ranged from 89 mg/L to 140 mg/L (as $CaCO_3$), based on 30 samples from October 2006 to April 2008. Because Harding Drain is an effluent dominated stream and upstream hardness data is not available, the lowest hardness of the effluent (89 mg/L as $CaCO_3$) was used to represent a reasonable worst-case receiving water hardness. Thus, for evaluating whether the MEC or Maximum Background Ambient Concentration exceeds the applicable criterion, the criterion was adjusted using a reasonable worst-case receiving water hardness of 89mg/L (as $CaCO_3$).

b) **Discharge Point No. 002 (San Joaquin River).** The upstream receiving water hardness in the San Joaquin River ranged from 32 mg/L to 345 mg/L, based on 20 samples from May 2006 to April 2007. Thus, a minimum upstream receiving water hardness of 32 mg/L (as $CaCO_3$) represents the reasonable worst-case upstream hardness and was used to adjust the criterion when comparing the Maximum Background Ambient Concentration to the criterion for the discharge to the San Joaquin River at Discharge Point No. 002. For comparing the MEC to the applicable criterion, in accordance with the SIP, CTR, and Order WQO 2008-0008, the reasonable worst-case downstream hardness was used to adjust the criterion. The procedures for determining the applicable criterion after proper adjustment using the reasonable worst-case downstream hardness is outlined in subsection ii. below.

ii. **Effluent Concentration Allowance (ECA) Calculations.** A 2006 Study[1] developed procedures for calculating the effluent concentration allowance (ECA)[2] for CTR hardness-dependent metals. The 2006 Study demonstrated that it is necessary to evaluate all discharge conditions (e.g. high and low flow conditions) and the hardness and metals concentrations of the effluent and receiving water when determining the appropriate ECA for these hardness-dependent metals. Simply using the lowest recorded upstream receiving water hardness to calculate the ECA may result in over or under protective WQBELs.

The equation describing the total recoverable regulatory criterion, as established in the CTR, is as follows:

$$\text{CTR Criterion} = \text{WER} \times (e^{m[\ln(H)]+b}) \qquad \text{(Equation 1)}$$

Where:

H = hardness (as $CaCO_3$)
WER = water-effect ratio

[1] Emerick, R.W.; Borroum, Y.; & Pedri, J.E., 2006. California and National Toxics Rule Implementation and Development of Protective Hardness Based Metal Effluent Limitations. WEFTEC, Chicago, Ill.

[2] The ECA is defined in Appendix 1 of the SIP (page Appendix 1-2). The ECA is used to calculate WQBELs in accordance with Section 1.4 of the SIP

m, b = metal- and criterion-specific constants

In accordance with the CTR, the default value for the WER is 1. A WER study must be conducted to use a value other than 1. The constants "m" and "b" are specific to both the metal under consideration, and the type of total recoverable criterion (i.e., acute or chronic). The metal-specific values for these constants are provided in the CTR at paragraph (b)(2), Table 1.

The equation for the ECA is defined in Section 1.4, Step 2, of the SIP and is as follows:

$$ECA = C \qquad (\text{when } C \leq B)^{1} \qquad (\text{Equation 2})$$

Where

C = the priority pollutant criterion/objective, adjusted for hardness (see Equation 1, above)

B = the ambient background concentration

The 2006 Study demonstrated that the relationship between hardness and the calculated criteria is the same for some metals, so the same procedure for calculating the ECA may be used for these metals. The same procedure can be used for chronic cadmium, chromium III, copper, nickel, and zinc. These metals are hereinafter referred to as "Concave Down Metals". "Concave Down" refers to the shape of the curve represented by the relationship between hardness and the CTR criteria in Equation 1. Another similar procedure can be used for determining the ECA for acute cadmium, lead, and acute silver, which are referred to hereafter as "Concave Up Metals".

<u>ECA for Concave Down Metals</u> – For Concave Down Metals (i.e., chronic cadmium, chromium III, copper, nickel, and zinc) the 2006 Study demonstrates that when the effluent is in compliance with the CTR criteria and the upstream receiving water is in compliance with the CTR criteria, any mixture of the effluent and receiving water will always be in compliance with the CTR criteria. Therefore, based on any observed ambient background hardness, no receiving water assimilative capacity for metals (i.e., ambient background metals concentrations are at their respective CTR criterion) and the minimum effluent hardness, the ECA calculated using Equation 1 with a hardness equivalent to the minimum effluent hardness is protective under all discharge conditions (i.e., high and low dilution conditions and under all mixtures of effluent and receiving water as the effluent mixes with the receiving water). This is applicable whether the effluent hardness is less than or greater than the ambient background receiving water hardness.

[1] The 2006 Study assumes the ambient background metals concentration is equal to the CTR criterion (i.e. C ≤ B)

The effluent hardness ranged from 89 mg/L to 140 mg/L (as $CaCO_3$), based on 30 samples from October 2006 to April 2008. Upstream receiving water hardness data for Harding Drain is not available. The upstream receiving water hardness in the San Joaquin River varied from 32 mg/L to 345 mg/L (as $CaCO_3$), based on 20 samples from May 2006 to April 2007. Using a hardness of 89 mg/L (as $CaCO_3$) to calculate the ECA for all Concave Down Metals will result in WQBELs that are protective under all potential effluent/receiving water mixing scenarios and under all known hardness conditions, as demonstrated in the example using copper for the San Joaquin River shown in Table F-5, below. This example assumes the following conservative conditions for the upstream receiving water:

- Upstream receiving water always at the lowest observed upstream receiving water hardness (i.e., 32 mg/L as $CaCO_3$)
- Upstream receiving water copper concentration always at the CTR criteria (i.e., no assimilative capacity).

As demonstrated in Table F-5, using a hardness of 89 mg/L (as $CaCO_3$) to calculate the ECA for Concave Down Metals ensures the discharge is protective under all discharge and mixing conditions. In this example, the effluent is in compliance with the CTR criteria and any mixture of the effluent and receiving water is in compliance with the CTR criteria. An ECA based on a lower hardness (e.g., lowest upstream receiving water hardness) would also be protective, but would result in unreasonably stringent effluent limits considering the known conditions. Therefore, in this Order the ECA for all Concave Down Metals has been calculated using Equation 1 with a hardness of 89 mg/L (as $CaCO_3$).

Table F-5. Copper ECA Evaluation

Minimum Observed Effluent Hardness	89 mg/L (as $CaCO_3$)
Minimum Observed Upstream Receiving Water Hardness	32 mg/L (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Copper Concentration	3.7 µg/L[1]
Copper $ECA_{chronic}$[2]	8.4 µg/L

Effluent Fraction	Mixed Downstream Ambient Concentration		
	Hardness[3] (mg/L) (as $CaCO_3$)	CTR Criteria[4] (µg/L)	Copper[5] (µg/L)
1%	34.55	3.8	3.8
5%	36.75	4.0	3.9
15%	42.25	4.5	4.4
25%	47.75	5.0	4.9
50%	61.50	6.2	6.1
75%	75.25	7.3	7.3
100%	89	8.4	8.4

1 Maximum assumed upstream receiving water copper concentration calculated using Equation 1 for chronic criterion at a hardness of **32 mg/L (as $CaCO_3$)**.

2 ECA calculated using Equation 1 for chronic criterion at a hardness of **89 mg/L (as $CaCO_3$)**.

3 Mixed downstream ambient hardness is the mixture of the receiving water and effluent hardness at the applicable effluent fraction.

4 Mixed downstream ambient criteria are the chronic criteria calculated using Equation 1 at the mixed hardness.

5 Mixed downstream ambient copper concentration is the mixture of the receiving water and effluent copper concentrations at the applicable effluent fraction.

ECA for Concave Up Metals – For Concave Up Metals (i.e., acute cadmium, lead, and acute silver), the 2006 Study demonstrates that due to a different relationship between hardness and the metals criteria, the effluent and upstream receiving water can be in compliance with the CTR criteria, but the resulting mixture may be out of compliance. Therefore, the 2006 Study provides a mathematical approach to calculate the ECA to ensure that any mixture of effluent and receiving water is in compliance with the CTR criteria (see Equation 3, below). The ECA, as calculated using Equation 3, is based on the reasonable worst-case ambient background hardness, no receiving water assimilative capacity for metals (i.e., ambient background metals concentrations are at their respective CTR criterion), and the minimum observed effluent hardness. The reasonable worst-case ambient background hardness depends on whether the effluent hardness is greater than or less than the upstream receiving water hardness. There are circumstances where the conservative ambient background hardness assumption is to assume that the upstream receiving water is at the highest observed hardness concentration. The conservative upstream receiving water condition as used in the Equation 3 below is defined by the term H_{rw}.

$$ECA = \left(\frac{m(H_e - H_{rw})(e^{m\{\ln(H_{rw})\}+b})}{H_{rw}} \right) + e^{m\{\ln(H_{rw})\}+b} \qquad \text{(Equation 3)}$$

m, b = criterion specific constants (from CTR)

H_e = minimum observed effluent hardness

H_{rw} = minimum observed upstream receiving water hardness when the minimum effluent hardness is always greater than observed upstream receiving water hardness ($H_{rw} < H_e$)

-or-

maximum observed upstream receiving water hardness when the minimum effluent hardness is always less than observed upstream receiving water hardness ($H_{rw} > H_e$)[1]

A similar example as was done for the Concave Down Metals is shown for lead, a Concave Up Metal, in Tables F-6 through F-8, below. As previously mentioned, the minimum effluent hardness is 89 mg/L (as $CaCO_3$), while the upstream receiving water hardness ranged from 32 mg/L to 345 mg/L (as $CaCO_3$). In this case, the minimum effluent concentration is within the range of observed upstream receiving water hardness concentrations. Therefore, Equation 3 was used to calculate two ECAs, one based on the minimum observed upstream receiving water hardness (i.e., 2.5 µg/L, see Table F-6) and one based on the maximum observed upstream receiving water hardness (i.e., 0.9 µg/L, see Table F-7). Using Equation 3, the lowest ECA results from using the maximum upstream receiving water hardness, the minimum effluent hardness, and assuming no receiving water capacity for lead (i.e., ambient background lead concentration is at the CTR chronic criterion).

However, because the maximum ambient hardness is significantly greater than the minimum observed effluent hardness, the assumption of no assimilative capacity results in unrealistically high ambient background metals concentrations that are not supported by the data. This results in an unreasonably low ECA, or in some cases even a negative ECA. The maximum upstream receiving water hardness is 345 mg/L (as $CaCO_3$), which corresponds to a chronic CTR criterion for total recoverable lead of 15 µg/L. Based on 26 samples in the receiving water, the maximum total lead concentration was only 1.52 µg/L, which demonstrates there is assimilative

[1] When the minimum effluent hardness falls within the range of observed receiving water hardness concentrations, Equation 3 is used to calculate two ECAs, one based on the minimum observed upstream receiving water hardness and one based on the maximum observed upstream receiving water hardness. The minimum of the two calculated ECAs represents the ECA that ensures any mixture of effluent and receiving water is in compliance with the CTR criteria.

capacity under conditions when the hardness of the receiving water is high. Under these circumstances, the 2006 Study recommends an iterative approach for calculating the ECA assuming some assimilative capacity exists in the receiving water at the higher hardness concentrations. Therefore, the total recoverable lead ECA at the maximum observed receiving water hardness has been iteratively determined assuming the maximum observed upstream receiving water hardness, a maximum upstream total lead concentration of 1.52 µg/L, and the effluent at the minimum observed hardness. This results in a chronic ECA for total recoverable lead of 2.7 µg/L (see Table F-8).

