Attachment 1

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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ORDER NO. R5-2010-0114-~~03~~04
NPDES NO. CA0077682
(as amended by Order R5-2011-0083, Order R5-2013-0124, Order R5-2014-0102, Order R5-2014-0103, Order R5-2014-0122, Order R5-2015-XXX, and WQ 2012-0013)

WASTE DISCHARGE REQUIREMENTS FOR THE
SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT
SACRAMENTO REGIONAL WASTEWATER TREATMENT PLANT
SACRAMENTO COUNTY

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 1. Discharger Information

Discharger	Sacramento Regional County Sanitation District
Name of Facility	Sacramento Regional Wastewater Treatment Plant
Facility Address	8521 Laguna Station Road
	Elk Grove, CA 95758
	Sacramento County
The U.S. Environmental Protection Agency (USEPA) and the Regional Water Quality Control Board have classified this discharge as a major discharge.	

The discharge by the **Sacramento Regional County Sanitation District** from the discharge points identified below is subject to waste discharge requirements as set forth in this Order:

Table 2. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude	Discharge Point Longitude	Receiving Water
001	Disinfected Secondary Treated Wastewater	38º 27' 15" N	121º 30' 00" W	Sacramento River

Table 3. Administrative Information

This Order was adopted by the Regional Water Quality Control Board on:	**9 December 2010**
This Order shall become effective on:	**50 days after the Adoption Date of this Order**
This Order shall expire on:	**1 December 2015**
The Discharger shall file a Report of Waste Discharge in accordance with title 23, California Code of Regulations, as application for issuance of new waste discharge requirements no later than:	**180 days prior to the Order expiration date**

I, Pamela C. Creedon, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 9 December 2010, as amended by Order R5-2011-0083 on 1 December 2011, Order R5-2013-0124 on 4 October 2013, Orders R5-2014-0102 and R5-2014-0103 on 8 August 2014, ~~and~~ Order R5-2014-0122 on 9 October 2014, and Order R5-2015-XXXX on XX July 2015. This Order was also amended by State Water Resources Control Board WQ 2012-0013 on 4 December 2012.

PAMELA C. CREEDON, Executive Officer

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The Basin Plan includes a list of Water Quality Limited Segments (WQLSs), which are defined as "…those sections of lakes, streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)." The Basin Plan also states, "Additional treatment beyond minimum federal standards will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment." The Delta is listed as a WQLS for Chlorpyrifos, DDT, Diazinon, Exotic Species, Group A Pesticides, Mercury, Polychlorinated byphenyls (PCBs) and unknown toxicity in the 303(d) list of impaired water bodies.

2. **Thermal Plan.** The State Water Board adopted the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California (Thermal Plan) on 18 May 1972, and amended this plan on 18 September 1975. This plan contains temperature objectives for surface waters. Requirements of this Order implement the Thermal Plan.

   The Thermal Plan allows regional boards to provide exceptions to specific water quality objectives in the Thermal Plan so long as the exceptions comply with CWA section 316(a) and federal regulations. The applicable exception is promulgated in 40 CFR Section 125.73(a), which provides that, "*Thermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made. This demonstration must show that the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a balanced indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made.*"

   The Central Valley Water Board, after consideration of the Discharger's temperature studies and consultation with the National Marine Fisheries Services (NMFS), the United States Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW) (fishery agencies), finds the Discharger's studies adequately demonstrate the following:

   - The thermal plume from the discharge will show no direct acute or chronic thermal effects on fishes (including larval and juvenile life stages), benthic macroinvertebrates, or plankton. The thermal exposures, either in the near-field plume area or far-field downstream areas would not exceed lethal or sub-lethal effect thresholds for aquatic life.

   - There is a sufficient zone of passage such that the thermal plume from the discharge will not result in blockage or significant delay of upstream

migration of adult fishes or downstream migration of larval and juvenile fishes. The discharge upon its full mixing with river flow would not block or delay upstream adult migration of fish species.

- Predatory fishes were not holding in the warmer water plume near the diffuser, where they could prey upon ESA-listed fishes as they migrate past the diffuser.

- Fishes were not holding within the plume area due to the elevated water temperature for sufficient periods of time to experience toxicity, based on plume water quality.

The Discharger has demonstrated that Effluent and Receiving Water Limitations based on the Thermal Plan are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made. This demonstration has shown the Effluent and Receiving Water Limitations for temperature in this Order are sufficient, considering the cumulative impact of the thermal discharge together with all other significant impacts on the species affected, to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.

Therefore, in accordance with 40 CFR Section 125.73(a) this Order continues the exceptions to Thermal Plan objectives 5A(1)(a) and 5A(1)(b) from Order 5-00-188, as follows:

- **Thermal Plan Objective 5A(1)(a) Exception:**

  The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than:

  25º F from 1 October through 30 April;

  -and-

  20º F from 1 May through 30 September

- **Thermal Plan Objective 5A(1)(b) Exception:**

  If the natural receiving water temperature is less than 65ºF, the discharge shall not create a zone, defined by water temperature of more than 2ºF above natural temperature, which exceeds 25 percent of the cross sectional area of the River at any point outside the zone of initial dilution.

  If the natural receiving water temperature is 65ºF or greater, the discharge shall not create a zone, defined by a water temperature of 1ºF or more above natural receiving water temperature which exceeds 25 percent of

the cross sectional area of the River at any point outside the zone of initial dilution for more than one hour per day as an average in any month.

3. **Bay-Delta Plan.** The Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) was adopted on 13 December 2006 by the State Water Board superseding the May 1995 and the 1991 Bay-Delta Plan. The Bay-Delta Plan identifies the beneficial uses of the estuary and includes objectives for flow, salinity, and endangered species protection.

   The Bay-Delta Plan attempts to create a management plan that is acceptable to the stakeholders while at the same time is protective of beneficial uses of the Sacramento – San Joaquin Delta. The State Water Board adopted Decision 1641 (D-1641) on 29 December 1999. D-1641 implements flow objectives for the Bay-Delta Estuary, approves a petition to change points of diversion of the Central Valley Project and the State Water Project in the Southern Delta, and approves a petition to change places of use and purposes of use of the Central Valley Project. The water quality objectives of the Bay-Delta Plan are implemented as part of this Order.

   The Sacramento River at Freeport is within the designated critical habitat for five federally-listed fish species including winter- and spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead (*O. mykiss*), Delta smelt (*Hypomesus transpacificus*) and Green sturgeon (*Acipenser medirostris*). Other listed wildlife species that feed on Central Valley fishes include the California Least Tern (*Stenula antillarum brownie*) and the Giant Garter snake (*Thamnopsis gigas*). In addition to the federally-listed species the California State Species of Special Concern include the Sacramento Splittail (*Pogonichthys macrolepidotus*) and the Central Valley Fall/Late-Fall Salmon (*Oncorhynchus tshawytscha*).

   Requirements of this Order specifically implement the applicable Water Quality Control Plans.

   The Central Valley Water Board adopted Resolution No. R5-2007-0161, Water Board's Actions to Protect Beneficial Uses of the San Francisco Bay/Sacramento- San Joaquin Delta Estuary on 6 December 2007. The purpose of the resolution is to identify and implement actions needed to protect the San Francisco/San Joaquin Delta beneficial uses. Some actions include exercising the State Water Board's water rights authority over water right decisions and exercising the San Francisco Bay Regional Water Quality Control Board's and Central Valley Water Board's authority over controlling water quality in the Delta.

~~H.~~**I. National Toxics Rule (NTR) and California Toxics Rule (CTR)**. USEPA adopted the NTR on 22 December 1992, and later amended it on 4 May 1995 and 9 November 1999. About 40 criteria in the NTR applied in California. On

methyl tertiary butyl ether, mercury, chlorine residual, diazinon, and chlorpyrifos. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this Order includes water quality based effluent limitations for BOD_5, total coliform organisms, and TSS to meet numeric objectives or protect beneficial uses.

WQBELs have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant WQBELs were derived from the CTR, the CTR is the applicable standard pursuant to 40 CFR 131.38. The scientific procedures for calculating the individual WQBELs for priority pollutants are based on the CTR-SIP, which was approved by USEPA on 18 May 2000. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by USEPA prior to 30 May 2000. Any water quality objectives and beneficial uses submitted to USEPA prior to 30 May 2000, but not approved by USEPA before that date, are nonetheless "*applicable water quality standards for purposes of the [Clean Water] Act*" pursuant to 40 CFR 131.21(c)(1). Collectively, this Order's restrictions on individual pollutants are no more stringent than required to implement the technology-based requirements of the CWA and the applicable water quality standards for purposes of the CWA.

~~M.~~**N.** **Antidegradation Policy**. 40 CFR 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Central Valley Water Board's Basin Plan implements, and incorporates by reference, both the state and federal antidegradation policies. As discussed in detail in the Fact Sheet, the permitted discharge is consistent with the antidegradation provision of 40 CFR 131.12 and Resolution No. 68-16.

~~N.~~**O.** **Anti-Backsliding Requirements.** Sections 303(d)(4) and 402(o)(2) of the CWA and federal regulations at 40 CFR 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions. Some effluent limitations in this Order are less stringent that those in Order No. 5-00-188 and Order 2010-0114-03. As discussed in detail in the Fact Sheet, this relaxation of effluent limitations is consistent with the anti-backsliding requirements of the CWA and federal regulations.

~~O.~~**P.** **Endangered Species Act.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). This Order requires compliance

III. Discharge Prohibitions

A. Discharge of wastewater at a location or in a manner different from that described in the Findings (Sections II.A and II.B of the Fact Sheet) is prohibited, with the exception of the disinfected secondary effluent that may be reclaimed for dust control and compaction on construction projects, landscape irrigation, wash down water, vehicle washing and grounds maintenance within the Facility boundaries, and for flushing of pipelines within the sewer collection system. It may also be used for in-plant process water and fire protection and used in the tertiary treatment plant and distribution system. Any use of reclaimed disinfected secondary effluent must meet the requirements of Title 22, California Code of Regulations, Section 60301, et seq. and the associated Department of Public Health guidelines as applicable. Runoff of disinfected secondary effluent is prohibited except as regulated by Master Reclamation Requirements, Order 97-146.

B. The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by Federal Standard Provisions I.G. and I.H. (Attachment D), and as described in Finding II.B, for the groundwater Corrective Action Program (CAP).

C. Neither the discharge nor its treatment shall create a nuisance as defined in section 13050 of the CWC.

D. The Discharger shall not allow pollutant-free wastewater to be discharged into the collection, treatment, and disposal system in amounts that significantly diminish the system's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants.

E. Discharge to the Sacramento River is prohibited when the Sacramento River instantaneous flow is less than 1300 cubic feet per second (cfs) at RSWU-001.

F. Discharge to the Sacramento River is prohibited when there is less than a 14:1 (river:effluent) flow ratio over a rolling one-hour period available in the Sacramento River at RSWU-001.

G. The discharge or storage of waste classified as 'hazardous' or 'designated', as defined in California Code of Regulations, title 23, section 2521, subdivision (a) and Water Code section 13173, is prohibited.

IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Effluent Limitations – Discharge Point No. 001

Effective immediately unless otherwise specified, the Discharger shall maintain compliance with the following final effluent limitations at Discharge Point No. 001, with compliance measured at Monitoring Location EFF-001 as described in the Monitoring and Reporting Program.

1. Final Effluent Limitations – Discharge Point No. 001

a. The Discharger shall maintain compliance with the following effluent limitations specified in Table 6:

Table 6. Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Conventional Pollutants						
Biochemical Oxygen Demand, 5-day @ 20°C[2]	mg/L	10	15	20	--	--
	lbs/day[1]	15,100	22,700	30,200	--	--
Total Suspended Solids[2]	mg/L	10	15	20	--	--
	lbs/day[1]	15,100	22,700	30,200	--	--
pH	standard units	--	--	--	6.0	8.0
Priority Pollutants						
Bis(2-ethylhexyl)phthalate	µg/L	--	--	13	--	--
Carbon Tetrachloride	µg/L	--	--	5.3	--	--
Chlorodibromomethane[3] (prior to nitrification facilities operating)	µg/L	--	--	2.2	--	--
Chlorodibromomethane[3] (after nitrification facilities begin operating)	µg/L	--	--	12	--	--
Copper, Total Recoverable	µg/L	~~7.3~~7.4	--	~~9.3~~10	--	--
Cyanide	µg/L	--	--	11	--	--
Dibenzo(ah)anthracene	µg/L	0.2	--	0.4	--	--
Dichlorobromomethane[3] (prior to nitrification facilities operating)	µg/L	--	--	3.4	--	--
Dichlorobromomethane[3] (after nitrification facilities begin operating)	µg/L	--	--	35	--	--
Methylene Chloride	µg/L	4.7	--	11	--	--
Pentachlorophenol	µg/L	--	--	18	--	--

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Tetrachloroethylene	µg/L	--	--	4.4	--	--
Non-Conventional Pollutants						
Settleable Solids	ml/L	0.1	--	0.2	--	--
Aluminum, Total Recoverable	µg/L	~~503~~470	~~--~~683	~~750~~--	--	--
Ammonia Nitrogen, Total (as N)[2] (Apr-Oct)	mg/L	1.5	--	2.0	--	--
	lbs/day[1]	2264	--	3019	--	--
Ammonia Nitrogen, Total (as N)[2] (Nov-Mar)	mg/L	2.4	--	3.3	--	--
	lbs/day[1]	3622	--	4981	--	--
Nitrate, Total (as N)[4]	mg/L	10	--	--	--	--
Manganese, Total Recoverable	µg/L	--	--	270	--	--
Methyl Tertiary Butyl Ether	µg/L	--	--	18	--	--

1 Based on a design average dry weather flow of 181 MGD.

2 This Order includes interim effluent limitations for BOD_5, TSS, and Total Ammonia Nitrogen (section IV.A.2.). Effective immediately, the interim effluent limitations shall apply in lieu of final effluent limitations for these constituents. The final effluent limitations for BOD_5 and TSS become effective 9 May 2023, and final effluent limitations for Total Ammonia Nitrogen become effective11 May 2021.

