

J U L Y 2 0 1 0

C I T Y O F M A N T E C A

Site-Specific Salinity Study Workplan for the City of Manteca Wastewater Quality Control Facility

submitted to

CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD

prepared by

LARRY WALKER ASSOCIATES



~ This Page Intentionally Left Blank ~

Introduction

The City of Manteca (City) owns and operates a Wastewater Quality Control Facility (WQCF), which treats wastewater collected from domestic, commercial, and industrial sources from the City of Manteca and a portion of the City of Lathrop. The City is required by Provision VI.C.2.c. of its Waste Discharge Requirements (WDR) Order No. R5-2009-0095 to submit a report on the results of a site-specific investigation of appropriate electrical conductivity (EC) and total dissolved solids (TDS) levels to protect the groundwater beneficial use of agricultural supply for the most salt sensitive crops in areas irrigated with groundwater in the WQCF vicinity under reasonable worst-case conditions. The schedule to complete the investigation is not to exceed 3 years from the time of the WDR adoption on October 8, 2009.

Provision VI.C.2.c of the NPDES permit states that “the study shall determine the sodium adsorption ratio of soils in the affected area, the alkalinity of soils to whether site specific conditions would reduce fluoride impacts, and the effects of rainfall and flood-induced leaching. The study shall evaluate how climate, soil chemistry, background groundwater quality, rainfall, and flooding affect salinity requirements. Based on these factors, as well as economic and environmental impacts (such as increased irrigation water usage, groundwater hydraulics and degraded water [quality]), the study shall recommend site-specific numeric values for EC and TDS that provide reasonable protection for the agricultural supply use designation for the groundwater.]¹”

The workplan presented herein is submitted in compliance with Provision VI.C.2.c that requires submittal of a Study workplan by July 8, 2010. The workplan describes the proposed technical approach and schedule for completing the required site-specific salinity investigation within the required timeframe.

Another relevant effort also required by the WDR, is the Method of Compliance Workplan/Schedule to ensure compliance with its WDR final groundwater limitations the City submitted on April 8, 2010 for Regional Water Board review. Among other constituents, the WDR contains final groundwater limitations for EC and TDS. These limitations are based on the current water quality objective or the natural background quality, whichever is greater. Since the site-specific water quality objectives for these constituents are yet to be determined as part of this site-specific salinity study, the WDR includes a reopener provision to revise the EC and TDS groundwater effluent limitations as appropriate upon the Regional Water Board’s review of the Study results and of related considerations.

¹ The text in brackets [...] appears to have been erroneously omitted from the final version of Order No. R5-2009-0095 and has been inserted here as it appears in a previous version of the WDR, Tentative Order R5-2009-XXXX, issued on August 10, 2009.

Overview of Existing Conditions

The WQCF receives, treats, and disposes wastewater generated in the City of Manteca and surrounding areas, including a portion of the City of Lathrop. Disposal of the WQCF effluent involves a combination of land application to irrigated fields and discharge to the San Joaquin River. In addition to sanitary wastes that are discharged to the Manteca WQCF, the facility also seasonally receives food-processing wastewater from Eckert Cold Storage, a produce washing and processing facility. Because this industrial wastewater does not include sanitary wastes, it can be used directly for irrigation of the land application area after blending with treated effluent from the Manteca WQCF. Secondary effluent and industrial wastewater are applied to 260.6 acres of City-owned and City-leased land as needed during the growing season (**Figure 1**). The agricultural fields grow fodder and feed crops for dairy feed. Secondary effluent in excess of crop demands undergoes tertiary treatment and is discharged to the San Joaquin River. Because of the limited, seasonal application of effluent to the agricultural lands, the WQCF disposes approximately 23 percent of its total annual effluent to land as opposed to the 77 percent being discharged to the river. For the past five years, the annual discharge averaged approximately 486 million gallons applied to land and 2120 million gallons discharged to the San Joaquin River.

