Public Hearing (3/20/13)
Bay-Delta Plan SED
Deadline: 3/29/13 by 12 noon

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3-29-13
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Central Valley Clean Water Association

Representing Over Fifty Wastewater Agencies

March 29, 2013

Ms. Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
PO Box 100
Sacramento, CA 95814
commentletters@waterboards.ca.gov

Re: Comments on Draft Substitute Environmental Document (SED) in support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary (Bay-Delta Plan): San Joaquin River Flows and Southern Delta Water Quality

Dear Ms. Townsend:

The Central Valley Clean Water Association (CVCWA) appreciates the opportunity to provide comments on the State Water Resources Control Board's (State Water Board) Draft Substitute Environmental Document (SED) for potential changes to the Bay-Delta Plan. CVCWA is a nonprofit association of Publicly Owned Treatment Works (POTWs) located throughout the Central Valley. CVCWA's primary mission is to represent wastewater agencies in regulatory matters while balancing environmental and economic interests. CVCWA members have a deep commitment to the protection of beneficial uses in the waters of the Central Valley, and have a special interest in the protection of uses in the Delta. Information contained in the Draft SED and the specific language in the Bay-Delta Plan is important to a number of CVCWA member agencies.

CVCWA representatives met with your staff on March 14, 2013, and discussed a number of comments on the Draft SED. As promised at that meeting and in the CVCWA testimony provided at the hearing on March 20, we are providing the following comments in writing for your consideration for use in modifying the SED and in preparing the Bay-Delta Plan.

Our comments are briefly stated below and are further amplified in detailed comments contained in Attachment A.

1. The Draft SED properly states that control of POTW discharges will not significantly affect ambient EC levels in the Delta. The Draft SED relies on available information, including modeling work performed by DWR in 2007 and more recent analyses prepared by the U.S. Bureau of Reclamation in 2011, to reach this conclusion. It is therefore problematic that, as stated in the Draft SED, the choice of EC objectives in the proposed alternative (SDWQ Alternative 2) could result in a requirement by several communities to install reverse osmosis treatment facilities to meet projected NPDES permit requirements. This is clearly an unreasonable outcome (extreme treatment requirements with no water quality benefit) which needs to be avoided through changes in either the objectives or the implementation language in the Bay-Delta Plan.

   In other words, it is CVCWA's position that while reverse osmosis requirements for Delta communities may be "reasonably foreseeable" under the proposed Bay-Delta Plan alternative for South Delta EC objectives, such requirements are not "reasonable." It is therefore CVCWA's position that this unreasonable outcome should be remedied through one or more available approaches, as described below.

2. One approach which should be considered is to expand the scope of alternative salinity objectives being considered. The Draft SED currently is considering three alternative salinity objectives in the South Delta: (1) Current Objectives, (2) an EC standard of 1000 umhos/cm, and (3) an EC standard of 1400 umhos/cm. Table 17.1 of the Draft SED indicates that "Service Providers," a category which includes POTWs, will experience a Significant impact under Alternative 2 (the proposed alternative), and will experience a Less than Significant impact under Alternative 3. The Draft SED should include at least one additional intermediate alternative, e.g., EC = 1200 umhos/cm or greater. Under such an alternative, based on available effluent quality data for the cities of Stockton and Tracy, potential requirements for reverse osmosis could be entirely avoided. This alternative should be evaluated, since, as stated in the Draft SED, an EC objective of 1200 umhos/cm or greater would still provide reasonable protection of South Delta agricultural uses.

3. The Draft SED should also consider different averaging periods for the proposed EC objectives, e.g., an annual average value that Delta communities can comply with and a monthly EC cap of 1400 umhos/cm.

4. The Bay-Delta Plan should include implementation language that addresses the NPDES permitting paradox that is identified in Comment

No. 1. The Plan should describe various considerations that should be made in NPDES permitting determinations related to EC effluent limits that would avoid unreasonable end-of-pipe effluent limits, including the following:

a. Application of EC limits as long term (e.g., annual) averages that would result in compliance for Delta communities;

b. Designation of specific points of compliance in the Delta for the proposed objectives that would allow dilution in the determination of reasonable potential and the derivation of effluent limits;

c. Use of a salinity variance adopted in the Sacramento-San Joaquin Basin Plans to postpone implementation of unreasonable effluent limits pending completion of a CV-SALTS long term salinity management plan and Basin Plan amendment that addresses this issue;

d. Use of compliance schedules as a short-term solution to avoid implementation of unreasonable effluent limits.