3 See task vi of the compliance schedule for ammonia (Section VI.C.7.b).

4 In its Order WQO 2012-0013, the State Water Board approved nitrate as an interim limitation.

b. Percent Removal. The average monthly percent removal of 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) shall not be less than 85 percent.

c. Chronic Whole Effluent Toxicity. There shall be no chronic whole effluent toxicity in the effluent discharge.

d. Acute Whole Effluent Toxicity. Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

i. 70%, minimum for any one bioassay; and

ii. 90%, median for any three consecutive bioassays.

e. Temperature. The maximum temperature of the discharge shall not exceed the natural receiving water temperature at RSWU-001 by more than 20°F from 1 May through 30 September and more than 25°F from 1 October through 30 April.

be reopened for addition and/or modification of effluent limitations and requirements, as appropriate, to require compliance with the applicable water quality objectives.

h. Ammonia Studies. The ammonia effluent limitations in this Order are based on USEPA's recommended National Ambient Water Quality Criteria for protection of aquatic life. However, studies are ongoing to evaluate the effect of ammonia on the inhibition of growth of diatoms in the Bay-Delta, studies to evaluate the sensitivity of delta smelt to ammonia toxicity, and studies of the technological feasibility of ammonia removal processes. Based on the result of these studies, this Order may be reopened to modify the ammonia effluent limitations, as appropriate.

i. Temperature ~~Studies~~Requirements. The temperature effluent limitations and receiving water ~~prohibitions~~ limitations in this Order are based on allowance of ~~the existing~~ Thermal Plan ~~exemption~~ exceptions that have been continued from Order 5-00-188~~conditions~~. NMFS, USFWS, and CDFW are the consulting agencies for consideration of Thermal Plan exceptions. These fishery agencies recommended the existing Thermal Plan Exceptions be continued from Order 5-00-188, and ~~United States Fish and Wildlife Service (USFWS)~~ requested studies to characterize fish behavior in the affected river reach to determine how fish behave in response to the discharge field, and whether predator concentrations are elevated in the thermal discharge field. The Discharger submitted the study in March 2013. ~~Based on the result of these studies, t~~This Order may be reopened to modify the temperature effluent limitations and receiving water ~~prohibitions~~limitations, as appropriate.

j. The Bay-Delta Plan. The South Delta salinity standards are currently under review by the State Water Board in accordance with implementation provisions contained in the Bay-Delta Water Quality Control Plan. If applicable water quality objectives of the Bay-Delta Plan are adopted, this Order may be reopened for addition and/or modification of effluent limitations and requirements, as appropriate.

k. Constituents of Emerging Concern (CECs). The State Water Resources Control Board is conducting studies on CECs discharged from wastewater treatment plants. Upon completion of the studies and formulation of recommendations for CEC monitoring, this Order may be reopened for addition of monitoring or special studies of CECs in the treatment plant discharge.

l. Interim Ammonia Effluent Limitations. The Discharger is required in the Pollution Prevention Program to evaluate means of reducing effluent ammonia concentrations in the interim until compliance with final Ammonia effluent limitations can be attained. If the Discharger identifies and implements strategies that reduce effluent Ammonia concentrations, this Order may be reopened for modification of the interim Ammonia Effluent Limitations.

that may have a reasonable potential to cause or contribute to an exceedance of water quality objectives. The Discharger shall comply with the following time schedule to conduct a study to determine if the effluent has the reasonable potential to cause or contribute to an instream exceedance of the applicable water quality objective for perchlorate and 1,2-Diphenyl-hydrazine:

Task		Compliance Date
i.	Submit Workplan and Time Schedule	90 days from Adoption Date of this Order
ii.	Begin Study	To be determined in Task i.
iii.	Complete Study	To be determined in Task i.
iv.	Submit Study Report	To be determined in Task i, or by three years from the Adoption Date of this Order, whichever is sooner.

c. *Hyalella azteca* Study. The Discharger shall submit a workplan and time schedule for Executive Officer approval to conduct a study to determine if it is feasible to use existing laboratory procedures to evaluate both acute and chronic toxicity of the discharge. The study should build upon existing research of whole effluent toxicity (WET) testing using *Hyalella azteca* and shall recommend monitoring frequencies that result in an effective evaluation of the discharge (e.g., monitoring conducted when pyrethroid pesticides may be prevalent in the discharge). The permit may be reopened to incorporate the testing if determined feasible.

Task		Compliance Date
i.	Submit Workplan and Time Schedule	90 days from Adoption Date of this Order
ii.	Begin Study	To be determined in Task i.
iii.	Complete Study	To be determined in Task i.
iv.	Submit Study Report	To be determined in Task i.

d. Temperature Study. Order R5-2010-0114 required ~~The~~ the Discharger ~~shall submit a workplan and time schedule for Executive Officer approval for development of~~ to develop a temperature study to evaluate the thermal effects of the discharge and that study has been completed. ~~determining whether permitted conditions are protective of the aquatic life beneficial uses of the Sacramento River~~. ~~The workplan shall be implemented upon approval by the Executive Officer.~~ The study ~~will~~ included an evaluation of: (1) the existing Thermal Plan Exception and its effects on aquatic life, and (2) any proposed request for new Thermal Plan Exception(s). The Discharger ~~must~~ was also required to consult with the ~~U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the California Department of Fish and Game~~USFWS,NMFS and CDFW~~,~~ to

ATTACHMENT F – FACT SHEET

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applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

C. The Facility discharges wastewater to the Sacramento River within the Sacramento-San Joaquin Delta, a water of the United States, and was previously regulated by Order No. 5-00-188 which was adopted on 4 August 2000 and expired on 1 August 2005. The terms and conditions of the previous Order were administratively continued and remained in effect until this Order, serving as new Waste Discharge Requirements (WDRs) and a renewed National Pollutant Discharge Elimination System (NPDES) permit, was adopted pursuant to this Order.

D. The Discharger filed a report of waste discharge and submitted an application for renewal of its Waste Discharge Requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permit on 1 February 2005. Supplemental information was requested on 19 August 2008 and received on 24 August 2010**.** A site visit was conducted on 22 July 2008, to observe operations and collect additional data to develop permit limitations and conditions. Additional information and reports were submitted by the Discharger for development of this Order. This Order was adopted on 9 December 2010, and has been subsequently amended, as follows:

1. On 1 December 2011, this Order was amended by R5-2011-0083 including modifications to the Monitoring and Reporting Program, recycled water use, and manganese effluent limitation.

2. On 4 December 2012, this Order was amended by State Water Resources Control Board WQ 2012-2013, which required amendment of the final effluent limitations for ammonia nitrogen (Total as N) and the ammonia effluent limitations calculation table.

3. On 4 October 2013, this Order was amended by Order R5-2013-0124 including modifications to the Monitoring and Reporting Program, and effluent limitations for dichlorobromomethane, chlorodibromomethane, and N-nitrosodimethylamine.

4. On 8 August 2014, this Order was amended by Order R5-2014-0102 and Order R5-2014-0103, which included modifications to the interim ammonia effluent limitation, and seasonal disinfection requirements, respectively.

5. On 9 October 2014, this Order was amended by Order R5-2014-0122 adding provisions to allow participation in the Delta Regional Monitoring Program.

6. On XX July 2015, this Order was amended by Order R5-2015-xxxx to comply with the judgment and peremptory writ of mandate entered by the Sacramento County Superior Court in the matter of *California Sportfishing Protection Alliance* v. *California Regional Water Quality Control Board, Central Valley Region (Case No. 34-2013-80001358-CU-QM-GDS)* ~~from the~~. The amendment addressed ~~,~~ 1) hardness-dependent CTR metals criteria and resulting effluent limitations, 2) Thermal Plan exceptions, and 3) aluminum effluent limitations.

"*5. Estuaries*

A. Existing discharges

(1) Elevated temperature waste discharges shall comply with the following:

a. The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.

b. Elevated temperature waste discharges either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.

c. No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.

d. Additional limitations shall be imposed when necessary to assure protection of beneficial uses."

~~The Regional Water Board, on 26 May 1989, adopted Resolution No. 89-094 granting an exception to objectives 5A(1)(a) (from 1 October to 30 April) and 5A(1)(b) of the Thermal Plan. Additionally, Resolution 89-094 requires that the temperature of the discharge shall not exceed the natural receiving water temperature by more than 25°F from 1 October through 30 April. The State Water Board, on 20 September 1990, adopted Resolution No. 90-103 approving and modifying Central Valley Water Board Resolution No.89-094. State Water Board Resolution No. 90-103 approved the exception to objective 5A(1)(a), but not the one to 5A(1)(b). It further required a study of the feasibility of meeting the existing objective,5A(1)(b). The Discharger submitted the required study in a report in October 1991, with supplements in November and December 1991. Based on the study, the State Water Board adopted Resolution No. 92-82 on 22 October 1992, granting the Discharger an exception to objective 5A(1)(b). Specifically, the exception allows a maximum increase of 2 °F in a zone that does not exceed 25 percent of the cross sectional area of the main river channel at any point. The exception also limited any excursion of objective 5A(1)(b) to no more than one hour per day as an average in any thirty-day period when the upstream temperature of the Sacramento River is 65 °F or greater. This exception was carried over in Waste Discharge Order No. 5-00-188.~~

(1) Thermal Plan Exceptions

The Thermal Plan allows regional boards to provide exceptions to specific water quality objectives in the Thermal Plan so long as the exceptions comply with CWA section 316(a) and federal regulations. The applicable exception is promulgated in 40 CFR Section 125.73(a), which provides that, "*Thermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards*

and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made. This demonstration must show that the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a balanced indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made."

a) Background

- The Central Valley Water Board, on 26 May 1989, adopted Resolution 89-094 granting exceptions to objectives 5A(1)(a) and 5A(1)(b) of the Thermal Plan. Objective 5A(1)(a) was relaxed such that the temperature of the discharge shall not exceed the natural receiving water temperature by more than 25°F from 1 October through 30 April. Objective 5A(1)(b) was waived.

- The State Water Board, on 20 September 1990, adopted Resolution 90-103 approving and modifying Central Valley Water Board Resolution 89-094. State Water Board Resolution 90-103 approved the exception to objective 5A(1)(a), but deferred a decision on the exception to 5A(1)(b). It required the Discharger to study the feasibility of meeting objective 5A(1)(b). The Discharger submitted the required study in a report in October 1991, with supplements in November and December 1991. Based on the study, the State Water Board found that the heat load contributed by the Dischargers effluent did not pose a threat to aquatic life, including salmon, at any season. The Board adopted Resolution 92-82 on 22 October 1992, granting the Discharger a conditional exception to objective 5A(1)(b). Specifically, the exception allowed a maximum increase of 2 °F in a zone that does not exceed 25 percent of the cross sectional area of the main river channel at any point. The exception also limited any excursion of objective 5A(1)(b) to no more than one hour per day as an average in any thirty-day period when the upstream temperature of the Sacramento River is 65 °F or greater. These requirements were implemented in Waste Discharge Requirements Order 5-00-188 adopted in August 2000.

