

Desalination and Alternatives
Water for a Thirsty County

2013-2014 Santa Cruz County Grand Jury
June 2014

Summary

Water is one of the most important resources for life. Much of Santa Cruz County receives its drinking water from groundwater sources (underground aquifers). Wells pump water from the aquifers to be treated and sent to our homes and businesses. In the coastal areas from Live Oak to the Pajaro Valley, many of the aquifers are already contaminated or in danger of contamination due to saltwater intrusion caused by over-pumping. There are many different ways to protect our aquifers from this environmental disaster. One way is to work with local agencies to come up with a regional plan to halt the intrusion where it has already occurred and to protect those aquifers yet to be tainted.

The City of Santa Cruz Water Department (SCWD) and Soquel Creek Water District (SqCWD) entered into a plan to do this through the construction of a regional seawater desalination plant. However, after several years of planning and studies, the Santa Cruz City Council put a halt to the project just a year before public vote due to strong and vocal opposition from a number of residents. This decision left SqCWD without a supplemental water supply and the City of Santa Cruz more vulnerable to future droughts. Additionally, the tabling of the desalination plant forces a restart of the process, since both agencies must now spend more than a year reevaluating projects either related to the desalination or that were originally eliminated from consideration seven years ago.

SqCWD is currently finishing work on its preliminary study of alternatives, while the City of Santa Cruz is only beginning the process of re-examining its alternatives. When time for project planning, environmental studies, and construction are factored in, there could be three to ten years or more of damage to the aquifer before a supplemental supply is in place. This leaves residents of the county both vulnerable to drought and in danger of having their underground water sources contaminated by seawater. It could take three to ten years to work out a reliable water source plan and get it up and running.

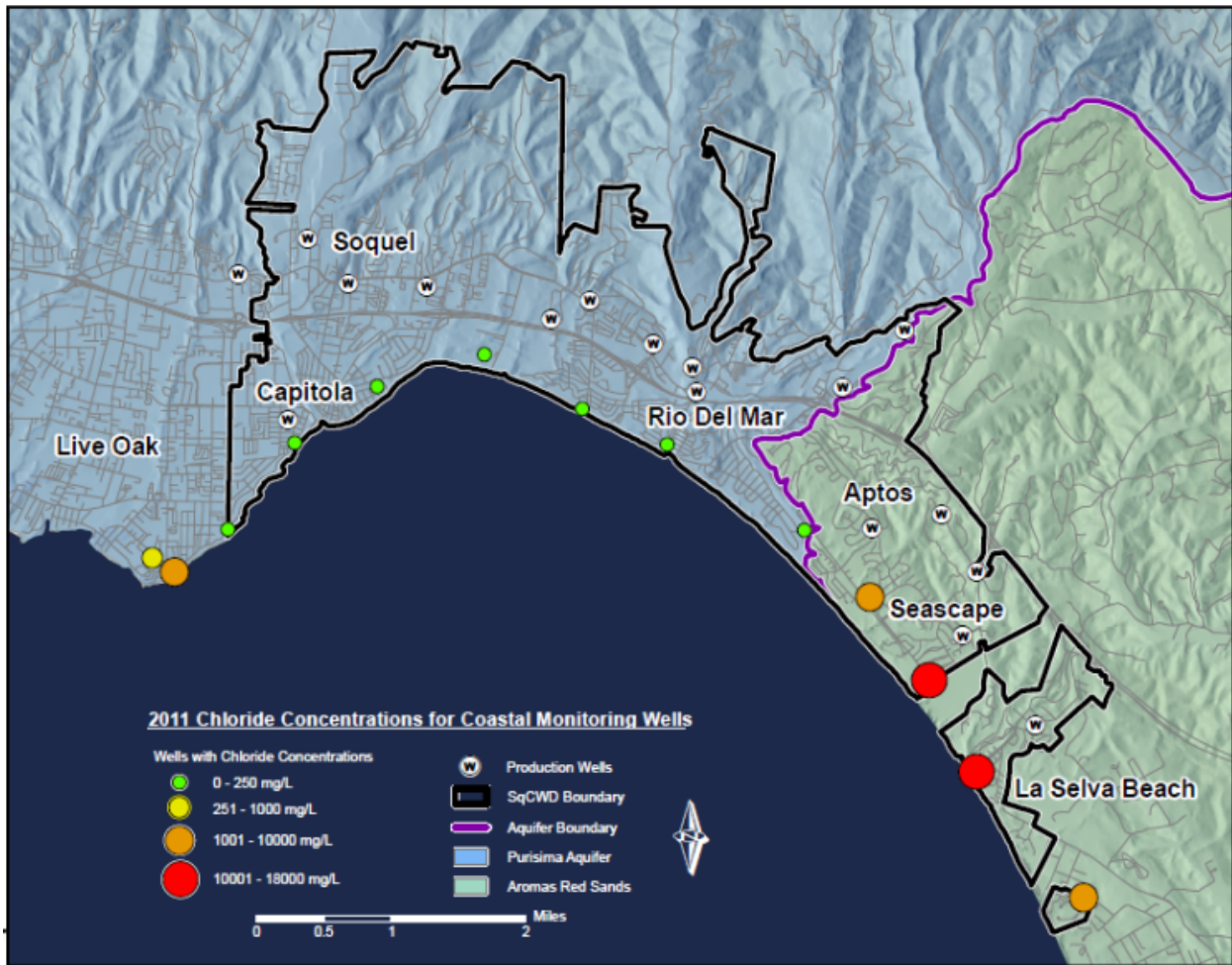
The Grand Jury examined the issues facing both SCWD and SqCWD as they attempt to manage their local water supply problems. Additionally, we examined the prospective plans for the regional desalination project as well as other alternatives being considered.

Background

Soquel Creek Water District

Soquel Creek Water District supplies water to the City of Capitola and the unincorporated areas of Aptos, Soquel, Rio del Mar, Opal Cliffs, Seascape, La Selva Beach, and portions of Live Oak. SqCWD obtains all of its water from groundwater sources in the Purisima and Aromas Red Sands aquifers. Portions of the Aromas Red Sands aquifer have been experiencing active saltwater intrusion for decades.

Soquel Creek Water District service area^[1]