5. The capital (construction) costs shown for reverse osmosis treatment in the Draft SED are low by a factor of two or more. Also, the O&M costs for RO treatment, which are a significant local expense, are not identified as a cost or quantified. Finally, the greenhouse gas impacts associated with the energy required for operation of reverse osmosis treatment units are not identified as an impact or quantified in the Draft SED. We strongly suggest that the cost and environmental impact information provided in Attachment A be incorporated in a revised Draft SED.

CVCWA supports the comments by the City of Tracy that address the above issues.

We appreciate the opportunity to provide these comments and are available for a follow-up meeting to continue to work with staff on language that will address the concerns we have raised.

Sincerely,

Debbie Webster

Debbie Webster,
Executive Officer

Attachment

ATTACHMENT A

Central Valley Clean Water Association (CVCWA) Comments on Public Draft Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality – December 2012

Development of SDWQ Alternatives

The State Water Resources Control Board (State Board) developed three South Delta Water Quality (SDWQ) alternatives for the Substitute Environmental Document (SED) that are comprised of numeric objectives for salinity and associated program actions. SDWQ Alternative 1 is the "no project" alternative that would retain the existing 2006 Bay-Delta Plan requirements for a maximum 30-day running average of mean daily EC of 0.7 millimhos per centimeter (mmhos/cm; equivalent to 0.7 dS/m) April 1–August 31 and 1.0 mmhos/cm September 1–March 31 for all water year types. These objectives are applicable to the three interior south Delta compliance stations and the compliance station in the San Joaquin River at Vernalis. (SED at 3-7.) SDWQ Alternative 2, the Preferred Alternative, would establish a numeric salinity objective of 1.0 dS/m as a maximum 30-day running average of mean daily EC for all months in the San Joaquin River between Vernalis and Brandt Bridge, Middle River from Old River to Victoria Canal, and Old River/Grant Line Canal from the Head of Old River to West Canal. (SED at 3-7.) SDWQ Alternative 3 is similar to SDWQ Alternative 2 except that it would establish a maximum 30-day running average of mean daily EC of 1.4 dS/m year round. (SED at 3-8.)

By limiting the SDWQ alternatives to just two options that would be different from the salinity objectives included in the existing 2006 Bay-Delta Plan, the State Board has ignored a consideration of environmental impacts that could occur under a maximum 30-day running average of mean daily EC of 1.1 dS/m or 1.25 dS/m. The State Board's analysis of environmental impacts associated with implementation of SDWQ Alternative 2 and Alternative 3 shows that the estimated impacts of each alternative differ depending on the specific impact under consideration. It is likely that a numeric salinity objective between the two objectives advanced by SDWQ Alternative 2 (1.0 dS/m) and Alternative 3 (1.4 dS/m) would have impacts intermediate to those estimated for SDWQ Alternative 2 and Alternative 3, and these intermediate impacts may, on balance, produce fewer and less significant environmental perturbations than those identified by the State Board for SDWQ Alternative 2 and Alternative 3. It is incumbent upon the State Board to expand its development and review of SDWQ alternatives to determine if numeric salinity objectives between those advanced in SDWQ Alternative 2 and Alternative 3 would offer a superior environmental alternative when considering impacts to all resources and entities that would likely be affected by implementation of new salinity objectives in the south Delta.

