

## Introduction

This water quality monitoring fact sheet was prepared by the Irrigated Agriculture Program of the Central Coast Regional Water Quality Control Board (Water Board) and made available on November 30, 2008. The data were delivered by Central Coast Water Quality Preservation, Inc. (CCWQP) to the Water Board as part of the monitoring and reporting requirements for all dischargers enrolled under *Conditional Waiver of Waste Discharge Requirements for Discharge from Irrigated Lands, Order No. R3-2004-0117*. Monitoring stations were selected to represent water quality in predominantly agricultural areas, but in some cases reflect mixed land uses upstream of the sites.

## 309GRN Salinas River at Elm Rd in Greenfield

The Cooperative Monitoring Program sampled Salinas River at Elm Rd in Greenfield 21 times (one sample per month) between January 2006 and December 2007, excluding three sample dates that were recorded as dry (September and October 2006; October 07).

## Summary of Water Quality Data

### Notable Measured Analytes for Water Quality Monitoring

Analyte/Parameter	Average	Range	Water Quality Criteria (WQC) or Guideline <sup>1</sup>	Percent Outside WQC or Guideline
Ammonia as N, Unionized	0.008 mg/L	0.001–0.013 mg/L	<0.025 mg/L <sup>+</sup>	0%
Nitrate/Nitrite as N	3.3 mg/L	0.0–42.5 mg/L	<10.0 mg/L*	5%
Orthophosphate as P	0.08 mg/L	0.00–0.26 mg/L	<0.12 mg/L*	30%
Turbidity (NTU)	135 NTU	0–2166 NTU	<25 NTU*	50%
Conductivity	0.51 mmho/cm	0.30–0.98 mmho/cm	Ranges: <sup>+</sup> <0.75 No Problem 0.75–3.0 Increasing >3.0 Severe	% in Range: 90% 10% 0%
pH	8.3	8.0–8.5	7.0–8.3 <sup>+</sup>	50%
Annual Median Dissolved Oxygen (% Saturation)	2006: 77% 2007: 95%	48–103%	>85% annual median <sup>+</sup>	Std not met Std met
Dissolved Oxygen	8.2 mg/L	4.7–11.8 mg/L	>5.0 mg/L (GEN/WARM) <sup>+</sup> >7.0 mg/L (SPWN/COLD) <sup>+</sup>	5% 25%
Chlorophyll a	0.9 µg/L	0.1–3.5 µg/L	<40 µg/L*	0%
Water Temperature	17.0°C	9.0–25.4°C	Water Basin Specific	--

+ Indicates standard defined in the Water Quality Control Plan, Central Coast Basin (Basin Plan)

\* Indicates guideline not described in the Basin Plan or not specifically stated as applicable to the beneficial uses of the site. Origin of the guideline is described in the individual discussion of the analyte/parameter.

The present and potential beneficial uses for **Salinas River (between Chualar and Nacimiento River)** as defined in the Basin Plan include Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Processing Supply (PROC), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Rare, Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM).

<sup>1</sup> Water Quality Criteria (WQC) are defined in the Water Quality Control Plan, Central Coast Basin (also referred to as the “Basin Plan”) to protect beneficial uses such as drinking water, fish habitat, irrigation water, etc. WQC include general water quality standards for some analytes as well as specific criteria based on the defined beneficial uses. Other water quality guidelines were compiled to provide a standard in order to compare sites. Bold indicates beneficial uses that apply to this watershed.

## Unionized Ammonia (as N)

Unionized ammonia (as N) is a calculated value based on water temperature, pH, and total ammonium concentration. Ammonia can be toxic in water. With high water temperature and/or high pH, ammonia becomes unionized and is toxic at much lower levels. The Basin Plan general water quality objectives state that unionized ammonia shall not exceed 0.025 mg/L. Over time, ammonia should reduce to nitrate, so long-lasting levels of ammonia may indicate continuous discharges of waste. **No unionized ammonia samples exceeded the standard. The average unionized ammonia concentration was 0.008 mg/L.**