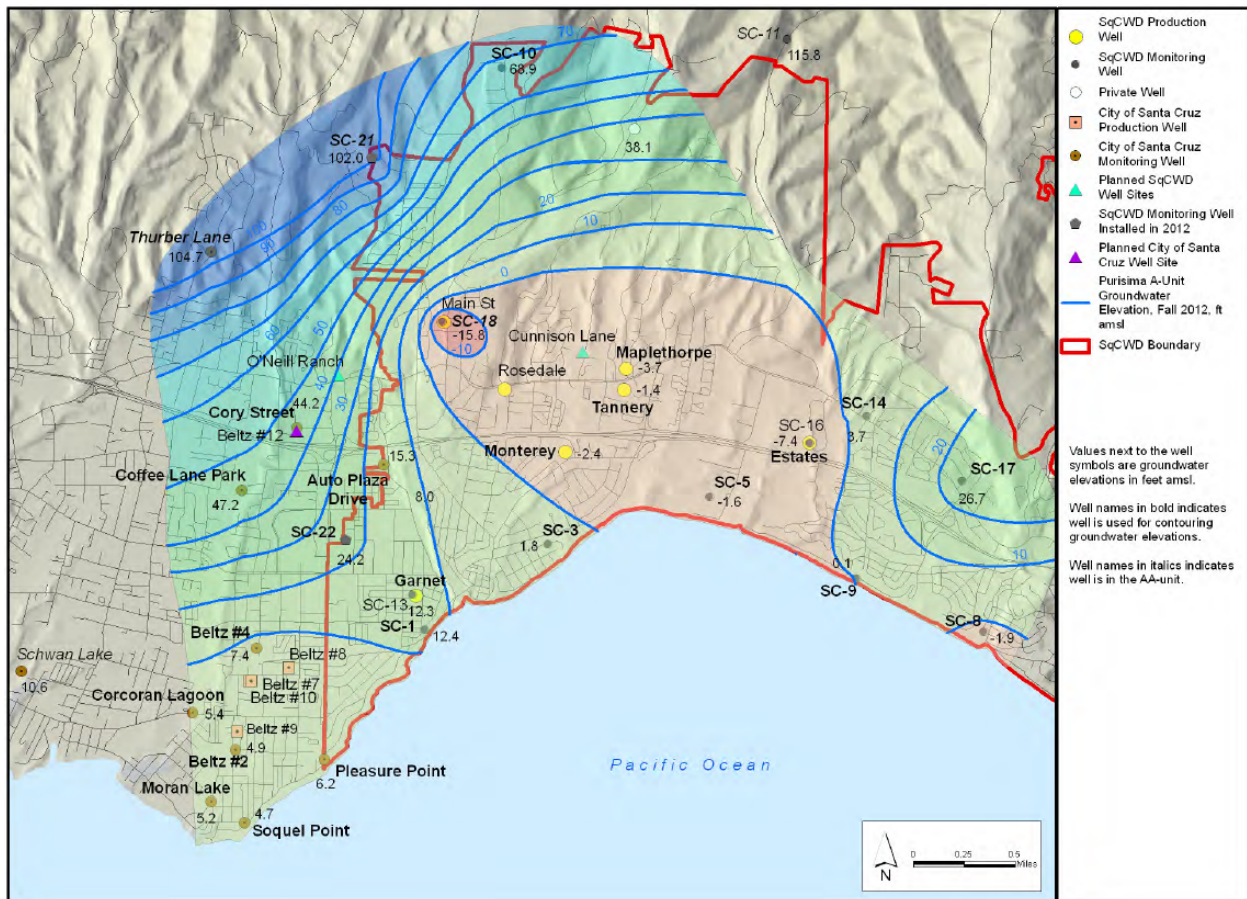


Due to overuse, the aquifers that supply water to the Soquel Creek Water District (SqCWD) are in imminent danger of saltwater intrusion. Maps from Basin Implementation Group (BIG) reports between 2007 and 2012 show wide fluctuations in aquifer levels in the Purisima basin. Purisima is one of the two aquifers from which SqCWD draws water. These fluctuations show low groundwater levels near major production wells, and especially near the coastline. These coastal groundwater levels need to be above sea level to prevent the seawater from pushing into the aquifer. In the fall of 2007, SqCWD production wells located less than half a mile north of Highway 1 reported water levels of 20 feet below sea level, with one portion in the 30 feet below sea level range. Water levels along the majority of the Purisima's coastline were also reported as being below sea level. Currently, the majority of SqCWD's portion of the Purisima aquifer is below the level needed to protect against saltwater intrusion.

SqCWD has moved its pumping further inland and is using the wells near the coast mainly for monitoring salinity. However, this relocation alone is not enough. Because the low groundwater levels are so close to our shoreline, once saltwater breaches the coastline it

will flood a major portion of the aquifer. And once saltwater has contaminated a well, it can no longer be used to produce drinking water. This issue is further compounded by climate change and the prediction of rising sea levels, which will require even higher groundwater levels to maintain adequate protection.

Groundwater Elevation Contours, Purisima Aquifer, Fall 2012^[1]



Note: Areas in red represent groundwater levels below sea level.

Santa Cruz

The City of Santa Cruz Water Department's (SCWD) service area covers the coastline from 41st Avenue to Davenport. The majority of the water supplied by the City of Santa Cruz Water Department (SCWD) comes from surface water (streams and rivers), with a small number of wells servicing customers in portions of Live Oak. The City of Santa Cruz also stores water in Loch Lomond Reservoir. During drought years the City's water supply is at risk due to high dependency upon flowing sources which dry up. The City's monitoring wells near Pleasure Point have already begun to show signs of saltwater intrusion.

In 2007 SCWD and SqCWD entered into negotiations to form the Santa Cruz Water Department and Soquel Creek Water District Regional Seawater Desalination Project (scwd²). Its goal was to plan, construct, and operate a regional desalination plant located

within the City of Santa Cruz. This was done in an effort to decrease the amount of water drawn from wells, and to provide water to the City during drought years,

During the summer of 2013, the City of Santa Cruz tabled plans for building the desalination plant and finalizing the project's Environmental Impact Report (EIR), as a result of public outcry from a number of citizens. Without an added water source SCWD will be in jeopardy during drought years, and both SCWD and SqCWD risk contaminating their shared aquifer with saltwater.

The Grand Jury examined supplemental water sources for residents and businesses in SqCWD. It also examined options to supply water to the City of Santa Cruz during droughts.

Scope

In evaluating the issues facing SCWD and SqCWD, the Grand Jury gathered data on alternatives. We met with staff and representatives of SCWD, SqCWD, and the County of Santa Cruz. We also spoke with field experts and local opposition groups to hear what is currently being done to address the water issues. In addition, we sought to find relative time frames for solutions to be implemented, and when possible, the ability of proposed solutions to remedy the overall problem.

Our main questions were:

- What are the main threats to our water supplies?
- What are the options to protect and preserve our local water supply?
- What options are currently being pursued?
- When can the relevant parties begin work on these options?
- When will the solutions be in place?

Investigation

Soquel Creek Water District

Although the word "creek" appears in the name of the water district, SqCWD is entirely reliant upon groundwater sources from the Purisima and Aromas Red Sands aquifers. There is no surface water source supplying water to the District, and it does not have water rights to any streams, rivers, or lakes within its service area. SqCWD shares the Aromas Red Sands aquifer with the Pajaro Valley Water Management Agency (PVWMA), Central Water District, and with private pumpers throughout the district's boundaries. SqCWD shares the Purisima aquifer with Central Water District, SCWD, and private pumpers. SqCWD is responsible for roughly 50% of the well pumping that occurs within its boundaries. The rest of the pumping is beyond SqCWD's control.

For the past 30 years more water has been pumped from the aquifers supplying SqCWD than has been recharged back into the aquifer. As a consequence, water levels in portions of the Purisima aquifer are approaching 16 ft below sea level.^[1] Additionally, as of October 2013, SCWD monitoring wells on the coast have begun to show increased levels of chlorides, which indicates the start of saltwater intrusion.

SqCWD contracts with an outside firm, Hydrometrics Water Resources Inc. (Hydrometrics), to analyze and assess SqCWD's aquifers. Hydrometrics estimates that the total sustainable yield from SqCWD's portion of the aquifers is 4,200 acre feet per year. Prior to 2009, the district had exceeded this number, pumping between 4,800 and 6,000 acre feet per year, resulting in a substantial deficit in the aquifer. Currently SqCWD is pumping water from its aquifers at 4,000-4,400 acre feet per year. At current pumping rates it is impossible for groundwater to rise to a level that would prevent seawater intrusion. Hydrometrics estimates that SqCWD would need to reduce pumping to 2,900 acre feet per year (a decrease of 28-35%) for a period of 20 years to replenish the aquifer.