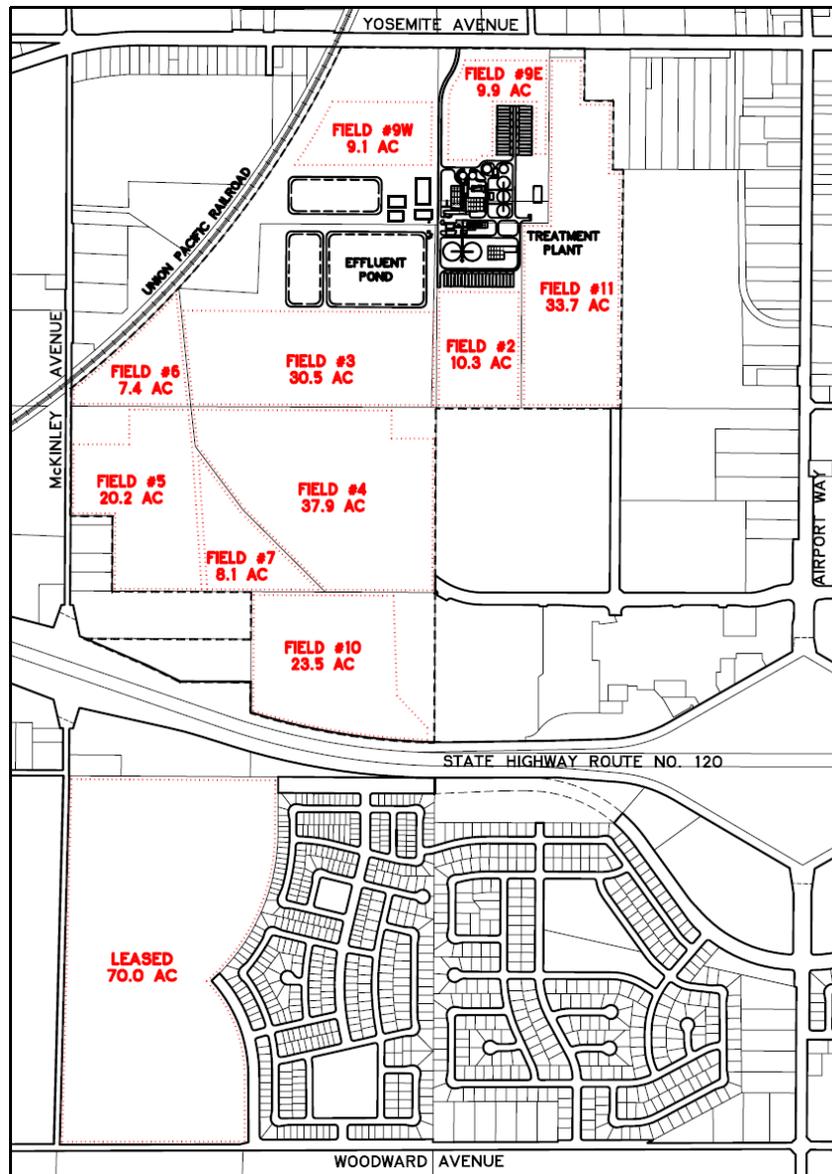


Figure 1. Manteca WQCF and Adjacent Land Disposal Areas (Image from R5-2009-0095)

Effluent quality during land discharge is assessed from samples at collection points LND-001 for waters used in irrigation (after the mixing point with the Eckert wastestream, if present) and LND-002, for WQCF effluent discharged to the storage pond or applied to land. Loadings to individual fields are assessed through application rates and monitoring of total nitrogen and BOD_5 . Land disposal areas have specified physical setbacks and disposal is restricted during certain times, such as during or just after significant storm events.

EC and TDS data collected from effluent disposed to land is summarized in **Table 1**. The data is from September 2007 (the date of the latest WQCF improvements) to October 2009 (the most recent irrigation season). The data was collected over the WQCF previous NPDES permit term and results may not be fully indicative of the current disposal and sampling procedures. Starting

with the 2010 irrigation season, data from the combined stream used in irrigation (after the mixing point with the Eckert wastestream, if present) will also be collected.

Table 1. Summary Concentrations in WQCF Effluent Disposed to Land

Constituent	Average	Minimum	Maximum
EC ($\mu\text{mhos/cm}$)	750	604	863
TDS (mg/L)	473	426	575

Groundwater quality immediately underlying the irrigation fields is assessed by samples collected quarterly from six monitoring wells located within and upgradient of the land disposal area (MW-3, MW-5, MW-9W, MW-10, MW-11, MW-AW). Five of the six wells are each located in individual fields, with the well name corresponding to the field they are located in (e.g., MW-3 is located in field 3). Well MW-AW is located approximately 1,200 feet east of the land application area, and is used as the background water quality monitoring location.

