** | **6** | Advanced treatment of Santa Cruz effluent for discharge to the San Lorenzo River d/s of Tait Street Diversion (no NPR users along the way) | 13 | 13 | 12 | 11 | 13 | 13 | 13 | 8 |
| **Alternative 7 – Direct Potable Reuse** | **7** | Raw Water Blending at Graham Hill WTP (via Coast PS or other point of blending) | 10 | 10 | 7 | 8 | 11 | 12 | 8 | 13 |
| **Alternative 8 – Regional GRRP** | **8a** | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | 12 | 14 | 12 | 14 | 5 | 10 | 12 | 14 |
| | **8b** | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley and San Lorenzo Valley | 11 | 12 | 12 | 13 | 4 | 9 | 11 | 11 |

## Projects That Consistently Rose to the Top

| Summary of Alternative Project Ranking and Sensitivity Analysis | | | TOP 4 RANKING PROJECTS | | | |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| | | | First | Second | Third | Fourth |
| Alternative | Sub-Alt # | Description | Count # of Times RANKING Occurs | | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Title 22 Upgrades | 7 | | | 1 |
| | 1b | Maximize tertiary treatment and reuse in the City | | 2 | | 3 |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz satellite treatment and reuse on campus | | | 1 | |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (no reuse in City) | | | | |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | | 2 | 1 | 1 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF to recharge Beltz Wellfield (GRR in Beltz + NPR users along the way back) | | 1 | 1 | 3 |
| | 3d | Send purified RW from an AWTF at/near SCWWTF to SqCWD (serve NPR users along the way) | | | 1 | |
| | 3e | Send purified RW from an AWTF at/near SCWWTF to SqCWD (GRR in Beltz + NPR along the way) | 1 | | 2 | |
| Alternative 4 – Santa Cruz GRRP | 4a | Santa Cruz GRR in Beltz Wellfield area with AWTF at/near SCWWTF (Serve NPR users along the way) | 1 | 2 | 2 | 1 |
| | 4b | Santa Cruz in Beltz Wellfield area with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | | | | |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for augmentation of Loch Lomond Reservoir (no NPR along the way) | | | | |
| Alternative 6 – Streamflow Augmentation | 6 | Advanced treatment of Santa Cruz effluent for discharge to the San Lorenzo River d/s of Tait Street Diversion (no NPR users along the way) | | | | |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS or other point of blending) | | | | |
| Alternative 8 – Regional GRRP | 8a | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | | | | |
| | 8b | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley and San Lorenzo Valley | | | | 1 |

**NPR:**
- ✓ Santa Cruz PWD Title 22 Upgrades
- ✓ Maximize Tertiary Treatment

**IPR:**
- ✓ Alt 3b Send tertiary to SqCWD for NPR along the way
- ✓ Alt 3c SqCWD led GRR in Purisma with AWTF at Soquel
- ✓ Alt 3e SqCWD led GRR in Purisma with AWTF at SC WWTF
- ✓ Alt 4a City led GRR in Purisma

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## Projects That Consistently Drop to the Bottom

| Summary of Alternative Project Ranking and Sensitivity Analysis | | | BOTTOM 2 RANKING PROJETS | |
|---|---|---|---|---|
| | | | 13 | 14 |
| | | | Second to Last | Last |
| Alternative | Sub-Alt # | Description | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Title 22 Upgrades | | |
| | 1b | Maximize tertiary treatment and reuse in the City | | |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz satellite treatment and reuse on campus | | |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (no reuse in City) | | |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | | |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF to recharge Beltz Wellfield (GRR in Beltz + NPR users along the way back) | | |
| | 3d | Send purified RW from an AWTF at/near SCWWTF to SqCWD (serve NPR users along the way) | | |
| | 3e | Send purified RW from an AWTF at/near SCWWTF to SqCWD (GRR in Beltz + NPR along the way) | | |
| Alternative 4 – Santa Cruz GRRP | 4a | Santa Cruz GRR in Beltz Wellfield area with AWTF at/near SCWWTF (Serve NPR users along the way) | | |
| | 4b | Santa Cruz in Beltz Wellfield area with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | | |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for augmentation of Loch Lomond Reservoir (no NPR along the way) | | 4 |
| Alternative 6 – Streamflow Augmentation | 6 | Advanced treatment of Santa Cruz effluent for discharge to the San Lorenzo River d/s of Tait Street Diversion (no NPR users along the way) | 5 | |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS or other point of blending) | 1 | |
| Alternative 8 – Regional GRRP | 8a | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | | 3 |
| | 8b | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley and San Lorenzo Valley | 1 | |

**IPR:**
- ✓ Alt 5: SWA
- ✓ Alt 6: Streamflow Augmentation
- ✓ Alt 7: DPR
- ✓ Alt 8a: 4-Way Regional GRRP

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## Results Most Influenced by Weighting

| Results | Directly Impacted Criteria | # of Criteria Influenced | % of Total Weighting *(Average of Themes)* |
|---|---|---|---|
| **Annual Volume of Reuse in City** | Water Supply, Beneficial Reuse, Cost Effectiveness, Env Enhancement | 4 | 54% |
| **Costs** | Cost Effectiveness, Finical Implementability | 2 | 24% |
| **#/Size of New Facilities** | Cost Effectiveness, Financial Implementability, Ease of Implementation, CEQA, Env Enhancement, Local Disruption | 6 | 51% |
| **Need for Advanced Treatment** | Cost Effectiveness, Financial Implementability, Operational Complexity, Local Disruption | 3 | 40% |