When the district became aware of the severity of the problem, it began to look for and evaluate supplemental water supplies. In an effort to mitigate impact from development, until a secondary water source was secured, SqCWD instituted a Water Demand Offset (WDO) program. This program required conservation measures to offset 120% of projected water use for new developments. In many cases, developers achieved the offset by funding the replacement of inefficient fixtures with high efficiency ones, or by replacing lawns with artificial turf. These offsets could be done anywhere within SqCWD's service area and were not limited to the projects being developed. In 2013, SqCWD increased the offset to 200%. During the last 10 years, 33,000 toilets have been replaced within the boundaries of SqCWD. Now, less than 10% of toilets in SqCWD are high flow. SqCWD ratepayers are in one of the top tiers of conservation in the state (9%), using 118 gallons per capita per day (0.132 acre feet per capita per year).

The purpose of the WDO program and conservation measures is to allow time to develop an adequate supplemental water supply. Due to the Santa Cruz City Council tabling the scwd² desalination plant, which had been projected to start service around 2016, the WDO program is under pressure. With no supplemental supply on the horizon there are questions about how long new development can be allowed to continue. This has led to portions of the community pressuring the Board of Directors to issue a moratorium on new hook-ups until there is a plan to replenish the aquifer.

Unfortunately, any reductions in use mandated by SqCWD do not apply to the private pumpers or other water agencies that share the aquifer. Additionally, private pumpers within the SqCWD's boundaries do not assist in the costs of research or development of a secondary supply. There are also no limits to how much water private pumpers can take from the aquifer.

In drought years, the rate at which the aquifer is recharged is reduced. Yet even during periods of intense storms much of the rainwater is not able to be absorbed into the ground and is lost as it flows to the ocean. Since current predictions are that climate change will increase the frequency of droughts and the intensity of winter storms groundwater recharge could be reduced even further over the next 50 to 100 years. SqCWD staff stated that climate change could slow recharge by as much as 30%.

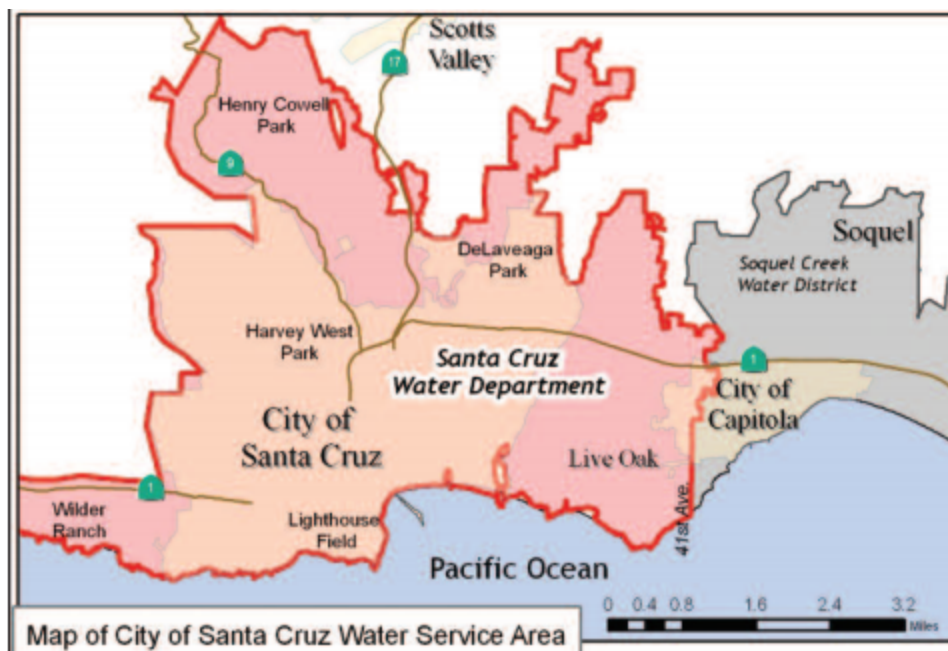
SqCWD is preparing to spend upwards of \$115 million on projects to prevent saltwater intrusion into its aquifers. These projects include the scwd² desalination plant, DeepWater Desalination (DWD), Waste Water Recycling (Recycling), District-only desalination,

Regional Water Transfers, forming a Replenishment District, and Mandatory Rationing.

During our investigation, SqCWD began to re-evaluate the various supplemental sources available. In an effort to increase public awareness of its dire situation, a series of Board meetings were recorded and broadcast on local television and the Internet. The results of the re-examination process were expected for the June 2014 Board meeting.

City of Santa Cruz Water Department

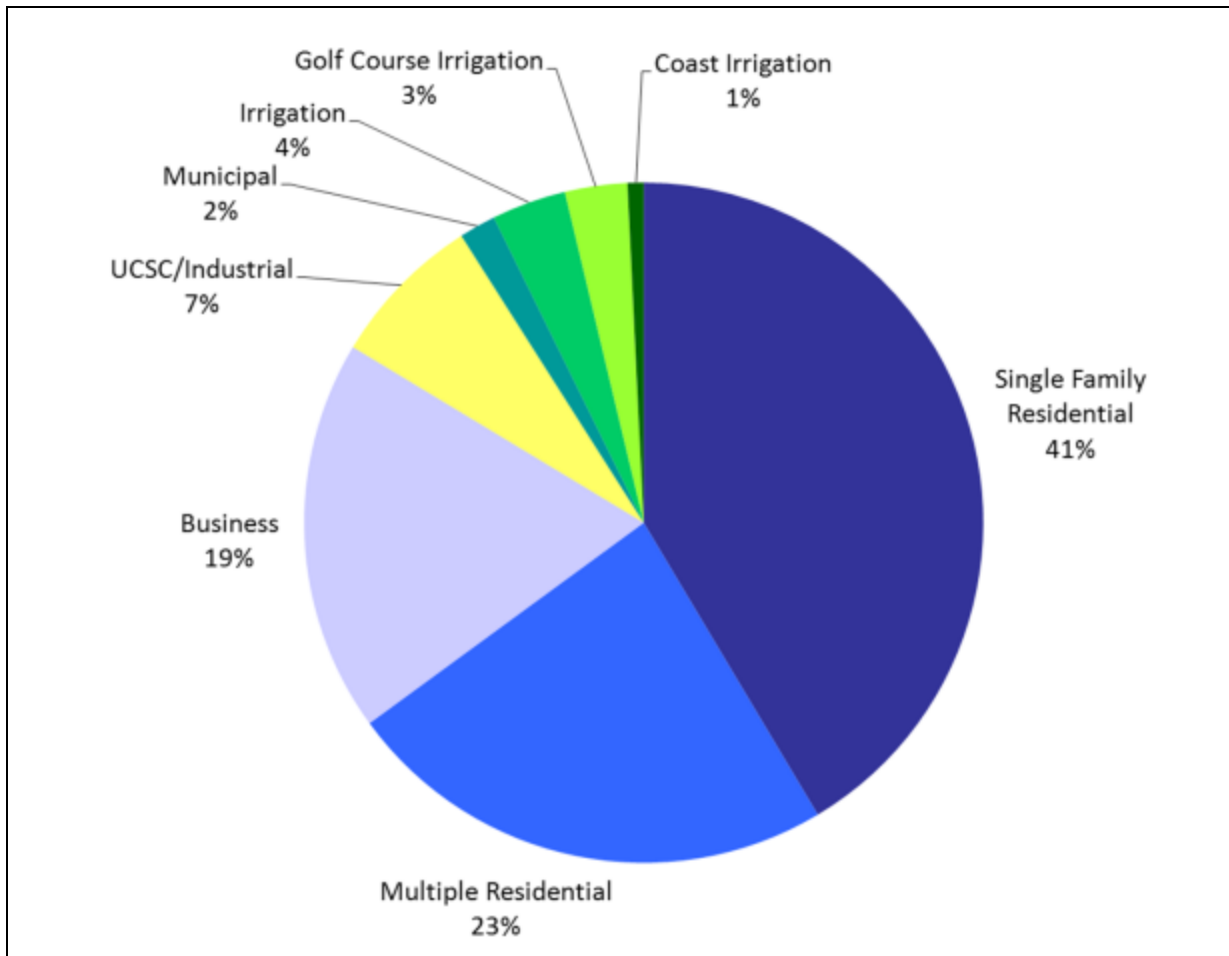
The City of Santa Cruz receives 95% of its water from flowing sources, such as the San Lorenzo River and north coast streams. An additional 5% comes from wells located largely in the western portion of Live Oak serviced by SCWD. Additionally, the City has up to 8,991 acre feet^[2] of water storage in Loch Lomond Reservoir to supplement supply when water cannot be drawn from the rivers.



