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CITY OF TURLOCK REGIONAL WATER QUALITY CONTROL FACILITY

Water Conservation and Drought Effects on City of Turlock Performance-Based Electrical Conductivity Effluent Limitations

Submitted to

CITY OF TURLOCK

Submitted by

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INTRODUCTION

On January 21, 2015, the Central Valley Regional Water Quality Control Board (Regional Board) issued the Tentative Waste Discharge Requirements Order (TO) to the City of Turlock (City) Regional Water Quality Control Facility (RWQCF) for the National Pollutant Discharge Elimination System (NPDES) permit (CA0078948), which allows discharge to the San Joaquin River. The TO includes a performance-based effluent limitation for electrical conductivity (EC) of 1,100 µmhos/cm as an annual average. Via this submittal, the City is requesting the proposed effluent limitation be increased to 1,250 µmhos/cm as an annual average, to consider the effects of increased water conservation efforts and drought conditions on influent and effluent flows and salinity.

EFFECT OF WATER CONSERVATION AND DROUGHT CONDITIONS

An analysis of EC data and influent flows from January 2012 through December 2014 demonstrate an increasing EC trend and decreasing influent and effluent flow trends. Water conservation efforts, in combination with the ongoing regional drought conditions, have decreased influent flows since 2012. EC concentrations have steadily increased over the same time period, as shown in Figure 1. Table 1 summarizes the annual average influent and effluent EC. Table 2 summarizes influent and effluent flow and a surrogate load calculation to demonstrate the decreasing trend in a salinity surrogate load as the product of EC (µmhos/cm) and flow (mgd).

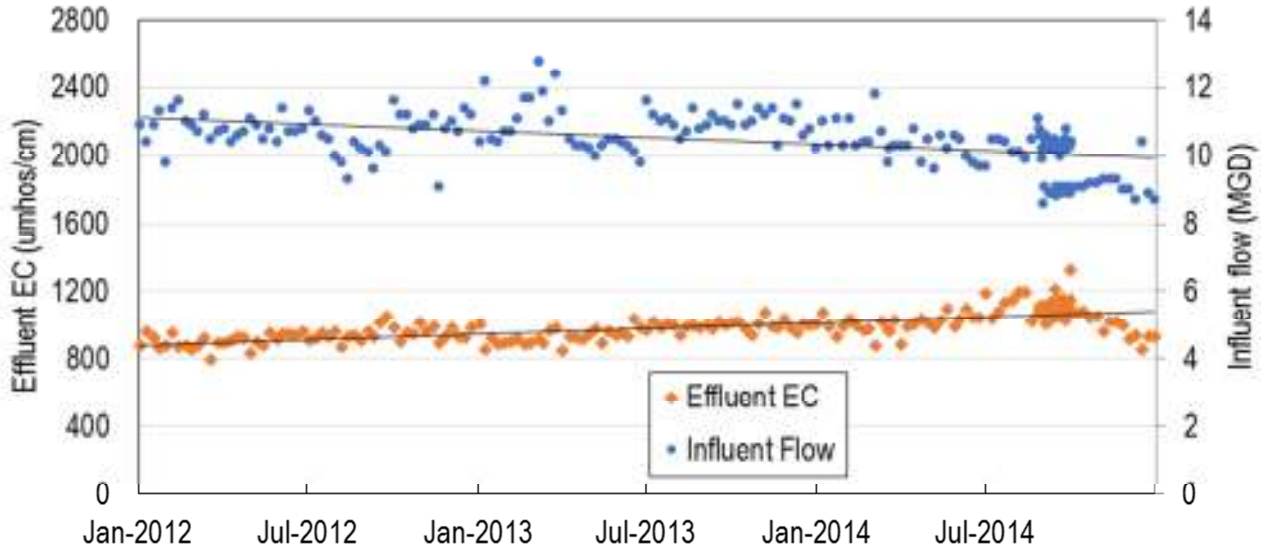

Figure 1. Effluent EC and Influent Flow

Table 1. Historical Annual Electrical Conductivity

	Influent				Effluent			
		EC (µmhos/cm)				EC (µmhos/cm)		
Calendar Year	Count	Average	Median	Standard Deviation	Count	Average	Median	Standard Deviation
2011	52	1,054	989	258	52	892	906	75
2012	52	1,036	1,000	190	52	926	928	48
2013	53	1,073	1,007	277	53	963	976	51
2014	82	1,291	1,203	321	83	1,056	1,050	80