Selection of Preferred SDWQ Alternative

The Preferred SDWQ Alternative, which is the same as Alternative 2 described in the SED, would establish a numeric salinity objective of 1.0 dS/m as a maximum 30-day running average of mean daily EC for all months in the San Joaquin River between Vernalis and Brandt Bridge, Middle River from Old River to Victoria Canal, and Old River/Grant Line Canal from the Head of Old River to West Canal. (SED at 3-7.) Chapter 13 of the SED, *Service Providers*, identifies six wastewater treatment plants (WWTPs) that discharge treated effluent into the southern Delta; these WWTPs include the City of Tracy, Deuel Vocational Institution, City of Manteca, City of Stockton, Mountain House Community Services District, and Discovery Bay Community Services District. (SED at 13-1.) The State Board found that SDWQ Alternative 2 would have "significant and unavoidable" impacts for wastewater treatment providers; specifically, the cities of Tracy and Stockton. (SED at 13-3.) SDWQ Alternative 3 was determined to have "less than significant" impacts for wastewater treatment providers. (SED at 13-4.) In contrast, SDWQ Alternative 2 was determined to "not result in any significant impacts on the environment" in regard to aquatic resources (SED at 7-2), and was determined to have "less than significant" impacts on agriculture resources (SED at 11-30). Similar to the "less than significant" impact of SDWQ Alternative 3 on municipal dischargers, this alternative was also found to have "less than significant" impacts on aquatic resources (SED at 7-2) and agricultural resources (SED at 11-30).

With reference to the discussion above regarding development of additional SDWQ alternatives, and the fact that SDWQ Alternative 2 was found to have "significant and unavoidable" impacts for wastewater treatment providers while Alternative 3 was found to have "less than significant" impacts on municipal dischargers, it is imperative that additional numeric salinity objectives be developed and evaluated by the State Board before it advances a "preferred" SDWQ alternative.

Methods of Compliance for SDWQ Alternatives

The various SDWQ alternatives advanced in the SED have the potential to impact Central Valley wastewater dischargers in that new south Delta water quality objectives for salinity would require some dischargers to implement advanced wastewater treatment technologies to remove salts from their effluents. The SED states that "it is reasonably foreseeable that municipalities would take one or more of the following actions to comply with National Pollutant Discharge Elimination System (NPDES) effluent limits established by the Central Valley Regional Water Quality Control Board (Central Valley Water Board), which would use the numeric salinity objectives in the SDWQ alternatives." (SED at 4-5.) The discharger actions described as helping to comply with new effluent limits for salinity include: (1) new source water supplies, (2) salinity pretreatment programs, and (3) desalination. Beginning in Chapter 4, but reiterated throughout the SED, it is stated that "a site-specific, project-level analysis of these potential methods of compliance is not possible due to uncertainty about timing, duration, and magnitude of the actions." (SED at 4-4.) To this end, the State Board provides only a cursory discussion in Chapter 18, *Economic Analyses,* of the general costs associated with each of the three salinity reduction actions listed above. In this chapter, it is noted that of the six WWTPs listed in Chapter 13 that discharge to the southern Delta, only three would be subjected to increased compliance costs as a result of adoption of either SDWQ Alternative 1 (City of Tracy, City of Stockton, City of Manteca) or SDWQ Alternative 2 (City of Tracy, City of Stockton).

Because all three of these municipalities have been working diligently over the past decade or longer to develop high quality source water supplies (see **Table** 1) and implement source control and pollution prevention programs focused on reducing electrical conductivity and total dissolved solids in municipal influent (see **Table** 2), CVCWA believes that desalination is in fact the only compliance option available to these dischargers if they are required to meet more stringent effluent limitations for salinity as the result of adoption of either SDWQ Alternative 1 or Alternative 2.

Table 1: Water Supply Source Control Actions Taken by Select South Delta Dischargers.