During years with reduced rainfall, SCWD must pull water from Loch Lomond. When below average rainfall continues for multiple years, storage in Loch Lomond drops. At the end of 2013, Loch Lomond was only two-thirds full, its lowest point in 16 years.^[3] During drought years, SCWD cannot both meet water demand and simultaneously replenish its water storage. This places its water supply and storage in jeopardy.

In March of 2013, SCWD began updating its Water Conservation Master Plan. SCWD is analyzing its current conservation achievements and evaluating future water conservation options. On 3/4/14, SCWD presented results of this analysis to the Santa Cruz City Water Commission, a body that advises the City Council on water issues. Water use in the City of Santa Cruz is 113 gallons per capita per day (0.126 acre feet per capita per year), placing it in the top 7% of conservation among California urban water agencies.

SCWD Use by Customer Category^[4]



One of the concerns voiced by residents is the increase in enrollment at UCSC. The above chart lists University of California Santa Cruz (UCSC)/Industrial accounting for 7% of water use. Through interviews with officials, we were informed that after the company Texas Instruments left Santa Cruz, UCSC became the single largest water use customer in the city, using 5% of the City's water supply. While UCSC enrollment has doubled over the last 14 years, its daily average water use per student has decreased, going from 210 gallons (0.235 acre feet per student per year) in 1997 to 164 (0.183 acre feet per student per year) in 2012. Current plans for University growth include water negotiations with the City.

With the desalination project on hold, SCWD does not currently have a long term solution to address its water shortfall in drought years. To help look into long term options, the Santa Cruz City Council created a fourteen member Water Supply Advisory Committee in October 2013. The committee will be counseled by Public Policy Collaboration, which will be paid an estimated \$280,000 from the money set aside for the scwd² desalination project.^[5]

Desalination

The process of converting seawater to drinking water is used successfully in many parts of the world, including California.^{[6][7][8]} The desalination process examined by scwd² planned to use reverse osmosis technology for the creation of a local supplemental water supply. In the scwd² draft Environmental Impact Report (dEIR), alternatives to desalination were also studied. However, criteria used for the selection of supplemental water sources^[9] led to community as well as State and Federal agency criticism that many alternatives were not recommended or not adequately addressed.

The dEIR looked at several potential desalination plant and pumping station locations on Santa Cruz's Westside near the present Waste Water Treatment Facility. This would allow for mixing of the brine from the desalination plant with the outflow from the Treatment Facility, making the water expelled into Monterey Bay closer to the salinity of seawater and saving the cost of building a separate outflow. Several different intake and pumping station location studies were also completed. The Grand Jury noted that while 18 of the 331 written comments on the dEIR were made by Federal, State, and local agencies, the majority came from residents in the vicinity of the proposed plant and pumping station locations.^[10]

The desalination plant is designed to be modular, which gives it the ability to be expanded as needed due to population growth or increases in demand due to changes in climate, streamflow requirements, or groundwater needs. Since desalination and direct-to-potable (drinkable) treatment of waste water both use reverse osmosis, the dEIR discussed the potential for changing the desalination plant to a direct-to-potable recycling facility once it becomes feasible. The consultants on the dEIR even considered having a small demonstration of this recycling on the plant grounds to educate the public.

The proposed desalination plan calls for SqCWD to manage the plant for most of the year at less than full capacity. During this time the plant would send desalinated water into the SCWD distribution system, mainly going to the residents in the vicinity of the plant. SqCWD would receive an equal amount of treated surface water from SCWD via a proposed intertie at the boundary between the two agencies near 41st Avenue in Capitola. During summer months, or whenever a decreased stream flow necessitated a reduction in pumping from the river, SCWD would operate the desalination plant at mid to maximum capacity to meet its water need, and SqCWD would draw from its well system.

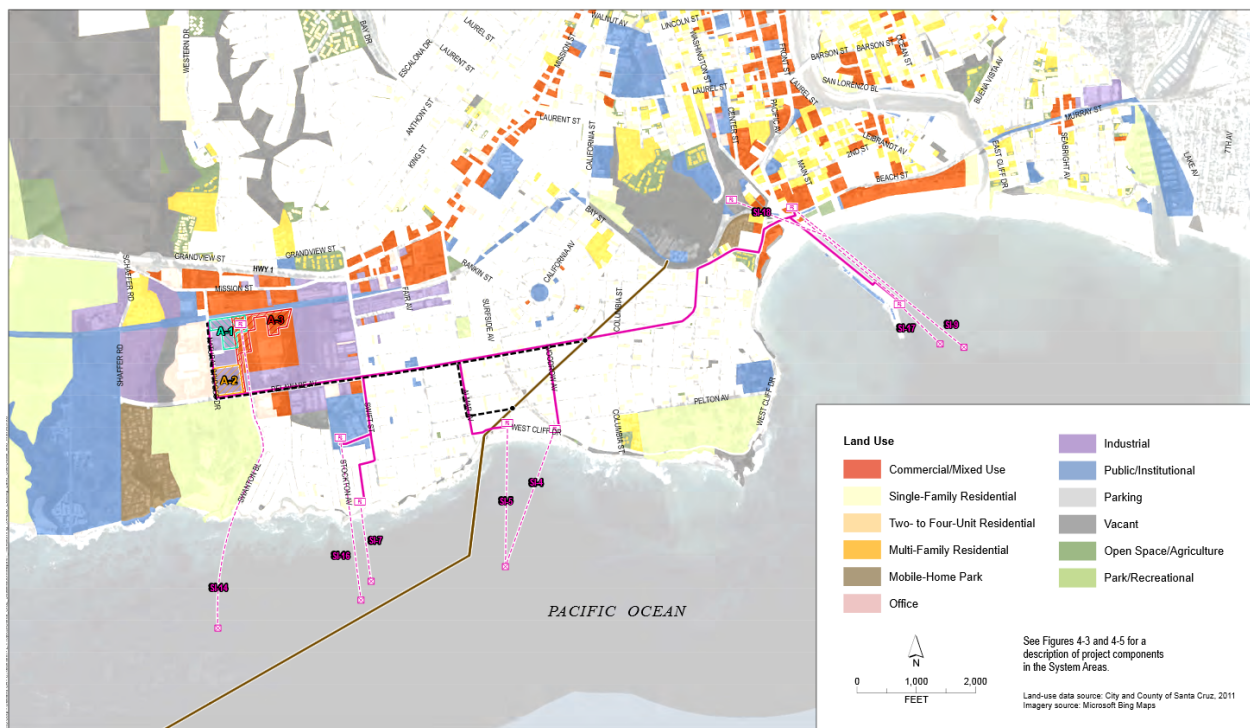
Opposition to scwd² Desalination

Opponents to the desalination plan cited several concerns during the development of the project.^[11] One of the major concerns brought up by the community dealt with the large amounts of electricity needed to push seawater through filters and the cost of that electricity, in both dollars and carbon emissions. There were also misgivings regarding the impact on the life of aquatic invertebrates and fish larvae since any intake, no matter how well it is designed, leads to impingement and entrapment to some degree. Some residents expressed apprehension about safety of the desalinated water for drinking if chemicals or pollutants were not completely removed from the ocean-sourced water.