- As a condition of Order 5-00-188, the Discharger completed and submitted a study assessing the thermal impacts of its discharge in the Sacramento River to the NMFS, titled "Thermal Effects of Sacramento Regional Wastewater Treatment Plant Discharges on

Migrating Fishes of the Sacramento River, February 2005." The thermal impact assessment recommended continuation of the existing thermal plan exceptions. The 2005 Thermal Study was reviewed by NMFS staff and they did not indicate any concerns with the Thermal Plan exceptions.

b) 2010 Temperature Study

- In July 2010, the Discharger submitted a new temperature study developed by Robertson-Bryan, Inc., "Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant", (RBI 2010), and requested revised Thermal Plan exceptions. The study consisted of thermal assessment and fisheries assessment. The thermal assessment characterized the temperatures in the vicinity and downstream of the diffuser at design flow rate at worse-case and typical flow condition and evaluated the temperature conditions against the thermal tolerances, exposure times, and migration paths of fishes that pass the diffuser. The fisheries assessment addressed blockage/significant delay of upstream spawning migrations of adult anadromous fish caused by near-field thermal plume, population-level effects resulting from mortality in fish caused by acute exposure, and population or community-level effects on fish resulting from far-field thermal effects.

- Based on the dynamic model performed by Flow Science, under all near-field conditions modeled, a zone of passage approximately 75-100 ft wide occurs along the west bank and 175-200 ft wide occurs along the east bank. Also the warmest part of the thermal plume is located close to the bottom of the river where few fish are expected to be exposed and exposure time ranges from seconds to minutes. Actively swimming fishes can readily avoid unfavorable temperatures within the plume by swimming around or over the portions of the plume. Therefore, a thermally tolerable zone of passage exists for all actively swimming fish species that pass the diffuser, and the thermal plume would not cause lethality to emigrating fishes or have adverse population- or community level effects to the anadromous or resident fishes. In addition, far-field temperature modeling results indicate that under fully-mixed conditions downstream of the discharge would not adversely affect aquatic life resources of the Sacramento River.

- During the 2010 permit renewal process, Central Valley Water Board staff consulted with NFMS, USFWS, and CDFW (fishery agencies) regarding the Discharger's proposed Thermal Plan exceptions. Staff issued a public scoping document regarding

aquatic life and wildlife preservation related issues and provided the scoping document for public review and comment on 28 April 2010.

NMFS[1] stated, "…listed species have sufficient swimming abilities to readily avoid the thermal component of this stressor." However, NMFS expressed concerns that the area of thermal mixing at the outfall diffuser had a potential to attract non-native predators of the listed species under the Endangered Species Act (ESA)[2] and recommended a predation study be performed. USFWS[3] recommended the exception from Order 5-00-188 be retained and no further exception be permitted. Additionally, USFWS recommended the Discharger initiate planning to address future increases in the discharge with consideration for changes in the Sacramento River as a result of climate change without the need for sequential Thermal Plan exceptions. USFWS was also concerned about the potential of thermal discharges to create winter thermal refugia for non-native predators and the lack of information for the protection of delta smelt, and recommended the renewed 2010 permit include a temperature study requirement.

- The recommendations from the fishery agencies were incorporated into the tentative NPDES permit that was issued on 3 September 2010. The tentative permit continued the Thermal Plan exceptions from Order 5-00-188 and required the Discharger to conduct a new temperature study to evaluate the concerns regarding predation. NMFS, USFWS, and CDFW concurred with the temperature requirements in the tentative permit. In their comments to the tentative Order, NFMS reiterated its recommendation about the predation study; USFWS acknowledged the incorporation of the thermal study and consented the permit provisions were protective of fish and wildlife related beneficial uses; and CDFW supported the inclusion of the temperature study to evaluate the protection of delta smelt and the Sacramento River biota.

c) 2013 Temperature Study

- After adoption of the 2010 Order, the Discharger contracted with Robertson-Bryan, Inc. to begin development of a work plan for conducting the temperature study. The fishery agencies participated in the development of the study work plan, and in March 2013, the Discharger submitted the required temperature study, "Temperature Study to Assess the Thermal Impacts on the

[1] Letter from NMFS to the Central Valley Water Board dated 12 September 2010 (NMFS 2010).
[2] Specifically, Sacramento River winter-run Chinook Salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), California Central Valley steelhead (*O. mykiss*), and the Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*).
[3] Letter from USFWS to Central Valley Water Board dated 18 August 2010 (USFWS 2010).

Sacramento Regional Wastewater Treatment Plant Discharge on Aquatic Life of the Lower ~~Sacrametno~~Sacramento River" (RBI 2013), to address the concerns of the fishery agencies. The study determined that:

1) Fish species (Chinook salmon, steelhead, delta smelt, green sturgeon, longfin smelt,Sacramento splittail, hardhead, Pacific lamprey, or river lamprey), phytoplankton, zooplankton, and benthic macroinvertebrates (BMI) would not experience thermal exposures that would exceed lethal or sub-lethal thresholds.

2) The thermal plume near the diffuser did not block/delay upstream migration of adult fishes or downstream migration of larval and juvenile fishes. The discharge upon its full mixing with river flow would not block upstream adult migration of Chinook salmon or other migratory fish species.

3) Large numbers of predatory fishes were not holding at the diffuser site due to elevated water temperatures. The study found that predation rates on Chinook salmon smolts emigrating past the diffuser were no higher than elsewhere in the lower Sacramento River, upstream and downstream of the diffuser site.

4) The migratory and resident predatory fishes tracked did not congregate and hold within the plume for continuous periods of time sufficient to result in exposure durations that would cause acute or chronic toxicity, based on plume water quality.

5) Discharges did not increase river temperatures, upon full mixing, by magnitude and duration that would be of concern for aquatic life in the lower Sacramento River or Delta.

- NMFS[1] reviewed the study in June 2014 and found that, "…Chinook salmon, steelhead, green sturgeon, as well as the other aquatic species examined migrating past the diffuser location and within the thermal plume would not experience thermal exposure that would exceed lethal or sub-lethal thresholds… " , "…juvenile Chinook salmon are not delayed or blocked by the thermal plume in their downstream migration and that based on the tracks of the individual fish, do not exhibit any apparent erratic behavior when encountering the thermal plume.", and "…the predation upon juvenile Chinook salmon within the close vicinity of the diffuser appeared to be minimal to nonexistent."

[1] Letter from NFMS to Central Valley Water Board dated 2 June 2014 (NMFS 2014).

- USFWS[1] reviewed the study and provided comments on 18 December 2013, which stated, "The final report of the temperature study is generally complete and is mostly consistent with the Work Plan developed with stakeholders that was completed in June 2011. There are, however, a few omissions in the study which prevent the Service from fully evaluating the thermal effects of the facility on delta smelt." The USFWS recommended that the Discharger modify the current study or provide additional analyses on delta smelt.

d) 2015 Delta Smelt Addendum

- In May 2015, the Discharger submitted an addendum developed by Robertson-Bryan, Inc, "Temperature Study to Assess the Thermal Impacts on the Sacramento Regional Wastewater Treatment Plant Discharge on Aquatic Life of the Lower Sacramento River: Delta Smelt Addendum" (RBI 2015). This addendum assessed the potential direct and indirect effects of the thermal discharge on all delta smelt life stages such as adults, larvae, and post-spawn adults, and on delta smelt critical habitat. The study concluded that the discharge "…would not cause lethality to individual delta smelt, result in chronic, adverse sublethal effects, adversely modify delta smelt critical habitat, prevent sustainability or recovery of the delta smelt population, or eliminate access to critical habitat primary constituent elements."

- The USFWS reviewed the addendum and found that the addendum addresses its concerns and the temperature study is complete for the evaluation of Thermal Plan exceptions.

The Central Valley Water Board, after consideration of the Discharger's studies and consultation with the fishery agencies, finds the Discharger's studies adequately demonstrate the following:

- The thermal plume from the discharge will show no direct acute or chronic thermal effects on fishes (including larval and juvenile life stages), benthic macroinvertebrates, or plankton. The thermal exposures, either in the near-field plume area or far-field downstream areas would not exceed lethal or sub-lethal effect thresholds for aquatic life.

- There is a sufficient zone of passage such that the thermal plume from the discharge will not result in blockage or significant delay upstream migration of adult fishes or downstream migration of larval and juvenile fishes. The discharge upon its full mixing with river flow would not block or delay upstream adult migration of fish species.

[1] Letter from USFWS to Central Valley Water Board dated 18 December 2013 (USFWS 2013).

- Predatory fishes were not holding in the warmer water plume near the diffuser, where they could prey upon ESA-listed fishes as they migrate past the diffuser.

- Fishes were not holding within the plume area due to the elevated water temperature for sufficient periods of time to experience toxicity, based on plume water quality.

The Discharger has demonstrated that Effluent and Receiving Water Limitations based on the Thermal Plan are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made. This demonstration has shown the Effluent and Receiving Water Limitations for temperature in this Order are sufficient, considering the cumulative impact of the thermal discharge together with all other significant impacts on the species affected, to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.

The Central Valley Water Board adopts the above findings and Thermal Plan exceptions based on the current evidence in the record, including studies required by Order R5-2010-0114 completed in March 2013 and May 2015, and comments received from USFWS, CDFW and NMFS. The Central Valley Water Board plans to consider the renewal of this NPDES permit in early 2016. At that time, the Board will consider all evidence in the record including any new information received, and additional comments from the above-listed resource agencies to determine whether the evidence supports continued use of the Thermal Plan exceptions as implemented in this Order.

Therefore, in accordance with 40 CFR Section 125.73(a) this Order continues the exceptions to Thermal Plan objectives 5A(1)(a) and 5A(1)(b) from Order 5-00-188, as follows:

- **Thermal Plan Objective 5A(1)(a) Exception:**

  The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than:

  25º F from 1 October through 30 April;

  -and-

  20º F from 1 May through 30 September

- **Thermal Plan Objective 5A(1)(b) Exception:**

If the natural receiving water temperature is less than 65ºF, the discharge shall not create a zone, defined by water temperature of more than 2ºF above natural temperature, which exceeds 25 percent of the cross sectional area of the River at any point outside the zone of initial dilution.

If the natural receiving water temperature is 65ºF or greater, the discharge shall not create a zone, defined by a water temperature of 1ºF or more above natural receiving water temperature which exceeds 25 percent of the cross sectional area of the River at any point outside the zone of initial dilution for more than one hour per day as an average in any month.

2. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** This Order implements the NTR and CTR as specified in the Finding contained at section II.I of this Order.

3. **State Implementation Policy (SIP).** This Order implements the SIP as specified in the Finding contained at section II.I of this Order.

4. **Alaska Rule.** This Order is consistent with the Alaska Rule as specified in the Finding contained at section II.L of this Order.

5. **Antidegradation Policy.** As specified in the Finding contained at section II.N of this Order and as discussed in detail in the Fact Sheet (Attachment F, Section IV.D.4.), the discharge is consistent with the antidegradation provisions of 40 CFR section 131.12 and State Water Resources Control Board (State Water Board) Resolution 68-16.

6. **Anti-Backsliding Requirements.** This Order is consistent with anti-backsliding policies as specified in the Finding contained at section II.M of this Order. Compliance with the anti-backsliding requirements is discussed in the Fact Sheet (Attachment F, Section IV.D.3).

7. **Emergency Planning and Community Right to Know Act**

   Section 13263.6(a) of the CWC, requires that "*the Regional Water Board shall prescribe effluent limitations as part of the waste discharge requirements of a POTW for all substances that the most recent toxic chemical release data reported to the state emergency response commission pursuant to Section 313 of the Emergency Planning and Community Right to Know Act of 1986 (42 U.S.C. Sec. 11023) (EPCRA) indicate as discharged into the POTW, for which the State Water Board or the Regional Water Board has established numeric water quality objectives, and has determined that the discharge is or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to, an excursion above any numeric water quality objective*".

and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation. Section 131.3(e), 40 CFR, defines existing beneficial uses as those uses actually attained after 28 November 1975, whether or not they are included in the water quality standards. Federal Regulation, 40 CFR section 131.10 requires that uses be obtained by implementing effluent limitations, requires that all downstream uses be protected and states that in no case shall a state adopt waste transport or waste assimilation as a beneficial use for any waters of the United States.

a. Receiving Water and Beneficial Uses. Beneficial uses applicable to Sacramento-San Joaquin Delta are as follows:

Table F-5. Basin Plan Beneficial Uses

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	**Sacramento – San Joaquin Delta**	Existing: Municipal and domestic supply (MUN); Agricultural supply, including irrigation and stock watering (AGR); Industrial process supply (PROC); Industrial service supply (IND); Water contact recreation, including canoeing and rafting (REC-1); Non-contact water recreation (REC-2); Warm freshwater habitat (WARM); Cold freshwater habitat (COLD); Migration of aquatic organisms, warm and cold (MIGR); Spawning, reproduction, and/or early development, warm (SPWN); Wildlife habitat (WILD); and Navigation (NAV).
NA	**Groundwater**	Municipal and domestic water supply (MUN); Agricultural supply (AGR); Industrial service supply (IND), and Industrial process supply (PRO).