## Ranking Most Affected by Weighting Theme

- **High Volume Reuse Projects** dominate WSAC Criteria and WSAC Values weighting themes (which only give 0-5% weight to other factors)
- **DPR and Regional GRRPs** score higher from a Maximizing Beneficial Reuse perspective
- Projects that **increase City responsibilities** for O&M rank low for Maximizing Eng/Ops Considerations
- **NPR Projects** rank higher for Low Cost and Minimize Local Impacts weighting themes

# 5. Finalizing RWFPS

a. Putting sensitivity analysis into perspective when selecting project

b. Discuss and select what projects will be evaluated in Financial Analysis Phase 1.

c. Discuss how project alternative section will frame the next steps with regard to

- ✓ further financial analysis,
- ✓ potential to phase projects,
- ✓ potential for other (not selected) projects to be part of a water supply portfolio

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# Selection of Project(s) for Financial Analysis Phase 1

**Summary of Alternative Project Ranking and Sensitivity Analysis**

| Alternative | Sub-Alt # | Description | RANKING for Sensitivity Analysis: Baseline (Balanced) | Maximize Water Supply | WSAC Criteria | WSAC Values | Maximize Beneficial Reuse | Maximizing Engineering & Operational Considerations | Low Cost | Minimize Local Impacts | Average RANKING for All Sensitivity Analysis |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENSITIVITY RANKING | | | | | | | | |
| Alternative 1 – Centralized Non-Potable Reuse | 1a | Santa Cruz PWD Title 22 Upgrades | 1 | 1 | 6 | 5 | 1 | 1 | 1 | 1 | 1 |
| | 1b | Maximize tertiary treatment and reuse in the City | 9 | 8 | 13 | 11 | 11 | 3 | 13 | 3 | 9 |
| Alternative 2 – Decentralized Non-Potable Reuse | 2 | UC Santa Cruz satellite treatment and reuse on campus | 2 | 6 | 9 | 9 | 5 | 5 | 3 | 2 | 6 |
| Alternative 3 – Santa Cruz Participation in SqCWD led Groundwater Recharge Reuse (GRR) Project | 3a | Send secondary effluent from SCWWTF to SqCWD for injection in SqCWD basin (no reuse in City) | 15 | 13 | 15 | 15 | 14 | 7 | 15 | 13 | 15 |
| | 3b | Send tertiary effluent from SCWWTF to SqCWD (serve NPR users along the way) | 4 | 7 | 6 | 7 | 10 | 2 | 2 | 4 | 5 |
| | 3c | Send additional secondary effluent from SCWWTF to SqCWD AWTF and deliver purified water from SqCWD AWTF to recharge Beltz Wellfield (GRR in Beltz + NPR users along the way back) | 3 | 2 | 1 | 3 | 2 | 4 | 5 | 9 | 2 |
| | 3d | Send purified RW from an AWTF at/near SCWWTF to SqCWD (serve NPR users along the way) | 7 | 10 | 9 | 9 | 13 | 6 | 4 | 5 | 8 |
| | 3e | Send purified RW from an AWTF at/near SCWWTF to SqCWD (GRR in Beltz + NPR along the way) | 6 | 4 | 1 | 2 | 4 | 8 | 7 | 6 | 4 |
| Alternative 4 – Santa Cruz GWRR Project | 4a | Santa Cruz GRR in Beltz Wellfield area with AWTF at/near SCWWTF (Serve NPR users along the way) | 5 | 3 | 1 | 1 | 3 | 9 | 6 | 7 | 3 |
| | 4b | Santa Cruz in Beltz Wellfield area with MBR + AWTF at DA Porath PS (Serve NPR users along the way) | 8 | 5 | 1 | 4 | 7 | 11 | 8 | 12 | 7 |
| Alternative 5 – Surface Water Augmentation (SWA) in Loch Lomond Reservoir | 5 | Advanced treatment of Santa Cruz effluent for augmentation of Loch Lomond Reservoir (no NPR along the way) | 13 | 14 | 14 | 12 | 15 | 15 | 11 | 10 | 13 |
| Alternative 6 – Streamflow Augmentation | 6 | Advanced treatment of Santa Cruz effluent for discharge to the San Lorenzo River d/s of Tait Street Diversion (no NPR users along the way) | 10 | 11 | 8 | 8 | 12 | 14 | 9 | 7 | 11 |
| Alternative 7 – Direct Potable Reuse | 7 | Raw Water Blending at Graham Hill WTP (via Coast PS or other point of blending) | 11 | 9 | 5 | 6 | 8 | 13 | 10 | 14 | 10 |
| Alternative 8 – Regional GWRR Project | 8a | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley, Soquel Creek and San Lorenzo Valley | 14 | 15 | 11 | 14 | 9 | 12 | 14 | 15 | 14 |
| | 8b | Regional GRRP in the Santa Margarita GW Basin to serve the City, Scotts Valley and San Lorenzo Valley | 12 | 12 | 11 | 13 | 6 | 10 | 12 | 11 | 12 |

