

Memorandum

To: Water Supply Advisory Committee (WSAC)
From: Bob Raucher and Colleen Donovan, Stratus Consulting Inc.
Date: 11/12/2014
Subject: A closer look at some of the Santa Cruz Water Management alternatives and summary of the “dots” exercise

In this memorandum we present a brief description of each of the Santa Cruz water management alternatives that Stratus Consulting and several of its subcontractors will look at more closely as part of its reconnaissance (Recon) (see Table 1). This is not intended to favor or eliminate any alternatives. Instead, it is an effort to cover a broad range during the Recon phase. We also provide the results of the “dots” exercise in Table 2.

Table 1. An overview of the Santa Cruz water management alternatives that Stratus Consulting and its subcontractors will look at in depth

Focus area	Alternative name from Master List	Solution(s)	Description
Demand	Markowitz: Landscaping, Capture, Reuse	Appropriate landscaping	Grey water for your landscape; minimize irrigation requirements; minimize lawns/design in patios. Rainwater to go into the house/building for domestic, non-potable use.
Demand	Santa Cruz Desal Alternatives (SCDA): Conservation Building Codes	#3 – Building Code Adoption	Forming a working group to consider building code revisions that include onsite water systems. These would go beyond the California Building Code, so that new buildings are highly water-efficient and can capture and reuse water onsite. The city can pass an ordinance requiring efficient fixtures in existing buildings.
Demand	SCDA: Water-Neutral Development	#2 – Water-Neutral Development	Implementing a water demand offset program, in which developers fund conservation retrofits elsewhere in the system to offset the new demand for water created by the development. The city needs to prevent growth from eroding our drought security by adopting a water-neutral growth policy in which developers fund conservation programs that are not already funded by ratepayers.
Demand	Smallman: Conservation Savings Accounts	Conservation Savings Accounts	Conservation accounts: Each water agency will show a special account with a line on each invoice. This account will accrue money from a percentage of the billing. The water agency shall also apply for grants for this program to help build these accounts. How to charge for water: Slowly increase base charge enough to run the agency, and start putting more and more of the high water use fee income toward conservation improvements. Part of the money could go toward capital improvement for the water agency and part could go into these conservation accounts. Eventually, there will be widespread conservation improvements furnished and installed from the money of high water users.
Storage	Bevirt: North Coast Water	Quarry Reservoirs	This project would convert the Liddell and San Vicente quarries into two reservoirs. This would provide a combined 11,000 acre-feet of storage capacity.

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Focus area	Alternative name from Master List	Solution(s)	Description
Supply	McKinney: Expanded Treatment Capacity	Membrane Filtration Plant (MFP)	<p>Implement a new MFP to treat high-turbidity (+ NTU) water from the San Lorenzo River (SLR) or from North Coast streams (Laguna Creek, Majors Creek, and Liddell Creek).</p> <p>Alt 1 (SLR-9): MFP with a treatment capacity of 9 million gallons per day (MGD) located near the SLR, close to the Tait Street Diversion, saving 9 MGD of raw water from the Loch Lomond Reservoir (LLR).</p> <p>Alt 2 (SLR-13): MFP with a treatment capacity of 13 MGD located near the SLR, close to the Tait Street Diversion, saving 13 MGD of raw water from LLR.</p> <p>Alt 3 (BSR-5): MFP with a treatment capacity of 5 MGD located near the Bay Street Reservoir, saving 5 MGD of raw water from LLR.</p>
Supply	McKinney: Ranney Collectors on SLR	Ranney collectors on SLR	An alternative to using the LLR is installing ranney collector wells along the SLR. Installing ranney collector wells along the SLR is an ideal alternative to extracting from Loch Lomond because ranney collectors can filter extremely turbid water.
Supply	Paul: (13) The Lochquifer Alternatives	Lochquifer	Divert up to 6,000 more acre-feet per year (AFY) of SLR/Zayante Creek winter water to Loch Lomond and dispense it from the Lochquifer throughout each year to water districts dependent upon wells, allowing wells to rest and aquifers to recharge quickly. This will involve (1) increasing the Lochquifer pipeline capacity to about 28 MGD by upgrading an existing, aging 14 MGD pipeline and adding a second one; (2) building an 8 MGD conventional water treatment plant to treat Lochquifer water all year; (3) use Ranney collectors for water diversions to filter out turbidity; and (4) build a low-cost settling pond for Felton diversions using large drain pipes.
Supply	Ripley: Reuse for agriculture	Indirect potable reuse (IDPR)/Irrigation	This is the Reclamation/Coast Groundwater Exchange (RCGE) water-supply strategy. The RCGE includes two construction projects: (1) a 4–5 MGD tertiary wastewater treatment plant and associated facilities to deliver water to North Coast farmers for irrigation, and (2) wells and associated facilities needed to extract the groundwater. In all years, the farmers would use reclaimed water rather than groundwater to irrigate their fields. In return, the city would get access to the groundwater supplies that the farmers currently use.
Supply	SCDA: Regional Aquifer Restoration	#7 – Aquifer Restoration	Sending river water to Scotts Valley and Soquel Creek during winter months, allowing these districts to reduce their well pumping and allow the aquifer to recharge.