Portions of the community also felt that the project was being pushed forward despite opposition primarily to support growth in the County and that little attention was given to

alternatives that do not yield a secondary supply of water, such as conservation. Additionally, there were concerns by local residents regarding the location of pumping stations in their neighborhoods. Each of the eight proposed intake locations included a different route through pumping stations. The inclusion of all the potential intake and pumping station locations in maps led to confusion since some residents thought that because a location was being studied the station would be built there. The Grand Jury was told by multiple officials that the large number of intake and pumping station locations that were presented led to opposition by neighbors of each location, multiplying opposition to the overall project.

Map of Proposed Intake, Pumping Station and Desalination Plant Locations^[9]



Officials from Santa Cruz City, County, and SqCWD mentioned that the failure of the desalination plan was partly due to an inadequate public information outreach to residents. The City did not address the various concerns of the citizens most directly affected by the proposed system. Multiple officials told the Grand Jury that the need for the project was not properly conveyed to the public. Additionally, one official noted, “Public outreach has not been done well. We butt heads behind the scenes. We need to reach out and talk to people, but the City [of Santa Cruz] says we need to be quiet and let it pass.”

In November of 2012, Measure P was passed by the citizens of the City of Santa Cruz. Measure P requires voter approval prior to the construction of a desalination plant within City limits. Such approval must occur during a general election year and only residents of the City of Santa Cruz may vote. The measure passed with a yes vote of 72%. This, combined with the number of negative public comments on the dEIR, led the City Council to

table discussions on finalizing the dEIR and pull the desalination plant proposal from the 2014 ballot. This has left the dEIR in an unfinalized state and leaves SqCWD ratepayers powerless to continue the cooperative scwd² Desalination plan.

The dEIR is based on older versions of SCWD and SqCWD resource plans, which predated recent information on climate change. Because of this, the dEIR does not account for recent climate change data and the projected impact on streamflow and groundwater recharge. Since desalination pulls water from the ocean it is not affected by drought or climate change. All other secondary supply options are susceptible to drought and/or climate change.

Every official we talked with recommended finalizing the EIR. SCWD and SqCWD are not bound by the recommendations of the EIR; they can choose or reject any or all options of the projects listed. Also, some of the projects and studies in the dEIR cannot be implemented or used until the EIR is finalized and approved. If the EIR is finalized, portions of it can be used in the construction of an independent desalination plant. This would allow for some savings in the development and planning process.

Of all the options explored in the dEIR and presented to SCWD and SqCWD, the scwd² desalination plan is the only option that by itself can meet the criteria to provide water to SCWD during a drought as well as allow SqCWD to rest its wells to recharge the aquifers.

DeepWater Desalination

DeepWater Desalination (DWD) is a project to run a regional desalination plant in Moss Landing. The proposed intake would be located 1.5 miles offshore. This project relies on the success of the Central Coast Regional Water Project (CCRWP) in establishing multiple private business ventures to use its cold seawater in their commercial plans. The warmed seawater will then be sent to the desalination plant. CCRWP will own both the intake and outflow that will service the proposed desalination plant.

Positive aspects of an intake/outflow in deep water include the fact that fewer organisms live in the deeper water, leading to a smaller impact on aquatic life. Preliminary studies conducted by Tenera Environmental^[12] suggest an insignificant impact on larval fish. Additional studies by Monterey Bay Aquarium Research Institute and Moss Landing Marine Laboratories show low turbidity in the water due to its depth and distance from shore. The depth of the outflow produces a positively buoyant plume, resulting in less impact on aquatic life at that depth.

While CCRWP will own the intake and outflow and operate a heat exchange unit in the vicinity of the desalination plant, the plant will not be run by CCWRP. Instead, a Joint Powers Authority (JPA) will be formed to operate the desalination plant. This JPA will be comprised of the agencies being supplied with water from the plant. One key criticism of DWD is that it relies on a business venture with the ownership of the intake/outflow in the hands of CCRWP. If CCRWP should become insolvent there are no measures currently in place to ensure that the JPA retains affordable access to the intake/outflow and gets electricity at an affordable rate. These concerns were brought up by SqCWD staff during a public board meeting on 10/15/13.

The largest cost of desalination is electricity. Through a deal with the City of Salinas, which

will establish a municipal electric utility, the JPA will get power at a reduced rate for the proposed desalination plant. The Salinas Municipal Utility will also work with CCRWP to supply power to a proposed data center that will be constructed near the DWD site. Parts of this plan are modeled on the City of Santa Clara's Municipal Utility agreement to supply power to Silicon Valley data centers. By pumping in very cold seawater from the deeper portions of the Monterey Bay, CCRWP can dramatically cut power costs for the data centers. Normal data centers use two to three times the power for cooling than a deep water cooled data center. As an example, in Finland Google uses deep water to cool its European data center. Salinas will buy power wholesale and sell it to both the desalination plant and the data center. Reduced power costs from Salinas and the use of a heat exchanger for cooling result in cheap energy and warmed seawater, lowering DWD's water production cost.

A major problem is that there is currently no pipeline between SqCWD and Moss Landing. One proposal would be to build the pipeline along existing rail lines at an estimated cost of \$1 million per mile, not including easements. When discussing the pipeline, representatives of SqCWD mentioned that they could design the pipeline so it could be used by other agencies, such as SCWD and Scotts Valley Water Department (SVWD).

A second problem for the proposed DWD plan is as follows. Phase 1 of development would produce 10,000 acre feet of water per year, while phase 2 would produce 25,000 acre feet per year. DWD predicts that Salinas will need at least 10,000 acre feet per year in order to get a reasonable return for contributing the electricity to the project. This is the total amount of water produced in phase 1. It is unlikely that all of phase 1 output would be allocated to Salinas. With expansion to 25,000 acre feet per year in phase 2, if Salinas receives the full 10,000 they expect, only 15,000 acre feet per year would be available for the remaining agencies. There are several agencies from Monterey, Santa Cruz and San Benito Counties evaluating this water source.

Project developers believe they can start producing water by 2016. However, there is little evidence that this schedule can be reached, as the project's EIR has not yet been completed, nor has the Joint Powers Authority (JPA) been formed to run the desalination plant.

Regional Water Transfers

Santa Cruz County has been updating the Integrated Regional Water Management (IRWM) program, a framework for local stakeholders to manage the region's water-related resources. IRWM is evaluating regional water transfers. This plan would take excess water from the Tait Street diversion of the San Lorenzo River between November and April. The water would be treated and distributed to nearby groundwater agencies, allowing them to rest their wells for a portion of the year. In return, Scotts Valley Water District (SVWD) and SqCWD would increase pumping during drought periods and send the water to SCWD. The amount of water returned to SCWD would require negotiations between the agencies to insure that aquifers are properly recharged in order to hold off saltwater intrusion and other effects of overdraft.