Table 2. Historical Annual Flow and Electrical Conductivity Load Surrogate

	Influent					Effluent				
			EC*Flow/1000					EC*Flow/1000		
Calendar Year	Flow (mgd)	Count	Average	Median	Standard Deviation	Flow (mgd)	Count	Average	Median	Standard Deviation
2011	10.1	365	10.84	10.8	1.27	9.5	365	9.87	9.9	1.07
2012	11.6	366	10.65	10.7	0.98	10.4	366	9.72	9.8	0.90
2013	10.6	365	10.71	10.8	0.91	9.9	364	9.43	9.4	1.11
2014	8.7	365	9.81	9.9	1.23	8.2	365	8.52	8.5	0.94

COMPARISON WITH PROPOSED ANNUAL LIMIT

The TO proposes an annual average performance-based EC effluent limitation of 1,100 µmhos/cm. The highest effluent EC between June 2010 and December 2014 occurred in September 2014 (1,325 µmhos/cm), which was subsequent to the Regional Water Board's dataset used in calculating the proposed EC limitation (April 2010 – April 2014). The highest annual average effluent EC level was 1,056 µmhos/cm, occurring in 2014. Figure 3 shows the effluent EC data compared to the annual effluent limit proposed in the TO.

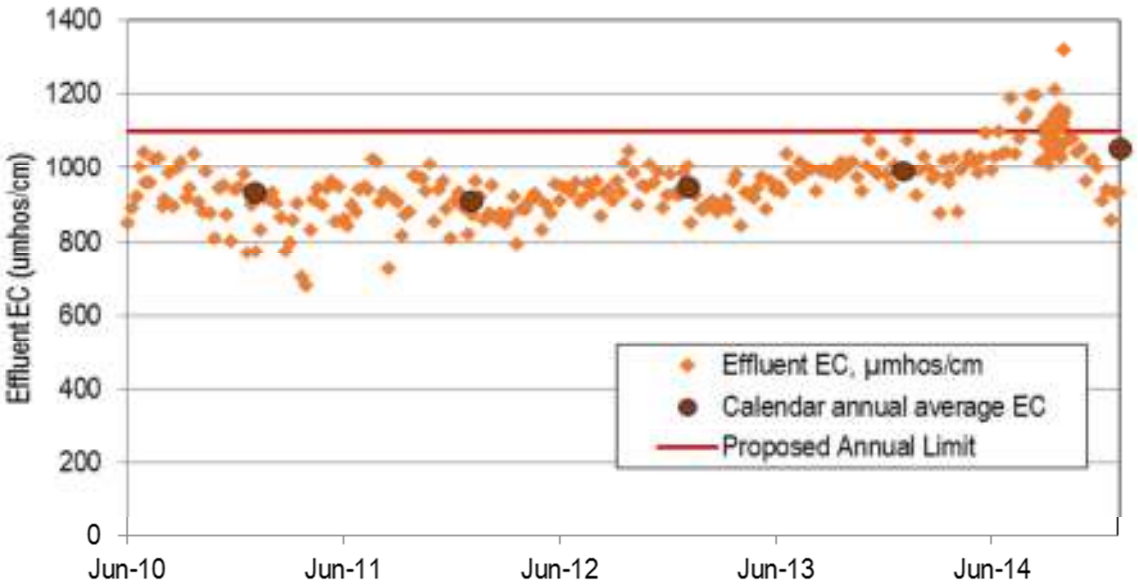

Figure 3. Effluent EC with Proposed Annual Limit

Under state law[1], urban water systems must reduce per capita water use by 20 percent by 2020, although some of that use is related to irrigation which does not reach the sewer system. The WQCF annual average influent flow has decreased approximately 13% based between 2010 and 2014 (11.2 mgd June 2010-June 2011 reduced to 9.8 mgd in calendar year 2014). If this trend in water conservation continues, effluent EC could increase above the proposed annual effluent limit.