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Focus area	Alternative name from Master List	Solution(s)	Description
Supply	Santa Cruz Water Department (SCWD): Water Reuse	Recycling (comprehensive)	Option 1: Potable reuse and groundwater replenishment for Tait Well Field Option 1a: Potable reuse and North Coast agricultural irrigation Option 1b: Potable reuse and SLR augmentation Option 2: Joint irrigation and groundwater replenishment for Tait Well Field Option 3: Santa Cruz regional groundwater replenishment project Option 4: Mid-county regional groundwater replenishment project Option 5: Large landscape irrigation with grey water
Supply	Sustainable Water Coalition: Desalination	Desalination as an option	Seawater is pumped to Desalination Plant through filtered intakes at such a low-flow velocity that the effect on marine life would be insignificant. Freshwater distributed to customers through existing water system. Brine waste from the desalination process is transferred to the city's existing wastewater treatment facility. Brine is mixed with treated wastewater and returned to the Pacific Ocean at close to the salinity and temperature of seawater.
Supply	Trevi: Forward Osmosis Desalination	Desalination	Trevi Systems, Inc., of Petaluma, California, has developed a forward osmosis (FO) process that relies on a source of low-grade heat at 80°C to supply a large percentage of the system's energy requirements. Waste heat, rather than electricity, is used to desalinate or remove impurities from the water. This FO process is at least four times more energy efficient than reverse osmosis (RO) in electricity use.

Table 2. A summary of the “dot” exercise

Category	Alternative name from Carie’s list	Alternative name from Master List	Vote tally	In-depth
Storage (on-stream, off-stream, underground, and groundwater development)	North Coast Water Storage (10)	Bevirt: North Coast Water	9.8	Yes
Recycled water	SCWD– 4 Reuse Scenarios – Potable Reuse, Groundwater Replenishment, Industrial Reuse, SLR augmentation (16)	SCWD: Water Reuse	7	Yes
Desalination	Desalination: The Best Strategy for a Truly Reliable Water Supply for Santa Cruz (11)	Sustainable Water Coalition: Desalination	6.8	Yes
Operational performance improvement (incremental supply improvements from current sources included)	WSAC Ranney Collectors (2)	McKinney: Ranney Collectors on SLR	5.5	Yes
Operational performance improvement (incremental supply improvements from current sources included)	Second 10–12 MGD WTP at the SLR Pump Station or Other Proposed Site (2)	McKinney: Expanded Treatment Capacity	3.5	Yes
Demand management	Building Code Revisions and On-Site Water Systems (19–22)	SCDA: Conservation Building Codes	2.6	Yes
Operational performance improvement (incremental supply improvements from current sources included)	Aquifer Restoration via Inter-District Collaboration (19–22)	SCDA: Regional Aquifer Restoration	2.5	Yes
Demand management	Water Neutral Development to Address Growth (19–22)	SCDA: Water-Neutral Development	2.3	Yes
Storage (on-stream, off-stream, underground, and groundwater development)	The Storm Aquarries Plan (16)	Smallman: Storm Aquarries	2.1	No
Regional water management	The Regional Water Authority Plan (5)	Smallman: Regional Water Authority	2	No
Operational performance improvement (incremental supply improvements from current sources included)	Water Supply Infrastructure – Water Loss Control Elements, Relocating the San Lorenzo Intake, and Additional Treatment Facility Elements (19–22)	SCDA: Enhance Existing Infrastructure	1.5	No