Currently, during periods of high water flow from winter storms, turbidity in the water forces

SCWD to halt water production at Tait Street and pull water from other sources. To overcome this problem, the County has discussed upgrades to the intake and pre-treatment facilities at Tait Street, allowing the more turbid water to be used (Diversion). Additionally, the County has looked into upgrading the Graham Hill Water Treatment Plant (GHWTP). These improvements are expensive, but would increase the amount of water available to SVWD and SqCWD from SCWD during periods of high turbidity. The following information covers water delivery from SCWD to SqCWD and SVWD.

Infrastructure Upgrades and Costs^[13]

- Intertie to SLVWD/SVWD (1-2 mgd) \$5.8 M
- Intertie to SqCWD (1.5-3.5 mgd) \$18.5 M
- Tait Division Works Upgrades (7.8 mgd) \$2.8 M
- Tait Expansion (to 14 mgd) \$5.9 M
- Treatment Plant Upgrades (to 16 mgd) \$55.7 M
- Diversion of Increased Turbidity Water \$1.1 M
- Operating Costs: \$147-715 K/yr

Note: The cost of pump stations and additional wells to deliver water back to SCWD during drought years has yet to be presented. M = Million, K = Thousand, mgd = million gallons per day.

Regional Water Transfer Project Phases^[13]

	<i>Project (deliveries to SVWD and returns to SCWD not shown)</i>	<i>SqCWD Yield (af/y)</i>	<i>Total Potential Yield</i>	<i>Capital Cost</i>
1	New Interties (Existing Rights)	120	445	\$27 M
2	Increase GHWTP capacity from 10 mgd to 16 mgd	292	623	\$78 M
3	Increase GHWTP capacity and Tait capacity from 7.8 to 14 mgd	1,022	1,495	\$91 M
4	Increase GHWTP capacity and turbidity treatment from 15 to 200 NTU (7.8 mgd)	417	798	\$86 M
5	Increase GHWTP capacity, increase Tait Street capacity, increase turbidity treatment	1,178	1,712	\$92 M

* Acre feet per year (af/y), Nephelometric Turbidity Units (NTU), million gallons per day (mgd).

To complete one of these projects, both SVWD and SqCWD must request water rights on the San Lorenzo River. This is a complicated process involving the California Environmental Quality Act (CEQA), California Department of Fish and Wildlife (CDFW), and the National Oceanographic and Atmospheric Administration (NOAA). Depending on the environmental studies, and on satisfaction of the requirements of the agencies dealing with streamflow and fisheries, granting of new water rights can take upwards of 10-20 years. Some County officials hope that previous studies of the Tait Street diversion could expedite the approval process. The state will not approve new water rights without compliance with CEQA, and the consent of CDFW and NOAA. The outcome of the above water rights approval process is unknown at this time. In the meantime, SVWD and SqCWD could apply for short term or emergency water rights to allow for some access to the water. All this would have to be done without jeopardizing SCWD's existing water rights.

Recycled Water

The City of Santa Cruz Waste Water Treatment Facility (SCWT) discharges more than twice as much water as SqCWD uses each year. All sewage within SqCWD and SCWD service areas is handled by onsite septic systems or processed at the SCWT. SCWT treats the water to secondary levels (not safe for reuse), then discharges it into the ocean. The facility currently discharges 9,415 acre feet per year.^[14]

In order to recycle water for use in agriculture, extra treatment is required. Currently state law does not allow for recycled water, regardless of treatment level, to be used as drinking water. Also, due to another state law, any application of recycled water requires separate pipes to transport the water to locations where it will be used. The cities of Scotts Valley

and Watsonville both use recycled water for irrigation.

SCWD uses over 8% of its drinking water for irrigation. SqCWD uses 11%-12% of its drinking water for irrigation. When the Grand Jury asked officials from SCWD and SqCWD about using recycled water exclusively for irrigation, they said they did not feel that the cost of building a plant to treat water to irrigation levels, and adding infrastructure to deliver the water for landscaping use, would be a wise fiscal choice. Additionally, since the largest irrigation users in SqCWD are private pumpers, there is no financial incentive for them to switch to recycled water for irrigation, only the incentive to do the right thing.

Construction of a reverse osmosis treatment facility would allow for expanded uses of recycled water. This more highly treated water can be used in natural recharge areas to form percolation ponds where the water filters into the aquifer. It can also be injected into the aquifer along the coast to help raise groundwater levels and create a barrier against saltwater intrusion. This would provide some direct recharge to the basin, but due to the close proximity to the ocean, only a portion of the injected water would be retained in the aquifer. Much of the injected water would diffuse toward the ocean. Another option is to inject the recycled water farther inland in an effort to recharge the aquifer.

Desalination typically uses twice as much electricity as recycled water uses for groundwater recharge because of the colder temperature of the seawater. This leads to production cost estimates of \$1,500-\$2,000 per acre foot for recycled water used in groundwater recharge versus \$2,500 per acre foot for desalination.

There are potential problems with all groundwater injection methods. The Department of Public Health sets “travel time” for recycled water injected into the ground. This is the time it takes for the injected water to travel through the aquifer to the closest production well. This can vary from 2 to 6 months^[15] and can only be done if there are no active or potential wells in the vicinity of the injection site. Given the large number of district and private wells currently in use, it is difficult to find a satisfactory location for injection. Since there is no current groundwater model of the Purisima basin there is no accurate way to project the impact of a given injection method.

Recycled water can also be used to augment streamflow or reservoir storage. However, due to high levels of nitrates from various sources present in the San Lorenzo watershed,^[16] this is unlikely to be useful for the San Lorenzo River or Loch Lomond Reservoir.

Potential changes in state law over the next two to eight years could open up the possibility of recycling water directly into drinkable water by using tertiary or higher level treatment. This would allow the over 9,000 acre feet of wastewater from the SCWT to be treated and used to augment the current water supply. The greatest barrier to potable reuse is perception, not technology. Public perception of “drinking toilet water” is a factor that would need to be overcome to move forward with direct-to-potable reuse.

In February of 2014, Kennedy/Jenks, a water engineering firm, presented a study of recycled water uses to the SqCWD Board. This study included plans for piping treated water from the SCWT to a recycled water treatment plant in mid-County. From there, it would be piped to irrigation sites and to injection wells. The Board elected to have options

2 and 3 (see below) researched and presented in June 2014. Additionally, the Board elected to continue examining direct-to-potable reuse.

Recycling Plans Presented to SqCWD Board on 2/4/14¹⁷

Alt	Description	Average Annual Recycled Water (AFY)	Potential Supplemental Supply (AFY)	Conceptual Capital Cost (mil \$)	Project Annualized Unit Cost (\$/AF)
1a	Centralized Recycled Water for Irrigation in SqCWD	510	510	\$68	\$8,600
1b	Decentralized Recycled Water for Irrigation in SqCWD	315	315	\$30	\$6,500
2	Recycled Water for Seawater Intrusion Barrier and Irrigation in SqCWD	4,000	1,030	\$154	\$9,700
3	Recycled Water for GW Replenishment and Irrigation in SqCWD	2,800	2,230	\$134	\$4,000
4	Recycled Water for GW Replenishment, Seawater Intrusion Barrier and Irrigation in SqCWD	6,200	2,750	\$190	\$4,600

* AFY = Acre feet per year, AF = Acre feet, GW = Groundwater

In the past, SqCWD studied the impact of a satellite recycling plant on Seascape Golf Course. In this scenario, the District could send recycled water to the golf course in exchange for Seascape reducing its pumping from the aquifer. However, since Seascape is not a part of SqCWD, there is no financial incentive for it to contribute to the cost of the project. Currently, SCWD, the Pasatiempo Golf Course, and the City of Scotts Valley are working on a deal to bring excess recycled water from Scotts Valley to the Pasatiempo course in exchange for SCWD sending drinking water to Scotts Valley.