The Delta is vital to California and comprises over 700 miles of interconnected waterways and encompasses 1,153 square miles. The Delta is home to over two hundred eighty species of birds and more than fifty species of fish, making it one of the most ecologically important aquatic habitats in the State. Drinking water for over 25 million Californians is pumped from the Delta via the State Water Project, Central Valley Water Project, and local water intakes. The Delta supports California's trillion dollar economy with $27 billion annually for agriculture. Additionally, the Delta has 12 million user-days for recreation each year.

b. Effluent and Ambient Background Data. The reasonable potential analysis (RPA), as described in section IV.C.3 of this Fact Sheet, was based on effluent data from 1 June 2005 through 30 July 2008 effluent and ambient background data from 1 January 1998 through 30 July 2008 submitted in SMRs, the Report

of Waste Discharge (ROWD), the Pretreatment Program Annual Reports and the Coordinated Monitoring Program. Additional data outside of this range was also analyzed where there was inadequate data to perform an analysis. Effluent and ambient data for iron and manganese was collected in 2009 because this data was not included in the other databases described above. The Discharger collected effluent and receiving water dioxin and furan data in 2002 and 2004 and are included under a technical memorandum SRWTP 13267 Dioxin Data. For the metals with hardness-dependent CTR criteria including cadmium, copper, chromium III, lead, nickel, silver, and zinc, the RPA was based on the effluent and ambient background data from 1 January 2012 to 31 December 2014.

c. Hardness-Dependent CTR Metals Criteria. The CTR and the NTR contain water quality criteria for seven metals that vary as a function of hardness. The lower the hardness the lower the water quality criteria. The metals with hardness-dependent criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.

This Order has established the criteria for hardness-dependent metals based on the hardness of the receiving water (actual ambient hardness) as required by the SIP[1] and the CTR[2]. The SIP and the CTR require the use of "receiving water" or "actual ambient" hardness, respectively, to determine effluent limitations for these metals. The CTR requires that the hardness values used shall be consistent with the design discharge conditions for design flows and mixing zones[3]. Where design flows for aquatic life criteria include the lowest one-day flow with an average reoccurrence frequency of once in ten years (1Q10) and the lowest average seven consecutive day flow with an average reoccurrence frequency of once in ten years (7Q10).[4] This section of the CTR also indicates that the design conditions should be established such that the appropriate criteria are not exceeded more than once in a three year period on average.[5] The CTR requires that when mixing zones are allowed the CTR criteria apply at the edge of the mixing zone, otherwise the criteria apply throughout the water body including at the point of discharge.[6] The CTR does not define whether the term "ambient," as applied in the regulations, necessarily requires the consideration of upstream as opposed to downstream hardness conditions.

Summary findings

Given the high variability in ambient hardness values (see Figure F-1 below), there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum). Because of this variability, staff

[1] The SIP does not address how to determine the hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water.

[2] The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used (40 C.F.R. § 131.38(c)(4)).

[3] 40 C.F.R. §131.3(c)(4)(ii)

[4] 40 C.F.R. §131.38(c)(2)(iii) Table 4

[5] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2

[6] 40 C.F.R. §131.38(c)(2)(i)

has determined that, based on the ambient hardness concentrations measured in the receiving water, the Board has discretion to select ambient hardness values within the range of 34 mg/L (minimum) up to 100 mg/L (maximum). Staff recommends that the Board use the ambient hardness values shown in Table F-6 for the following reasons.

1. Using the ambient receiving water hardness values shown in Table F-6 will result in criteria and effluent limitations that ensure protection of beneficial uses under all ambient receiving water conditions.

2. The Water Code mandates that the Central Valley Water Board establish permit terms that will ensure the reasonable protection of beneficial uses. In this case, using the lowest measured ambient hardness to calculate effluent limitations is not reasonable, because it would result in overly conservative limits that will impart substantial costs to the Discharger and ratepayers without providing any additional protection of beneficial uses. In compliance with applicable state and federal regulatory requirements, Board staff has instead used an ambient hardness value to calculate the proposed effluent limitations for hardness-dependent metals. The proposed effluent limitations will still be fully protective of all beneficial uses under all flow conditions. ~~The California Water Code requires the Water Board to be fair and reasonable when setting regulations. Using lower ambient hardness values will result in more conservative effluent limits that are not needed to protect beneficial uses or comply with state policies and federal regulations, yet will result in additional costs to the Discharger and rate payers.~~

3. Using an ambient hardness that is higher than the minimum of 34 mg/L will result in a limit that may allow increased metals to be discharged to the river, but such discharge is allowed under the antidegradation policy (State Water Board Resolution 68-16). The Board finds that this degradation is consistent with the antidegradation policy (see antidegradation findings in Section IV.D.4 of the Fact Sheet). The Antidegradation policy requires the Discharger to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that: a) a pollution or nuisance will not occur, and b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

4. Using the ambient hardness values shown in Table F-6 is fully consistent with the CTR and SIP's requirements for developing metals criteria.

Table F-6. Summary of CTR Criteria for Hardness-dependent Metals

CTR Metals	Ambient Hardness (mg/L)[2,3]	CTR Criteria (µg/L, total recoverable)[1]	
		acute	chronic
Copper	84	12	8.0
Chromium III	84	1500	180

CTR Metals	Ambient Hardness (mg/L)[2,3]	CTR Criteria (µg/L, total recoverable)[1]	
		acute	chronic
Cadmium	78 (acute) 84 (chronic)	3.4	2.1
Lead	78	60	2.3
Nickel	84	400	45
Silver	72	2.3	--
Zinc	84	100	100

[1] Metal criteria rounded to two significant figures in accordance with the CTR (40 C.F.R. §131.38(b)(2)).

[2] The ambient hardness values in this table represent actual observed receiving water hardness measurements from the dataset shown in Figure F-1, observed within the past five years.

[3] The CTR's hardness dependent metals criteria equations vary differently depending on the metal, which results in differences in the range of ambient hardness values that may be used to develop effluent limitations that are protective of beneficial uses and comply with CTR criteria for all ambient flow conditions.

Background

The State Water Board provided direction regarding the selection of hardness in two precedential water quality orders; WQO 2008-0008 for the City of Davis Wastewater Treatment Plant (Davis Order) and WQO 2004-0013 for the Yuba City Wastewater Treatment Plant (Yuba City Order). The State Water Board recognized that the SIP and the CTR do not discuss the manner in which hardness is to be ascertained, thus regional water boards have considerable discretion in determining ambient hardness so long as the selected value is protective of water quality criteria under the given flow conditions. (Davis Order, p.10). The State Water Board explained that it is necessary that, "The [hardness] value selected should provide protection for all times of discharge under varying hardness conditions." (Yuba City Order, p. 8). The Davis Order also provides that, "Regardless of the hardness used, the resulting limits must always be protective of water quality criteria under all flow conditions." (Davis Order, p. 11)

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

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

Where:

H = ambient hardness (as $CaCO_3$) [1]

WER = water-effect ratio

m, b = metal- and criterion-specific constants

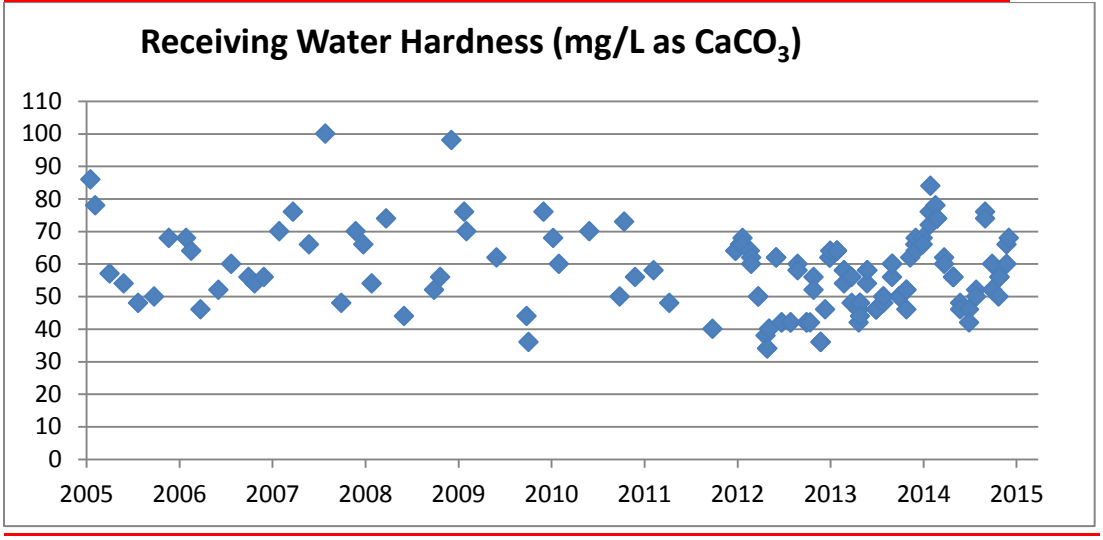
[1] For this discussion, all hardness values are expressed in mg/L as $CaCO_3$.

The direction in the CTR regarding hardness selection is that it must be based on ambient hardness and consistent with design discharge conditions for design flows and mixing zones. Consistent with design discharge conditions and design flows means that the selected "design" hardness must result in effluent limitations under design discharge conditions that do not result in more than one exceedance of the applicable criteria in a three year period.[1] Where design flows for aquatic life criteria include the lowest one-day flow with an average reoccurrence frequency of once in ten years (1Q10) and the lowest average seven consecutive day flow with an average reoccurrence frequency of once in ten years (7Q10). The 1Q10 and 7Q10 Sacramento River flows are 5,060 cfs and 5,846 cfs, respectively.

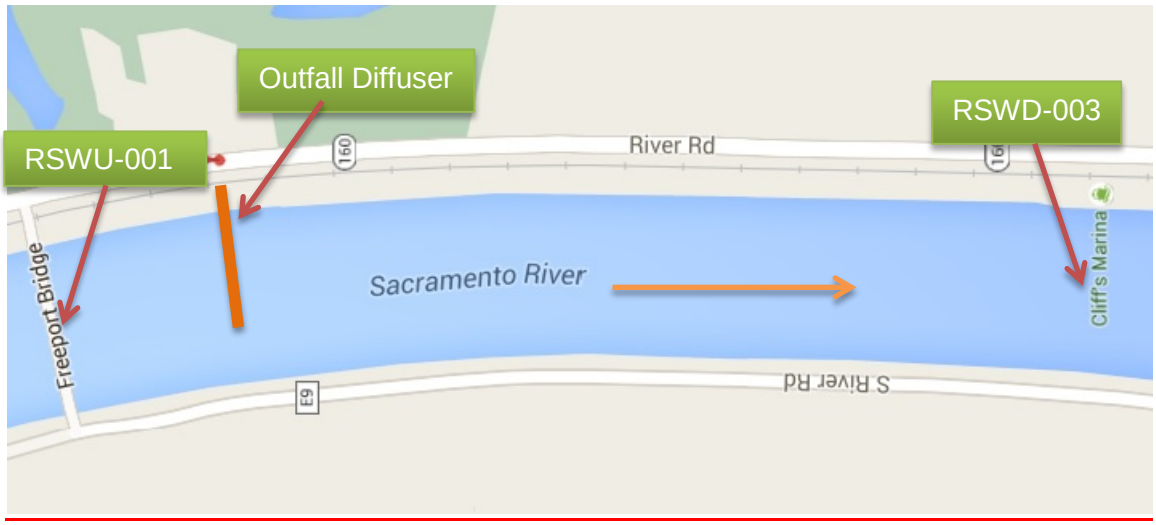
Ambient conditions

The upstream receiving water hardness at receiving water monitoring location RSWU-001 (Sacramento River at Freeport Bridge) varied from 34 mg/L to 100 mg/L, based on 107 samples from January 2005 to December 2014; the downstream receiving water hardness at receiving water monitoring location RSWD-003 (Sacramento River at Cliff's Marina) varied from 34 mg/L to 76 mg/L, based on 38 samples from January 2012 through December 2014. The Board has found that downstream hardness must be considered in developing metals criteria because it best represents the ambient receiving water downstream of the facility. In the location of the discharge, the receiving water periodically reverses direction, so both upstream and downstream hardness have been used in this analysis. Figure F-1 below shows the observed hardness data measured in the receiving water.

Figure F-1. Observed Receiving Water Hardness Concentrations January 2005-December 2014 (Upstream and Downstream Values)



[1] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2



In this analysis, the entire range of ambient hardness concentrations shown in Figure F-1 were considered to determine the appropriate ambient hardness to calculate the CTR criteria and effluent limitations that are protective under all discharge conditions.

Approach to derivation of criteria

As shown above, ambient hardness varies substantially. Because of the variation, there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum, mid--point). While the hardness selected must be hardness of the ambient receiving water, selection of an ambient receiving water hardness that is too high would result in effluent limitations that do not protect beneficial uses. Also, the use of minimum ambient hardness would result in criteria that are protective of beneficial uses, but such criteria may not be representative or fair and reasonable considering the wide range of ambient conditions.