Groundwater concentrations of EC and TDS are summarized in **Table 2** and **Table 3**, respectively. These summaries are based on data collected from June 2004 through December 2010, mostly over the term of the WQCF previous WDR permit. Background data has been collected at well MW-AW since August 2005 when the well became operational. Monitoring well MW-11 was also constructed more recently, in February 2007.

Table 2. Summary Concentrations of Electrical Conductivity ($\mu\text{mhos/cm}$)

Well	N	% Detected	Average	Min	Max
Backgr. (MW-AW)	19	100%	335	209	395
MW-3	25	100%	1311	599	1894
MW-5	25	100%	1215	956	1714
MW-9W	24	100%	909	285	1370
MW-10	25	100%	680	411	1224
MW-11	13	100%	796	403	1133

Table 3. Summary Concentrations of Total Dissolved Solids (mg/L)

Well	N	% Detected	Average	Min	Max
Backgr. (MW-AW)	19	100%	234	162	331
MW-3	24	100%	883	644	1390
MW-5	24	100%	747	580	1008
MW-9W	23	100%	571	174	848
MW-10	24	100%	418	246	811
MW-11	13	100%	497	278	734

As indicated in the tables, average EC and TDS values in the wells located within the irrigation fields are higher than the levels in the background well but are also generally higher than the levels measured in the WQCF effluent disposed to land. Average EC levels range from 680 $\mu\text{mhos/cm}$ in MW-10 to 1,311 $\mu\text{mhos/cm}$ in MW-3 (**Table 2**). Average TDS values range from 418 mg/L in MW-10 to 883 mg/L in MW-3 (**Table 3**).

Technical Approach

The City will incorporate the latest developments in the State Water Board's evaluation of the Southern Delta EC objectives in its consideration for a Study approach. The State Water Board evaluation is relying on a January 2010 report – "Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta" by Dr. Glenn Hoffman (Hoffman Report). The study's technical approach will be based on assessing the agricultural beneficial uses based on the steady-state model for EC levels in the root zone as described in the Hoffman Report. The Study will recommend water quality objectives which will result in reasonable protection of beneficial uses of water as required by the Porter –Cologne Water Quality Control Act and the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. Specifically, assumptions regarding crop selection, rainfall, soil selection, and other conditions in the area surrounding the WQCF will be selected to establish site-specific objectives "to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters..." (Water Code, 13000, 13140).

The proposed technical approach consists of the work tasks described below. Where reference is made to the City in the task descriptions, it shall mean the City of Manteca staff and/or its designated consultant.

TASK 1 – INITIATE PROJECT / ASSESS DATA NEEDS

The City will prepare a preliminary list of data and information needed to perform the study and probable sources for these data. Data needed for the study include: historical climate data for the study area (*i.e.*, rainfall, temperature, rates of evapotranspiration, etc., for the agricultural area irrigated with groundwater influenced by the WQCF current effluent to land disposal practices); maps of the study area, including the locations of groundwater wells; quantitative recent history of crops grown in the study area; chemical and physical properties of soils in the study area; recent water quality and flow of WQCF effluent disposed to land; and quality of the groundwater in the vicinity of the WQCF. Care will be taken to review effluent and groundwater quality data collected in the past five years, following recent salinity decreases in WQCF effluent tied to improvements in the quality of the City water supply. The City will review the data list and determine what data are needed from existing data files. The City will finalize the data needs list based on input from City staff and experts in local agriculture as needed, identify data sources, and determine if additional data must be collected through sampling and analysis of water and/or soils.

TASK 2 – COLLECT AVAILABLE EXISTING DATA

Based on the data needs list developed in Task 1, the City will obtain needed data from available existing sources. Data sources will include: Hoffman's report, UC Cooperative Extension, County Agricultural Commissioner's office, local Resource Conservation Districts, Natural Resources Conservation Service, City data files, DWR data files for wells, and local farmers' well water and crop data and knowledge of irrigation practices.

TASK 3 – DEVELOP STUDY APPROACH AND ASSUMPTIONS

The City will consult with experts on local agriculture to discuss the technical approach and key assumptions and criteria to be used in the study to determine appropriate levels of EC and TDS

to reasonably protect agricultural beneficial uses of water in the study area of interest. Their input will be used to develop an outline of the technical approach and to identify the key criteria and assumptions to be used in the study. A key issue to be decided will be the criteria that define a reasonable level of protection of beneficial agricultural water use considering all of the variables that can affect crop yield. Another key issue will be determining the extent of the area surrounding the WQCF where the groundwater used for agricultural irrigation may be influenced by the City's effluent disposal practices.