As the potential increase in EC is correlated with a decrease in flow, the total salt loads from the WQCF will remain the same. The calculated EC discharge load (the product of effluent flow and EC) between 2010 and 2014 is shown in Figure 5.

[1] The 2009 legislative package SBX7-7 requires a statewide 20% reduction in urban per capita water use by 2020.

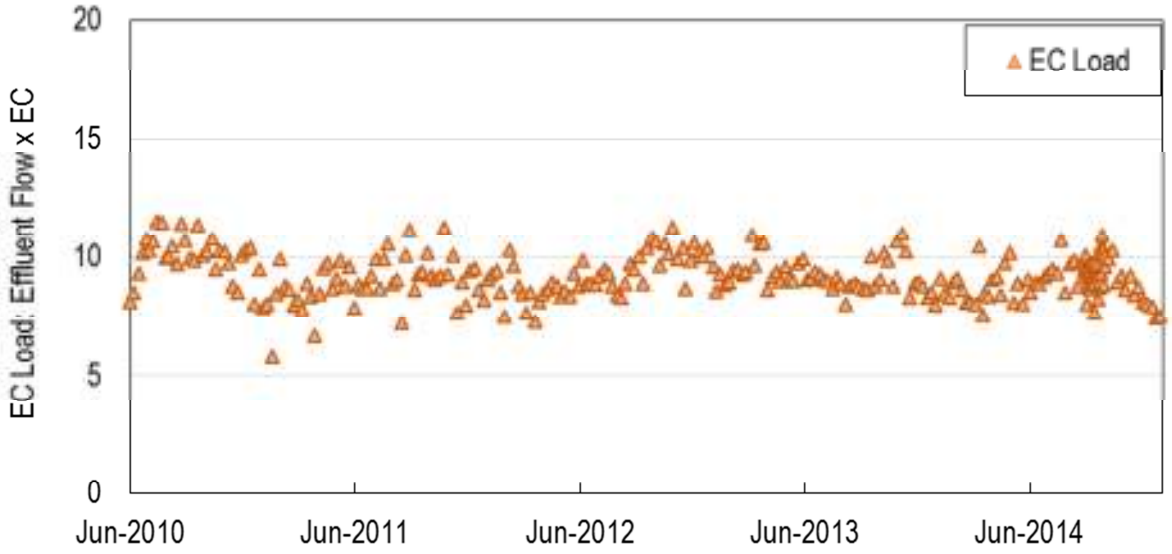

Figure 5. Calculated Surrogate Salinity "Load" (Effluent Flow x EC)

PROJECTED EFFLUENT EC WITH CONTINUED WATER CONSERVATION AND DROUGHT

Best-fit least-squares regression lines for influent flow and effluent EC versus time were developed using Minitab statistical software. If water conservation continues at the same rate and results in similar influent conditions, the City would reach a 20 percent reduction in influent flows during 2017 (reaching annual average of 8.9 MGD, from the June 2010-June 2011 baseline average flow of 11.2 MGD). Based on the effluent EC regression analysis, the corresponding annual average effluent EC in 2017 would be 1,243 µmhos/cm. The historical data and projected conditions are shown in Figure 4 where the increasing trend of EC corresponds to a decrease in influent flow. The discharged load of salinity also decreases under these projections.