Reasonable worst-case ambient conditions. To determine whether a selected ambient hardness value results in fair and reasonable effluent limitations that are fully protective while complying with federal regulations and state policy, staff have conducted an analysis considering varying ambient hardness and flow conditions. To do this, the Board has ensured that the receiving water hardness and criteria selected for effluent limitations are protective under "reasonable-worst case ambient conditions." These conditions represent the receiving water conditions under which derived effluent limitations would ensure protection of beneficial uses under all ambient flow and hardness conditions.

Reasonable worst-case ambient conditions:

- "Low receiving water flow." CTR design discharge conditions (1Q10 and 7Q10) have been selected to represent reasonable worst case receiving water flow conditions.

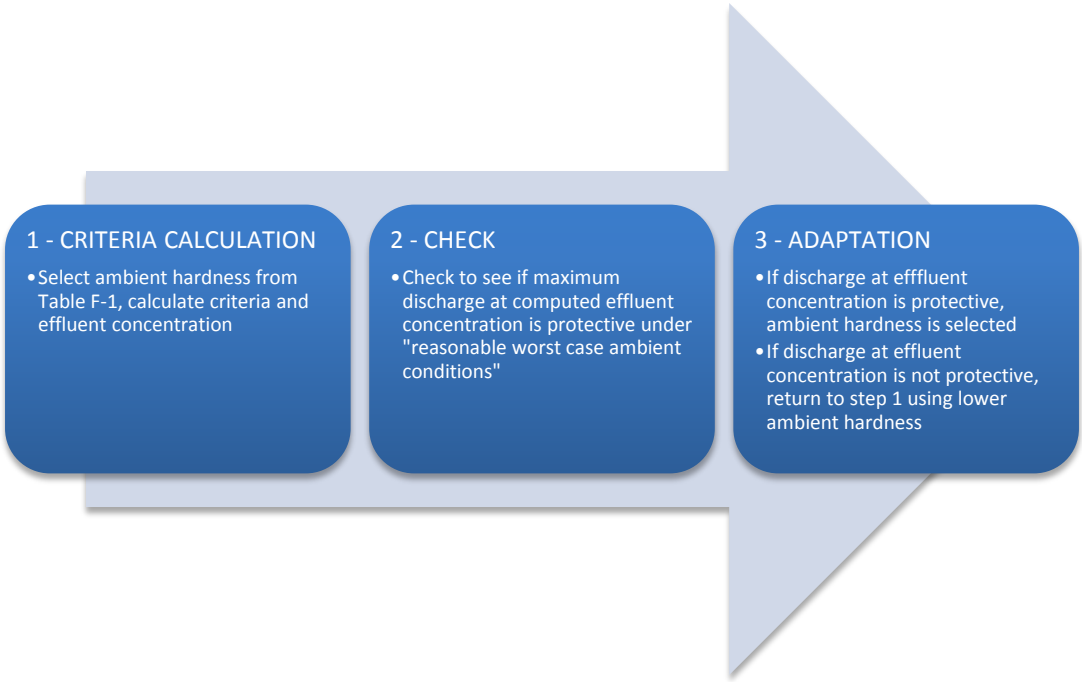
- "High receiving water flow (maximum receiving water flow)." This additional flow condition has been selected consistent with the Davis Order, which required that the hardness selected be protective of water quality criteria under all flow conditions.

- "Low receiving water hardness." The minimum receiving water hardness condition of 34 mg/L was selected to represent the reasonable worst case receiving water hardness.

- "Upstream ambient metal concentration at criteria." This condition assumes that the metal concentration in the upstream receiving water is equal to CTR criteria (upstream of the facility's discharge).

Iterative approach. An iterative analysis has been used to select the ambient hardness to calculate the criteria that will result in ~~fair and reasonable~~ effluent limitations that protect beneficial uses under all flow conditions.

The iterative approach is summarized in the following algorithm and described below in more detail.



1. CRITERIA CALCULATION. CTR criteria are calculated based on actual measured ambient hardness sample results, starting with the maximum observed ambient hardness of 100 mg/L. Effluent concentrations are calculated.

2. CHECK. Using USEPA's simple mass balance equation[1], maximum discharge at the computed effluent concentration is assumed. Resultant downstream metal concentration is then compared with downstream calculated CTR criteria under reasonable worst-case ambient conditions.

3. ADAPT. If step 2 results in:

   (A) receiving water metal concentration that complies with CTR criteria under reasonable worst-case ambient conditions, then the hardness value is selected.

   (B) receiving water metal concentration greater than CTR criteria, then return to bullet 1, selecting a lower ambient hardness value.

The CTR's hardness dependent metals criteria equation contains metal-specific constants, so the criteria vary differently depending on the metal. Therefore, steps 1 through 3 must be repeated separately for each metal until ambient hardness values are determined that will result in criteria and effluent limitations that comply with the CTR and protect beneficial uses for all metals. This is the reason for the differences in the selected ambient hardness values shown in Table F-6 above.

Results of iterative analysis

The above iterative analysis for each CTR hardness-dependent metal results in the selected ambient hardness values shown in Table F-6, above. Using these hardness values to calculate criteria, which are actual sample results collected in the receiving water, will result in effluent limitations that are protective under all ambient flow conditions. Copper and silver are used as examples below to illustrate the results of the analysis. Tables F-7 and F-8 below summarize the numeric results of the three step iterative approach for copper and silver. As shown in the example tables, ambient hardness values of 84 mg/L (copper) and 72 mg/L (silver) are used to derive criteria and effluent limitations. Then under the "check" step, worst-case ambient receiving water conditions are used to test whether discharge at the computed effluent limitations results in compliance with CTR criteria and protection of beneficial uses.

The results of the above analysis, summarized in the tables below, show that the ambient hardness values selected using the three-step iterative process results in protective effluent limitations that achieve CTR criteria under all flow conditions ~~that are fair and reasonable~~.

[1] U.S. EPA NPDES Permit Writers' Handbook (EPA 833-K-10-001 September 2010, pg. 6-24)

Table F-7. Verification of CTR Compliance for Copper ~~Effluent Limitations~~

Receiving water hardness used to compute effluent limitations				**84 mg/L**
Effluent Concentration Allowance for Copper				**8.0 µg/L**
Effluent Limitations for Copper				**7.4/10[2] µg/L**
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Copper Concentration[1] (µg/L)**	
1Q10	36.7	4.0	3.9	**Yes**
7Q10	36.4	3.9	3.9	**Yes**
Max receiving water flow	34.2	3.7	3.7	**Yes**

[1] This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.
[2] Average monthly effluent limit of 7.4 µg/L and maximum daily effluent limit of 10 µg/L were calculated based on the effluent concentration allowance in accordance with section 1.4 of the SIP.

Table F-8. Verification of CTR Compliance for Silver ~~Effluent Limitations~~

Receiving water hardness used to compute effluent limitations				**72 mg/L**
Effluent Concentration Allowance for Silver				**2.3 µg/L**
Effluent Limitations for Silver				**N/A[2]**
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Silver Concentration[1] (µg/L)**	
1Q10	36.7	0.7	0.7	**Yes**
7Q10	36.4	0.7	0.7	**Yes**
Max receiving water flow	34.2	0.6	0.6	**Yes**

[1] This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.
[2] There is no effluent limitation for silver as it demonstrates no reasonable potential.

~~**c. Priority Pollutant Metals**~~

i. ~~**Hardness Dependent CTR Metals Criteria.** The *California Toxics Rule* and the *National Toxics Rule* contain water quality criteria for seven metals that vary as a function of hardness. The lower the hardness the lower the water quality criteria. The metals with hardness-dependent criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.~~

This Order has established the criteria for hardness-dependent metals based on the reasonable worst-case ambient hardness as required by the SIP[1], the CTR[2] and State Water Board Order No. WQO 2008-0008 (City of Davis). The SIP and the CTR require the use of "receiving water" or "actual ambient" hardness, respectively, to determine effluent limitations for these metals. (SIP, § 1.2; 40 CFR § 131.38(c)(4), Table 4, note 4.) The CTR does not define whether the term "ambient," as applied in the regulations, necessarily requires the consideration of upstream as opposed to downstream hardness conditions. Therefore, where reliable, representative data are available, the hardness value for calculating criteria can be the downstream receiving water hardness, after mixing with the effluent (Order WQO 2008-0008, p. 11). The Central Valley Water Board thus has considerable discretion in determining ambient hardness (*Id.*, p.10.).

The hardness values must also be protective under all flow conditions (*Id.*, pp. 10-11). As discussed below, scientific literature provides a reliable method for calculating protective hardness-dependent CTR criteria, considering all discharge conditions. This methodology produces criteria that ensure these metals do not cause receiving water toxicity, while avoiding criteria that are unnecessarily stringent.

(a) Reasonable Potential Analysis (RPA). The SIP in Section 1.3 states, "The RWQCB shall…determine whether a discharge may: (1) cause, (2) have a reasonable potential to cause, or (3) contribute to an excursion above any applicable priority pollutant criterion or objective." Section 1.3 provides a step-by-step procedure for conducting the RPA. The procedure requires the comparison of the Maximum Effluent Concentration (MEC) and Maximum Ambient Background Concentration to the applicable criterion that has been properly adjusted for hardness. Unless otherwise noted, for the hardness-dependent CTR metals criteria the following procedures were followed for properly adjusting the criterion for hardness when conducting the RPA.

- 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. In this evaluation the portion of the receiving water affected by the discharge is analyzed. For hardness-dependent criteria, the hardness of the effluent has an impact on the determination of the applicable criterion in areas in the receiving water affected by the discharge. Therefore,

[1] The SIP does not address how to determine the hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water.

[2] The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used. It further requires that the hardness values used must be consistent with the design discharge conditions for design flows and mixing zones.

for this situation it is necessary to consider the hardness of the effluent in determining the applicable hardness 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.

- For comparing the Maximum Ambient Background Concentration to the applicable criterion, in accordance with the SIP, CTR, and Order WQO 2008-0008, the reasonable worst-case upstream hardness was used to adjust the criterion. In this evaluation the area outside the influence of the discharge is analyzed. For this situation, the discharge does not impact the upstream hardness. Therefore, the effect of the effluent hardness was not included in this evaluation. Upstream receiving water hardness data for the Sacramento River ranged from 26 mg/L to 100 mg/L (as CaCO3), based on 100 samples from June 2005 to July 2008. The minimum observed upstream receiving water hardness, 26 mg/L as $CaCO_3$, was used to adjust the CTR criteria when comparing Maximum Background Ambient Concentration to the criterion.

(b) Effluent Concentration Allowances (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 water quality-based effluent limitations.

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

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

Where:

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

[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 water quality-based effluent limitations in accordance with Section 1.4 of the SIP.

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 (when C ≤ B)[1] (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".

ECA for Concave Down Metals – 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.

The effluent hardness ranged from 80 mg/L to 150 mg/L (as CaCO3), based on 216 samples from June 2005 to July 2008. The upstream

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

receiving water hardness varied from 26 mg/L to 100 mg/L (as CaCO3), based on 100 samples from June 2005 to July 2008. Using a hardness of 80 mg/L (as $CaCO_3$) to calculate the ECA for all Concave Down Metals will result in water quality-based effluent limitations that are protective under all potential effluent/receiving water mixing scenarios and under all known hardness conditions, as demonstrated in the example using copper shown in Table F-6, 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., 26 mg/L as $CaCO_3$).
- Upstream receiving water copper concentration always at the CTR criteria (i.e., no assimilative capacity). Based on available data, the receiving water never exceeded the CTR criteria for any metal with hardness-dependent criteria.

As demonstrated in Table F-6, using a hardness of 80 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 80 mg/L (as $CaCO_3$).

Table F-6. Copper ECA Evaluation

Minimum Observed Effluent Hardness	80 mg/L (as $CaCO_3$)
Minimum Observed Upstream Receiving Water Hardness	26 mg/L (as $CaCO_3$)
Maximum Assumed Dissolved Upstream Receiving Water Copper Concentration	3.0 µg/L[1]
Dissolved Copper $ECA_{chronic}$[2]	7.7 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%	26.5	3.0	3.0
5%	28.7	3.2	3.2
15%	34.1	3.7	3.7
25%	39.5	4.2	4.1
50%	53	5.4	5.3
75%	66.5	6.6	6.5
100%	80	7.7	7.7

[1] Maximum assumed upstream receiving water dissolved copper concentration calculated using Equation 1 for chronic criterion at a hardness of 26 mg/L (as $CaCO_3$).

[2] Dissolved ECA calculated using Equation 1 for chronic criterion at a hardness of 80 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 (as dissolved) are the chronic criteria calculated using Equation 1 at the mixed hardness.