City of Tracy
1995 – The City initiated a project to bring South San Joaquin Irrigation District's Stanislaus River water through 40 miles of pipeline to Tracy.
2001 – The City entered into long-term agreements to purchase additional surface water from the Delta-Mendota Canal (DMC) to replace groundwater.
2002 – The City began designing an expansion to the potable water treatment plant to process the additional DMC surface water.
2004 – Surface water from the DMC became available.
2005 – Delivery of surface water from the South San Joaquin Irrigation District's Stanislaus River supply commenced in September. A pilot project to store surplus surface water supplies in the Semitropic Water Storage District in Kern County was successful.
2007 – The City completed an expansion to the potable water treatment plant to process the additional DMC surface water.
2008 – The City completed construction of a transmission pipeline allowing Stanislaus River water deliveries to a second location within Tracy. 62% of the City's water supply is now from Stanislaus River water.
2010 – The City completed construction of an Aquifer Storage and Recovery (ASR) well and received approval from the Central Valley Water Board in December 2010 to perform pilot tests on injection of drinking water into the groundwater basin.
2011 – The City completed Year-2 of the pilot project where it injected into and then extracted from the groundwater basin 250 acre-ft of drinking water. The pumping of native groundwater was limited to 1.7% of the City's total potable water supply (Bayley, 2012).
2012 – The City completed Year-2 of the pilot program where it injected 700 acre-ft of drinking water into the groundwater basin, and is currently extracting the last of the injected water.
City of Stockton
2008-2012 – 73% of City of Stockton Metropolitan Area's water supply is from surface water sources and the remaining 27% is from groundwater sources (RBI, 2009).
2012-2105 – Phase I of the City's Delta Water Supply Project (DWSP) will aim to source as much water supply from surface waters as possible, with up to 27% of the total supply sourced from the DWSP diverted surface waters and 73% of the total supply from other surface water sources (RBI, 2009).
2015-2030 – Phase II of the City's DWSP will see the total amount of groundwater contributing to the overall water supply decrease (RBI, 2009).
2031-2050 – By the end of Phase III of the City's DWSP (2050), it is estimated that approximately 21% (during wet years) and 35% (during dry years) of the total water supply will be sourced from groundwater (RBI, 2009).
City of Manteca
Pre-2005 – Prior to 2005, 100% of the City's source water was supplied by groundwater (LWA, 2012).
2005 – The City began substituting a portion of its groundwater supply with surface water from the South San Joaquin Irrigation District water plant. In 2005, 25% of the City's water supply was sourced from surface water; 75% of the total supply was sourced from groundwater (LWA, 2012).
2005-2009 – The proportional contribution of surface water to the City's water supply steadily increased to 50% (LWA, 2012). This portion is expected to remain constant (City of Manteca, 2009).

Table 2: Source Control, Pollution Prevention, and Facility Upgrade Actions Taken by Select South Delta Dischargers.

City of Tracy
Between 2006 and 2008, Leprino Foods Company (Leprino), the only industrial facility in the City of Tracy, reduced its daily TDS loading to the WWTP by approximately 20% through source loading reductions. Leprino achieved source reductions by implementing numerous best management practices in its plant operations, all of which are designed to make efficient use of incoming raw materials, ingredients, and cleaning chemicals, thus minimizing discharges to the wastewater collection system. As the quality of the City of Tracy's water supply improves, further reductions in the TDS/EC contributions from the Leprino plant effluent are expected (City of Tracy, 2010).
City of Stockton
The City of Stockton provides discharge permits to Significant Industrial Users (SIUs) through its industrial pretreatment program to regulate and control the discharge of salinity to the Regional Wastewater Control Facility (RWCF). Discharge permits for new SIUs contain an interim TDS concentration limit of 1000 mg/L as a daily maximum and an interim loading limit in pounds per month. The loading limit is based on an average TDS concentration limit of 800 mg/L and the permitted flow for that SIU (RBI, 2009).
The City of Stockton has replaced alum with polyaluminum chloride at the RWCF as a means to reduce the need for caustic during the treatment process. Some caustic is still used on occasion to optimize performance of nitrifying biotowers. These adjustments have led to an overall slight reduction in effluent EC levels, as described by the City of Stockton RWCF Chief Plant Operator (Garcia, 2012).
City of Manteca
The City of Manteca constructed the Industrial Pipeline System to eliminate EC (salinity) discharged to the WQCF by the City of Manteca's largest industrial discharger, Eckert Cold Storage (Eckert). The Industrial Pipeline System has been fully operational since April 2007. It diverts Eckert's food-processing wastes to direct application on agricultural fields (City of Manteca, 2009).
The City of Manteca developed a PPP that contains an effectiveness evaluation for pollution prevention strategies aimed at limiting and/or reducing EC levels in the WQCF influent (LWA, 2010). These strategies are specifically aimed at residential brine-discharging water softeners.
The City of Manteca replaced the WQCF's existing chlorine contact tank with tertiary filtration and UV disinfection, which appeared to contribute to a slight reduction in effluent EC levels; however, this reduction was not considered significant, nor was it distinguishable from the normal variability observed in the concentrations of this parameter in the City's effluent (City of Manteca, 2009).

