Memorandum

To: Santa Cruz Water Supply Advisory Committee

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

Date: 10/13/2014

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

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

1. Local economic indicator comparison

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

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

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

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

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

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

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

2. Top water users: employees and revenue by sector

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

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

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

Table 3. Employment per MG per Year for Comparison Cities

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

Table 4. Revenue per MG per Year for Comparison Cities

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

3. Data sources

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

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

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

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

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

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

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

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

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

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

Company employment and revenue is from the Lexis Nexis database:

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

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

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