[5] Mixed downstream ambient copper concentration (dissolved) is the mixture of the receiving water and effluent dissolved 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}.

$$ECA_{[1]} = \left(\frac{m(H_e - H_{rw})(e^{m\{\ln(H_{rw})\}+b})}{H_{rw}} \right) + e^{m\{\ln(H_{rw})\}+b} \qquad \text{(Equation 3)}$$

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]

[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

~~A similar example as was done for the Concave Down Metals is shown for lead, a Concave Up Metal, in Tables F-7 and F-8, below. As previously mentioned, the minimum effluent hardness is 80 mg/L (as $CaCO_3$), while the upstream receiving water hardness ranged from 26 mg/L to 100 mg/L (as CaCO3), based on 100 samples from June 2005 to July 2008. 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 and one based on the maximum observed upstream receiving water hardness. Using Equation 3, the lowest ECA results from using the minimum upstream receiving water hardness, the minimum effluent hardness, and assuming no receiving water assimilative capacity for lead (i.e., ambient background lead concentration is at the CTR chronic criterion).~~

~~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.~~

Table F-7. Lead ECA Evaluation Using Minimum Receiving Water Hardness

Minimum Observed Effluent Hardness	80 mg/L (as $CaCO_3$)
Minimum Observed Upstream Receiving Water Hardness	26 mg/L (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Lead Concentration	0.57 µg/L [1]
Lead ECA_{acute} [2]	2.1 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%	26.5	0.6	0.6
5%	28.7	0.6	0.6
15%	34.1	0.8	0.8
25%	39.5	1.0	1.0
50%	53.0	1.4	1.3
75%	66.5	1.9	1.7
100%	80.0	2.4	2.1

[1] Maximum assumed upstream receiving water lead concentration calculated using Equation 1 for acute criterion at a hardness of 26 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 and 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 Using Maximum Receiving Water Hardness

Minimum Observed Effluent Hardness	80 mg/L (as $CaCO_3$)
Maximum Observed Upstream Receiving Water Hardness	100 mg/L (as $CaCO_3$)
Maximum Assumed Upstream Receiving Water Lead Concentration	3.2 µg/L[1]
Lead ECA_{acute}[2]	2.4 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%	99.8	3.2	3.2
5%	99.0	3.1	3.1
15%	97.0	3.1	3.1
25%	95.0	3.0	3.0
50%	90.0	2.8	2.8
75%	85.0	2.6	2.6
100%	80.0	2.4	2.4

[1] Maximum assumed upstream receiving water lead concentration calculated using Equation 1 for chronic criterion at a hardness of 100 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 and the acute 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.

Using Equation 3 to calculate the ECA for all Concave Up Metals will result in water quality-based effluent limitations that are protective under all potential effluent/receiving water mixing scenarios and under all known hardness conditions, as demonstrated in Tables F-7 and 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 lowest upstream receiving water hardness) is also protective, but would lead to unreasonably stringent effluent limits considering the known conditions. Therefore, Equation 3 has been used to calculate the ECA for all Concave Up Metals in this Order.

Table F-9 summarizes the ECAs calculated for all hardness-dependant metals.

Table F-9. Summary of ECA Evaluations

Metals	Effluent Concentration Allowances, ECAs (ug/L) as total recoverable metals	
	acute	chronic
Copper	11	7.7
Chromium III	1500	72
Cadmium	3.3	2.1
Lead	54	2.1
Nickel	390	43
Silver	1.8	--
Zinc	99	99

d. Conversion Factors. The CTR contains aquatic life criteria for arsenic, cadmium, chromium III, chromium VI, copper, lead, nickel, silver, and zinc which are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The default USEPA conversion factors contained in Appendix 3 of the SIP were used to convert the applicable dissolved criteria to total recoverable criteria.

e. Dilution Credits/Mixing Zones. The SRCSD has requested mixing zones and dilution credits for compliance with acute and chronic aquatic life water quality criteria, and human carcinogen water quality criteria. The Central Valley Water Board has the discretion to accept or deny mixing zones and dilution credits. The CWA directs states to adopt water quality standards to protect the quality of its waters. USEPA's current water quality standards regulation authorizes states to adopt general policies, such as mixing zones, to implement state water quality standards (40 CFR section 122.44 and section 122.45). The USEPA allows states to have broad flexibility in designing its mixing zone policies. Primary policy and guidance on determining mixing zone and dilution credits is provided by the SIP and the Basin Plan. If no procedure applies in the SIP or the Basin Plan, then the Central Valley Water Board may use the USEPA Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001) (TSD).

The TSD defines a mixing zone as follows, "…*a mixing zone is an area where an effluent discharge undergoes initial dilution and is extended to cover the secondary mixing in the ambient waterbody. A mixing zone is an allocated impact zone where water quality criteria can be exceeded as long as acutely toxic conditions are prevented.*"[1] The SIP provides guidance on mixing zones and dilution credits in establishing water quality-based effluent limitations. Water quality criteria and objectives must be met throughout a water body except within a mixing zone. All mixing zones shall be as small as practicable and must meet specific conditions. The allowance of mixing zones by the Central Valley Water

1 TSD, Glossary

summer flows average 10,000 cfs, they can fall below 4,000 cfs. Daily flow probabilities for the Sacramento River at Freeport, based on U.S. Geologic Survey gauged flow data from 1942-1989, indicate that there is only a 10% probability of flows less than or equal to 10,000 cfs, and a 10% probability of flows greater than 70,000 cfs. Therefore, typical flows in the Sacramento range from 10,000 to 70,000 cfs. The critical low flows for the Sacramento River based on flow data at Freeport from 1970 to 2009 are shown in Table F-10, below.

Table F-~~10~~9. Critical Receiving Water Flows

Critical Low Flows	Receiving Water Flow (cfs)
1Q10[1]	5060
7Q10[2]	5846
30Q5[3]	8234
Harmonic Mean[4]	15733

[1] Lowest daily average flow with a return frequency of 10 years.
[2] Lowest 7-day average flow with a return frequency of 10 years.
[3] Lowest 30-day average flow with a return frequency of 5 years.
[4] At Freeport from 1 January 1970 through 31 December 2009.

ii. **Water Quality Models.** For completely-mixed discharges, the Central Valley Water Board may grant a mixing zone and apply a dilution credit in accordance with Section 1.4.2.1 of the SIP, based on the dilution ratio. For incompletely-mixed discharges, the Discharger must perform a mixing zone study to demonstrate to the Central Valley Water Board that a dilution credit is appropriate. The SRWTP discharge is considered an incompletely-mixed discharge, so the Discharger conducted a mixing zone study. A mathematical dynamic model was developed by Flow Sciences Incorporated and consists of five models linked in series, with the output from previous models used as part of the inputs to subsequent models. The models are linked as shown in Figure F-1 and are described below.

PROSIM – *U.S. Bureau of Reclamation's Project Simulation Model*. PROSIM simulates the existing hydrologic conditions in the Delta study area and was used to calculate the 70-year period of record (1922-1991) that served as the basis for the SRCSD study. Flow and storage calculated by PROSIM was used as input to the Temperature Models. Also, output from PROSIM were used as input to the Fischer Delta Model (FDM) and includes: export pumping rates from Tracy and Banks; Contra Costa Water District pumping at Rock Slough and Old River; North Bay Aqueduct pumping; City of Vallejo pumping; net Delta consumptive use; Delta Cross Channel position; and Delta inflows from Yolo Bypass, San Joaquin River, Calaveras River, Cosumnes River, Mokelumne River, and Sacramento River.

Temperature Models – *U.S. Bureau of Reclamation models*. The Bureau of Reclamation has developed temperature models for five reservoirs (Trinity,

The allowance of acute or chronic mixing zones for ammonia do not meet these requirements, because ammonia discharges from the Facility have been shown to be negatively affecting the receiving water far downstream of the discharge within the Delta, not just the areas defined by the requested mixing zones. The allowance of the requested mixing zones for ammonia would comprise the integrity of the entire water body, adversely impact biologically sensitive or critical habitats, and produce undesirable or nuisance aquatic life.

Acute and chronic aquatic life dilution credits for ammonia have not been granted. This Order requires full nitrification for removal of ammonia. See Section IV.C.3 of the Fact Sheet for a detailed discussion.

Copper – Assimilative capacity is available for copper in the receiving water. However, based on facility performance, dilution credits for copper are not needed, therefore, dilution credits have not been allowed for copper. Table F-10~~1~~, below, shows the WQBELs calculated using SRCSD's dynamic model with the allowance of ~~acute and~~ chronic aquatic life dilution, end-of-pipe effluent limitations using a reasonable worst-case steady-state approach, and the Facility's performance. This information demonstrates the Facility can meet end-of-pipe effluent limitations, therefore, no dilution credits have been allowed for copper.

Table F-~~16~~10. WQBELs for Copper

	Average Monthly Effluent Limitation	Maximum Daily Effluent Limitation
Dynamic Modeling	7.7 µg/L	9.8 µg/L
Steady-State Approach	~~7.3~~7.4 µg/L	~~9.3~~10 µg/L
Facility Performance[~~1~~]	~~6.8~~ 6.5 µg/L (maximum observed monthly average)	8.1 µg/L (99.9th percentile)[1]

[1] Projected 99.9th percentile of effluent copper data from 1 January 2012 to 31 December 2014~~June 2005-October 2009~~

Cyanide – Table F-11~~2~~, below, shows the WQBELs for cyanide calculated using SRCSD's dynamic model with the allowance of acute and chronic aquatic life dilution, WQBELs calculated using SRCSD's dynamic model with the allowance of only chronic aquatic life dilution, end-of-pipe effluent limitations using a reasonable worst-case steady-state approach, and the Facility's performance. This information demonstrates the Facility cannot meet end-of-pipe effluent limits, but can meet WQBELs calculated with the allowance of chronic aquatic life dilution. Acute aquatic life dilution is not needed for cyanide. Assimilative capacity is available for cyanide in the receiving water, and, as discussed above, the chronic aquatic life mixing zone meets the requirements of the SIP and Basin Plan. Therefore, the WQBELs for cyanide have been developed considering the allowance of chronic aquatic life dilution.

Table F-~~17~~11. WQBELs for Cyanide

	Average Monthly Effluent Limitation	Maximum Daily Effluent Limitation
Dynamic Modeling (acute and chronic dilution)	21 µg/L	40 µg/L
Dynamic Modeling (chronic dilution only)	11 µg/L	22 µg/L
Steady-State Approach	4.3 µg/L	8.3 µg/L
Facility Performance[1]	11 µg/L	

[1] Projected 99.9th percentile of effluent cyanide data from June 2005-October 2009

Chlorpyrifos – A TMDL has been adopted for chlorpyrifos and diazinon and includes waste load allocations (WLA) for NPDES dischargers. The WLA have been adopted in the Basin Plan as water quality objectives and dilution are not allowed. Therefore, end-of-pipe effluent limitations based on the Basin Plan water quality objectives are required by the Basin Plan.

Aluminum– Based on existing effluent data from ~~June 2005~~January 2012 – ~~October 2009~~December 2014, the Facility can meet end-of-pipe effluent limitations for aluminum of 200 µg/L annual average. Therefore, a dilution credit has not been allowed. Additionally, there is no assimilative capacity in the receiving water. The Sacramento River maximum aluminum concentrations are over ~~8000~~ 900 µg/L. The Discharger collected ~~61~~ 104 effluent samples during this time period resulting in samples ranging from ~~12~~ 5.7 to ~~35.2~~38 µg/L. ~~The effluent sampling was part of the three times per year sampling required in the previous permit, which required daily sampling for one week three times per year.~~ The discharge never exceeded the new ~~AMEL or MDEL~~effluent limitations.

Carbon tetrachloride - Based on existing effluent data from June 2005- October 2009, it appears that the Facility cannot meet end-of-pipe effluent limitations for carbon tetrachloride of 0.25 µg/L and 0.50 µg/L, as an average monthly effluent limitation (AMEL) and maximum daily effluent limitation (MDEL), respectively. The Discharger collected 101 samples during this time period resulting in 95 non-detect samples (i.e., ranging from <0.06 µg/L to <0.5 µg/L), three J-flagged estimates of 0.1 µg/L, 0.1 µg/L, and 0.2 µg/L, and three samples above the reporting level at 0.5 µg/L, 1.4 µg/L, and 1.7 µg/L. The effluent sampling was part of the three times per year sampling required in the previous permit, which required daily sampling for one week three times per year. Assimilative capacity is available for carbon tetrachloride in the receiving water, and, as discussed above, the human health mixing zone meets the requirements of the SIP and Basin Plan. Therefore, the WQBELs for carbon tetrachloride have been developed considering the allowance of human carcinogen dilution credits.

Table F-~~18~~12. Salinity Water Quality Criteria/Objectives

Parameter	Agricultural WQ Goal[1]	Secondary MCL[3]	Average Ambient Background	Effluent	
				Average	Maximum
EC (µmhos/cm)	Varies[2]	900, 1600, 2200	163	764	960
TDS (mg/L)	Varies	500, 1000, 1500	98	410	540
Sulfate (mg/L)	Varies	250, 500, 600	--	90	110
Chloride (mg/L)	Varies	250, 500, 600	5.1	90	100

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.