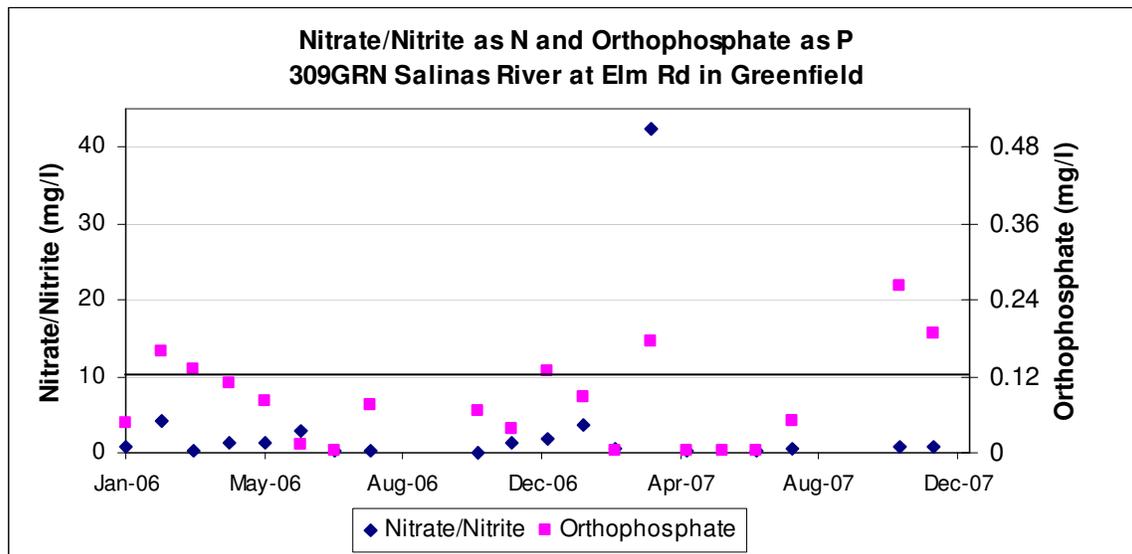
## Nitrate/Nitrite as N

The Municipal and Domestic Supply (MUN) objective states in Table 3-2 of the Basin Plan that nitrate as  $\text{NO}_3$  shall not exceed 45 mg/L. This value is equivalent to 10 mg/L of nitrate as N. Nitrite accounts for a small percent of total nitrate/nitrite, and therefore, nitrate as N criterion was used as a guideline for nitrate/nitrite. **One of 20 nitrate/nitrite samples (5%) exceeded the guideline (April 2007 – 42.5 mg/L). The average concentration was 3.3 mg/L.**

## Orthophosphate as P

The Basin Plan does not contain orthophosphate standards. The Central Coast Ambient Monitoring program (CCAMP) non-regulatory guideline for general water quality objectives states that orthophosphate concentrations shall not exceed 0.12 mg/L. **Orthophosphate concentrations exceeded the guideline in six of 20 samples (30%). The three highest concentrations of orthophosphate were measured during or after April 2007, which may indicate increasing levels of orthophosphate at this site. All exceedances occurred between November and April, which may show increased level during winter and early spring. The average concentration was 0.08 mg/L.**

The chart below shows the nitrate/nitrite and orthophosphate concentration levels throughout the sampling period. The guidelines for nitrate/nitrite as N and orthophosphate as P state that their concentrations shall not exceed 10 mg/L and 0.12 mg/L, respectively, shown by the black horizontal line on the graph.



## Turbidity

The Basin Plan states: “Water shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.” Sigler et al.<sup>2</sup> shows that turbidity levels of 25 NTU or greater caused reduction in juvenile salmonid growth due to interference with their ability to find food. Turbidity is often affected by suspended material in runoff. **Ten of 20 turbidity readings (50%) exceeded the guideline. All samples after April 2007 exceeded the guideline. Turbidity levels in the Salinas River at Elm Road in Greenfield averaged 135 NTU. However, the standard deviation was 479 NTU, indicating extreme (high and low) readings.**

<sup>2</sup> Sigler, J.W., T.C. Bjornn, & F.H. Everst. (1984). *Effects of chronic turbidity on density and growth of steelhead and coho salmon*. Transactions of the American Fisheries Society. 113:142-150.