With the SCWT being operated by the City of Santa Cruz, any plans that SqCWD might have for using recycled water depend on a partnership with the city. There is a limited amount of wastewater available, and if the city moves forward with recycling on its own, there could be little to no wastewater for SqCWD. During our investigation, no representatives from the City or SqCWD mentioned plans for a regional wastewater recycling plant.

Individualized Desalination (District-only Desalination)

While SCWD cannot construct a desalination plant of its own without a “yes” vote from the citizens of Santa Cruz, SqCWD is able to construct its own desalination plant. This issue is addressed in the scwd² EIR.^[18]

Due to the constraints of Measure P, a SqCWD desalination plant needs to be constructed on land outside the Santa Cruz City limits. Studies suggest that a District-only plant would require at least a two acre plot. Currently, SqCWD does not own a plot of land large enough to construct such a plant.

The scwd² intake studies had to contend with environmental issues from the sediments deposited by the San Lorenzo River. However, since SqCWD’s area of service is outside the sediment flow zone of the San Lorenzo River, it has several different options for intakes that were not possible with the scwd² plant. There are also potential amendments that could allow direct discharge of brine. Although legal in some situations, the direct discharge of brine can cause damage to aquatic life.

If secondary treated water is piped in from Santa Cruz there is the possibility for brine to be mixed with treated water and discharged at a normal salinity level. This would address some of the concerns regarding aquatic life. This would also allow the plant to be converted to a direct-to-potable recycling plant at a later date. Once again, SqCWD would depend on the availability of treated water from SCWT. If the City of Santa Cruz chose to create its own recycling or desalination plant this could limit the amount of treated water available to SqCWD.

The Integrated Resource Plan (IRP) projects that a district-only desalination plant is ten years from completion, if no studies carry over from the scwd² dEIR. Some issues from the scwd² dEIR require additional research, but consultants advise that no major faults exist. Finalization of the dEIR would require meeting with regulators, renegotiating the contract with URS Corporation (an engineering firm that was involved in the process), and addressing public comments to incorporate them into the EIR. The City’s original date to address public comments was 11/12/13, but due to the City Council’s decision to table the project and the EIR, it has been postponed indefinitely. Since the finalization process was placed on hold, there is nothing that SqCWD or SCWD can do to formally address the EIR. SqCWD is researching which portions of the dEIR can be applied to its District-only project.^[19] The results of this research will have an impact on any cost projections and time table of the project. Current projections list the cost of the project between \$86.2 million and \$114 million. The low number is greater than SqCWD’s portion of the scwd² project; the high number is the full cost of the scwd² plant. These cost estimates are similar to SqCWD’s expenses for mandatory rationing.

Mandatory Rationing

In the absence of a supplemental supply, SqCWD will be forced to enact its mandatory rationing plan. This entails mandating a drastic cut in water usage to all its ratepayers for over 20 years. Residential customers in the District use approximately 74 gallons per day per person (0.083 af/y per person). If mandatory rationing is in effect, water use would be reduced to 53 gallons per day per person (0.059 af/y per person), a reduction of 30%.

Currently, one third of the ratepayers in SqCWD use 53 gallons per day or less.

Mandatory rationing would be combined with a moratorium on new hookups. This would require SqCWD to cease granting “conditional will serve” letters for new development or remodels. This would hamper growth within the district’s boundaries and limit future County tax revenue.

Mandatory rationing will cost the district \$110 million to implement, taking away funds needed for a supplemental supply. Much of the cost of mandatory rationing is due to increases in conservation measures that the district will have to fund and install for the businesses in their jurisdiction, such as replacing all toilets and commercial fixtures with lower flow models. Also, additional staff hours will be needed to deal with these installations and the enforcement of water budgets, as well as likely litigation secondary to the higher rates. Water sale reductions of 30% will reduce SqCWD’s income by as much or more. This will force the district to almost double water rates, with sharp penalties for those exceeding rationing guidelines. This increase will have drastic effects on small businesses within the district. Commercial use accounts for approximately 5% of the District’s use.^[20] In addition, mandatory rationing in SqCWD will likely have a negative impact on tourism throughout the County due to the effect increased water rates will have on vacation rental prices in SqCWD.

Replenishment District

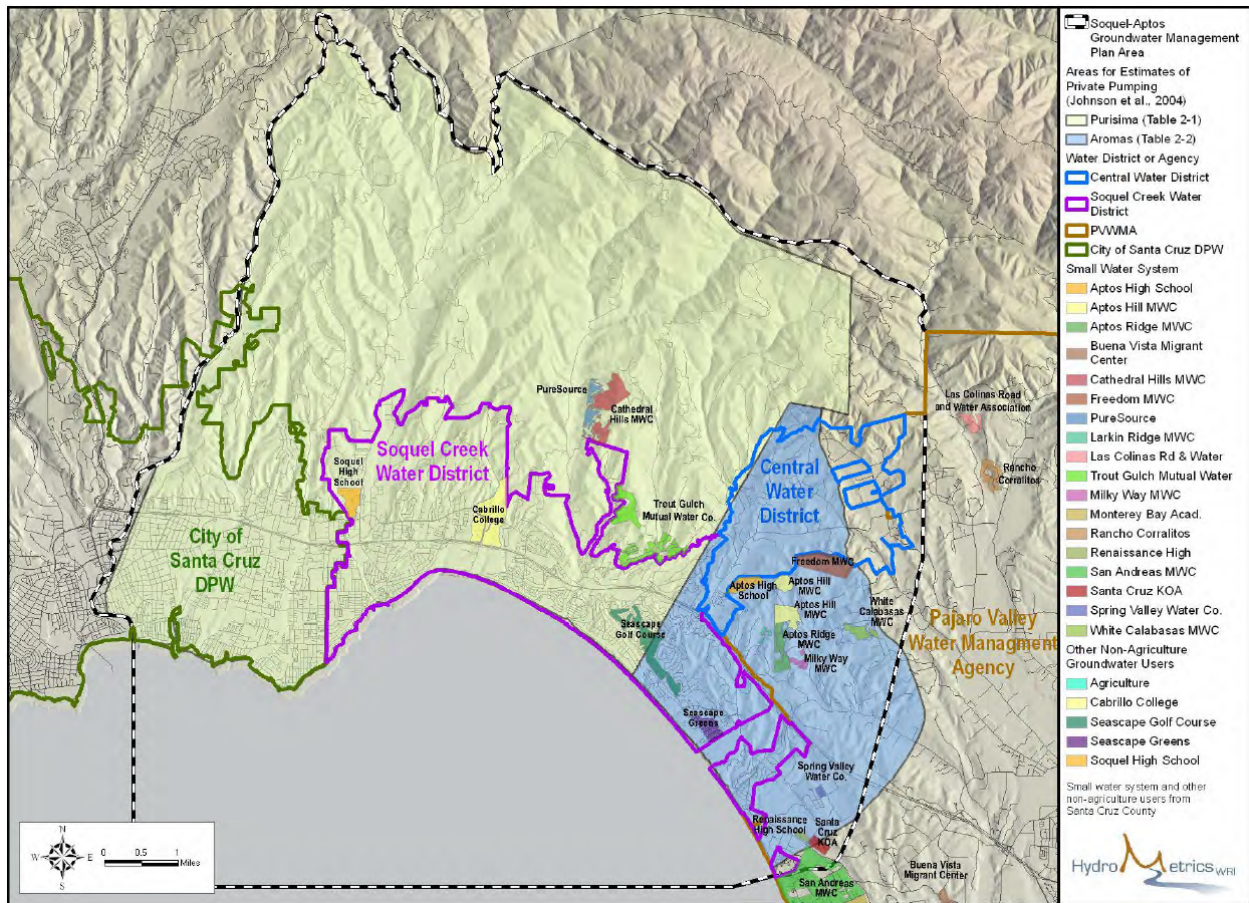
SqCWD is responsible for just over half of the water pumping in the Purisima basin, yet it is paying for more than half of the cost to research and develop methods to protect the aquifer from saltwater intrusion. Other County water districts and the City of Santa Cruz also assist in the research process designed to keep the shared groundwater source safe for all. Private pumpers and small water systems account for approximately 3,000 acre feet per year or 35% of the overall groundwater extractions within SqCWD’s boundaries. Private pumpers in the Purisima basin are not limited in the amount of water that they can pump, nor do they pay to assist in the development of any solution designed to protect the aquifer.