Table F-~~19~~13. Basin Plan Water Quality Objectives for EC Sacramento River at Emmaton, Based on Water Year Type (maximum 14-day running average of mean daily EC in µmhos/cm)

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 14 June	450	450	450	450	2780
15 June – 19 June	450	450	450	1670	2780
20 June – 30 June	450	450	1140	1670	2780
1 July - 15 August	450	630	1140	1670	2780

For priority pollutants, the SIP dictates the procedures for conducting the RPA. EC, TDS, chloride, and sulfate are not priority pollutants. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used best professional judgment in determining the appropriate method for conducting the RPA for these non-priority pollutant salinity constituents. For conducting the RPA, the USEPA recommends using a mass-balance approach to determine the expected critical downstream receiving water concentration using a steady-state approach[1]. This downstream receiving water concentration is then compared to the applicable water quality objectives to determine if the discharge has reasonable potential to cause or contribute to an in-stream excursion. This approach allows assimilative capacity and dilution to be factored into the RPA. This USEPA recommended approach has been used for these salinity constituents. The

[1] USEPA NPDES Permit Writers' Course (EPA 833-B-97-001 rev. October 2009)

November 2000 to July 2008. The maximum instream EC concentration is 283 µmhos/cm, using Equation 2, above. The maximum instream EC concentration is less than all applicable water quality objectives for EC. Therefore, there is no reasonable potential for the discharge to cause or contribute to an instream excursion of the applicable water quality objectives for EC.

(c) Sulfate. Sulfate concentrations in the effluent ranged from 50 mg/L to 110 mg/L, with an average of 90 mg/L. Background concentrations in the Sacramento-San Joaquin Delta were not monitored. However, based on the low chloride, electrical conductivity, the sulfate concentrations are probably also low. There is no reasonable potential for the discharge to cause or contribute to an instream excursion of the applicable water quality objectives for sulfate.

(d) Total Dissolved Solids. The average TDS effluent concentration was 410 mg/L with concentrations ranging from 200 mg/L to 540 mg/L. The projected maximum effluent concentration, calculated as discussed above, is 547 mg/L. The background receiving water TDS ranged from 35 mg/L to 180 mg/L, with an average of 98 mg/L. The maximum instream TDS concentration is 192 mg/L, using Equation 2, above. The maximum instream TDS concentration is less than all applicable water quality objectives for TDS. Therefore, there is no reasonable potential for the discharge to cause or contribute to an instream excursion of the applicable water quality objectives for TDS.

Based on the relatively low reported salinity, the discharge does not have reasonable potential to cause or contribute to an in-stream excursion of water quality objectives for salinity. However, since the discharge is to the Sacramento-San Joaquin Delta, an additional concern is the salt contribution to Delta waters. Allowing the Discharger to increase its current salt loading may be contrary to the Region-wide effort to address salinity in the Central Valley. Therefore, this Order includes a performance-based effluent limitation of 900 µmhos/cm for EC to be applied as an annual average to limit the discharge to current levels. This performance-based effluent limitation was calculated as the 99.9th percentile of the running annual average effluent EC based on effluent data from June 2006 through April 2010.

In order to ensure that the Discharger will continue to control the discharge of salinity, this Order includes a requirement to develop and implement a salinity evaluation and minimization plan. Also water supply monitoring is required to evaluate the relative contribution of salt from the source water to the effluent.

iv. Lead.

(a) WQO. The CTR includes hardness-dependeant criteria for the protection of freshwater aquatic life for lead. The criteria for lead are presented in

dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentration to total concentrations. The USEPA default conversion factors for lead were used for the discharge.

(b) RPA Results. For the effluent, the applicable lead chronic criterion (maximum 4-day average concentration) is 2.~~1~~ 3 µg/L and the applicable acute criterion (maximum (1-hour concentration) is ~~54~~ 60 µg/L, as total recoverable, (see Table F-~~9~~ 6, above). ~~The MEC for total lead was 1.19 µg/L, b~~Based on data collected between ~~June~~ January ~~2005~~ 2012 and ~~July~~ December ~~2008~~2014, the MEC for total lead was 0.5 µg/L. For the receiving water, ~~the applicable lead chronic criterion is 0.57 µg/L and the applicable acute criterion is 15 µg/L, as total recoverable, based on a hardness of 26 mg/L (as $CaCO_3$), using USEPA default translators. The maximum observed~~ upstream total lead concentration ~~was~~ varied from 0.120.067 µg/L to 1.3 µg/L~~, . based on data from 1992-2008~~Using paired hardness and lead data, the maximum ambient receiving water concentration did not exceed the applicable CTR criteria for lead. .~~ Based on this information, lead in the discharge does not exhibit reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

v. Silver.

(a) WQO. The CTR includes hardness-dependeant criteria for the protection of freshwater aquatic life for silver. The criteria for silver are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentration to total concentrations. The USEPA default conversion factors for silver were used for the discharge.

(b) RPA Results. For the effluent, the applicable silver acute criterion (maximum (1-hour concentration) is ~~1.8~~2.3 µg/L, as total recoverable, (see Table F-~~9~~ 6, above). The MEC for total silver was 0.~~15~~ 046 µg/L, based on data collected between January 2012 and December 2014~~June 2005 and July 2008~~. For the receiving water, ~~the applicable silver acute criterion is 0.4~~ 63 µg/L, as total recoverable, based on a hardness of 26 34 ~~mg/L (as $CaCO_3$), using USEPA default translators. The maximum observed~~all upstream total silver concentrations ~~was~~ were 0.02 µg/L~~non~~ detect, based on data from 2012-2014~~1992-2008~~. Using paired hardness and silver data, the maximum ambient receiving water concentration did not exceed the applicable CTR criteria for silver. Based on this information, silver in the discharge does not exhibit reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

vi. Zinc.

(a) WQO. The CTR includes hardness-dependeant criteria for the protection of freshwater aquatic life for zinc. The criteria for zinc are presented in

dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentration to total concentrations. The USEPA default conversion factors for ~~silver~~ zinc were used for the discharge.

(b) RPA Results. For the effluent, the applicable zinc chronic criterion (maximum 4-day average concentration) is ~~99~~ 103 µg/L and the applicable acute criterion (maximum (1-hour concentration) is ~~99~~ 103 µg/L, as total recoverable, (see Table F-~~9~~ 6, above). The MEC for total zinc was ~~33.5~~41 µg/L, based on data collected between January 2012 and December 2014~~June 2005 and July 2008~~. For the receiving water, ~~the applicable zinc acute and chronic criterion is 38 µg/L, as total recoverable, based on a hardness of 26 mg/L (as $CaCO_3$), using USEPA default translators. The maximum observed~~ upstream total zinc concentrations varied from X µg/L to 9.7µg/L ~~was 2~~.17 µg/L, based on data from 2012-2014~~1992-2008~~. Using paired hardness and zinc data, the maximum ambient receiving water concentration did not exceed the applicable CTR criteria for zinc. Based on this information, zinc in the discharge does not exhibit reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

vi. 1,2-Diphenyl-hydrazine

(a) WQO. The CTR includes a criterion of 0.04 µg/L for 1,2-diphenyl-hydrazine for the protection of human health for waters from which both water and organisms are consumed.

(b) RPA Results. The maximum observed upstream receiving water concentration was not detected out of 17 samples at a MDL of <0.1 µg/L. The maximum effluent concentration (MEC) for 1,2-diphenyl-hydrazine was 2.8 µg/L J-flagged on 8 June 2007 with another J-flagged of 2.1 µg/L on 9 June 2007 out of 85 samples. However, the Discharger submitted a technical memorandum (TM) from Larry Walker Associates dated 26 May 2010 that provided evidence that the two detected samples are not representative of the effluent. The TM found that, "1,2-diphenyl-hydrazine rapidly oxidizes to azobenzene in water. The Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profile[1] reports that analysis of 1,2-diphenylhydrazine in wastewater is "virtually meaningless" because, due to this oxidation, the concentration measured in the sample cannot be directly related to the actual concentration at the time of collection. One study referenced in the ATSDR toxicological profile reported that 1,2-diphenylhydrazine, '. . . instantaneously decomposes to azobenzene in the GC injection port,' and therefore gas chromatography (GC) is not suitable for detecting 1,2-diphenyl-hydrazine." This information puts into question the two j-flagged samples that were measured using EPA Method 625, which is a gas chromatography

[1] ATSDR, 1990. Toxicological Profile for 1,2,-Diphenylhydrazine. Available at: http://www.atsdr.cdc.gov/toxprofiles/tp136.html.

(b) RPA Results. The maximum effluent concentration (MEC) for acid soluble aluminum was ~~35.2~~38 µg/L out of ~~61~~ 104 samples while the maximum observed upstream receiving water total concentration was ~~8800~~ 900 µg/L out of ~~32~~ 12 samples. Therefore, aluminum in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above both the NAWQC~~A~~ chronic water quality object and the secondary MCL.

(c) WQBELs. Due to no assimilative capacity, dilution credits are not allowed for development of the WQBELs for aluminum. This Order contains a final annual average effluent limitation for aluminum of 200 µg/L based on the secondary MCL. In addition, an AMEL of ~~503~~ 470 µg/L and AWEL of 683 µg/L, ~~and MDEL of 750 µg/L~~ has been applied based on USEPA's NAWQC for aluminum for protection of aquatic life.

(d) Plant Performance and Attainability. Analysis of the effluent data shows that the MEC of ~~35.2~~38 µg/L is less than the applicable WQBELs. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

ii. Ammonia

(a) WQO. 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. Because the Sacramento-San Joaquin Delta has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages in the Sacramento-San Joaquin Delta is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used.

(b) RPA Results. 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 does not currently use nitrification to remove ammonia from the waste stream. Ammonia is known to cause acute and/or chronic toxicity to aquatic organisms. Therefore, the discharge has reasonable potential to cause or contribute

observed upstream receiving water concentration was 0.21 µg/L out of 43 samples. Therefore, tetrachloroethylene in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of human health.

(c) WQBELs. The receiving water contains assimilative capacity for pentachlorophenol, therefore, a dilution credit of 56:1 was allowed in the development of the WQBELs for tetrachloroethylene. Based on the allowable dilution credit, an AMEL of 37 µg/L and a MDEL of 75 µg/L is calculated. The Central Valley Water Board finds that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilation capacity of tetrachloroethylene and could violate the Antidegradation Policy. For this reason, a performance-based effluent limitation is calculated (See Table F-19. Performance-based Effluent Limitations Statistics). This Order contains a final MDEL for tetrachloroethylene of 4.4 µg/L.

(d) Plant Performance and Attainability. Analysis of the effluent data shows that the MEC of 0.9 µg/L is less than the applicable WQBELs. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

xi. Copper

(a) WQO. The CTR includes hardness-dependeant criteria for the protection of freshwater aquatic life for copper. The criteria for copper are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentration to total concentrations. The USEPA default conversion factors for copper in freshwater of 0.96 for both the acute and the chronic criteria were used for the discharge.

(b) RPA Results. For the effluent, the applicable copper chronic criterion (maximum 4-day average concentration) is 7.78.0 µg/L and the applicable acute criterion (maximum (1-hour concentration) is 11 12 µg/L, as total recoverable, (see Table F-9, above). The MEC for total copper was 6.3410 µg/L, based on data collected between June 2005 and July 2008January 2012 and December 2014. For the receiving water, upstream total copper concentration varied from 0.89 µg/L to 5.8 µg/L. Using paired hardness and copper data, the maximum ambient receiving water concentration did not exceed the applicable CTR criteria for copper. the applicable copper chronic criterion is 3.0 µg/L and the applicable acute criterion is 4.0 µg/L, as total recoverable, based on a hardness of 26 mg/L (as $CaCO_3$), using USEPA default translators. The maximum observed upstream total copper concentration was 20.4 µg/L, based on data from 1992-2008. Based on this information, copper in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

upstream total copper concentration varied from 0.89 µg/L to 5.8 µg/L. Based on paired hardness and copper data, the maximum ambient receiving water concentration did not exceed the applicable CTR criteria for copper.

(c) WQBELs. As discussed in Section IV.C.3.d.vi of the Fact Sheet, the Facility can meet end-of-pipe effluent limits for copper. Therefore, dilution credits have not been applied in the calculation of the WQBELs.

Using the acute and chronic ECAs for copper shown in Table F-~~9~~ 6, above, this Order contains final Average Monthly Effluent Limitations (AMEL) and Maximum Daily Effluent Limitations (MDEL) for copper of ~~7.3~~7.4 ~~-~~µg/L and ~~9.3~~10 µg/L (total recoverable), respectively.