# 6. Next Steps Beyond the RWFPS

a. Parallel projects pursued by different departments/regional entities
b. Near-term vs Long-term pursuits
c. Nexus with WSAC Work (Phase 2 work for Corona and Raftelis is creating water supply portfolio(s))

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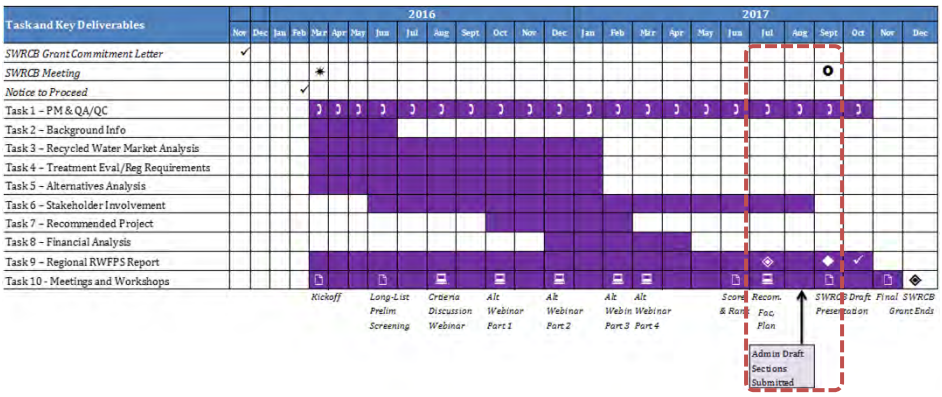
# Schedule

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# OPEN DISCUSSION

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# QUESTIONS


| | | |
|---|---|---|
| Kennedy/Jenks: | Dawn Taffler | DawnTaffler@KennedyJenks.com |
| | Melanie Tan | MelanieTan@KennedyJenks.com |
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| | Jim Henderson | jhenderson@coronaenv.com |
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| Merritt Smith: | Dave Smith | davesmith@merritt-smith.com |


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# Santa Cruz Regional
# Recycled Water Facilities Planning Study (RWFPS)

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## WEBINAR
## Recommended Project and Financing and Revenue Considerations
## 17 July 2017 from 10 am to 12:00 pm

Conf Call - (855) 813-2486 Code – 2484
Web Meeting - http://conf.kennedyjenks.com/conference/2484

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## AGENDA

**Overall Webinar Objective:** Present Recommended Projects with updated maps and costs. Present considerations for implementation, operations, financing and options for a future revenue program.

**Goal:** Obtain consensus on considerations and assumptions for Recommended Plan, Construction Financing Plan and Revenue Program to include in Sections 9 & 10 of the RWFPS

**Caveat:** Sections 9 & 10 are structured to meet the SWRCB Grant Requirements. Many of the elements related to the implementation plan, operation plan, financing and revenue program will require additional studies, agreements and design details to confirm. This webinar and the RWFPS will provide an overview of considerations and next steps to develop the City's recycled water program.

---

1. **Today's Webinar**
2. **Recommended Project**
    a. Phase 1: SCPWD Title 22 Project …… Ann/Dan (PWD)
    b. Phase 2: BayCycle Project
    c. Other Reuse Opportunities
3. **Implementation Plan Considerations**
4. **Operation Plan Considerations**
5. **Financing and Revenue Considerations** …… Andrea (RFC)
6. **Next Steps**

# City of Santa Cruz Recycled Water Facilities Planning Study

WEBINAR
Recommended Projects and
Financing and Revenue Considerations
July 17, 2017

Conf Call: *(855) 813-2486 Code – 2484*
Desktop Sharing: http://conf.kennedyjenks.com/conference/2484
Recording: http://conf.kennedyjenks.com/recording/6180669

** Includes amended notes to reflect discussion at webinar*

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## Agenda

- **Recommended Project**
  - Phase 1: SCPWD Title 22 Project
  - Phase 2: BayCycle Project
  - Other Reuse Opportunities
- **Implementation Plan Considerations**
- **Operation Plan Considerations**
- **Financing and Revenue Considerations**

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## Today's Webinar

- **Objective:** Present Recommended Projects with updated maps and costs. Present considerations for implementation, operations, financing and options for a future revenue program.
- **Goal:** Obtain consensus on considerations and assumptions for Recommended Plan, Construction Financing Plan and Revenue Program to include in Sections 9 & 10 of the RWFPS

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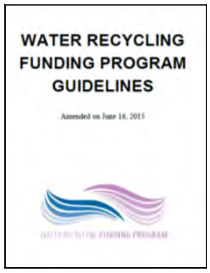
## Today's Webinar

- Sections 9 & 10 are structured to meet the SWRCB Grant Requirements.
- Many of the elements related to the implementation plan, operation plan, financing and revenue program will require additional studies, agreements and design details to confirm.
- This webinar and the RWFPS will provide an overview of considerations and next steps to develop the City's recycled water program.