Using Equation 3 to calculate the ECA for all Concave Up Metals, based on the minimum observed upstream receiving water hardness, will result in WQBELs that are protective under all potential effluent/receiving water mixing scenarios and under all known hardness conditions, as demonstrated in Table F-8, for lead. In this example, the effluent is in compliance with the CTR criteria and any mixture of the effluent and receiving water is in compliance with the CTR criteria. Use of a lower ECA (e.g., calculated based solely on the highest upstream receiving water hardness) is protective, but would lead to unreasonably stringent effluent limits considering the known conditions. Therefore, Equation 3 using the minimum observed upstream receiving water hardness has been used to calculate the ECA for all Concave Up Metals in this Order.

Table F-6. Lead ECA Evaluation

Minimum Observed Effluent Hardness	**89 mg/L** (as $CaCO_3$)
Minimum Observed Upstream Receiving Water Hardness	**32 mg/L** (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Lead Concentration	**0.8 µg/L**[1]
Lead $ECA_{chronic}$[2]	**2.5 µg/L**

Effluent Fraction	**Mixed Downstream Ambient Concentration** **Hardness**[3] **(mg/L)** (as $CaCO_3$)	**CTR Criteria**[4] **(µg/L)**	**Lead**[5] **(µg/L)**
1%	34.6	0.8	0.8
5%	36.8	0.9	0.9
15%	42.3	1.1	1.1
25%	47.8	1.2	1.2
50%	61.5	1.7	1.6
75%	75.3	2.2	2.1
100%	89.0	2.7	2.5

1 Minimum assumed upstream receiving water lead concentration calculated using Equation 1 for chronic criterion at a hardness of **32 mg/L (as $CaCO_3$)**.

2 ECA calculated using Equation 3 for chronic criteria.

3 Mixed downstream ambient hardness is the mixture of the receiving water and effluent hardness at the applicable effluent fraction.

4 Mixed downstream ambient criteria are the chronic criteria calculated using Equation 1 at the mixed hardness.

5 Mixed downstream ambient lead concentration is the mixture of the receiving water and effluent lead concentrations at the applicable effluent fraction.

Table F-7. Lead ECA Evaluation

Minimum Observed Effluent Hardness	**89 mg/L** (as $CaCO_3$)
Maximum Observed Upstream Receiving Water Hardness	**345 mg/L** (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Lead Concentration	**15.4 µg/L**[1]
Lead $ECA_{chronic}$[2]	**0.9 µg/L**

Effluent Fraction	**Mixed Downstream Ambient Concentration** **Hardness**[3] **(mg/L)** (as $CaCO_3$)	**CTR Criteria**[4] **(µg/L)**	**Lead**[5] **(µg/L)**
1%	342.4	15.2	15.2
5%	332.2	14.7	14.7
15%	306.6	13.2	13.2
25%	281.0	11.9	11.8
50%	217.0	8.5	8.1
75%	153.0	5.5	4.5
100%	89.0	2.7	0.9

1 Maximum assumed upstream receiving water lead concentration calculated using Equation 1 for chronic criterion at a hardness of **345 mg/L (as $CaCO_3$)**.
2 ECA calculated using Equation 3 for chronic criteria.
3 Mixed downstream ambient hardness is the mixture of the receiving water and effluent hardness at the applicable effluent fraction.
4 Mixed downstream ambient criteria are the chronic criteria calculated using Equation 1 at the mixed hardness.
5 Mixed downstream ambient lead concentration is the mixture of the receiving water and effluent lead concentrations at the applicable effluent fraction.

Table F-8. Lead ECA Evaluation

Minimum Observed Effluent Hardness	**89 mg/L** (as $CaCO_3$)
Maximum Observed Upstream Receiving Water Hardness	**345 mg/L** (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Lead Concentration	**1.52 µg/L[1]**
Lead $ECA_{chronic}$[2]	**2.7 µg/L**

Effluent Fraction	**Mixed Downstream Ambient Concentration** Hardness[3] (mg/L) (as $CaCO_3$)	CTR Criteria[4] (µg/L)	Lead[5] (µg/L)
1%	342.4	15.2	1.5
5%	332.2	14.7	1.6
15%	306.6	13.2	1.7
25%	281.0	11.9	1.8
50%	217.0	8.5	2.1
75%	153.0	5.5	2.4
100%	89.0	2.7	2.7

1 Maximum assumed upstream receiving water lead concentration based on maximum observed upstream receiving water lead concentration.
2 ECA determined iteratively until all mixtures of effluent and receiving water are in compliance with the CTR criteria.
3 Mixed downstream ambient hardness is the mixture of the receiving water and effluent hardness at the applicable effluent fraction.
4 Mixed downstream ambient criteria are the chronic criteria calculated using Equation 1 at the mixed hardness.
5 Mixed downstream ambient lead concentration is the mixture of the receiving water and effluent lead concentrations at the applicable effluent fraction.

c. **Assimilative Capacity and Mixing Zone.** Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. In determining whether a discharge has the reasonable potential to contribute to an in-stream excursion, the dilution of the effluent in the receiving water may be considered where areas of dilution are defined. The available dilution may also be used to calculate protective effluent limitations by applying water quality criteria at the edge of the defined mixing zone. These calculations include receiving water pollutant concentrations that are typically based on worst-case conditions for flow and concentration.

i. **Harding Drain.** For extended periods each year there are occasions of no flow in Harding Drain other than the effluent. The effluent dominated nature of Harding Drain means that the existing beneficial uses must be protected, but that no credit for receiving water dilution is available. Although the discharge, at times, maintains the aquatic habitat, constituents may not be discharged that may cause harm to aquatic life. At times, natural flows within Harding Drain help support an aquatic habitat, and significant dilution may occur during and immediately following high rainfall events. Both high and low flow conditions may exist within a short time span, where Harding Drain would be dry without the discharge and periods when sufficient background flows provide hydraulic continuity with the San Joaquin River.

Since the worst-case condition has no dilution at the point of discharge into Harding Drain, dilution and assimilative capacity within Harding Drain were not considered in establishing effluent limitations for pollutants in the effluent. For pollutants that demonstrated reasonable potential, effluent limitations were applied at the point of discharge to Harding Drain. The lack of dilution results in more stringent effluent limitations to protect the beneficial uses.

ii. **San Joaquin River.** The Discharger has requested dilution credits be used for calculation of WQBELs for carbon tetrachloride, chlorodibromomethane, dichlorobromomethane, and nitrate for discharges to the San Joaquin River. Section 1.4.2.2 of the SIP, provides that mixing zones should not be allowed at or near drinking water intakes. Furthermore, regarding the application of a mixing zone for protection of human health, the TSD states that," *...the presence of mixing zones should not result in significant health risks, when evaluated using reasonable assumptions about exposure pathways. Thus, where drinking water contaminants are a concern, mixing zones should not encroach on drinking water intakes.*" There are no known drinking water intakes in the vicinity of the discharge.

For constituents where water quality criteria are based on human health objectives, critical environmental impacts are expected to occur far downstream from the source such that complete mixing is a valid assumption. With regard to completely mixed discharges the SIP states, "*For completely-mixed discharges...the amount of receiving water available to dilute the effluent shall be determined by calculating the dilution ratio (i.e. the critical receiving water flow divided by the effluent flow)...*" Therefore, for purposes of establishing WQBELs for carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane in this Order for discharges to the San Joaquin River, dilution credits may be granted based on the critical flows of the receiving water and effluent discharge.

For nitrate, the Primary Maximum Contaminant Level (MCL) is designed to be protective over shorter periods of time (e.g., 30 days or less), and therefore a human health dilution credit based on the harmonic mean flow is not appropriate.

The Discharger provided a dilution/mixing zone study prepared by Larry Walker Associates on 16 June 2009 (Technical Memorandum entitled "City of Turlock Water Quality Control Facility – San Joaquin River Discharge Mixing Zone Study and Requested Amendment to Tentative Order, NPDES No. CA0078948"). Using the Cornell Mixing Zone Expert System (CORMIX) model, the point of complete mixing downstream of the Discharger's proposed discharge to the San Joaquin River was estimated. A summary of the primary data inputs to the CORMIX model are provided below:

- A value of 100 feet (30.5 meters) was estimated for river width; the cross section geometry was estimated using aerial photo width measurements.
- River depths were estimated under a number of selected design/critical flows using Manning's equation.
- The effluent concentration was arbitrarily specified equal to 100 mg/L. In CORMIX, this value (or any other reference value) can be used in the absence of actual effluent concentration data. This means that some of the CORMIX-calculated concentrations along the longitudinal dimension of the plume (i.e., along the stream reach) are lower than the arbitrarily selected effluent concentration and are simply used to calculate the CORMIX dilution ratio.
- The proposed outfall cross-section was estimated to be 2 meters wide by 0.2 meters deep, which corresponds to the maximum permitted flow rate.

Two primary model scenarios were run; 1) one corresponding to a harmonic mean flow of the San Joaquin River (617 cubic feet per second) for use in evaluating potential dilution for carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane (consistent with the SIP and USEPA *Technical Support Document for Water Quality-based Toxic Control* or TSD), and 2) one corresponding to 30Q10 critical low flow of the San Joaquin River (180 cubic feet per second) for use in evaluating potential dilution for nitrate (use of the 30Q10 is consistent with the USEPA TSD recommendations for noncarcinogens).[1] For each model scenario, two evaluations were performed: 1) estimates of the distance downstream to achieve complete mix; and 2) estimates of the dilution available at the downstream monitoring location, 400 meters from the proposed discharge point into the San Joaquin River.

[1] The USEPA TSD states that because the effects of noncarcinogens are more often associated with shortened exposures, EPA suggests the use of the 30Q5 critical low flow. The 30Q10 proposed by the Discharger would generally result in a more conservative (i.e., lower) critical flow.

According to the report, initial mixing at the proposed point of discharge is momentum and buoyancy based; complete mixing is then achieved more slowly through dispersion as the narrow plume hugs the eastern bank of the San Joaquin River. For carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane the results of the study indicates that the edge of the mixing zone where complete mixing occurs in the San Joaquin River is 3,048 meters (just under 2 miles) downstream of the proposed discharge point to the San Joaquin River. The width and depth of the mixing zone is approximately 30.48 meters and 0.93 meters, respectively. For nitrate, the results of the study indicates that the edge of the mixing zone where complete mixing occurs is 3,007 meters (almost 1.9 miles) downstream of the proposed discharge point to the San Joaquin River. The width and depth of the mixing zone is approximately 30.48 meters and 0.57 meters, respectively.