By implementing changes to water supply and industrial source control practices, the cities of Tracy and Manteca have achieved reductions in effluent EC concentration. The City of Tracy achieved a 25% reduction in WWTP effluent EC between 2007 and 2011. The City of Manteca achieved an approximate 32% reduction in its Water Quality Control Facility monthly average effluent EC in recent years. The City of Stockton is looking for its newly constructed Delta Water Supply Project to augment local groundwater and existing surface water supplies to meet the Stockton's water demands and reduce water supply salinity contributions to Stockton's RWCF (RBI, 2009). However, each of the three subject dischargers would not be able to comply with water quality based effluent limitations for salinity based on the existing 2006 Bay-Delta Plan salinity objectives (SDWQ Alternative 1), and the cities of Tracy and Stockton would not be able to comply with water quality based effluent limitations based on the 1.0 dS/m EC objective associated with SDWQ Alternative 2. Additionally, the State Board should make clear that the seasonal 0.7 dS/m and 1.0 dS/m salinity objectives contained in the 2006 Bay-Delta Plan do not apply to municipal dischargers of treated wastewater.

Cost Evaluation of Reverse Osmosis Treatment

Being that salinity reduction through improved potable water supplies, source control actions, pollution prevention programs, and facility upgrades have not reduced salts in the effluents of the three subject dischargers to the degree that they could comply with more stringent salinity limits that could come from forthcoming changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary (Bay-Delta Plan), each discharger has developed planning level cost estimates for reverse osmosis (RO) treatment to comply with existing 2006 Bay-Delta Plan requirements (i.e., SDWQ Alternative 1: EC objective of 700 µmhos/cm April 1–August 31 and 1000 µmhos/cm September 1–March 31), and for the cities of Tracy and Stockton to comply with SDWQ Alternative 2: an EC objective of 1.0 dS/m or 1000 µmhos/cm year around. **Table** 3 and **Table** 4 provide Central Valley discharger-developed planning level cost estimates for RO treatment to comply with SDWQ Alternative 1 and Alternative 2, respectively. It should be noted that the cost estimates provided below do not include microfiltration (MF) as a pre-treatment for effluent prior to RO treatment. However, MF is a common treatment component in salt removal applications, and is sometimes required to achieve necessary salt removal efficiency from a RO system.

Table 3: Planning Level Cost Estimates for Reverse Osmosis (RO) Treatment Necessary to Comply with SDWQ Alternative 1.

Discharger	RO Treatment (mgd) required to meet 700 µmhos/cm EC Limit[1]	Cost ($ Million)				
		Capital[2,3]	Annualized Capital[4]	Annual O&M[2]	Total Annual[5]	Present Worth[6,7]
City of Tracy[8]	11.9	67.0	4.5	6.6	11.1	166
City of Stockton[9]	37.5	211	14.1	20.9	35.0	523
City of Manteca[10]	7.1	40.0	2.7	3.9	6.6	99

Notes:

1. Effluent flow requiring RO treatment to meet a 700 µmhos/cm EC effluent limitation from April 1 through August 31 using a 25% safety factor to address the range of influent EC concentrations observed for the facility.
2. Capital and O&M costs developed using: Memorandum: Modification of Flow Basis for Treatment Train Costs as Previously Presented in the "Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant" (Carollo, March 2009). (Carollo, 2010)
3. Treatment costs include engineering, administrative, legal, and contingency costs. All costs in June 2012 dollars (ENRCCI 9838). The ENRCCI for Sacramento, CA (9838) was estimated by taking the average ENRCCI for the U.S. 20 Cities (i.e., 20-City Average) and the ENRCCI for San Francisco, CA.
4. Annualized capital costs developed using a 30-year amortization period and 5.25 percent interest rate.
5. Total Annual Cost = Annualized Capital Cost + Annual O&M Cost.
6. Present worth represents the summation of the capital construction cost plus the capitalized annual operation and maintenance cost based on a 30-year planning period and 5.25 percent interest rate.
7. Due to the recent bankruptcy of the City of Stockton, it may not be able to receive an interest rate as low as 5.25 percent, and therefore the actual cost of implementing RO treatment may be greater than shown in the above table.
8. Partial RO treatment requirement of 11.9 mgd based on WWTP average effluent EC of 1223 µmhos/cm from data collected 2009–2020, summer months only (April–August).
9. Partial RO treatment requirement of 37.5 mgd based on RWCF average effluent EC of 1111 µmhos/cm from data collected 2007–2011, summer months only (April–August).
10. Partial RO treatment requirement of 7.1 mgd based on WQCF average effluent EC of 763 µmhos/cm from data collected 2008–2011, summer months only (April–August).