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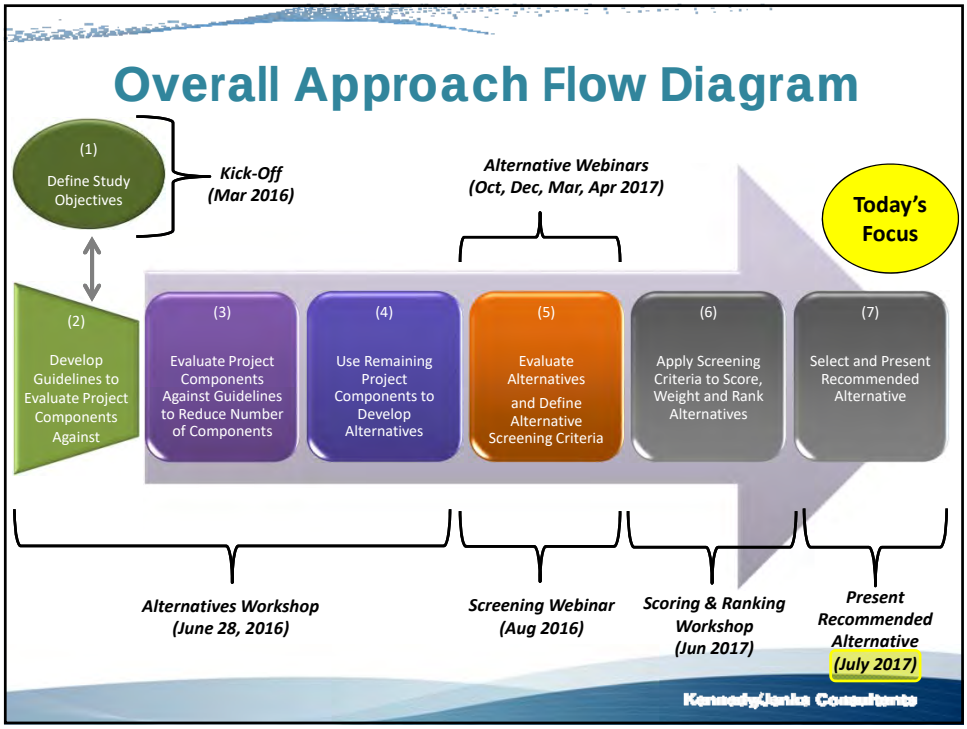


## Recommended Projects

- **Phase 1: SCPWD Title 22 Project** – implement a near-term non-potable reuse project to meet in-plant demands, develop a bulk water station and serve the near-by La Barranca Park.
- **Phase 2: BayCycle Project** – expand the Phase 1 project to increase production and non-potable reuse to serve customers along Bay Street including UCSC and other City customers

Phase 1 and 2 are the focus of the Recommended Project and Construction Financing Plan for the RWFPS

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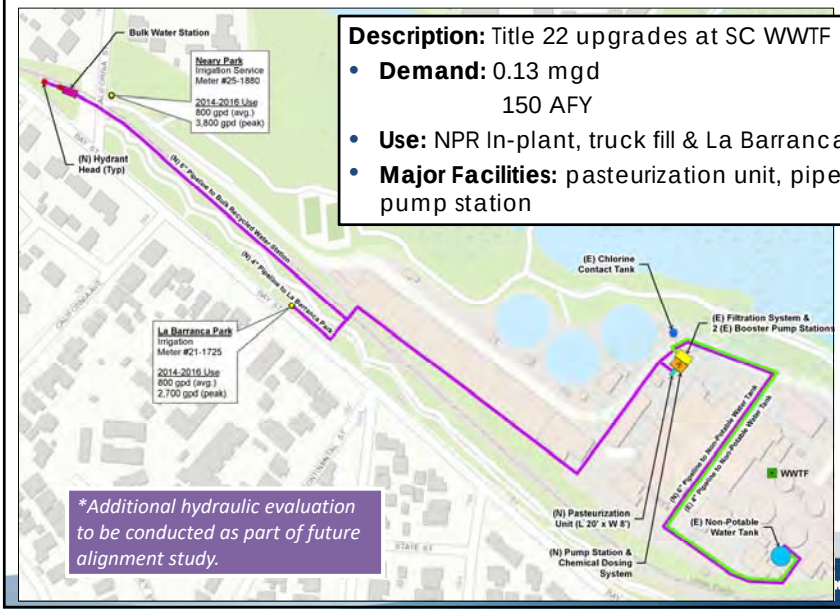
# Other Reuse Opportunities

1. **Coordination with Pure Water Soquel** – continue to work closely with SqCWD to support the Pure Water Soquel project including, but not limited to, the delivery of source water and considerations for benefits of shared infrastructure.
2. **Explore GRR in Mid-County Basin** – to replenish the Mid-County Basin through a collaborative project with Pure Water Soquel or as an independent City led project
3. **Explore GRR in Santa Margarita Basin –** continue regional discussions related to the benefits and limitations for a Regional GRRP in the SMGB, which has the potential to make the region more resilient in the long term.

Represent longer term efforts that will require more time to work collaboratively with regional partners and/or future studies to confirm the viability of groundwater replenishment.