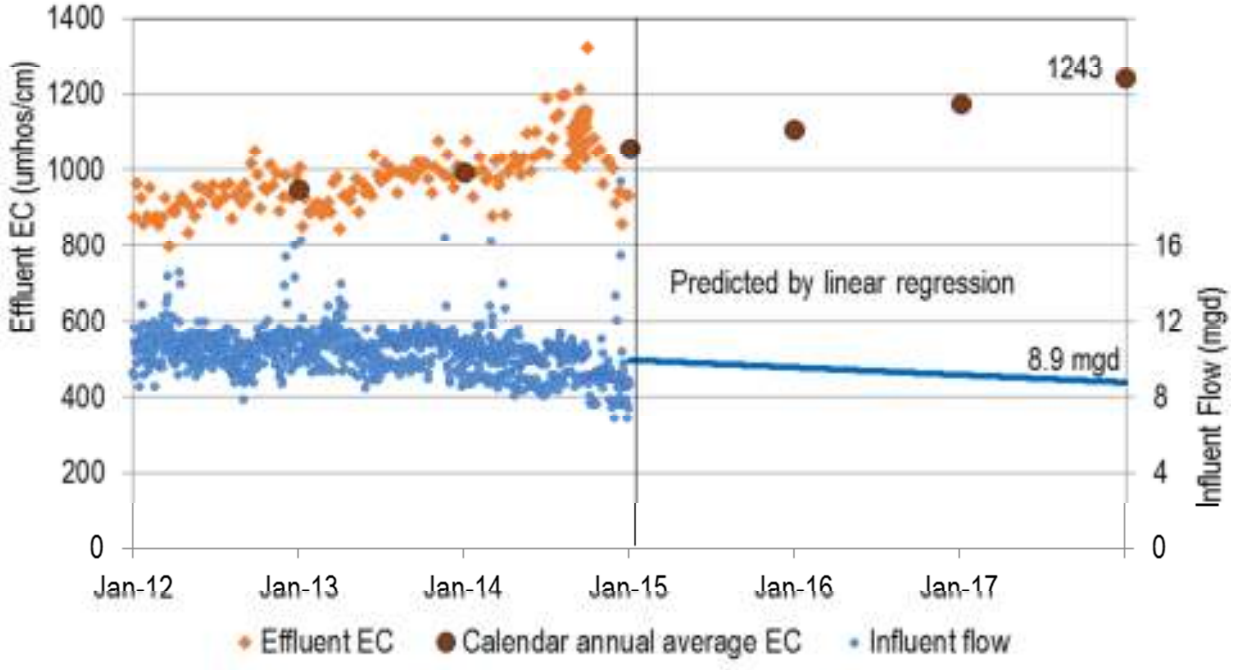

Figure 4. Predicted Effluent EC Levels and Influent Flows

RECOMMENDED FINAL ELECTRICAL CONDUCTIVITY EFFLUENT LIMITATION

A final effluent limitation of 1,250 µmhos/cm as an annual average is recommended to allow for continued water conservation efforts and potential drought effects on influent and effluent EC. If water conservation or drought conditions change substantially before or after 2017, this limit may need to be revised to account for this new information. This performance-based effluent limitation is still protective of beneficial uses because the overall discharged load would not increase, the City's discharge is recognized as a near-negligible fraction of the total San Joaquin River salinity load, and it is still below the secondary drinking water standard upper limit (1,600 µmhos/cm).

SOURCE CONTROL AND TREATMENT EFFORTS

The City currently maintains a Pretreatment Program and is implementing a Salinity Source Control Program to reduce discharged salts.

Pretreatment Program

The purpose of the City's pretreatment program is to protect the treatment plant and receiving waters from adverse impacts of industrial and/or commercial discharges into the City's collection system. The pretreatment program consists of 25 permitted non-domestic dischargers, twelve of which are classified as significant industrial users (SIUs). These include mainly food processing industries in addition to one industrial laundromat and one plastics recycling center. The remaining 13 are minor industries which are permitted due to the potential of their discharge to impact the City's WQCF. These include medical facilities, automotive-related businesses, and groundwater remediation sites.

The City's pretreatment staff inspects grease interceptors, sand/oil separators, monitors food preparation businesses and auto-related businesses, besides investigating illicit discharges to the sewer collection and storm drain systems. Forty-two percent of the WQCF influent flow comes from food processing and dairy industries, based on 2013 data.

Salinity Source Control Program

The City has developed and implemented a Salinity Source Control Program as required by Order No. R5-2010-002.

Phase 1 of a Salinity Study was performed in 2011, which revealed that approximately 35% of the salt (as TDS) loading comes from the potable water system, 37% from the Significant Industrial Users (SIUs), and 28% from other sources such as residential, commercial, and non-metered dischargers. The Salinity Study also estimated that four of the SIUs may contribute 80% of the incremental salt load provided by industry.