As noted, the City will incorporate the latest developments in the State Water Board's evaluation of the Southern Delta EC objectives (based on the Hoffman Report) in its consideration for a Study approach. Along with data evaluation efforts described in Task 2, the City will review the Hoffman Report to assess to what extent the methodology and findings of the report may be applicable to conditions in the vicinity of the WQCF. The approach recommended in the Hoffman Report and investigations currently underway in other Central Valley municipalities will form the basis for the final study approach. The City will submit the final study approach to the Regional Water Board for review and approval.

TASK 4 – FINALIZE STUDY APPROACH UPON REVIEW BY REGIONAL WATER BOARD

The City will submit its proposed Study approach from Task 3 to Regional Water Board staff for review. As necessary, following Regional Water Board review, City staff and consultants will meet with Regional Water Board staff to discuss any Regional Water Board concerns regarding the proposed approach. The City will then finalize the Study approach following any input from Regional Water Board staff, as appropriate.

TASK 5 – COLLECT NEW FIELD DATA

If new data needs are identified in Tasks 1 and 2 or as the Study approach is developed under Tasks 3 and 4, the City will obtain needed data by collecting and analyzing samples of groundwater, WQCF land-disposed effluent, or soil as necessary. The magnitude of the monitoring effort needed to collect the data will be determined and a monitoring program will be developed as necessary to address the data needs.

TASK 6 – DERIVE SITE-SPECIFIC WATER QUALITY OBJECTIVES

The City will use the assumptions and approach developed in Tasks 3 and 4 and the data obtained in Tasks 2 and 5 to compare with the modeling inputs and assumptions used in the Hoffman Report. The Hoffman Report evaluated the benefits of using different modeling approaches and ultimately relied on a steady-state model to calculate the root zone EC and TDS under a range of conditions based on historical data from the Southern Delta. The model considered the effects of climate, soil chemistry, rainfall, flood-induced leaching, irrigation methods, background groundwater quality, and water uptake and salt tolerance of crops produced in the area. Conditions in and around Manteca are expected to closely parallel the Southern Delta conditions used as input in the Hoffman Report model, since Manteca itself is part of the Southern Delta. The EC and TDS levels in irrigation water modeled by Hoffman will likely provide reasonable protection for the most salt-sensitive crops grown in the study area.

TASK 7 – COMPARE BACKGROUND GROUNDWATER QUALITY TO SITE-SPECIFIC WATER QUALITY OBJECTIVES

Background water quality as measured in well MW-AW, upgradient of the WQCF land application area will be compared to the objectives determined in Task 6. The WQCF's groundwater limitations established in the WDR are based on the water quality objective or the natural background quality, whichever is greater.

TASK 8 – PREPARE AND SUBMIT REPORT

The City will prepare a report that describes the process, criteria, assumptions, and models, as modified, used in the Study. The report will present results of the site-specific investigation detailing the effects of background groundwater quality, irrigation practices, precipitation, flooding, and local soil properties on crop production in the study area. The report will recommend numeric levels for EC and TDS groundwater concentrations that are reasonably protective of the most salt-sensitive crops grown within the study area boundary. In addition, the report will respond to comments received from Regional Water Board staff pursuant to Task 4, if needed. The City will prepare a final report for submittal to the Regional Water Board within three years of the WDR adoption (*i.e.*, by October 8, 2012).

Schedule

The tasks will be conducted according to a schedule shown in **Table 1** that will result in compliance with the permit requirement for submittal of the final report to the Regional Water Board by October 8, 2012.

Table 1. Site-Specific Salinity Study Schedule

Task	Completed by
Task 1 – Initiate Project/Assess data needs	September 2010
Task 2 – Collect available existing data	November 2010
Task 3 – Develop study approach and assumptions	March 2011
Task 4 – Finalize study approach upon review by Regional Water Board	August 2011
Task 5 – Collect new field data	TBD, as needed
Task 6 – Derive site-specific water quality objectives	August 2012
Task 7 – Compare background groundwater quality to site-specific water quality objectives	August 2012
Task 8 – Prepare and submit report	October 8, 2012

The activities described above will commence as needed and upon receipt of written acceptance of this work plan from the Regional Water Board. Per requirements of the WDR Monitoring and Reporting Program (Attachment E, Section X.D.1) progress on these tasks will be summarized for the Regional Water Board in Progress Reports due annually every December 1.