In 1996 SqCWD and Central Water District (CWD) formed the Basin Implementation Group (BIG) to manage the Purisima aquifer. This group is composed of representatives from the water agencies involved, and includes an at-large member who is typically associated with a smaller water system, such as a private pumper. During the course of the Grand Jury’s investigation, both CWD and SqCWD voted to invite SCWD and the County of Santa Cruz to join BIG.

A Replenishment District would allow for private pumpers to contribute to the protection of the aquifer. Under AB 3030^[21] one of the powers provided to BIG with an approved and adopted groundwater management plan, is the establishment of a Replenishment District to raise revenue and pay for facilities to manage the basin. This could allow BIG to charge a groundwater management fee to private pumpers within its boundaries to help pay for the research and implementation of any plans to save the aquifer. Any fees assessed in this manner are obligated to go to basin-specific research and projects. Revenue obtained from the Replenishment District could be used on projects such as injecting recycled water

into the basin for a barrier or recharge.

Map of Potential Groundwater Replenishment District Boundaries^[22]



Due to the inclusion of the County in BIG, any replenishment district established over the Purisima aquifer is able to extend to the full dimensions of the basin, not just the portions represented by SqCWD, CWD, and SCWD. Areas can only be included if the mapping of the groundwater basin demonstrates that the area contributes to the danger at hand and will be protected by actions taken. Currently there is no in-depth mapping of the Purisima basin.

Findings

- F1.** Both SCWD and SqCWD urgently need a supplemental water source.
- F2.** The longer SqCWD and SCWD wait to secure a viable alternative to the overdraft problem, the greater the danger of degradation and possible permanent loss of aquifers.
- F3.** The decision by the City of Santa Cruz to suspend participation in the scwd² desalination project forced SqCWD to re-start the planning process without a regional partner.
- F4.** The City of Santa Cruz did not adequately communicate the urgent need for a

supplemental water source to its ratepayers.

F5. The scwd² desalination plant is the only available single alternative that can address in a timely manner all of the supplemental water needs of SCWD and SqCWD, while at the same time being immune to climate change.

F6. The draft EIR must be finalized before the environmental studies and alternative projects included in it can be implemented.

F7. DeepWater and District-only desalination projects will face many obstacles, including completion of EIRs and securing local approval.

F8. The private company Central Coast Regional Water Project will have inordinate control over the water rates of the DeepWater Desalination project since it will control the intake pipe.

F9. Agencies that wait to buy into the DeepWater plant may be excluded because the limited amount of water produced may already be allocated.

F10. State water rights evaluations will delay the prospective start date of the Regional Water Transfer Project.

F11. Without modification, the SCWD Tait Street treatment facility is not large enough to accommodate the needs of the Regional Water Transfer Project.

F12. Officials in SCWD and SqCWD have not given sufficient consideration to a regional recycling plant.

F13. A water recycling facility would allow for injection wells to either help recharge the aquifer or to build a barrier against seawater intrusion.

F14. Because there is no detailed groundwater model of the Purisima basin, it is difficult to do the studies and research needed to protect the aquifer.

F15. Private pumpers have unregulated access to water and do not contribute financially to aquifer protection efforts.

Recommendations

R1. City of Santa Cruz Water Department should secure a supplemental water supply. (F1, F2)

R2. Soquel Creek Water District should secure a supplemental water supply. (F1, F2)

R3. The City of Santa Cruz should ensure that the scwd² draft EIR be finalized by the end of calendar year 2014. (F5-7)

R4. The City of Santa Cruz should immediately convey to its citizens the urgency of the long term regional water situation. (F1-4)

R5. The City of Santa Cruz should strongly consider reviving the scwd² desalination plan prior to the next available General Election. (F1-7)

R6. City of Santa Cruz Water Department and Soquel Creek Water District should continue to pursue a regional solution such as Desalination or Regional Water Transfers

with Recycling. (F7-13)

R7. Members of the Basin Implementation Group should complete work on a groundwater model of the Purisima basin as soon as possible. (F14)

R8. The Basin Implementation Group should establish a Replenishment District for the Purisima aquifer. (F15)

Commendations

C1. We commend SqCWD for holding board meetings at Capitola City Hall to address supplemental supply and mandatory rationing. This allows for greater public participation and awareness of the discussions via local access television and the internet.

Responses Required

<i>Respondent</i>	<i>Findings</i>	<i>Recommendations</i>	<i>Respond Within/ Respond By</i>
Board of Directors, Soquel Creek Water District	F1-15	R2, R3, R6	90 Days 9/15/14
City of Santa Cruz Water Commission	F1-6, F10-15	R1, R3, R6	90 Days 9/15/14
Santa Cruz City Council	F1-6	R1, R3-6	90 Days 9/15/14
Basin Implementation Group, Purisima Groundwater Basin	F14, F15	R7, R8	90 Days 9/15/14

Definitions

- *Acre-foot*: Unit of volume often used in reference to groundwater sources and reservoirs. It is the volume of one acre of surface area with a depth of one foot, exactly 43,560 cubic feet. It contains 325,853 gallons.
- *af/y*: Acre feet per year.
- *BIG*: Basin Implementation Group
- *CDFW*: California Department of Fish and Wildlife
- *CCRWP*: Central Coast Regional Water Project
- *CEQA*: California Environmental Quality Act
- *CWD*: Central Water District
- *dEIR*: Draft Environmental Impact Report
- *DWD*: Deep Water Desalination
- *EIR*: Environmental Impact Report
- *HCP*: Habitat Conservation Plan
- *IRWMP*: Integrated Regional Water Management Plan

- *IWRP*: Integrated Water Resources Program
- *mgd*: Million gallons per day
- *NOAA*: National Oceanic and Atmospheric Administration
- *NTU*: Nephelometric Turbidity Units. A measure of particulates in water.
- *Public Policy Collaboration*: Agency hired to mediate the Santa Cruz Water Alternatives Advisory Committee.
- *SCWD*: City of Santa Cruz Water Department
- *scwd²*: Santa Cruz Water Department and Soquel Creek Water District Regional Seawater Desalination Project
- *SqCWD*: Soquel Creek Water District
- *SVWD*: Scotts Valley Water District
- *Turbidity*: The measure of clarity in water. Particles carried in water make the water cloudy or opaque and can cause difficulty in treatment. In local streams and rivers this is often due to storm runoff carrying soil into the surface water sources.
- *UWMP*: Urban Water Management Plan
- *WDO*: Water Demand Offsets. A program to compensate for new demand by implementing conservation measures elsewhere.

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