Phase 2 of the Salinity Study was completed in April 2013, and focused on the four major salt discharging SIUs identified in Phase 1. The purpose of Phase 2 was to determine whether the TDS concentrations in the SIUs' discharge were due to dissolved organic matter or inorganic minerals. Essentially, all dissolved organic matter is removed by the WQCF and is not discharged in effluent; therefore, if the percentage of organic matter in industrial discharge is high, the measured TDS would overstate the true mineral salinity of the sample. It was found that no more than 28% of the inorganic mineral salt load to the WQCF is contributed by SIUs. Therefore, no recommendations for additional steps to reduce mineral salt load in SIU wastewater were made.

Industrial source control efforts currently in effect are:

- SIU's are inspected annually and the importance of reducing salt load to the collection system is discussed with facility management;
- Elimination of a raw turkey cooling method, which resulted in salt brine discharged to the RWQCF weekly. The replacement process does not add EC to the discharge;
- Discontinuation of wet applied salt to product by butter and cheese production industries, in favor of a blower system with sweeping cleanup instead of hosing. Excess salt is reused instead of discharged to the sewer system;

- Storage tanks and associated plumbing to reuse ammoniated cleaning materials were installed, allowing for the natural degradation of chemicals during the equalization or neutralization process, which requires less acid application and therefore a reduction of the reaction product, salts;
- The installation of EC probes and associated monitoring equipment at seven industries with the potential for high salt discharge. The probes were linked to the RWQCF SCADA system and monitored 24 hours per day. EC probes were also installed at the RWQCF influent flumes with an alarm notification to alert the plant operator in the event of a slug load of high salt content, so the flow can be diverted to the holding ponds.

The City has retained the consulting firm of EKI to develop a Salinity Source Control Work Plan. The Work Plan will include the following tasks:

Task 1. Updating the 2011 Salinity Source Evaluation. EKI proposes to review the current data and refine estimates of salt loads contributed by commercial, industrial, and residential users, identifying any data gaps.

Task 2. Compiling and Assessing Salinity Source Control Strategies. EKI proposes to review the information from Task 1 and compile a list of potential salinity source control strategies to be reviewed by City staff. These may include pursuing alternate potable water sources, establishing programs to discourage or ban the use of self-regenerating water softeners, performing outreach to commercial and industrial customers to identify and implement salinity reduction opportunities, incorporating nanofiltration or reverse osmosis in the RWQCF treatment process, and/or eliminating discharge to the San Joaquin River by increasing recycled water use for agricultural supply. The City will evaluate these strategies based on effectiveness, ease of implementation, and cost.

Task 3. Based on the findings of Tasks 1 and 2, a Treatment or Alternative Salinity Reduction Method Workplan will be drafted incorporating the City's comments, and submitted by the due date of June 1, 2015.

North Valley Regional Recycled Water Program

As previously reported to the Regional Board, the City is collaborating with other municipalities and federal and state agencies regarding the possibility of conveying recycled water to farmers on the west side of the Central Valley through the Delta-Mendota Canal, via the North Valley Regional Recycled Water Program. The NVRRWP group includes the City of Turlock, the City of Modesto, and the Del Puerto Water District (DPWD), and is proposing to move the point of discharge for both Cities' wastewater treatment facilities to the Delta Mendota Canal, where DPWD will have access to the discharged water.

The City is continuing to work with Modesto and Ceres as the Stanislaus Regional Water Authority in negotiating a surface water agreement with local irrigation districts. So far, negotiations have been stalled due to the drought, Federal Energy Regulatory Commission (FERC) relicensing, and other issues beyond the City's control. However, the City expects to renew discussions with these irrigation districts in 2015.

ADDITIONAL INFORMATION

The City is an active participant in the Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS). CV-SALTS is a collaborative stakeholder initiative to better

manage salts in the Central Valley through a Salt and Nutrient Management Plan (SNMP) for the Central Valley. The Lower San Joaquin River Salinity Basin Plan Amendment is a separate, but related initiative. Through this effort, the Basin Plan will be amended to define how the chemical narrative water quality objective (for salinity) is to be interpreted for the protection of agriculture and other beneficial uses. It is our understanding that the Regional Board intends to make all salinity-related permit requirements consistent with the efforts currently underway by CV-SALTS, or to include schedules that allow coordination with efforts underway by CV-SALTS. It is likely that, through this process, alternative salinity objectives will be developed and applied to the San Joaquin River.