Based on its review of the Discharger's response, the Regional Water Board concludes that adequate justification exists and dilution should be allowed for carbon tetrachloride, chlorodibromomethane, dichlorobromomethane, and nitrate. For human health criteria the SIP recommends using the harmonic mean receiving water flow and the long-term arithmetic mean to calculate a dilution credit (SIP at Section 1.4.2.1). In an effort to limit the size of the mixing zone, the Discharger has requested that the dilution be based on the design flow of the Facility (20 MGD). Based on the harmonic mean flow of 617 cubic feet per second (cfs) or 398 MGD of the San Joaquin River calculated using USEPA's DFLOW software for the period of 1981 through 2008, and the design discharge flow of 20 MGD, a dilution credit of 19.9 may be allowed for the calculation of WQBELs for carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane. Based on the above, the Regional Water Board will apply a dilution factor of 19.9 for carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane.

For nitrate, the dilution credit is calculated using the 30Q10 (180 cfs or 116 MGD) and the design discharge flow of 20 MGD. Therefore, a dilution ratio of up to 5.8:1 may be allowed for the calculation of WQBELs for nitrate. The Discharger, in its mixing zone study, has requested that the dilution factor be limited to 2.4, which reflects a mixing zone at which a performance-based effluent limitation can be achieved. The edge of the mixing zone representing the dilution factor of 2.4 is 29.7 meters (just under 100 feet) downstream of the outfall to the San Joaquin River. The width and depth of the mixing zone is approximately 7.3 meters and 0.57 meters, respectively. The Regional Water Board concurs with use of the smaller mixing zone for nitrate that represents the performance of the existing Facility. The observed average effluent concentration for the Facility is 16 mg/L nitrate (as N), with a standard deviation of 3.8 mg/L nitrate (as N). A statistically derived performance-based effluent limitation of 29 mg/L nitrate (as N) was calculated based on the effluent average (16 mg/L) plus 3.3 times the standard deviation (3.3 x 3.8 mg/L = 13 mg/L). However, because the maximum observed effluent nitrate concentration of 31 mg/L exceeds the statistically derived effluent limitation, this Order includes a performance-based effluent limitation for nitrate equivalent to the maximum observed effluent concentration.

iii. **Consistency with Mixing Zone Requirements.** This Order only allows a mixing zone for human health criteria. This Order does not allow mixing zones for compliance with aquatic toxicity criteria. The mixing zone is as small as practicable, will not compromise the integrity of the entire water body, restrict the passage of aquatic life, dominate the waterbody or overlap existing mixing zones from different outfalls.

According to Section 1.4.2.2 of the SIP (Mixing Zone Conditions), a mixing zone shall not cause the following conditions:

(1) Compromise the integrity of the entire water body – The proposed human health mixing zone is approximately 2 miles long, constituting a small fraction of the total river reach.

(2) Cause acutely toxic conditions to aquatic life passing through the mixing zone – The mixing zone request was for select human health criteria and objectives. This Order does not allow an acute aquatic life mixing zone and requires compliance with an acute toxicity effluent limitation that requires acute bioassays using 100% effluent (i.e., no dilution). Compliance with the acute toxicity effluent limitation assures the effluent is not acutely toxic.

(3) Restrict the passage of aquatic life – As described above, the narrow plume hugs the eastern bank of the San Joaquin River. Therefore granting the mixing zone should not restrict the passage of aquatic life.

(4) Adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws – This Order does not allow mixing zones for compliance with aquatic toxicity criteria. The Discharger must meet stringent end-of-pipe effluent limitations for constituents that demonstrated reasonable potential to exceed aquatic toxicity criteria (i.e., aluminum, ammonia, copper, chloride, selenium, and total residual chlorine).

(5) Produce undesirable or nuisance aquatic life – The mixing zone request was for select human health criteria and objectives. This Order requires end-of-pipe effluent limitations (e.g. for biochemical oxygen demand and total suspended solids) and discharge prohibitions to prevent these conditions from occurring.

(6) Result in floating debris, oil, or scum – The mixing zone request was for select human health criteria and objectives. This Order requires end-of-pipe effluent limitations (e.g., for BOD_5 and TSS) and discharge prohibitions to prevent these conditions from occurring.

(7) Produce objectionable color, odor, taste, or turbidity – The mixing zone request was for select human health criteria and objectives. This Order requires end-of-pipe effluent limitations (e.g., for BOD_5 and TSS) and discharge prohibitions to prevent these conditions from occurring.

(8) Cause objectionable bottom deposits – The mixing zone request was for select human health criteria and objectives. The granting of the mixing zone should not affect operations at the Facility, and should not produce objectionable bottom deposits.

(9) Cause nuisance – The mixing zone request was for select human health criteria and objectives, none of which should cause a nuisance within or outside the mixing zone.

(10) Dominate the receiving water body or overlap a mixing zone from different outfalls – The City of Modesto discharge is located approximately 5.5 miles downstream from the proposed outfall to the San Joaquin River. The edge of the mixing zone is approximately 3.5 miles upstream from the City of Modesto discharge locations; therefore an overlap of mixing zones does not occur.

(11) Be allowed at or near any drinking water intake – The discharge enters the San Joaquin River just over 28 miles upstream of the nearest drinking water supply (in the Delta downstream of Vernalis). The human health criteria mixing zone extends just over 3,000 meters downstream of the discharge. There is significant dilution, much more than that is allowed in this Order, prior to any drinking water intake within the Delta. There are no known drinking water intakes within the mixing zone.

As suggested by the SIP, in determining the extent of or whether to allow a mixing zone and dilution credit, the Regional Water Board has considered the presence of pollutants in the discharge that are carcinogenic, mutagenic, teratogenic, persistent, bioaccumulative, or attractive to aquatic organisms, and concluded that the allowance of the mixing zone and dilution credit is adequately protective of the beneficial uses of the receiving water. Although carbon tetrachloride, chlorodibromomethane, and dichlorobromomethane, are carcinogens, exposure (short- and long-term) to humans within the proposed mixing zone will be limited.

The mixing zone therefore complies with the SIP. The mixing zone also complies with the Basin Plan, which requires that the mixing zone not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zone, the Regional Water Board has considered the procedures and guidelines in the EPA's Water Quality Standards Handbook, 2d Edition (updated July 2007), Section 5.1, and Section 2.2.2 of the Technical Support

Document for Water Quality-based Toxics Control (TSD). The SIP incorporates the same guidelines.

d. **Metal Translators.** The Discharger submitted monitoring data to support metal translators for the discharge to the San Joaquin River on 11 June 2008. A formal report was requested by the Regional Water Board on 16 June 2008. The Discharger submitted the report on 16 July 2008 and requested acute and chronic translators be used to calculate aquatic life criteria for copper, lead, and zinc. Upon review of the Metals Translator Report, the Regional Water Board identified several deficiencies, including the manner in which the translator study was conducted, the interpretation of the data, and the conclusions reached. Regional Water Board staff issued their comments to the Discharger on 31 October 2008, to which the Discharger submitted a response on 21 November 2008. The Discharger's response addressed the major concerns regarding the Metals Translator Report.

For the discharge to the San Joaquin River at Discharge Point No. 002, the Discharger calculated site-specific translators in accordance with USEPA guidance using only effluent samples as shown in Table F-9 and using a synthetic sample simulating critical low flow conditions in the San Joaquin River in accordance with the EPA translator guidance (4:1 based on the 7Q10 taken from other studies in the vicinity of the discharge) as shown in Table F-10. Based on the findings of the Metals Translator Report, the Discharger requested that water quality criteria for copper, lead, and zinc be calculated using site-specific translators derived using the synthetic sample for the discharge to the San Joaquin River.

Table F-9. Metals Translators Based on Effluent Samples

Parameter	Translator (1/fD)	
	Acute	Chronic
Copper, Total Recoverable	1.22	1.52
Lead, Total Recoverable	1.08	1.32
Zinc, Total Recoverable	1.00	1.04

Table F-10. Metals Translators Based on Synthetic Samples

Parameter	Translator (1/fD)	
	Acute	Chronic
Copper, Total Recoverable	1.45	1.82
Lead, Total Recoverable	6.67	11.34
Zinc, Total Recoverable	1.19	1.39

USEPA's translator guidance states that "*depending on state guidance or regulatory negotiations, samples may be collected from the effluent, the receiving water before mixing with the effluent, the receiving water edge of the mixing zone, and/or the receiving water in the far field (beyond the mixing zone).*" Although the USEPA guidance allows for alternative sampling locations, the allowance of chronic translators based on the 4:1 synthetic samples is not consistent with section 1.4.2 of the SIP. Section 1.4.2 of the SIP requires a mixing zone study in order to grant mixing zones and dilution credits. However, translators based on the 4:1 synthetic samples assume dilution is available even though an appropriate mixing zone analysis has not been conducted for metals and aquatic life protection. Therefore, until an applicable mixing zone analysis has been conducted, it is not appropriate to grant the translators based on the 4:1 synthetic sample. In lieu of calculating water quality criteria using the translators based on the 4:1 synthetic samples, Regional Water Board staff concludes that it is appropriate to apply the proposed translators based on effluent samples to adjust water quality criteria for copper, lead, and zinc for the discharge to the San Joaquin River from Discharge Point No. 002.

For the discharge to Harding Drain at Discharge Point No. 001, the Discharger has requested that water quality criteria also be calculated using the site-specific translators derived using effluent monitoring data for the period of September 2006 through April 2007. Because these translators are based on effluent samples only, and are representative and protective of the receiving water under critical low flow conditions (i.e., during periods of no dilution), the Regional Water Board finds that it is appropriate to apply the proposed translators based on effluent samples to adjust water quality criteria for copper, lead, and zinc for the discharge to Harding Drain from Discharge Point No. 001.

3. Determining the Need for WQBELs

a. CWA section 301 (b)(1) requires NPDES permits to include effluent limitations that achieve technology-based standards and any more stringent limitations necessary to meet water quality standards. Water quality standards include Regional Water Board Basin Plan beneficial uses and narrative and numeric water quality objectives, State Water Board-adopted standards, and federal standards, including the CTR and NTR. The Basin Plan includes numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00.) With regards to the narrative chemical constituents objective, the Basin Plan states that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At a minimum, "*...water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)*" in Title 22 of CCR. The narrative tastes and odors objective states: "*Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.*"

b. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Based on information submitted as part of the application, in studies, and as directed by monitoring and reporting programs, the Regional Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard from Discharge Point No. 001 to Harding Drain for aluminum, ammonia, carbon tetrachloride, chlorine residual, chlorodibromomethane, copper, dichlorobromomethane, electrical conductivity, nitrate, pH, selenium, and pathogens. The Regional Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard from Discharge Point No. 002 to the San Joaquin River for aluminum, ammonia, boron, carbon tetrachloride, chloride, chlorine residual, chlorodibromomethane, copper, dichlorobromomethane, electrical conductivity, iron, lead, manganese, nitrate, pH, selenium, silver, and pathogens. WQBELs for these constituents are included in this Order. A summary of the reasonable potential analysis (RPA) is provided in Attachment G, and a detailed discussion of the RPA for each constituent is provided below.

c. The Regional Water Board conducted the RPA in accordance with Section 1.3 of the SIP. Although the SIP applies directly to the control of CTR priority pollutants, the State Water Board has held that the Regional Water Board may use the SIP as guidance for water quality-based toxics control.[1] The SIP states in the introduction "*The goal of this Policy is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency.*" Therefore, in this Order the RPA procedures from the SIP were used to evaluate reasonable potential for both CTR and non-CTR constituents, except for non-CTR constituents where the Secondary MCL is the applicable water quality objective, and as otherwise described in section IV.C.3 of this Fact Sheet.