With reference only to the capital costs shown in **Table 3** and **Table 4**, these estimates are significantly higher than those provided in Appendix H, *Evaluation Methods of Compliance*, of the SED that utilize Department of Water Resources California Water Plan Update 2009 (DWR, 2009) information to estimate a capital cost range of $5–22 million to construct a reverse osmosis treatment facility to treat 10 million gallons per day (mgd) of municipal wastewater. (SED at H-71.) The SED's capital unit cost (per mgd) for RO treatment ranges from $560,000 to $2,240,000. This capital cost range does not include operations and maintenance (O&M) costs. It is interesting that the State Board would elect not to provide annual O&M cost estimates as the SED states the following at H-70 of Appendix H, *Evaluation Methods of Compliance*: "The costs of RO include the costs associated with the construction of the RO facilities and operation and maintenance costs associated with energy and brine disposal." Referring strictly to the unit cost of RO treatment, the $560,000–$2,240,000 range reported in the SED is significantly lower than the unit cost range of $5.6–$10 million taken from the estimates provided in Tables 3 and 4 ($5.6 million) and an independent salinity best practicable treatment or control study undertaken by the City of Tracy which estimates RO treatment to have a unit cost of $10 million (City of Tracy, 2011).

Table 4: Planning Level Cost Estimates for Reverse Osmosis (RO) Treatment Necessary to Comply with SDWQ Alternative 2.

Discharger	RO Treatment (mgd) required to meet 700 µmhos/cm EC Limit[1]	Cost ($ Million)				
		Capital[2,3]	Annualized Capital[4]	Annual O&M[2]	Total Annual[5]	Present Worth[6,7]
City of Tracy[8]	8.0	45.0	3.0	4.5	7.5	112
City of Stockton[9]	23.1	130.1	8.7	12.8	21.5	321

Notes:

1. Effluent flow requiring RO treatment to meet a 1000 µmhos/cm EC effluent limitation from April 1 through August 31 using a 25% safety factor to address the range of influent EC concentrations observed for the facility.
2. Capital and O&M costs developed using: Memorandum: Modification of Flow Basis for Treatment Train Costs as Previously Presented in the "Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant" (Carollo, March 2009). (Carollo, 2010)
3. Treatment costs include engineering, administrative, legal, and contingency costs. All costs in June 2012 dollars (ENRCCI 9838). The ENRCCI for Sacramento, CA (9838) was estimated by taking the average ENRCCI for the U.S. 20 Cities (i.e., 20-City Average) and the ENRCCI for San Francisco, CA.
4. Annualized capital costs developed using a 30-year amortization period and 5.25 percent interest rate.
5. Total Annual Cost = Annualized Capital Cost + Annual O&M Cost.
6. Present worth represents the summation of the capital construction cost plus the capitalized annual operation and maintenance cost based on a 30-year planning period and 5.25 percent interest rate.
7. Due to the recent bankruptcy of the City of Stockton, it may not be able to receive an interest rate as low as 5.25 percent, and therefore the actual cost of implementing RO treatment may be greater than shown in the above table.
8. Partial RO treatment requirement of 8.0 mgd based on WWTP average effluent EC of 1223 µmhos/cm from data collected 2009–2020, summer months only (April–August).
9. Partial RO treatment requirement of 23.1 mgd based on RWCF average effluent EC of 1111 µmhos/cm from data collected 2007–2011, summer months only (April–August).