# Phase 1: SCPWD Title 22 Project




**Description:** Title 22 upgrades at SC WWTF

- **Demand:** 0.13 mgd
  150 AFY
- **Use:** NPR In-plant, truck fill & La Barranca Park
- **Major Facilities:** pasteurization unit, pipelines, pump station

**Additional hydraulic evaluation to be conducted as part of future alignment study.*

## Phase 1: SCPWD Title 22 Project

- Purpose of the project is to enhance the robustness of the reclaimed water system and provide Title 22 water for off-site use.
- Estimated Demands

| Demands | Average (gpd) | Peak (gpd) |
|---|---|---|
| In-plant Use | 126,000 | 193,000 |
| Bulk Water Station Use* | 4,800 | 11,000 |
| La Barranca Park** | 800 | 2,700 |
| Neary Park** | 800 | 3,800 |
| **TOTAL** | **132,400** | **210,500** |

* Total average demand from 3 bulk water stations in 2014
** Average irrigation demand between 2012-2014



## Phase 1: SCPWD Title 22 Project

- Key component upgrades
  - Upgrade treatment with Title 22 pasteurization unit
  - Convert existing chlorine contact tank to storage
  - New distribution system pump station and pipelines
  - New bulk water station
  - New dedicated pipeline to 2 water tank
  - Upgrade secondary effluent booster pumps

# Phase 1: SCPWD Title 22 Project

- **Funding**
  - $250,000 in FY 2018 WWTF CIP
  - Water /Public Works FY 2019 Funds TBD
- **Next Steps**
  - Title 22 Engineering Report
  - Environmental Documents
  - Design of Treatment System Upgrades
  - Design of Distribution System

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# Phase 1: Summary of Costs

| Facility Component | Est. Loaded Cost ($) |
|---|---|
| Treatment | 730,000 |
| Pipelines | 380,000 |
| Pump Stations | 130,000 |
| Storage | 0 |
| Site Retrofit Costs | 20,000 |
| **Total Construction Cost ($)** | **1,260,000** |
| | |
| **Annual O&M Costs ($/year)** | **$250,000** |

Annual Life Cycle Unit Cost ($/AFY) = $2,200

* Based on reuse of 0.13 mgd (150 AFY) of Title 22 water

*Facility Costs at the WWTF to be differentiated from those off-site (capital and O&M)*

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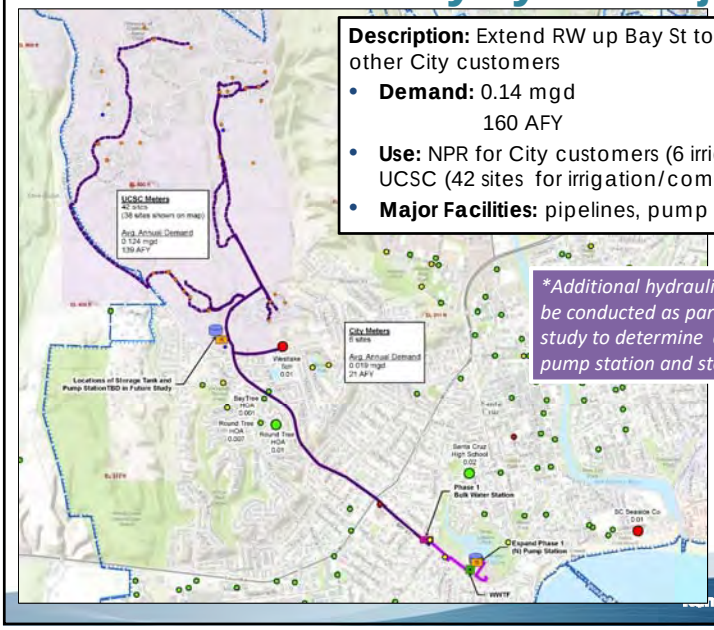
# Phase 2: BayCycle Project



**Description:** Extend RW up Bay St to serve UCSC and other City customers

- **Demand:** 0.14 mgd
  160 AFY
- **Use:** NPR for City customers (6 irrigaiton sites) and at UCSC (42 sites for irrigation/commercial)
- **Major Facilities:** pipelines, pump station and storage

**Additional hydraulic evaluation and siting to be conducted as part of future alignment study to determine optimal location for pump station and storage on UCSC Campus.*



# Phase 2: Summary of Costs

| Facility Component | Est. Loaded Cost ($) |
|---|---|
| Treatment | 220,000 |
| Pipelines | 7,380,000 |
| Pump Stations | 690,000 |
| Storage | 380,000 |
| Site Retrofit Costs | 3,030,000 |
| **Total Construction Cost ($)** | **11,700,000** |
| | |
| **Annual O&M Costs ($/year)** | **$320,000** |

*Facility Costs on campus to be differentiated from those off-campus (capital and O&M)*

Annual Life Cycle Unit Cost = $5,400

* Based on annual demand of 0.14 mgd (160 AFY) for City and UCSC customers

# Implementation Plan Considerations

| Considerations | Phase 1 | Phase 2 |
|---|---|---|
| **Coordination** | SCPWD and SCWD | City and UCSC |
| **Ability and Timing of Users** | SCWWTF = Ready to connect<br>Bulk Water Station = New<br>Park = Retrofit needed | City customers = retrofit<br>UCSC = Agreement and retrofits |
| **Water Recycling Requirements** | Title 22 Report, Title 17 cross-connection, Supervisor training, monitoring and reporting, etc. | |
| **Commitments from Potential Users** | Memo or Letter of intent to use from SCPWD, SCWD and City Parks | Letter of interest from UCSC; develop agreement prior to initial design work or other financial commitments |
| **Water Rights Impact** | None required as Water Code Section 2010 assigns ownership of the treated wastewater to the owner of the wastewater treatment plant. | |
| **Permits, Right-of-Way, Design and Construction** | RWQCB/DDW permits for production and distribution, NOI for RW program, obtain ROW for pipelines and infrastructure, design, construction & environmental | |