## Conductivity

Conductivity is measured from a water sample. Based on Table 3-3 of the Basin Plan showing Guidelines for Interpretation of Quality of Water for Irrigation, conductivity below 0.75 mmho/cm causes no problems to irrigation, between 0.75 and 3 mmho/cm causes increasing problems, and conductivity above 3 mmho/cm causes severe problems. The conductivity level can be greatly affected by geologic and biological influences and is not necessarily related to agricultural activities. **Eighteen of 20 conductivity samples (90%) indicated no problems to irrigation water; two samples (10%) indicated increasing problems; no samples indicated severe problems. Both samples showing increasing problems occurred in February.**

## pH

Multiple beneficial uses have objectives for pH. The Basin Plan general water quality objective for pH is between 7.0 and 8.5; MUN, AGR, REC-1, and REC-2 pH objectives are between 6.5 and 8.3. The standard, therefore, is 7.0-8.3 if one or more of MUN, AGR, REC-1, and REC-2 is defined as a beneficial use. pH above 9 can cause skin irritation to humans and makes water inhospitable to many species. **Ten of 20 pH samples (50%) exceeded the standard. Samples ranged from 8.0 to 8.5. All samples exceeding the standard occurred between February and August.**

## Dissolved Oxygen Concentration and Dissolved Oxygen Saturation

The Basin Plan general water quality objectives state annual median dissolved oxygen shall remain above 85% saturation. General and WARM objectives state that the dissolved oxygen concentration must remain above 5.0 mg/L at all times, and SPWN and COLD objectives state that the dissolved oxygen concentration must remain above 7.0 mg/L at all times. **One of 20 samples (5%) did not meet the general and WARM concentration standard, and five samples (25%) did not meet the COLD and SPWN concentration standard. Dissolved oxygen did not meet the saturation standard during 2006, with a median annual value of 77% saturation. The median annual value for 2007 (95%) met the standard for dissolved oxygen saturation.**

## Chlorophyll a

Healthy and appropriate Chlorophyll a levels are not defined in the Basin Plan. Chlorophyll a indicates phytoplankton growth, a necessary component of healthy water bodies. Because turbidity causes interference for the Chlorophyll a probe, measurements of Chlorophyll a may not be accurate when turbidity is above 1000 NTU. Chlorophyll a levels over 40 µg/L are considered problematic by North Carolina Administrative Code (NCAC). **No readings exceeded the guideline. The Chlorophyll a readings averaged 0.9 µg/L.**

## Temperature

Sullivan et al.<sup>3</sup> state that the maximum weekly average temperatures for protection of steelhead or rainbow trout, and coho salmon are 19.6 and 19.7°C respectively. **The temperature averaged 17.0°C and ranged from 9.0 to 25.4°C. Though weekly averages were not taken, the temperatures taken at this site indicate averages that may regularly exceed the maximum temperatures for fish protection.**

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<sup>3</sup> Sullivan, K., D.J. Martin, R.D. Cardwell, T.E. Toll, & S. Duke. (2000). *An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria*. Portland, OR: Sustainable Ecosystems Institute.

## Summary of Toxicity Data

### Species with Significant Mortality

	Feb-06	May-06	Aug-06	Feb-07	Mar-07	Apr-07
Invertebrate (Water Column)	No		Yes	No	No*	
Invertebrate (Sediment)		No				No
Fish (Water Column)	No		No	No	No	
Algae (Water Column)	No		No	No	No	

Indicates complete mortality within 48 hours of test initiation

\*Indicates significant effect on growth or reproduction (even though mortality did not have a significant effect)

Significant effect is determined by statistically significant rates of mortality, growth, or reproduction compared to a control sample and provides an indication that something is affecting plant or animal life in the stream. Invertebrates show significant sensitivity to organophosphates and pesticides. Significant effect to algae often indicates the presence of herbicides and metals such as copper. Fish are less sensitive to organophosphates but can be impacted by other pollutants such as ammonia and pyrethroid pesticides.

### Photos of Site



July 2006



February 2006

### QAQC

The data in this water quality monitoring fact sheets meet the quality assurance and quality control requirements of the Water Board's Surface Water Ambient Monitoring Program (SWAMP). Additional surface water monitoring data are available at the Water Board's Central Coast Ambient Monitoring Program website <http://www.ccamp.org>. Any questions regarding the data or analysis should be directed to either **Peter Meertens** at [pmeertens@waterboards.ca.gov](mailto:pmeertens@waterboards.ca.gov) (805) 549-3869 or **Amanda Bern** at [abern@waterboards.ca.gov](mailto:abern@waterboards.ca.gov) (805) 594-6197.