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Recycled water	Reclaimed Water, the Perfect Complement to Water Conservation (2)	McKinney: Water Reuse	1.3	No
Recycled water	Reclamation/Coast Groundwater Exchange (8)	Ripley: Reuse for agriculture	1.3	Yes
Recycled water	Trevi Systems: A Low GHG Desalination/Water Re-Use Process (4)	Trevi: Forward Osmosis Desalination	1.3	Yes
Desalination	Aqueous Freshwater Recovery Systems (14)	Aqueous: Desalination (non-membrane)	1.3	No
Storage (on-stream, off-stream, underground, and groundwater development)	Zayante Dam and Reservoir (16)	SCWD: Zayante Dam and Reservoir	1.3	No
Storage (on-stream, off-stream, underground, and groundwater development)	Off-Stream Storage Reservoir (18)	Fieberling: Expand Storage	1.3	No
Storage (on-stream, off-stream, underground, and groundwater development)	Three-Year Reserve of Water for Fish, Drought Relief, and Aquifer Recharge (25)	Malone: Enhanced Storage and Recharge	1.1	No
Demand management	Encourage Climate-Appropriate Landscaping (19–22)	SCDA: Climate Appropriate Landscape	1.1	No
Demand management	Rate Increase Strengthen Water Savings (17)	Holt: Rate-Driven Conservation Behavior	1.1	No
Demand management	Water Conservation Accounts Plan (5)	Smallman: Conservation Savings Accounts	1.1	Yes
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (14) Upgrade Water Intertie	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (15) Cross-County Pipeline	1	No

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Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (16) Water Looping	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (13) The Lochquifer Alternatives	1	Yes
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (11) Multi-purpose Settling Ponds	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (1–10, 22) Foundation Strategies	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (12) Diversion Alternatives	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (17) Detention Tub String	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (18) Weir Systems	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (19) Stream Relocation	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (20) SLR Alluvial Plain Wells	1	No

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Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (21) Groundwater Rights Management	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (23) Loch-Down Alternatives	1	No
Operational performance improvement (incremental supply improvements from current sources included)	Recommendations Series: Upgrading Existing Interties, Cross-County Raw-Water Pipeline, Water Looping, and More (1)	Paul: (24) Cowell Railroad Pipeline	1	No
Regional water management	Regional Cross-District Groundwater Management, Restructuring and Consolidation (12)	McGilvray: (10) Regional Collaboration	1	No
Grey water	zNano-Water Filtration System (24)	zNano: On-site Water Reuse	1	No
Other	Beyond Curtailment (Watershed Restoration) (19–22)	SCDA: Conservation Education	1	No
Other	Water-Energy Nexus and Sustainable Water Sources through Ocean Energy (7)	Brown: Zero-emission Wave Energy	1	No
Grey water	Collection of Residential Shower and Bathtub Grey Water to Flush Toilets and Provide Irrigation Water	Garges: Residential grey water	0.5	No
Storage (on-stream, off-stream, underground, and groundwater development)	The Reservoir Plan (16)	Smallman: Reservoirs	0.3	No
Storage (on-stream, off-stream, underground, and groundwater development)	Water Skate Parks (5)	Smallman: Water Skate Parks	0.1	No
Storage (on-stream, off-stream, underground, and groundwater development)	Water Supply Infrastructure – Additional Groundwater Development, and Aquifer Storage and Recovery Elements (19–22)	SCDA: Watershed Restoration	0.1	No

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Demand management	Price Water to Encourage Conservation (19–22)	SCDA: Conservation Pricing	0.1	No
Demand management	Maximum Application of the WaterSmart Conservation and Customer Engagement Program (12)	McGilvray: (9) Implement Conservation	0.1	No
Demand management	How to Save Water in your Landscape and House (6)	Markowitz: Landscaping, Capture, Reuse	0.1	Yes
Demand management	Timely and Adequate Demand Management in Dry Years (19–22)	SCDA: Demand Management During Droughts	0.1	No
Demand management	Composting Toilets in Public Venues (13)	Scott: Composting Toilets	0.1	No
Demand management	WaterSmart Software (9)	WaterSmart: Home Water Reports	0.1	No
Demand management	Rebates to Unlock Water-Efficient Technologies and Retrofits (24)	zNano: Conservation rebate program	0.1	No
Recycled water	Using Available Recycled Water to Irrigate Santa Cruz Golf Courses (12)	McGilvray: (1) Recycled Water for Irrigation	0	No
Recycled water	Tertiary Recycled Treated Water	McGilvray: (8) Tertiary Treatment, Reuse	0	No
Recycled water	The Recycle Plan (5)	Smallman: Recycled Water	0	No
Other	Atmospheric Water Generators	DewPoint: Atmospheric Water Generation	0	No