d. WQBELs were calculated in accordance with section 1.4 of the SIP, as described in Attachment F, Section IV.C.4, except for non-CTR constituents where a Secondary MCL is the applicable water quality objective, and as otherwise described in section IV.C.3 of this Fact Sheet.

e. The Discharger completed final upgrades to the Facility to provide tertiary treatment in the spring of 2006. However, effluent monitoring during the start-up period may not be representative of current effluent quality, as mixtures of coagulants and operation of the DensaDeg® filter were still under refinement. Additionally, the Discharger reported in the cover letter to the SMR for September 2006 that a new methane phase digester began operation on 6 August 2006; a new acid-phase digester came on-line on 12 September 2006; and an additional primary flotator began operation on 26 September 2006. Therefore, effluent monitoring data used to conduct the RPA included SMRs, priority pollutant monitoring, and the Discharger's Metals Translator Report from the period of October 2006 through April 2008. Receiving water monitoring data used to conduct the RPAs included SMRs and priority pollutant monitoring from

[1] See, Order WQO 2001-16 (Napa) and Order WQO 2004-0013 (Yuba City).

the period of May 2005 through April 2008, and the Metals Translator Report from the period of May 2006 through April 2007.

f. **Aluminum.** USEPA developed National Recommended Ambient Water Quality Criteria for protection of freshwater aquatic life for aluminum. The recommended 4-day average (chronic) and 1-hour average (acute) criteria for aluminum are 87 µg/L and 750 µg/L, respectively. The Secondary Maximum Contaminant Level - Consumer Acceptance Limit for aluminum is 200 µg/L.

The MEC for acid-soluble aluminum was 56.3 µg/L, based on 12 samples collected between October 2006 and April 2008. Upstream receiving water acid-soluble aluminum data for Harding Drain is not available. The maximum observed upstream receiving water acid-soluble aluminum concentration in the San Joaquin River was 457 µg/L, based on 20 samples collected between May 2005 and April 2008.

The MEC for total aluminum was 640 µg/L, based on 31 samples collected between October 2006 and April 2008 and reported in the Discharger's SMRs and Metals Translator Report. The maximum observed upstream receiving water total aluminum concentration in Harding Drain was 500 µg/L, based on six samples collected between May 2005 and April 2008. The maximum observed upstream receiving water total aluminum concentration in the San Joaquin River was 4,440 µg/L, based on 26 samples collected between May 2005 and April 2008. Therefore, the discharge of total aluminum to Harding Drain has the reasonable potential to cause an excursion above the secondary MCL. The discharge of total aluminum to the San Joaquin River has the reasonable potential to cause an excursion above the acute aquatic life criterion.

Footnote L to the National Recommended Ambient Water Quality Criteria summary table for aluminum indicates that the chronic aquatic life criterion is based on studies conducted under specific receiving water conditions with a low pH (6.5 to 6.8 pH units) and low hardness (<10 mg/L as $CaCO_3$). Monitoring data demonstrates that these conditions are not similar to those in Harding Drain, which has a pH ranging from 6.7 to 8.9. Although no hardness data for Harding Drain is available, the critical condition in Harding Drain occurs when there is no flow upstream of the discharge point. During this critical condition, the effluent from the Facility constitutes the flow in Harding Drain. The lowest reported effluent hardness was 89 mg/L. Thus, it is likely that application of the chronic criterion of 87 µg/L is not necessary to protect aquatic life in Harding Drain. Although this Order authorizes emergency discharges to Harding Drain in the event of a power failure at the pump station subsequent to the commencement of discharges to Discharge Point No. 002, these discharges will be infrequent and short in duration (i.e., several minutes) such that a chronic criterion is unnecessary for the protection of aquatic life.

Monitoring data demonstrates that the conditions under which the chronic aquatic life was developed are also not similar to those in the San Joaquin River, which has a pH ranging from 7.1 to 8.5 and hardness concentrations ranging from 98 mg/L to 318 mg/L as $CaCO_3$. Because the hardness values in the San Joaquin River are higher (which decreases the toxic effects to aquatic life) than the water hardness values in which the criterion was developed, USEPA advises that a water effects ratio might be appropriate to better reflect the actual toxicity of aluminum to aquatic organisms.

In April 2005, the City of Modesto completed a Phase I Water-Effects Ratio Study (WER) for aluminum near its discharge point which is downstream of the Discharger's proposed outfall in the San Joaquin River, and on 11 November 2005, submitted the results in its Aluminum Water-Effect Ratio Study Plan. The Phase 1 WER study consisted of range-finding toxicity tests, in which the species *Daphnia magna*, *Ceriodaphnia dubia*, and Rainbow Trout were evaluated. In addition, on 12 April 2007, the City of Manteca completed a Phase II aluminum WER study for the San Joaquin River near its discharge point, which is downstream of the City of Modesto. The Modesto Phase I WER study was not adequate to calculate a WER, but results suggested that a WER greater than 1.0 may be appropriate. The Manteca Phase II WER study, which may be used to calculate a WER for the City of Manteca's discharge, indicated that a WER of 22.7 can be applied to the chronic criterion for aluminum. Since the characteristics of the San Joaquin River (e.g. hardness and pH) near Modesto and Manteca are similar to those near the Discharger's proposed outfall in the San Joaquin River, the results of the City of Modesto's WER study and the City of Manteca's WER study put into question the applicability of the stringent CCC recommended by the National Ambient Water Quality Criteria for aluminum. Based on the above information, using the chronic criterion recommended in the National Ambient Water Quality Criteria (87 µg/L) is not appropriate for the San Joaquin River in the vicinity of the Discharger's proposed outfall.

In the absence of an applicable chronic aquatic life criterion, the most stringent water quality criterion is the Secondary MCL - Consumer Acceptance Limit for aluminum of 200 µg/L. Both the discharges to Harding Drain and the San Joaquin River have a reasonable potential to cause or contribute to an in-stream excursion above the Secondary MCL for aluminum. Based on input from the Department of Public Health (DPH) and the fact that secondary MCLs are designed to protect consumer acceptance, effluent limitations based on secondary MCLs are applied as an annual average concentration. An annual average effluent limitation of 200 µg/L for aluminum is included in this Order based on protection of the Basin Plan's numeric chemical constituents objective.

The discharge to the San Joaquin River also demonstrates reasonable potential to exceed the acute aquatic life criterion for aluminum, and it is uncertain whether regulating the discharge based on the secondary MCL (200 µg/L as an annual average) would also be protective of the acute aquatic life criterion. Therefore, this Order also includes an average monthly effluent limitation (AMEL) and a maximum daily effluent limitation (MDEL) of 261 µg/L and 750 µg/L, respectively,, based on USEPA's National Ambient Water Quality Criteria for the protection of freshwater aquatic life for discharges to the San Joaquin River (see Attachment F, Table F-14 for WQBEL calculations).

In USEPA's Ambient Water Quality Criteria for Aluminum—1988 [EPA 440/5-86-008], USEPA states that "[a]*cid-soluble aluminum…is probably the best measurement at the present…*"; however, USEPA has not yet approved an acid-soluble test method for aluminum. Replacing the ICP/AES portion of the analytical procedure with ICP/MS would allow lower detection limits to be achieved. Based on USEPA's discussion of aluminum analytical methods, this Order allows the use of the alternate aluminum testing protocol described above to meet monitoring requirements.

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for the discharge to Harding Drain and the San Joaquin River. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for aluminum are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the aluminum effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

g. **Ammonia.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger currently uses nitrification to remove ammonia from the waste stream. Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia would violate the Basin Plan narrative toxicity objective. Applying 40 CFR 122.44(d)(1)(vi)(B), it is appropriate to use the NAWQC for the protection of freshwater aquatic life for ammonia.

The NAWQC for the protection of freshwater aquatic life for total ammonia, recommends acute (1-hour average; criteria maximum concentration or CMC) standards based on pH and chronic (30-day average; criteria continuous concentration or CCC) standards based on pH and temperature. USEPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day CCC. USEPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature. As discussed in section III.C.1 of this Fact Sheet, warm and cold SPWN beneficial uses have been applied to Harding Drain. Additionally, warm SPWN is an existing use of the San Joaquin River. Early life stages of fish are likely present in the San Joaquin River from the mouth of the Merced River to Vernalis, and anadromous King (Chinook) salmon occasionally run in reaches of the San Joaquin River during wet years. Therefore, the recommended criteria for waters where salmonids and early life stages are present were used.

The maximum permitted effluent pH is 8.5, as the Basin Plan objective for pH in the receiving stream is the range of 6.5 to 8.5. In order to protect against the worst-case short-term exposure of an organism, a pH value of 8.5 was used to derive the acute criterion. The resulting acute criterion is 2.14 mg/L.

Downstream receiving water temperature and pH data from the Discharger's monthly monitoring reports from October 2006 through April 2008 were used to develop the chronic criteria. Using downstream receiving water data, the 30-day CCC was calculated for each day when temperature and pH were measured. The resulting lowest 99.9% 30-day CCC is 2.67 mg/L (as N) for the discharge to Harding Drain. The resulting lowest 99.9% 30-day CCC is 3.68 mg/L (as N) for the discharge to the San Joaquin River. The 4-day average concentration is derived in accordance with the USEPA criterion as 2.5 times the 30-day CCC. Based on the 30-day CCC of 2.67 mg/L (as N), the 4-day average concentration that should not be exceeded is 6.68 mg/L (as N) for the discharge to Harding Drain. Based on the 30-day CCC of 3.68 mg/L (as N), the 4-day average concentration that should not be exceeded is 9.20 mg/L (as N) for the discharge to the San Joaquin River.

The Regional Water Board calculates WQBELs in accordance with SIP procedures for non-CTR constituents, and ammonia is a non-CTR constituent. The SIP procedure assumes a 4-day averaging period for calculating the long-term average discharge condition (LTA). However, USEPA recommends modifying the procedure for calculating permit limits for ammonia using a 30-day averaging period for the calculation of the LTA corresponding to the 30-day CCC. Therefore, while the LTAs corresponding to the acute and 4-day chronic criteria were calculated according to SIP procedures, the LTA corresponding to the 30-day CCC was calculated assuming a 30-day averaging period. The lowest LTA representing the acute, 4-day average, and 30-day CCC is then selected for deriving the average monthly effluent limitation (AMEL) and the maximum daily effluent limitation (MDEL). The remainder of the WQBEL calculation for ammonia was performed according to the SIP procedures.