### Attachment: Monitoring Data

SiteTag	Salinas River at Elm Rd in Greenfield											
309 GRN	Beneficial Uses: MUN, AGR, PRO, IND, GWR, REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, RARE, COMM											
		Ammonia as N, Unionized	Chlorophyll a	Conductivity	Instantaneous Flow	Nitrate/Nitrite as N	Orthophosphate as P	Oxygen, Dissolved	Oxygen, Saturation	pH	Turbidity	Water Temp
Units		mg/L	µg/L	mmho/cm	CFS	mg/L	mg/L	mg/L	%		NTU	°C
1/25/2006	Jan-06	0.002	1.12	0.456	165.9	0.906	0.046	10.77	96	8.17	96.1	10.3
2/23/2006	Feb-06	0.0125	1.39	0.976	90.5	4.2	0.158	5.99	60	8.28	4.2	15.7
3/30/2006	Mar-06	0.0031	3.55	0.427	821.2	0.274	0.132	8.47	82	8.17	2166	14.1
4/25/2006	Apr-06	0.0125	0.63	0.641	672.5	1.3	0.1086	7.5	75	8.07	9.4	15.4
5/26/2006	May-06	0.0125	1.93	0.653	343.7	1.3	0.082	7.37	84	8.39	11	21.7
6/28/2006	Jun-06	0.0111	1.44	0.625	84.6	2.89	0.012	6.65	79	8.48	0.2	23.7
7/26/2006	Jul-06		1.21	0.328	385.0	0.359	0.0038	6.22	72	8.36	38	22.6
8/24/2006	Aug-06	0.0125	0.59	0.316	280.6	0.3	0.074	5.3	65	8.44	7.4	25.4
9/28/2006	Sep-06	No Water in Channel										
10/24/2006	Oct-06	No Water in Channel										
11/14/2006	Nov-06	0.0125	0.84	0.303	319.2	0.007	0.066	7.47	77	8.04	35.6	17.2
12/13/2006	Dec-06	0.0125	0.42	0.554	149.8	1.2	0.037	8.02	76	8.27	4.3	13.5
1/30/2007	Jan-07	0.0032	0.05	0.549	176.8	1.9	0.1267	4.72	48	8.14	7.9	16.0
2/15/2007	Feb-07	0.0125	0.13	0.953	30.1	3.6	0.0861	9.79	93	8.45	0.05	13.6
3/22/2007	Mar-07	0.0074	0.78	0.408	129.0	0.448	0.0038	8.16	82	8.49	24.4	15.4
4/6/2007	Apr-07	0.0065	0.37	0.475	107.3	42.5		9.21	94	8.41	4.4	16.4
4/16/2007	Apr-07				46.5		0.1759					
5/30/2007	May-07	0.0084	0.76	0.384	262.7	0.145	0.0038	9.04	96	8.51	42.6	18.1
6/26/2007	Jun-07		0.53	0.356	293.1		0.0038	8.74	103	8.53	56.6	23.3
7/24/2007	Jul-07	0.00135	0.99	0.377	375.5	0.2	0.0038	8.72	93	8.28	59.1	18.6
8/29/2007	Aug-07	0.00175	0.51	0.407	315.6	0.5	0.0502	8.68	96	8.35	39.1	20.3
10/24/2007	Oct-07	Site Dry										
11/28/2007	Nov-07	0.0015	0.27	0.462	304.1	0.74	0.2633	11.76	101	8.03	71.3	9.2
12/17/2007	Dec-07	0.0026	0.23	0.511	266.3	0.734	0.1888	11.51	99	8.15	26.7	9.0
Average		0.008	0.9	0.51	267.6	3.3	0.08	8.2	Below	8.3	135	17.0
Standard Deviation		0.005	0.8	0.19	194.5	9.6	0.07	1.9		0.2	479	4.8
Minimum		0.001	0.1	0.30	30.1	0.0	0.00	4.7	48	8.0	0	9.0
Maximum		0.013	3.6	0.98	821.2	42.5	0.26	11.8	103	8.5	2166	25.4
Standard		<0.025	<40	<0.75		<10	<0.12	>7		7-8.3	<25	
%Outside		0%	0%	90%		5%	30%	25%		50%	50%	
Standard 2				3				>5	Median Annual DO %			
%Outside				0%				5%	Year	Median	Meet Criteria	
									2006	77%	No	
									2007	95%	Yes	
greatest turbidity during greatest flow												
indicates times exceeding standard												