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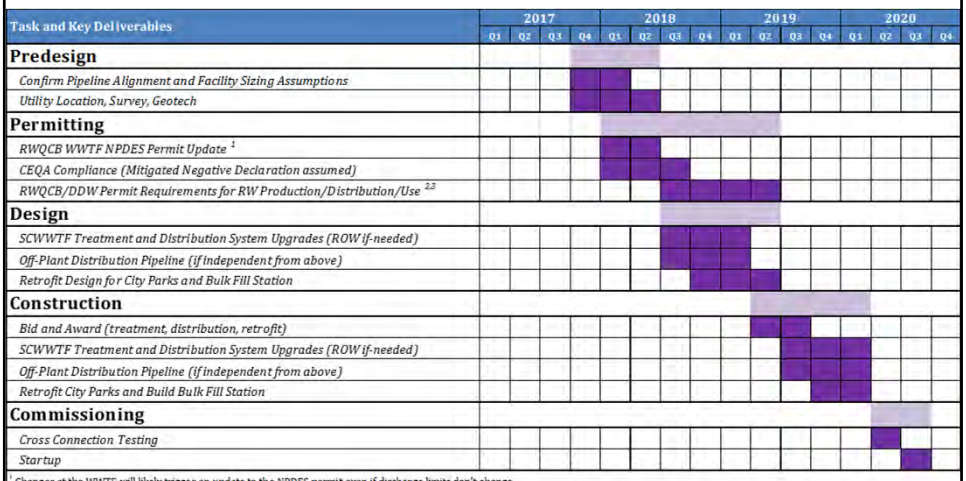
# Anticipated Phase 1Schedule




[1] Changes at the WWTF will likely trigger an update to the NPDES permit even if discharge limits don't change.
[2] Per SWRCB Order WQ 2016-0068-DDW http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2016/wqo2016_0068_ddw.pdf
[3] Includes Title 22 Engineering Report, Retrofit Report and Notice of Intent for Uses.

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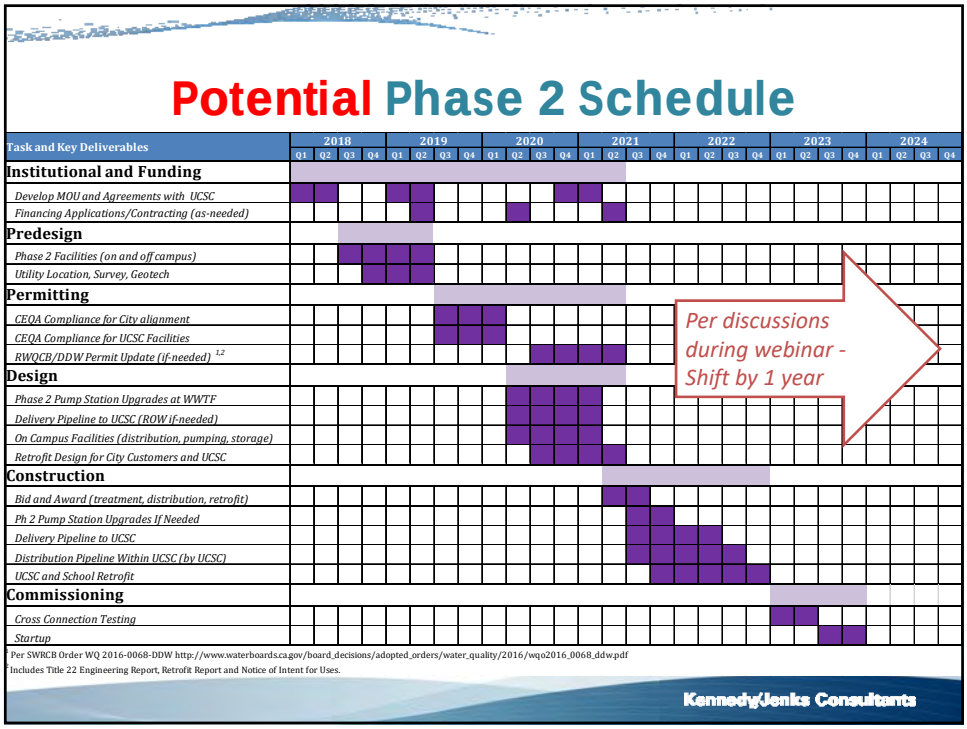
# Potential Phase 2 Schedule




[1] Per SWRCB Order WQ 2016-0068-DDW http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2016/wqo2016_0068_ddw.pdf
[2] Includes Title 22 Engineering Report, Retrofit Report and Notice of Intent for Uses.