CVCWA believes a more accurate unit cost estimate for construction of a RO treatment facility in the Central Valley is approximately $5.6–$10/mgd, based on the same calculations used to generate the cost estimates provided in **Table 3** and **Table 4** (low end of range) and RO cost estimates developed in a 2011 City of Tracy study (high end of range; City of Tracy, 2011). This range is approximately 2.5–4.5 times greater than the high end capital unit cost estimate

($2.24 million) provided in the SED. Again, the desalination cost range provided in the SED only considers capital costs, and therefore does not provide a complete assessment of all advanced treatment costs that would be borne by ratepayers served by a WWTP that is required to implement RO as a means to comply with more stringent effluent limits for salinity stemming from the adoption of either SDWQ Alternative 1 or Alternative 2. Using the calculations underlying the planning level costs estimates shown in **Table** 3 and **Table** 4, it is estimated that annual O&M costs would be approximately $555,000 per mgd treated with RO. If, in fact, the RO treatment costs provided in the SED do include O&M costs, as well as engineering, administrative, legal, and contingency costs associated with construction and operation of an RO treatment facility, then the costs presented in the SED are even lower than those presented in **Table** 3 and **Table** 4. For its next draft of the SED, the State Board should strive for more clarity and transparency in its cost estimates, consider the RO cost estimates provided herein, and update cost estimates provided in the SED to the current engineering construction cost index.

Environmental Impacts of RO Treatment

While the brine disposal method (evaporation ponds) considered in the SED is different from and requires less energy than the brine disposal method (thermal brine concentration, crystallization, and land disposal) associated with the planning level cost estimates provided in **Table** 3 and **Table** 4, both treatment systems include RO, which is an energy intensive process itself. As stated in the SED, evaporation ponds would be the less expensive brine disposal option for a WWTP; however, under circumstances where land for evaporation ponds is not available at or adjacent to a WWTP, thermal brine concentration, crystallization, and ultimate land disposal of crystallized residuals might be the preferred brine disposal option. **Table** 5 shows annual estimated CO_2 emissions for the three subject discharges to comply with SDWQ Alternative 1 and Alternative 2 using either evaporation ponds or thermal concentration and crystallization as means of brine disposal (additional calculations shown in Appendix A).

Table 5: Greenhouse Gas Emissions Associated with the Operation of RO Treatment Systems Utilizing Two Different Brine Disposal Methods to Comply with SDWQ Alternatives 1 and 2.

	Annual Estimated CO_2 Emissions (metric tons)[1]			
	Evaporation Ponds[2]		Thermal Concentration and Crystallization[3]	
Discharger	**SDWQ Alt. 1**	**SDWQ Alt. 2**	**SDWQ Alt. 1**	**SDWQ Alt. 2**
City of Tracy	2,474	1,663	17,554	11,801
City of Stockton	7,795	4,802	55,318	34,076
City of Manteca	1,476	n/a	10,938	n/a
Total Emissions	**11,745**	**6,465**	**83,810**	**45,877**

Notes:

1. CO_2 emissions based on 0.81 lbs of CO_2 produced per kWh of electricity consumed (CCAR, 2007).
2. Daily power usage based on estimate of 1,550 kWh consumed per million gallons treated with RO (Carollo, 2007).
3. Daily power usage based on estimate of 11,000 kWh consumed per million gallons treated with RO with liquid brine subsequently undergoing thermal concentration and crystallization (Carollo, 2007).

The SED states the following with regard to greenhouse gas (GHG) emissions: "Any potential air quality and GHG emissions due to increased power generation would be minor." (SED at H-72.) The State Board reasons that increased electrical load from RO treatment facilities would be small compared to existing electrical grid capacity, and therefore, additional power generation facilities would not need to be constructed. The State Board further reasons that if new power generation facilities are not required, then GHG emissions from new RO treatment facilities must be minor. In fact, GHG emissions from new RO treatment facilities would not be minor and the total annual CO_2 emissions estimates provided in **Table** 5 can be translated into a variety of equivalent impacts that may be more easily understood by the layperson than air quality impacts due to emissions of *x* number of metric tons of CO_2 per year. For example, by using the U.S. EPA's online Greenhouse Gas Equivalencies Calculator[1], it can be determined that total CO_2 emission associated with using RO and evaporation ponds to comply with SDWQ Alternative 2 (6,465 metric tons) is equivalent to the GHG emissions from 1,222 passenger vehicles added to the roadways. The total CO_2 emission associated with using RO and thermal concentration and crystallization to comply with SDWQ Alternative 1 (83,810 metric tons) is equivalent to the GHG emissions from 15,840 passenger vehicles added to the roadways. These GHG emissions and associated air quality impacts stemming from the implementation of RO with some type of brine disposal for two or more wastewater dischargers in the Central Valley do not appear to be "minor," as described in the SED. This is especially true when considering these additional CO_2 emissions would be released into the San Joaquin Valley Air Basin, one of the nation's most polluted air basins. For its next draft of the SED, the State Board should quantify the estimated GHG emissions and associated air quality impacts due to implementation of RO at WWTPs that could occur with adoption of SDWQ Alternatives 1 and 2.