This Order contains a final AMEL and MDEL for ammonia of 1.1 mg/L and 2.1 mg/L, respectively, based on the NAWQC for the protection of freshwater aquatic life for discharges to Harding Drain and the San Joaquin River (see Attachment F, Tables F-15 and F-16 for WQBEL calculations). Based on monitoring data submitted from October 2006 through April 2008, it appears the Discharger can immediately comply with these limitations.

h. **Bis (2-Ethylhexyl) Phthalate.** Bis (2-ethylhexyl) phthalate, in addition to several other phthalates, is used primarily as one of several plasticizers in polyvinyl chloride (PVC) resins for fabricating flexible vinyl products. According to the Consumer Product Safety Commission, USEPA, and the Food and Drug Administration, these PVC resins are used to manufacture many products, including soft squeeze toys, balls, raincoats, adhesives, polymeric coatings, components of paper and paperboard, defoaming agents, animal glue, surface lubricants, and other products that must stay flexible and non-injurious for the lifetime of their use. The State MCL for bis (2-ethylhexyl) phthalate is 4 µg/L and the USEPA MCL is 6 µg/L. The NTR criterion for human health protection for consumption of water and aquatic organisms is 1.8 µg/L and for consumption of aquatic organisms only is 5.9 µg/L.

   Bis (2-ethylhexyl) phthalate was detected in the effluent five times with an MEC of 17.5 µg/L, based on seven samples collected between October 2006 and April 2008. However, based on the review of the lab data sheets for the samples, each of the detected samples was suspected to be the result of contamination, having the data qualifiers "B", "GG", and/or "O-01". The maximum observed bis (2-ethylhexyl) phthalate concentration in Harding Drain was 19 µg/L, based on six samples collected between May 2005 and April 2008. The maximum observed bis (2-ethylhexyl) phthalate concentration in the San Joaquin River was 12.3 µg/L, based on six samples collected between May 2005 and April 2008.

   As described above, bis (2-ethylhexyl) phthalate is a commonly used plasticizer and is to some extent ubiquitous in the environment. Since bis (2-ethylhexyl) phthalate is a common contaminant of sample containers, sampling apparatus, and analytical equipment, and sources of the detected bis (2-ethylhexyl) phthalate may be from plastics used for sampling or analytical equipment, it is uncertain whether reasonable potential actually exists and therefore effluent limitations for bis (2-ethylhexyl) phthalate are not being established at this time. Instead of limitations, additional monitoring has been established for bis (2-ethylhexyl) phthalate; should monitoring results indicate that the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality standard, then this Order may be reopened and modified by adding an appropriate effluent limitation.

i. **Boron.** Table III-1 of the Basin Plan contains water quality objectives for boron in the San Joaquin River from the mouth of the Merced River to Vernalis as follows:

Table F-11. Site-Specific Water Quality Objectives for Boron

Constituent	Maximum Concentration (mg/L)[1]	Applicable Water Bodies
Boron	2.0 (15 March through 15 September) 0.8 (monthly mean, 15 March through 15 September)	San Joaquin River, mouth of the Merced River to Vernalis
	2.6 (16 September through 14 March) 1.0 (monthly mean, 16 September through 14 March)	
	1.3 (monthly mean, critical year[2])	

1 Boron objectives are total concentrations.
2 See Table IV-3 of the Basin Plan.

Boron concentrations in the effluent ranged from 195 μg/L to 325 μg/L for 22 samples collected by the Discharger from October 2006 through April 2008. The maximum upstream receiving water concentration in the San Joaquin River was 877 μg/L, based on six samples collected between May 2005 and April 2008. Because the receiving water exceeds the site-specific Basin Plan objective for boron (0.8 mg/L as a monthly mean applicable from 15 March through 15 September) and boron was detected in the effluent, the discharge to the San Joaquin River has reasonable potential to cause or contribute to an exceedance of the water quality objective for boron.

The San Joaquin River in the vicinity of the discharge is included on the 303(d) list as an impaired water body due to elevated boron levels. The Regional Water Board completed a TMDL for salt and boron in the lower San Joaquin River and amended the Basin Plan to include water quality objectives and waste load allocations. The Basin Plan Amendment for the Control of Salt and Boron Discharges into the Lower San Joaquin River was adopted by the Regional Water Board on 10 September 2004, by Resolution No. R5-2004-0108, and was approved by the State Water Board and by the Office of Administrative Law. The Basin Plan amendment is now state law, and went into effect on 28 July 2006. However, the compliance schedule was not originally approved by USEPA, because it was not specifically requested by the State Water Board. A request for approval of the compliance schedule was submitted later, which received USEPA approval on 12 March 2008. According to the control program associated with the Basin Plan amendment, "*The salt and boron control program establishes salt load limits to achieve compliance at the Airport Way Bridge near Vernalis with salt and boron water quality objectives for the LSJR.*", and according to the TMDL report associated with the Basin Plan amendment, the two major NPDES permittees in this area (one of which is the Discharger) "*account for no more than two percent of the total salt load at Vernalis.*"

The control program states that "*control actions that result in salt load reductions will be effective in the control of boron.*" However, the TMDL primarily targets non-point discharges and it is uncertain whether salt reductions in municipal wastewater discharges effectively reduces boron. Therefore, although the TMDL for salt and boron does not contain waste load allocations for point source discharges of boron, this Order includes final effluent limitations for boron due to concerns regarding elevated concentrations of boron in the San Joaquin River. The site-specific Basin Plan objectives for boron are established directly as effluent limitations. Based on monitoring data submitted from October 2006 through April 2008, it appears the Discharger can immediately comply with these limitations.

j. **Carbon Tetrachloride.** Carbon tetrachloride is a clear heavy organic liquid with a sweet aromatic odor similar to chloroform. It is primarily used to make chlorofluorocarbon propellants and refrigerants, though its use has been declining steadily. It has also been used as dry cleaning agent and in fire extinguishers, in making nylon, as a solvent for rubber cement, soaps, insecticides, etc. The CTR criterion for human health protection for consumption of water and aquatic organisms for carbon tetrachloride is 0.25 µg/L.

The MEC for carbon tetrachloride was 1.9 µg/L, based on 10 samples collected between October 2006 and April 2008. Carbon tetrachloride was not detected in the upstream receiving water in either Harding Drain or the San Joaquin River, based on three samples collected between May 2005 and April 2008. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for carbon tetrachloride. No dilution is allowed for discharges to Harding Drain due to periods of no flow in Harding Drain.

This Order includes an AMEL and MDEL for carbon tetrachloride of 0.25 µg/L and 0.72 µg/L, respectively, based on the CTR criterion for the protection of human health for discharges to Harding Drain (see Attachment F, Table F-17 for WQBEL calculations).

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for the discharge to Harding Drain. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for carbon tetrachloride are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the carbon tetrachloride effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

The Discharger performed an upstream ambient disinfection byproduct low-level concentration study to better quantify available assimilative capacity in the San Joaquin River. The Discharger collected upstream samples on 25 February 2009 and 15 April 2009. The analytical laboratory performed a modified USEPA 524.2 method that uses a selected ion monitoring (SIM) procedure with gas chromatograph/mass spectrometry (GC/MS) analysis. The SIM method targets limited predetermined ion ranges allowing higher scanning rates for these ranges. The reporting limits using the SIM method are approximately three to five times lower than the method detection limit (MDL) for the standard method. Based on the use of the SIM procedure, all target chlorination byproducts concentrations were reported as "not detected" at a reporting limitation of 0.05 µg/L.

The ambient monitoring demonstrates the San Joaquin River has assimilative capacity for carbon tetrachloride. As described in section IV.C.2.c, a dilution credit for carbon tetrachloride of 19.9 can be granted, based on the available human health dilution. This Order includes an AMEL and MDEL for carbon tetrachloride of 4.2 µg/L and 12 µg/L, respectively, based on the CTR criterion for the protection of human health for discharges to the San Joaquin River (see Attachment F, Table F-18 for WQBEL calculations). Based on the sample results for the effluent, it appears the Discharger can meet these new limitations for the discharge to the San Joaquin River.

k. **Chlorine Residual.** The Discharger uses chlorine for disinfection, which is extremely toxic to aquatic organisms. The Discharger uses a sodium bisulfate process to dechlorinate the effluent prior to discharge to Harding Drain and the San Joaquin River. Due to the existing chlorine use and the potential for chlorine to be discharged, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative toxicity objective.

The USEPA *Technical Support Document for Water Quality-Based Toxics Control* [EPA/505/2-90-001] contains statistical methods for converting chronic (4-day) and acute (1-hour) aquatic life criteria to average monthly and maximum daily effluent limitations based on the variability of the existing data and the expected frequency of monitoring. However, because chlorine is an acutely toxic constituent that can and will be monitored continuously, an average 1-hour limitation is considered more appropriate than an average daily limitation. Average 1-hour and 4-day limitations for chlorine, based on these criteria, are included in this Order. Based on data reported during the term of Order No. 5-01-122, it appears as if the Discharger can immediately comply with these new effluent limitations for chlorine residual.

l. **Chlorodibromomethane.** The CTR includes a chlorodibromomethane criterion of 0.41 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. The MEC for chlorodibromomethane was 10.3 µg/L, based on 10 samples collected between October 2006 and April 2008. Chlorodibromomethane was not detected in the upstream receiving water in either Harding Drain or the San Joaquin River, based on six samples collected between May 2005 and April 2008. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for chlorodibromomethane.

No dilution is allowed for discharges to Harding Drain due to periods of no flow in Harding Drain. Therefore, an AMEL and MDEL for chlorodibromomethane of

0.41 µg/L and 0.78 µg/L, respectively, are included in this Order based on based on the CTR criterion for the protection of human health for discharges to Harding Drain (see Attachment F, Table F-20 for WQBEL calculations).

The ambient monitoring demonstrates the San Joaquin River has assimilative capacity for chlorodibromomethane. As discussed above under carbon tetrachloride, and based on the use of the SIM procedure, all target chlorination byproducts concentrations were reported as "not detected" at a reporting limitation of 0.05 µg/L. As described in section IV.C.2.c.ii, a dilution credit for chlorodibromomethane of 19.9 can be granted, based on the available human health dilution. This Order includes an AMEL and MDEL for chlorodibromomethane of 7.6 µg/L and 14 µg/L, respectively, based on the CTR criterion for the protection of human health for discharges to the San Joaquin River (see Attachment F, Table F-21 for WQBEL calculations).

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for discharges to Harding Drain and the San Joaquin River. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for chlorodibromomethane are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the chlorodibromomethane effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

m. **Copper.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for copper. The criteria for copper are presented in dissolved concentrations. USEPA recommends conversion factors to calculate dissolved criteria. The USEPA default conversion factors for copper in freshwater are 0.96 for both the acute and the chronic criteria. Using the reasonable worst-case representative ambient hardness of 89 mg/L as $CaCO_3$, as described in section IV.C.2.b of this Fact Sheet, and the default conversion factors, the applicable chronic criterion (maximum 4-day average concentration) is 8.1 µg/L and the applicable acute criterion (maximum 1-hour average concentration) is 12 µg/L, as dissolved concentrations.

As discussed in section IV.C.2.d of this Fact Sheet, the applicable site-specific acute and chronic translators for the discharge to Harding Drain and the San Joaquin River are 1.22/fD and 1.52/fD, respectively. Using the site-specific translators, the applicable acute criterion is 15 µg/L and the applicable chronic criterion is 12 µg/L, as total recoverable.

The MEC for total copper was 16 µg/L, based on 31 samples collected between

October 2006 and April 2008 and reported in the Discharger's SMRs and Metals Translator Report. The maximum observed upstream receiving water total copper concentration in Harding Drain was 12 µg/L, based on six samples collected between May 2005 and April 2008. The maximum observed upstream receiving water total copper concentration in the San Joaquin River was 17 µg/L, based on 26 samples collected between May 2005 and April 2008.