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# Operation Plan Considerations

| Considerations | Phase 1 | Phase 2 |
|---|---|---|
| **Responsible Parties** | Water Dept (SCWD), Public Works (SCPWD), City Parks Supervisor | City, UCSC, Customer Site Supervisors |
| **Equipment Operations & Maintenance** | SCPWD = Title 22 upgrades<br>SCPWD = on-site distribution<br>SCPWD/SCWD[1] = off-site distribution<br>SCPWD/SCWD[1] = bulk water station<br>SCWD = City Parks<br>SCWD = residential fill station[2] | SCWD = distribution<br>SCWD = City customers<br>UCSC = campus customers |
| **Monitoring** | SCPWD = production<br>SCWD = distribution/customers | SCPWD = production<br>SCWD = distribution & customers<br>UCSC = Campus customers |
| **Irrigation Scheduling** | SCWD = work with customers | SCWD = work with customers<br>UCSC = Campus customers |

[1] *City department lead for facilities outside of the WWTF to be determined*
[2] *Residential fill station could be initiated as part of Phase 1 or 2*

*Water Department to be the "face" of RW for customers*

# Financing and Revenue Considerations

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## Construction Financing Options

- PAYGO (Pay-as-you-go)
  - Water, Recycled Water, or Wastewater
- Debt Financing
- Grants / Loans
- Capacity Fees
- Combination of two or more

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# Potential Funding Mechanisms
# PAYGO vs Debt

**PAYGO**

| Advantages | Disadvantage |
|---|---|
| • Save on interest charges<br>• Eliminate cost of issuance<br>• No bond covenants to satisfy<br>• Projects only funded when cash is available<br>• Additional admin. costs are avoided | • If capital costs spike - rates spike<br>• Capital may need to be deferred due to liquidity<br>• Existing customers are absorbing entire burden<br>• Inequity between existing / future customers<br>• Other needs not addressed due to CIP costs |

**Debt**

| Advantages | Disadvantage |
|---|---|
| • Favorable low interest rates<br>• Critical capital projects may move forward<br>• Achieve intergenerational equity<br>• Mitigate rate spikes in specific years<br>• Smooth out revenue adjustments | • Total project cost increases due to interest and COI<br>• Bond coverage requires additional revenue collection<br>• Incurring debt may not be an option - politically<br>• Debt payments must be made while commodity revenue may fluctuate |

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# Potential Funding Mechanisms
# Grant / Loan Funding

- Grant Funding
  - There are quite a few grants ava projects
    - ✓ SWRCB Water Recycling Funding Program
      - Research, feasibility studies, planning, and construction
    - ✓ Integrated Regional Water Mgt. Implementation Grant
    - ✓ Proposition 1
      - Regional Water Reliability, Water Recycling, Groundwater Sustainability
    - ✓ NOAA Coastal Resiliency Grants Program
  - Competitive basis, additional requirements (regulatory & administrative), timing of funds, often require ability to fund project without grants (matching funds)

Phase 1: Candidate for SRF Loan
Phase 2: Candidate for Category III
SWRCB Grant 25% = ~$3M

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## Financing Plan Considerations

It's important to look at the entire picture

- Objectives
  - ✓ Meet Regulations, New Water Supply, Reliability/Sustainability
- Assessing Revenue Needs
  - ✓ Capital Costs (Grants / Debt / PAYGO)
  - ✓ Annual Operations and Maintenance Costs
  - ✓ Conversion Costs (user hookup)
  - ✓ Depreciation recovery for ongoing reinvestment
- Revenue Recovery
  - ✓ Cost of Service
  - ✓ Interfund Transfers (Cost Sharing between Enterprises)
  - ✓ Type of capital expense may dictate funding mechanism



## What is the Industry Standard / Practice?

- Historically, recycled water rates have been pegged as percent of potable water rates (75% - 95%)
  - Legacy approach; not necessarily defensible
  - Provides financial incentive to use recycled water; otherwise, no reason to switch
  - RFC recommends a cost of service approach providing similar result (i.e. 75% -95% of potable)
    - ✓ Cost sharing required
    - ✓ Compliant with Proposition 218 & Proposition 26

## Legal Case Study:

- **Griffith vs. Pajaro Valley Water Mgt. Agency (2013)**
  - Agency included revenue requirements related to recycled water in the potable water rates as a groundwater augmentation charge
  - Plaintiff argued rates violated the proportionality requirements and that recycled water was not available to ALL customers
  - Ruling: Groundwater augmentation does NOT exceed the proportionate cost of providing service because ALL groundwater users benefit from the agencies groundwater management activities
    - ✓ Charges may be used to fund debt service
    - ✓ Charges may be used to fund recycled water service



## Legal Case Study:

- **CTA vs. City of San Juan Capistrano**
  - Proposition 218 **does** allow public water agencies to pass on to their customers the capital costs of improvements to provide additional water, including building a recycling system
  - Recycled water is a **new source** of water
  - Government Code § 53750(m) – water is part of a holistic distribution system

## Why do we need recycled water?

- **Is it for additional water supply/reliability? If so:**
  - Expansion of purple pipe may be covered through connection fees and/or potable water rates
  - Tertiary cost may be covered in the higher tiers of potable water users since their demand requires additional supply
  - Remaining operating costs recovered by recycled rates
- **Is it due to wastewater discharge requirements that require tertiary level treatment? If so:**
  - Expansion of treatment plant may be covered in wastewater connection fees or recycled water
  - Tertiary cost may be covered as part of the wastewater rates



## Why do we need recycled water?

- **Is it combination of both?**
  - Tertiary costs may be allocated to wastewater and to the higher potable water tiers
  - Purple pipe can be covered in utility capacity fees and rates
  - O&M should still be recovered from recycled water

| Costs | Potable Rates | Wastewater Rates | Recycled Rates | Water Capacity Fees | Recycled Capacity Fees |
|---|---|---|---|---|---|
| **Tertiary** | Commonly | Commonly | Not usually | Commonly | Not usually |
| **Purple Pipe** | Commonly | No | Commonly | Commonly | Commonly |
| **Operating** | Not usually | No | Yes | No | No |