References

California Climate Action Registry (CCAR). (2007). *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions, Version 2.2*, March.

Carollo. (2007). *Project Memorandum: Energy Cost and Carbon Footprint for Reverse Osmosis and NTF & Denit Alternatives.* Tony Park, SRCSD for SRWTP 2020 Master Plan, December.

Carollo. (2010). *Memorandum: Modification of Flow Basis for Treatment Train Costs as Previously Presented in the "Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant" (Carollo, March 2009).* Reverse Osmosis Costs: Elisa Garvey, SRCSD for Project SRWTP Advanced Treatment Cost Updates, August.

City of Manteca. (2009). *Infeasibility Analysis and Compliance Schedule Justification in Support of a Time Schedule Order for the City of Manteca Wastewater Quality Control Facility.* Draft letter to Mr. James Marshall of the California Regional Water Quality Control Board – Central Valley Region from Phil Govea, P.E., Deputy Director of Public Works, City of Manteca.

City of Tracy. (2010). *Infeasibility Analysis and Compliance Schedule Justification in Support of a Time Schedule Order for the City of Tracy Wastewater Treatment Plant and NPDES Permit Modifications*. Draft letter to Mr. James Marshall of the California Regional Water Quality Control Board – Central Valley Region from Steve Bayley, Deputy Director of Public Works, City of Stockton, September.

[1] http://www.epa.gov/cleanenergy/energy-resources/calculator-html

City of Tracy. (2011). *City of Tracy WWTP Best Practicable Treatment or Control Study.* Prepared by CH2M Hill, Sacramento, July 2011.

Garcia, F. (2012). Personal communication with the City of Stockton Regional Wastewater Control Facility Chief Plant Operator. Email communication, July 25, 2012.

Larry Walker Associates (LWA). (2012). *City of Manteca Water Quality Control Facility – Evaluation of Best Practicable Treatment or Control (BPTC) for Constituents of Concern to Groundwater Quality.* Submitted to the California Regional Water Quality Control Board – Central Valley Region, October.

RBI (2009). *City of Stockton Regional Wastewater Control Facility Salinity Plan, Draft.* Prepared on behalf of the City of Stockton Municipal Utilities Department, June.

Appendix A – Greenhouse Gas Emissions Calculations

Discharger	Effluent Treated with RO (MGD)	Estimated Daily Power Usage for RO Treatment (kWh)[1]	Estimated Daily CO_2 Emissions (lbs)[2]	Estimated Daily CO_2 Emissions (metric tons)	Estimated Annual CO_2 Emissions (metric tons)
Greenhouse Gas Emissions Associated with Compliance with SDWQ Alternative 1					
Reverse Osmosis with Evaporation Ponds					
City of Tracy	11.9	18,445	14,940	6.8	2,474
City of Stockton	37.5	58,125	47,081	21.4	7,795
City of Manteca	7.1	11,005	8,914	4.0	1,476
Reverse Osmosis with Thermal Brine Concentration, Crystallization, and Land Disposal					
City of Tracy	11.9	130,900	106,029	48.1	17,554
City of Stockton	37.5	412,500	334,125	151.6	55,318
City of Manteca	7.1	78,100	63,261	28.7	10,474
Greenhouse Gas Emissions Associated with Compliance with SDWQ Alternative 2					
Reverse Osmosis with Evaporation Ponds					
City of Tracy	8.0	12,400	10,044	4.6	1,663
City of Stockton	23.1	35,805	29,002	13.2	4,802
Reverse Osmosis with Thermal Brine Concentration, Crystallization, and Land Disposal					
City of Tracy	8.0	88,000	71,280	32.3	11,801
City of Stockton	23.1	254,100	205,821	93.4	34,076

Notes:

1. Daily power usage based on estimate of 11,000 kWh consumed per MG treated with RO (Carollo, 2007).
2. CO_2 emissions based on 0.81 lbs of CO_2 produced per kWh of electricity consumed (CCAR, 2007).