The MEC for dissolved copper was 8 µg/L, based on 31 samples collected between October 2006 and April 2008. The maximum observed upstream receiving water dissolved copper concentration in Harding Drain was 2.7 µg/L, based on six samples collected between May 2005 and April 2008. The maximum observed upstream receiving water dissolved concentration in the San Joaquin River was 2.64 µg/L, based on 26 samples collected between May 2005 and April 2008.

Because total copper in the effluent exceeds the total chronic criterion for the discharges to Harding Drain and the San Joaquin River and dissolved copper in the effluent is present in the effluent at a concentration just slightly below the dissolved chronic criterion, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for copper for discharges to both Harding Drain and the San Joaquin River.

As described in section IV.C.2.b of the Fact Sheet, the ECA_{acute} and $ECA_{chronic}$ for discharges to both Harding Drain and the San Joaquin River were determined using a hardness of 89 mg/L (as $CaCO_3$), which is protective under all discharge and mixing conditions. As also described in section IV.C.2.d of the Fact Sheet, the Regional Water Board has applied site-specific translators for copper. This results in an ECA_{acute} and an $ECA_{chronic}$ for copper of 12 µg/L and 15 µg/L, respectively. Using the procedures for calculating WQBELs in section 1.4 of the SIP, an AMEL and MDEL for total copper of 8.9 µg/L and 15 µg/L, respectively, are included in this Order based on CTR criteria for the protection of freshwater aquatic life for discharges to Harding Drain and the San Joaquin River (see Attachment F, Table F-22 for WQBEL calculations).

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for discharges to Harding Drain and the San Joaquin River. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for copper are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the copper effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

n. **Diazinon and Chlorpyrifos.** The San Joaquin River has been identified on the 303(d) list as an impaired waterbody due to elevated concentrations of diazinon and chlorpyrifos. The Regional Water Board completed a TMDL for diazinon and chlorpyrifos in the lower San Joaquin River and amended the Basin Plan to include water quality objectives and waste load allocations. The Basin Plan Amendment for the Control of Diazinon and Chlorpyrifos Runoff into the Lower San Joaquin River was adopted by the Regional Water Board on 21 October 2005, and was approved by the State Water Board on 2 May 2006. The Basin Plan amendment was approved by the Office of Administrative Law on 30 June 2006, and is now state law. The amendment was approved by USEPA and went into effect on 20 December 2006.

The amendment "*...modifies the Basin Plan Chapter III (Water Quality Objectives) to establish site specific numeric objectives for chlorpyrifos and diazinon in the San Joaquin River, and identifies the requirement to meet the additive toxicity formula already in Basin Plan Chapter IV (Implementation), for the additive toxicity of diazinon and chlorpyrifos.*"

The amendment provides that: "*The Waste Load Allocations (WLA's) for all NPDES-permitted dischargers.. shall not exceed the sum (S) of one (1) as defined below.*

where

$$S = \frac{C_D}{WQO_D} + \frac{C_C}{WQO_C} \leq 1.0$$

C_D *= diazinon concentration in µg/L of point source discharge for the WLA.*
C_C *= chlorpyrifos concentration in µg/L of point source discharge for the WLA.*
WQO_D *= acute or chronic diazinon water quality objective in µg/L.*
WQO_C *= acute or chronic chlorpyrifos water quality objective in µg/L.*

Available samples collected within the applicable averaging period for the water quality objective will be used to determine compliance with the allocations and loading capacity. For purposes of calculating the sum (S) above, analytical results that are reported as "non-detectable" concentrations are considered to be zero."

Water quality objectives for diazinon and chlorpyrifos to be used in the additive toxicity WLA were included in the amendment and are incorporated into the Basin Plan as shown below:

Table F-12. Site-Specific Water Quality Objectives for Diazinon and Chlorpyrifos

Pesticide	Maximum Concentration and Averaging Period	Applicable Water Bodies
Chlorpyrifos	0.025 µg/L; 1-hour average (acute)	San Joaquin River from Mendota Dam to Vernalis (Reaches include Mendota Dam to Sack Dam (70), Sack Dam to Mouth of Merced River (71), Mouth of Merced River to Vernalis (83))
	0.015 µg/L; 4-day average (chronic) Not to be exceeded more than once in a 3 year period.	
Diazinon	0.16 µg/L; 1-hour average (acute)	
	0.10 µg/L; 4-day average (chronic) Not to be exceeded more than once in a 3 year period.	

In terms of a schedule for compliance with the WLA, the Basin Plan amendment provides that "*Compliance with applicable water quality objectives, load allocations, and waste load allocations for diazinon and chlorpyrifos in the San Joaquin River is required by December 1, 2010.*"

Results of effluent monitoring conducted by the Discharger using Method EPA 622, from October 2006 through April 2008, indicate concentrations of diazinon and chlorpyrifos have been less than the analytical reporting limit or 0.08 µg/L. Diazinon and chlorpyrifos can now be analyzed using EPA Method 8141A, EPA Method 625M or an equivalent GC/MS method to reporting limits of 0.020 µg/L and 0.010 µg/L, respectively. Since diazinon and chlorpyrifos have not been detected in the effluent, this Order does not include effluent limitations for these pollutants. However, this Order includes new monitoring requirements that specify a lower reporting limit sufficient for comparison with the applicable diazinon and chlorpyrifos water quality objectives and for use in the additive toxicity calculation. If diazinon and/or chlorpyrifos are detected in the effluent at a level with the reasonable potential to exceed the water quality objectives, this Order may be reopened to include effluent limitations for diazinon and chlorpyrifos.

o. **Dichlorobromomethane.** The CTR includes a dichlorobromomethane criterion of 0.56 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. The MEC for dichlorobromomethane was 28.9 µg/L, based on 19 samples collected between October 2006 and April 2008. Dichlorobromomethane was not detected in the upstream receiving water in either Harding Drain or the San Joaquin River, based on six samples collected between May 2005 and April 2008. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for dichlorobromomethane.

No dilution is allowed for discharges to Harding Drain due to periods of no flow in

Harding Drain. Therefore, an AMEL and MDEL for dichlorobromomethane of 0.56 µg/L and 0.81 µg/L, respectively, are included in this Order based on based on the CTR criterion for the protection of human health for discharges to Harding Drain (see Attachment F, Table F-23 for WQBEL calculations).

The ambient monitoring demonstrates the San Joaquin River has assimilative capacity for dichlorobromomethane. As discussed above under carbon tetrachloride, and based on the use of the SIM procedure, all target chlorination byproducts concentrations were reported as "not detected" at a reporting limitation of 0.05 µg/L. As described in section IV.C.2.c.ii, a dilution credit for dichlorobromomethane of 19.9 can be granted, based on the available human health dilution. This Order includes an AMEL and MDEL for dichlorobromomethane of 11 µg/L and 16 µg/L, respectively, based on the CTR criterion for the protection of human health for discharges to the San Joaquin River (see Attachment F, Table F-24 for WQBEL calculations).

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for discharges to Harding Drain and the San Joaquin River. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for dichlorobromomethane are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the dichlorobromomethane effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

p. **Dissolved Oxygen.** The Basin Plan contains a water quality objective for dissolved oxygen requiring that the dissolved oxygen concentrations of waters designated as COLD and SPWN shall not be reduced below 7.0 mg/L at any time. Prior to the adoption of Order No. 5-01-122, the Discharger was governed by Order No. 95-059, which included secondary treatment standards for BOD_5 and allowed the dissolved oxygen concentration in Harding Drain to be as low as 5.0 mg/L. Additionally, review of receiving water monitoring indicated that dissolved oxygen levels in Harding Drain downstream of the discharge occasionally dropped below the Basin Plan objectives for dissolved oxygen and the San Joaquin River downstream and upstream of the discharge occasionally dropped below the Basin Plan objectives for dissolved oxygen. In order to ensure compliance with the Basin Plan objectives and receiving water limitations for dissolved oxygen, Order No. 5-01-122 contained a final effluent limitation that required the dissolved oxygen concentration of the discharge not be reduced below 7.5 mg/L. Order No. 5-01-122 also required the Discharger to conduct a study to determine if the proposed tertiary treatment requirements for BOD_5 would be fully protective of the beneficial uses of the receiving waters.

The Discharger submitted their study on 1 July 2003 and concluded that the tertiary treatment requirements for BOD_5 would be sufficient to protect downstream dissolved oxygen levels in the receiving waters. Since the completion of the tertiary treatment facilities, the Discharger has maintained compliance with the effluent limitations for BOD_5. The dissolved oxygen concentration in the effluent was below the effluent concentration of 7.5 mg/L on 18 June 2007 with a concentration of 7.1 mg/L, however the remaining 578 samples taken between October 2006 and April 2008 were above the effluent limitation of 7.5 mg/L. All effluent samples were above the water quality objective for dissolved oxygen of 7.0 mg/L. Additionally, the downstream receiving water concentration in Harding Drain was below the water quality objective only twice on 1 August 2007 and 26 September 2007 out of 83 samples taken between October 2006 and April 2008. On both occasions, the effluent concentration was above the water quality objective for dissolved oxygen. Therefore, the Regional Water Board finds that the tertiary treatment limitations for BOD_5 effectively protect downstream beneficial uses and that the discharge does not exhibit reasonable potential to cause or contribute to an exceedance of the water quality objective for dissolved oxygen. Therefore, this Order does not retain the effluent limitation for dissolved oxygen from Order No. 5-01-122. However, this Order does retain effluent and receiving water monitoring and receiving water limitations for dissolved oxygen in order to continue evaluation of the effects of the discharge on the receiving water.

q. **Iron.** The Basin Plan water quality objectives for chemical constituents requires that water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in Title 22 of the CCR. The Secondary MCL - Consumer Acceptance Limit for iron is 300 µg/L. Based on input from DPH and the fact that secondary MCLs are designed to protect consumer acceptance, effluent limitations based on secondary MCLs are applied as an annual average concentration.

The maximum annual average effluent concentration for iron was 148 µg/L, based on 14 samples collected between April 2007 and April 2008. The maximum annual average upstream receiving water iron concentration in Harding Drain was 218 µg/L, based on two samples collected during the period from August 2006 through August 2007. The maximum annual average upstream receiving water iron concentration in the San Joaquin River was 2,353 µg/L, based on two samples collected during the period from August 2006 through August 2007. The maximum annual average receiving water and effluent concentrations were used in the RPA for evaluating the secondary MCL based on input from the DPH and the fact that MCLs are designed to protect human health over long exposure periods. Therefore, it was considered appropriate to analyze reasonable potential based on an annual average concentration. As a result there is no reasonable potential for iron to exceed applicable objectives in Harding Drain. However, because concentrations of iron

r. **Lead.** The CTR includes hardness dependent criteria for the protection of freshwater aquatic life for lead. As discussed in section IV.C.2.c of this Fact Sheet, receiving water hardness data is not available for Harding Drain. Therefore, to determine reasonable potential for lead in discharges to Harding Drain, aquatic life criteria were developed using the default conversion factors and a hardness of 89 mg/L (as $CaCO_3$). The applicable acute (1-hour average) criterion is 70 µg/L and the applicable chronic (4-day average) criterion is 2.7 µg/L, as total recoverable. The MEC for lead was 1.4 µg/L, based on 32 samples collected between October 2006 and April 2008. The maximum observed upstream receiving water lead concentration in Harding Drain was 2 µg/L, based on six samples collected between May 2005 and August 2007. Therefore, lead in the discharge to Harding Drain does not exhibit reasonable potential to exceed water quality criteria for lead.