*City to fill out this table with preliminary guidance for cost sharing.*

## What is going on in the Industry?

- El Toro Water District
  - Potable water rates have a RW component in the inefficient tiers (Tiers 3 & 4) that fund RW capital costs
  - Recycled water rates fund O&M and a portion of R&R / Debt Service
- Elsinore Valley MWD
  - Potable rates have rate components to fund RW
    - ✓ O&M is based on avoided purchased water costs
    - ✓ Capital costs are shared by future users (capacity fee), RW rates, and Potable rates for customers beyond their allocated water budget
- Fallbrook PUD
  - WW treatment plant costs (debt service) are allocated between wastewater and recycled water customers. Recycled users pay for the tertiary portion of costs.



## Industry…

- Camarillo CSD
  - Relatively new enterprise
  - Potable funded Infrastructure – treated as an interfund loan with repayment occurring in future years
  - O&M covered by recycled rates
- Temescal Valley Water District
  - Mature enterprise, ~50% of total water demand is from recycled water
  - 100% of recycled revenue needs is funded from Recycled water rates
  - New recycled customers pay a recycled capacity fee

**There are lots of options and some level of flexibility, however, Projects and Policy should drive revenue recovery**

## Using Data to Guide Policy Decisions

- **Phase I – PWD Title 22 Project**
  - Majority of Title 22 tertiary treated water will be used within the plant
  - Construction costs will be funded by the Wastewater Enterprise Fund (i.e. paid for by existing wastewater customers)
    - ✓ May consider applying for Grant/Low interest SRF Loan
  - Will ongoing costs be born by wastewater customers or should recycled/potable customers share in these costs?



## Using Data to Guide Policy Decisions

- **Phase 2 - BayCycle**
  - Substantial Construction Costs
    - ✓ ~$12M Construction Costs
    - ✓ Expected recycled demand ~ 160 AFY
  - It may be reasonable to fund these costs via the potable water enterprise (New Water Supply)
    - ✓ However, is it feasible given the considerable potable infrastructure reinvestment already underway?
  - Consider using SRF Loan (1.7% interest) and grant funding / reimbursement

# Other Key Considerations

- **Phase 2 - BayCycle**
  - Timing of the project and new user connections
  - Demand Projections
    - ✓ What happens if UCSC doesn't commit or uses more/less recycled water than projected?
    - ✓ May need to consider setting up a contract rate with an annual minimum charge based on a "Use or Lose" structure
  - Keep in mind the fiscal impact of converting potable users over to recycled
    - ✓ A significant portion of Potable revenue requirements are recovered over the variable charge.
    - ✓ Recycled user candidates are currently potable customers
    - ✓ This will result in lost revenue if no adjustments are made to the potable rates



# Partnerships through Contract Customers

- Major stakeholder
- Engagement starts early and customers have skin in the game
- Contract agreement outside of Prop. 218
  - Identify minimum revenue needs for project viability
  - Provides more flexibility for negotiations and agreement
  - Competitive rate may be determined for usage above minimum
  - Term for rates may be for multiple years

## Long-term Projects

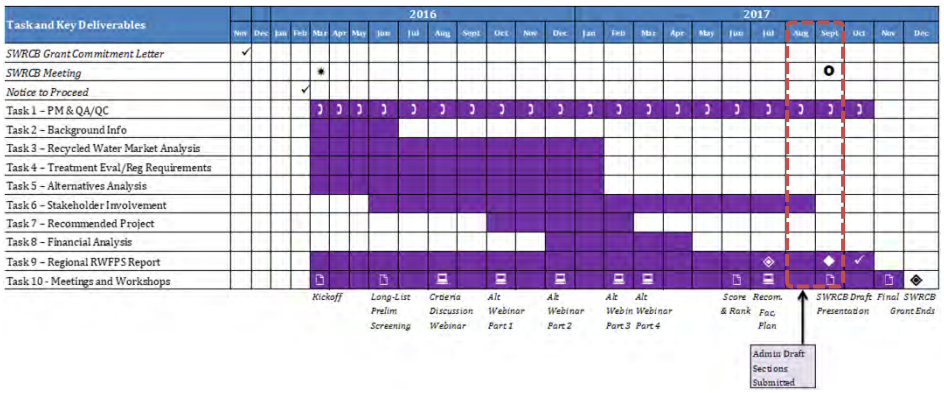
- Will need to be further evaluated once projects are known
- Good candidates for grant funding
  - Benefits a wider community / region
  - Supports groundwater sustainability and regional water reliability
- Pricing Policy
  - Purified recycled water likely seen as a new water source and may be priced as supplemental water supply



## IPR / Groundwater Recharge

- Multiple agencies have separate charge for groundwater recharge
  - East Valley – all units of water
  - Met customers – standby charge
  - Tustin – Recharge fee by OCWD
  - Sierra Madre – New ground water recharge (current project)
  - San Diego – IPR – new project to assist with setting rates
    - ✓ Reservoir replenishment
    - ✓ Pure Water SD

# Schedule




**NEXT STEPS**

Kennedy/Jenks Consultants

# OPEN DISCUSSION

Kennedy/Jenks Consultants

# QUESTIONS


| | | |
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