Reasonable potential to exceed the hardness-dependent criteria for lead in the San Joaquin River was determined using the reasonable worst-case downstream receiving water hardness and the maximum effluent lead concentration during the period from October 2006 through April 2008. For the receiving water, paired upstream receiving water hardness and upstream receiving water lead concentrations from May 2005 through April 2008 were evaluated. On 21 June 2006, the background receiving water lead concentration of 1.52 µg/L exceeded the chronic aquatic life criterion of 1.1 µg/L, which was determined using the observed upstream receiving water hardness of 44 mg/L on the same day. Therefore, no assimilative capacity is available for lead in the San Joaquin River. Because there is no assimilative capacity for lead, and lead was detected in the effluent, lead in the discharge to the San Joaquin River has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

As discussed in section IV.C.2.d of this Fact Sheet, the applicable site-specific acute and chronic translators for the discharge to the San Joaquin River are 1.08/fD and 1.32/fD, respectively. As described in section IV.C.2.b of the Fact Sheet, the ECA_{acute} and $ECA_{chronic}$ for lead were determined using the reasonable worst-case downstream hardness. Using the criteria determined using this process and the site-specific translators results in an ECA_{acute} for lead of 55 µg/L and an $ECA_{chronic}$ of 2.9 µg/L. Using the procedures for calculating WQBELs in section 1.4 of the SIP, an AMEL and MDEL for lead of 2.6 µg/L and 3.9 µg/L, respectively, are included in this Order based on the CTR criterion for the protection of freshwater aquatic life for discharges to the San Joaquin River (see Attachment F, Table F-25 for WQBEL calculations).

The MEC for lead of 1.4 µg/L indicates that the Discharger can immediately comply with these limitations.

s. **Manganese.** The Basin Plan water quality objectives for chemical constituents requires that water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in Title 22 of the CCR. The Secondary MCL - Consumer Acceptance Limit for manganese is 50 µg/L. Based on input from DPH and the fact that secondary MCLs are designed to protect consumer acceptance, effluent limitations based on secondary MCLs are applied as an annual average concentration.

The maximum annual average effluent concentration for manganese was 22 µg/L, based on 14 samples collected between April 2007 and April 2008. The maximum annual average upstream receiving water manganese concentration in Harding Drain was 15 µg/L, based on three samples collected during the period from May 2006 through May 2007. The maximum annual average upstream receiving water manganese concentration in the San Joaquin River was 185 µg/L, based on two samples collected during the period from August 2006 through August 2007. The maximum annual average receiving water and effluent concentrations were used in the RPA for evaluating the secondary MCL based on input from the DPH and the fact that MCLs are designed to protect human health over long exposure periods. Therefore, it was considered appropriate to analyze reasonable potential based on an annual average concentration. As a result there is no reasonable potential for manganese to exceed applicable objectives in Harding Drain. However, because concentrations of manganese in the San Joaquin River exceed the Secondary MCL and manganese was detected in the effluent, a reasonable potential exists to cause or contribute to an in-stream excursion above the Secondary MCL for manganese in the San Joaquin River. An annual average effluent limitation of 50 µg/L for manganese is included in this Order based on protection of the Basin Plan's narrative chemical constituents objective for discharges to the San Joaquin River.

The MEC for manganese of 50 µg/L is equivalent to the applicable annual average effluent limitation. Additionally, the highest annual average for manganese was 22 µg/L, which is below the applicable annual average effluent limitation. Therefore, it appears the Discharger can immediately comply with these limitations.

t. **Mercury.** The current USEPA National Ambient Water Quality Criteria for protection of freshwater aquatic life, continuous concentration, for mercury is 0.77 µg/L (30-day average, chronic criteria). The CTR contains a human health criterion (based on a threshold dose level causing neurological effects in infants) of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Both values are controversial and subject to change. In 40 CFR Part 131, USEPA acknowledges that the human health criteria may not be protective of some aquatic or endangered species and that "*...more stringent mercury limits may be determined and implemented through use of the State's narrative criterion.*" In the CTR, USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

The MEC for mercury was 0.0134 µg/L. While concentrations in the effluent do not exceed the existing ambient water quality and human health criteria published by USEPA, the San Joaquin River from the Merced River to the Tuolumne River and the Sacramento-San Joaquin Delta downstream of the discharge have been listed as an impaired water body pursuant to Section 303(d) of the Clean Water Act for mercury, based on fish tissue concentration and not water column toxicity. The California DPH has issued health warnings regarding the consumption of fish from Delta waterways, and health advisories by the Cal/EPA Office of Environmental Health Hazard Assessment remain in effect for human consumption of fish in the Delta due to excessive concentrations of mercury in fish tissue. Additional loading resulting from the discharge from the Facility has the potential to cause or contribute to the impairment resulting from mercury bioaccumulation in the Delta.

The SIP recommends the Regional Water Board consider whether the mass loading of bioaccumulative pollutants should be limited in the interim to "representative current levels" pending development of applicable water quality standards or TMDL allocation. The intent is, at a minimum, to prevent further impairment while a TMDL for a particular bioaccumulative constituent is being developed. Any increase in loading of mercury to an already impaired water body would further degrade water quality.

This Order contains an interim performance-based mass effluent limitation of 0.82 lbs/year for mercury for the effluent discharged to the receiving water. This limitation is based on maintaining the mercury loading at the current level until a TMDL can be established and USEPA develops mercury standards that are protective of human health. The mass limitation was derived using the MEC and the design average daily flow rate of the current treatment plant (20 MGD):

(0.0000134 mg/L) * 20 MGD * 8.34 * [365 days/year] = 0.82 lbs/year

If the Regional Water Board determines that a mercury offset program is feasible for Dischargers subject to a NPDES permit, this Order may be reopened to reevaluate the interim mercury mass loading limitation(s) and the need for a mercury offset program.

u. **Methylene Blue Active Substances (MBAS).** The Basin Plan water quality objectives for chemical constituents requires that water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in Title 22 of the CCR. The Secondary MCL - Consumer Acceptance Limit for MBAS is 500 µg/L. Based on input from DPH and the fact that secondary MCLs are designed to protect consumer acceptance, effluent limitations based on secondary MCLs are applied as an annual average concentration.

   The maximum annual average effluent concentration for MBAS was 180 µg/L, based on 25 samples collected between October 2006 and October 2007. Upstream receiving water monitoring information for MBAS is not available for Harding Drain or the San Joaquin River. Therefore, the discharge does not have a reasonable potential to cause or contribute to an in-stream excursion above the Secondary MCL for MBAS.

v. **Nitrate.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. Nitrate and nitrite are known to cause adverse health effects in humans. DPH has adopted a Primary MCL at Title 22 CCR, Table 64431-A, for the protection of human health for nitrate equal to 10 mg/L (measured as nitrogen). Title 22 CCR, Table 64431 A, also includes a primary MCL of 10,000 µg/L for the sum of nitrate and nitrite, measured as nitrogen.

   For nitrate, USEPA has developed Drinking Water Standards (10,000 µg/L as Primary MCL) and NAWQC for protection of human health (10,000 µg/L for non-cancer health effects). Recent toxicity studies have indicated a possibility that nitrate is toxic to aquatic organisms.

   Inadequate or incomplete denitrification may result in the discharge of nitrate and/or nitrite to the receiving stream. The conversion of ammonia to nitrites and the conversion of nitrites to nitrates present a reasonable potential for the discharge to cause or contribute to an in-stream excursion above the Primary MCLs for nitrate. In addition, the MEC for nitrate, based on 35 samples taken between 9 October 2006 and 8 July 2009, was reported as 31 mg/L. Therefore, an AMEL for nitrate of 10 mg/L is included in this Order based on the Primary MCL for discharges to Harding Drain. This effluent limitation is included in this Order to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the beneficial use of municipal and domestic supply.

   As described in section IV.C.2.c, the Regional Water Board concurs with the use of a performance-based effluent limitation of 31 mg/L to serve as the basis for the effluent limitation for discharges to the San Joaquin River to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the beneficial use of municipal and domestic supply.

Based on the sample results for the effluent, the limitations appear to put the Discharger in immediate non-compliance for discharges to Harding Drain. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for nitrate are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the nitrate effluent limitations is established in TSO No. R5-2010-0003 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

w. **Oil and Grease.** Order No. 5-01-122 included numeric monthly average and daily maximum effluent limitations of 10 mg/L (1,668 lbs/day) and 15 mg/L (2,502 lbs/day), respectively. The MEC for oil and grease was 11 mg/L, based on 38 samples collected between October 2006 and April 2008. The highest monthly average for oil and grease was 9.15 mg/L. However, since November 2007, oil and grease has been reported as non-detect (at an analytical detection level of 5.0 mg/L). Therefore, monitoring data for oil and grease indicates that there is no reasonable potential to exceed water quality objectives. Furthermore, oil and grease used to be a problem at many POTWs and was a necessary effluent limit to protect receiving waters, but implementation of fats oils and grease (FOG) pretreatment programs in conjunction with improved levels of treatment have resulted in an overall reduction of oil and grease in wastewater treatment plant effluent. Therefore, as described in section IV.D.3, oil and grease effluent limitations have not been retained in this Order.

x. **Pathogens**. The beneficial uses of the Harding Drain and the San Joaquin River include municipal and domestic supply, water contact recreation, and agricultural irrigation supply, and there is, at times, less than 20:1 dilution. To protect these beneficial uses, the Regional Water Board finds that the wastewater must be disinfected and adequately treated to prevent disease. The principal infectious agents (pathogens) that may be present in raw sewage may be classified into three broad groups: bacteria, parasites, and viruses. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream. The wastewater must be treated to tertiary standards (filtered), or equivalent, to protect contact recreational and food crop irrigation uses.

The California Department of Public Health (DPH) has developed reclamation criteria, CCR, Division 4, Chapter 3 (Title 22), for the reuse of wastewater. Title 22 requires that for spray irrigation of food crops, parks, playgrounds, schoolyards, and other areas of similar public access, wastewater be adequately disinfected, oxidized, coagulated, clarified, and filtered, and that the effluent total coliform levels not exceed 2.2 MPN/100 mL as a 7-day median. As coliform organisms are living and mobile, it is impracticable to quantify an exact number of coliform organisms and to establish weekly average limitations. Instead, coliform organisms are measured as a most probable number and regulated based on a 7-day median limitation.

Title 22 also requires that recycled water used as a source of water supply for non-restricted recreational impoundments be disinfected tertiary recycled water that has been subjected to conventional treatment. A non-restricted recreational impoundment is defined as "*...an impoundment of recycled water, in which no limitations are imposed on body-contact water recreational activities.*" Title 22 is not directly applicable to surface waters; however, the Regional Water Board finds that it is appropriate to apply an equivalent level of treatment to that required by DPH's reclamation criteria because the receiving water is used for irrigation of agricultural land and for contact recreation purposes. The stringent disinfection criteria of Title 22 are appropriate since the undiluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation. Coliform organisms are intended as an indicator of the effectiveness of the entire treatment train and the effectiveness of removing other pathogens. The method of treatment is not prescribed by this Order; however, wastewater must be treated to a level equivalent to that recommended by DPH.

In addition to coliform testing, an operational specification for turbidity has been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. The tertiary treatment process, or equivalent, is capable of reliably meeting a turbidity limitation of 2 nephelometric turbidity units (NTU) as a daily average. Failure of the filtration system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. Coliform testing, by comparison, is not conducted continuously and requires several hours, to days, to identify high coliform concentrations.

This Order contains effluent limitations and a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. The Regional Water Board has previously considered the factors in CWC section 13241 in establishing these requirements.

y. **pH.** The Basin Plan includes a water quality objective for surface waters (except for Goose Lake) that the "*...pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.*" Effluent Limitations for pH are included in this Order based on the Basin Plan objectives for pH for discharges to Harding Drain and the San Joaquin River.

z. **Salinity.** The discharge contains total dissolved solids, chloride, sulfate, and electrical conductivity. These are water quality parameters that are indicative of the salinity of the water. Their presence in water can be growth limiting to certain agricultural crops and can affect the taste of water for human consumption. There are no USEPA water quality criteria for the protection of aquatic organisms for these constituents. The Basin Plan contains a chemical constituent objective that incorporates State MCLs, contains a narrative objective, and contains numeric water quality objectives for electrical conductivity, total dissolved solids, sulfate, and chloride.

Table F-13. Salinity Water Quality Criteria/Objectives

Parameter	Agricultural WQ Goal[1]	Secondary MCL[3]	Basin Plan	Effluent	
				Average	Maximum
EC (µmhos/cm)	Varies[2]	900; 1,600; 2,200	700 (1 Apr – 31 Aug) 1,000(1 Sep – 31 Mar)[4]	913	1,198
TDS (mg/L)	Varies	500; 1,000; 1,500	500, 1000, 1500	556	722
Sulfate (mg/L)	Varies	250, 500, 600	250, 500, 600	60	81
Chloride (mg/L)	Varies	250, 500, 600	250, 500, 600	123	154

1 Agricultural water quality goals based on *Water Quality for Agriculture*, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985)

2 The EC level in irrigation water that harms crop production depends on the crop type, soil type, irrigation methods, rainfall, and other factors. An EC level of 700 umhos/cm is generally considered to present no risk of salinity impacts to crops. However, many crops are grown successfully with higher salinities.

3 The secondary MCLs are stated as a recommended level, upper level, and a short-term maximum level.

4 Applies in the San Joaquin River at Airport Way Bridge near Vernalis.

i. **Chloride**. The secondary MCL for chloride is 250 mg/L, as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The recommended agricultural water quality goal for chloride, that would apply the narrative chemical constituent objective, is 106 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 106 mg/L water quality goal is intended to protect against adverse effects on sensitive crops when irrigated via sprinklers.

USEPA developed National Recommended Ambient Water Quality Criteria for protection of freshwater aquatic life for chloride. The recommended 4-day average (chronic) and 1-hour average (acute) criteria for chloride are 230 mg/L and 860 mg/L, respectively. USEPA recommends that the ambient criteria are protective of the aquatic life beneficial uses of receiving waters in lieu of site-specific criteria.

Chloride concentrations in the effluent ranged from 105 mg/L to 154 mg/L, with an average of 123 mg/L, for 32 samples collected by the Discharger from October 2006 through April 2008. Chloride was detected in the effluent at a concentration of 384 mg/L. However, this sample was considered an outlier and was not used in the reasonable potential analysis. The dataset was represented by a standard deviation of 13 and a mean of 123. Therefore, the high sample concentration was 20 standard deviations from the mean, which is considered an outlier (4 standard deviations is considered an outlier). Background receiving water monitoring for chloride is not available for Harding Drain. The maximum observed upstream chloride concentration in the San Joaquin River was 487 mg/L, based on 20 samples collected between May 2005 and April 2008. Concentrations of chloride in the effluent and the San Joaquin River exceed the agricultural water quality goal of 106 mg/L, and concentrations of chloride in the San Joaquin River exceed the USEPA National Recommended Ambient Water Quality Criteria for protection of freshwater aquatic life for chloride of 230 mg/L.

ii. **Electrical Conductivity**. The secondary MCL for electrical conductivity is 900 µmhos/cm as a recommended level; 1,600 µmhos/cm as an upper level; and 2,200 µmhos/cm as a short-term maximum. The State Water Board has established salinity standards in the Bay-Delta Plan. The Bay-Delta Plan prescribes numeric electrical conductivity standards to protect agricultural irrigation at several locations in the Sacramento – San Joaquin Delta, including in the San Joaquin River at Airport Way Bridge near Vernalis, downstream of the discharge. The salinity objectives for this station include 700 µmhos/cm during the irrigation season (April through August) and 1,000 µmhos/cm during the non-irrigation season (September through March).

A review of the Discharger's monitoring reports from October 2006 through April 2008 shows an average effluent electrical conductivity of 913 µmhos/cm, with a range from 690 µmhos/cm to 1,198 µmhos/cm for 578 samples. These levels exceed the applicable objectives. The background receiving water electrical conductivity concentration in Harding Drain averaged 433 µmhos/cm in 141 sampling events collected by the Discharger from May 2005 through April 2008. The background receiving water electrical conductivity concentration in the San Joaquin River averaged 865 µmhos/cm in 157 sampling events collected by the Discharger from May 2005 through April 2008.

iii. **Sulfate**. The secondary MCL for sulfate is 250 mg/L as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. Sulfate concentrations in the effluent ranged from 39 mg/L to 81 mg/L, with an average of 60 mg/L, for 15 samples collected by the Discharger from October 2006 through April 2008. Background receiving water monitoring for sulfate is not available for Harding Drain. The maximum observed upstream sulfate concentration in the San Joaquin River was 297 mg/L.

iv. **Total Dissolved Solids.** The secondary MCL for total dissolved solids is 500 mg/L as a recommended level; 1,000 mg/L as an upper level; and 1,500 mg/L as a short-term maximum. The recommended agricultural water quality goal for total dissolved solids, that would apply the narrative chemical constituent objective, is 450 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W.

Westcot, Rome, 1985). Water Quality for Agriculture evaluates the impacts of salinity levels on crop tolerance and yield reduction, and establishes water quality goals that are protective of the agricultural uses. The 450 mg/L water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops. Only the most salt sensitive crops require irrigation water of 450 mg/L or less to prevent loss of yield. Most other crops can tolerate higher total dissolved solids concentrations without harm, however, as the salinity of the irrigation water increases, more crops are potentially harmed by the total dissolved solids, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

The average total dissolved solids effluent concentration was 556 mg/L; concentrations ranged from 408 mg/L to 722 mg/L for 166 samples collected by the Discharger from October 2006 through April 2008. These concentrations exceed the applicable water quality objectives. Background receiving water monitoring for total dissolved solids is not available for either Harding Drain or the San Joaquin River.

v. **Salinity Effluent Limitations.** Chloride in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a level necessary to protect aquatic life resulting in a violation of the Basin Plan's narrative toxicity objective. Therefore, this Order contains a final AMEL and MDEL for chloride of 203 mg/L and 328 mg/L, respectively, based on USEPA's National Ambient Water Quality Criteria for the protection of freshwater aquatic life (see Attachment F, Table F-19 for WQBEL calculations). Based on monitoring data, it appears the Discharger can immediately comply with these effluent limitations.

The San Joaquin River in the vicinity of the discharge is included on the 303(d) list as an impaired water body due to elevated electrical conductivity levels. Salinity levels in the lower San Joaquin River are affected by both the salt loads and the quantity of flow in the river. High salt loads result from a combination of upstream water diversions, discharges of saline drainage water, and subsurface accretions to the San Joaquin River from groundwater. Studies have indicated that non-point sources, primarily return flows from irrigated agriculture and wetland areas, contribute the majority of the controllable discharges of salt.

The Regional Water Board completed a TMDL for salt and boron in the lower San Joaquin River and amended the Basin Plan to include water quality objectives and waste load allocations. The Basin Plan Amendment for the Control of Salt and Boron Discharges into the Lower San Joaquin River was adopted by the Regional Water Board on 10 September 2004, by Resolution No. R5-2004-0108, and was approved by the State Water Board, the Office of Administrative Law and USEPA. According to the control program associated with the Basin Plan amendment, "*The salt and boron control program establishes salt load limits to achieve compliance at the Airport Way Bridge* *near Vernalis with salt and boron water quality objectives for the LSJR.*", and according to the TMDL report associated with the Basin Plan amendment, the two major NPDES permittees in this area (one of which is the Discharger) "*account for no more than two percent of the total salt load at Vernalis.*" The control program establishes waste load allocations for point source discharges of salt in the basin, and the Basin Plan amendment includes compliance schedules to comply with the control program. The control program's goal "*is to achieve compliance with salt and boron water quality objectives without restricting the ability of dischargers to export salt out of the San Joaquin River basin…The Regional Board encourages real-time water quality management and pollutant trading of waste load allocations, load allocations, and supply water allocations as a means for attaining salt and boron water quality objectives while maximizing the export of salts out of the LSJR watershed.*"

The control program provides that "*Existing NPDES point source dischargers are low priority and subject to the compliance schedules for low priority discharges in Table IV-6.. Low priority discharges have 16 years (Wet through Dry Water Year Types) and 20 years (Critical Water Year Types) from the effective date of the control program to comply with the TMDL allocations.*"

The State Water Board's 1995 Bay-Delta Plan contains salinity objectives for the San Joaquin River at Vernalis to protect agricultural and beneficial uses of water in the southern Delta. The existing salinity water quality objectives for the San Joaquin River at Vernalis are 1,000 µmhos/cm between 1 September and 31 March, and 700 µmhos/cm between 1 April and 31 August.

The Discharger has no treatment facilities specific to salinity, and therefore, cannot currently comply with the final effluent limitations based on the control program waste load allocations. Results of monitoring conducted by the Discharger from October 2006 through April 2008 indicate the average electrical conductivity concentration in the effluent was 913 µmhos/cm, with concentrations that ranged from 690 µmhos/cm to 1,198 µmhos/cm. Electrical conductivity levels in Harding Drain from May 2005 through April 2008 ranged from 73 µmhos/cm to 1,407 µmhos/cm. Electrical conductivity levels in the San Joaquin River from May 2005 through April 2008 ranged from 104 µmhos/cm to 1,651 µmhos/cm. Compliance with State Water Board's 1995 Bay-Delta Plan salinity objectives for San Joaquin River at Vernalis could require use of reverse osmosis or similar salt removal technologies, but may not ultimately be necessary due to other activities required by the TMDL.

Final WQBELs for salinity have been established in this Order with full compliance required by 28 July 2022 for all water year types except critically dry and 28 July 206 for critically dry years. The compliance schedule is consistent with the State Water Board's Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits (Resolution No.