(d) Plant Performance and Attainability. ~~Analysis of the effluent data shows that the MEC of 6.7 µg/L is less than the applicable WQBELs.~~ The Central Valley Water Board concludes, ~~therefore~~based on an analysis of the effluent data, that immediate compliance with these effluent limitations is feasible.

xii. Cyanide

(a) WQO. The CTR includes maximum 1-hour average and 4-day average criteria of 22 µg/L and 5.2 µg/L, respectively, for cyanide for the protection of freshwater aquatic life.

(b) RPA Results. The maximum effluent concentration (MEC) for cyanide was 10 µg/L while the maximum observed upstream receiving water concentration was 5.0 µg/L. Therefore, cyanide in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for the protection of freshwater aquatic life.

(c) WQBELs. As discussed in Section IV.C.3.d.vi of the Fact Sheet, based on Facility performance acute aquatic life dilution is not needed and has not been allowed for cyanide. However, chronic aquatic life dilution may be allowed for cyanide. Based on results of the Discharger's dynamic model for compliance with the CTR criteria for cyanide at the edge of the chronic aquatic life mixing zone, MDEL of 22 µg/L, and an AMEL of 11 µg/L is calculated. The Central Valley Water Board finds that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilation capacity of cyanide and could violate the Antidegradation Policy. For this reason, a performance-based effluent limitation is calculated (See Table F-19. Performance-based Effluent Limitations Statistics). This Order contains a maximum daily effluent limitation (MDEL) for cyanide of 11 µg/L.

(d) Plant Performance and Attainability. Analysis of the effluent data shows that the MEC of 10 µg/L is less than the MDEL. The Central Valley

(b) RPA Results. The highest daily temperature of the discharge was more than 20° F above the natural receiving water temperature. The discharge is an elevated temperature waste, which could cause or threaten to cause the receiving water temperature to exceed temperature objectives established in the Thermal Plan. Therefore, reasonable potential exists for temperature and WQBELs are required.

~~**(b)** The SRWTP discharges to the Sacramento River via a 400-foot outfall (300-foot diffuser with 74 ports) that is placed on the bottom of the river perpendicular to the river flow. The Sacramento River in the vicinity of the discharge is approximately 600 feet wide at the surface, about 400 feet wide at the bottom and 25 - 30 feet deep. The Sacramento River at the point of discharge experiences tidal flows that slow the river flow, and at times cause flow reversals. The existing NPDES permit adopted in 2000 (Order No. 5-00-188), prohibits river discharge when the flow ratio (Sacramento River: effluent) is less than 14:1. The existing permit also prohibits discharge when river flows are less than 1,300 cubic feet per second (cfs). These discharge prohibitions are based on the design of the outfall diffuser to ensure adequate mixing of effluent with river water. When either of these two conditions exists, the SRCSD ceases its surface water discharge and diverts treated effluent to storage basins.~~

~~The Lower Sacramento River and Delta serve as a migration corridor and/or provide other types of habitat (e.g., spawning, rearing) for many anadromous fish species. In addition, the lower Sacramento River supports numerous resident native and introduced fish species and diverse assemblage of BMIs, an important source for many adult and juvenile fishes. The following table lists those species of concern that may be impacted within the vicinity of the discharge:~~

~~Common Name~~	~~Scientific Name~~	~~Anadromous/ Resident~~	~~Status~~
~~Chinook salmon~~	~~Onocorhynchus Ishawytscha~~		
~~Fall-run~~	~~Onocorhynchus Ishawytscha~~	~~Anadromous~~	~~FSC~~
~~Late-fall run~~	~~Onocorhynchus Ishawytscha~~	~~Anadromous~~	~~CSC, FSC~~
~~Spring-run~~	~~Onocorhynchus Ishawytscha~~	~~Anadromous~~	~~ST, FT~~
~~Winter-run~~	~~Onocorhynchus Ishawytscha~~	~~Anadromous~~	~~SE, FE~~
~~Steelhead trout~~	~~O. mykiss~~	~~Anadromous~~	~~FT~~
~~Green sturgeon~~	~~Acipenser medirostros~~	~~Anadromous~~	~~FC, CSC/C1~~
~~Striped bass~~	~~Morone saxatills~~	~~Anadromous~~	~~I~~
~~American shad~~	~~Alsoa sapidissima~~	~~Anadromous~~	~~I~~
~~White sturgeon~~	~~A. transmontanus~~	~~Anadromous~~	~~N~~
~~River lamprey~~	~~Lampetra ayresi~~	~~Anadromous~~	~~CSC/C2~~
~~Pacific lamprey~~	~~L. tridentate~~	~~Anadromous~~	~~FSC~~
~~Hardhead~~	~~Mylopharidib conocephalus~~	~~Resident~~	~~CSC/C2~~
~~Splittail~~	~~Pogonichthys macrolepdiotus~~	~~Resident~~	~~CSC~~
~~Delta smelt~~	~~Hypomesus traspacificus~~	~~Resident~~	~~FT, SE~~
~~Status Codes~~	~~FE = Federally listed as endangered~~	~~ST = Listed as threatened by California~~	

	FT = Federally listed as threatened FSC = Federal Species of Concern SE = Listed as endangered by California N= Native species, no State or federal status	CSC= CA Species of Concern C1=Should be listed as threatened or endangered C2 = Declining, potentially threatened I= Introduced, no State or federal status

As a condition of Waste Discharge Order No. 5-00-188, the Discharger completed and submitted a study assessing the thermal impacts of its discharge in the Sacramento River to the National Marine Fisheries Services (NMFS), titled "Thermal Effects of Sacramento Regional Wastewater Treatment Plant Discharges on Migrating Fishes of the Sacramento River, February 2005." This thermal impact assessment recommended continuation of the existing thermal plan exemptions. The 2005 Thermal Study was previously reviewed by NMFS staff and they did not indicate any concerns with the proposed Thermal Plan exception. Since this time, however, conditions under which the evaluation was made have changed. There has been a significant pelagic organism decline in the Delta, new species are threatened and there has been a change in the diffuser configuration. In December 2009, the Discharger requested revised changes to their Thermal Plan exemption. In June 2010, the Discharger in a letter to the Central Valley Water Board withdrew its request for an expanded wastewater treatment plant. Due to these changes the Discharger prepared a new study, "Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant", July 2010. With this revised July 2010 study, new thermal plan exemptions were requested.

Table F-15 below outlines the Thermal Plan requirements, the Thermal Plan exception allowed in the current NPDES permit (Order 5-00-188), and the Discharger's most recent proposed Thermal Plan exception request for the NPDES permit renewal.

Table F-15. Existing and Proposed Thermal Plan Exception Requirements

Thermal Plan Requirements (Section 5.A.(1)a-c)	Existing NPDES Permit Requirements (181 mgd discharge)	SRCSD Proposed NPDES Requirements (181 mgd)
5.A.(1)a The maximum effluent temperature shall not exceed the natural receiving water temperature by more than 20°F	The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than: 25°F from 1 October through 30 April; -or- 20°F from 1 May through 30 September *(meets Thermal Plan requirements)*	The daily average temperature of the effluent shall not exceed the daily average natural receiving water temperature by more the 20°F 1 April through 30 September, or by more the 25°F 1 October through 31 March
5.A.(1)b Elevated temperature waste discharges either individually or combined with other discharges shall not create a zone, defined by water	If the natural receiving water temperature is less than 65º F: The discharge shall not create a zone, defined by water temperature of more than **2°F** above the natural receiving water temperature, which exceeds 25 percent of the cross sectional area of the River at any point outside the	The discharge shall not create a zone, defined by water temperatures of more than 2.5°F above natural receiving water temperature, which exceeds 50 percent of the cross-sectional area of the river at any point, evaluated as a daily average.

temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.	zone of initial dilution. If the natural receiving water temperature is 65° F or greater: Meets Thermal Plan requirements at any point outside the zone of initial dilution.	
5.A.(1)c No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.	No Exception (*Meets Thermal Plan Requirements)*	No Exception (*Meets Thermal Plan Requirements)*

The July 2010 thermal plan exception justification study is based on the dynamic model for temperature performed by Flow Science. The modeled temperature plumes show a zone of passage at the surface of the Sacramento River approximately 75-100 feet wide on the west bank and 175-200 feet wide on the east bank. The surface width of the river at the diffuser is 600 feet. The zone of passage at the bottom of the river is smaller due to the configuration of the west bank. The study concluded that both surface water swimming fish and bottom water swimming fish would avoid the heated plume by swimming around or on top of it.

According to the United States Fish and Wildlife Service, the range of delta smelt extends from San Pablo Bay upstream to about Verona on the Sacramento River, though the majority of the population occupies from western Suisun Bay to about the City of Sacramento. Delta smelt enter the Sacramento River and Deep Water Ship Channel year round and specifically from late December to June to spawn in temperatures between about 12-18°C. Pre-spawning adults could be expected in the vicinity of the City of Sacramento from the latter part of December through June. Some larvae could be expected in the vicinity of the City of Sacramento during February through June. During the larval stage delta smelt are at their most vulnerable to zones of poor water quality or high water temperature due to their small size and limited mobility.

The Critical Thermal Maxima (CTM) is the temperature for a given species above which most individuals respond with unorganized locomotion and is considered to be the lethal temperature, for juvenile and adult delta smelt it is reported as 25.4°C (77.7°F)[1]. Delta smelt egg survival decreases at

[1] Swanson, Christina, Turid Reid, Paciencia S. Young and Joseph J. Cech, Jr. 2000. Comparative environmental tolerances of threatened delta smelt (Hypomesus transpacificus) and introduced wakasagi (H. nipponensis) is an altered California estuary. Oecologia 123: 384-390.

[2] Bennett, WA. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3.

~~temperatures above 15-16°C (about 60°F) and is greatly reduced by 20°C (68°F)[2]. Other ways to affect aquatic organisms include the rate of temperature change and the organism's ability to avoid or move to more favorable temperatures.~~

~~Central Valley Water Board staff requested the National Marine Fisheries Service (NMFS), the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Game Wildlife (CDFW) evaluate the July 2010 study and make recommendations on the thermal plan exception request by the Discharger.~~

~~The USFWS expressed several concerns about the lack of knowledge on the synergistic effects of multiple pollutants, like chemical and thermal contamination. The concern that potential of thermal discharges may create winter refugia for non-native predator species and uncertainty about the near-field thermal conditions and delta smelt's migration behavior.~~

~~The USFWS recommends the exception from WDR Order No. 5-00-188 be retained and no further exception be permitted for protection of Delta smelt. Additionally, the USFWS recommends the Discharger initiate planning to address future increases in the discharge with consideration for changes in the Sacramento River as a result of climate change without the need for sequential Thermal Plan exceptions. To determine whether permitted conditions are protective of delta smelt and Sacramento River biota, tThe USFWS requesteds specific monitoring and studies be conducted and include the following:~~

- ~~**(1)** Continuous monitoring of the thermal discharge in coordination with mixing zone monitoring during December-June.~~
- ~~**(2)** Study using hydroacoustic technology to determine if there are aggregations of large fish or schools of small fish in the zone of elevated water temperature that are atypical compared to other nearby mid-channel river reaches.~~
- ~~**(3)** Acute and chronic testing with rainbow trout bi-weekly during December-June for two years with ambient water upstream of Freeport Bridge and 65 feet for acute and 360 feet for chronic downstream of the diffuser.~~

(c) WQBELs. The temperature effluent limitation is carried forward from the previous Order ~~.~~ and the WQBELs for temperature are consistent with the Thermal Plan exception, as follows:

The maximum temperature of the discharge shall not exceed the natural receiving water temperature at RSWU-001 by more than 20°F from 1 May

through 30 September and more than 25°F from 1 October through 30 April.

~~(c)~~**(d) Plant Performance and Attainability.** The temperature effluent limitation is carried forward from the previous Order. The Discharger has demonstrated continuous compliance with the effluent limitation. Therefore, based on existing performance the Facility can immediately comply with the temperature effluent limit.

4. WQBEL Calculations

a. This Order includes WQBELs for copper, ammonia, cyanide, carbon tetrachloride, chlorodibromomethane, dichlorobromomethane, methylene chloride, tetrachloroethylene, pentachlorophenol, bis(2-ethylhexyl) phthalate, dibenxon(ah)anthracene, aluminum, nitrate, nitrite, manganese, MTBE, mercury, temperature, settleable solids, diazinon, and chlorpyrifos. As discussed above in Section IV.C.2.d, the Discharger developed a dynamic mathematical model to evaluate near-field dilution and a mixing zone for compliance with chronic aquatic life criteria has been granted. The Discharger's dynamic model has been used to calculate the WQBELs for cyanide. For the remaining constituents a steady-state approach has been used to calculate the WQBELs. The general steady-state methodology for calculating WQBELs based on the different criteria/objectives is described in subsections IV.C.4.b through e, below. See Attachment H for the WQBEL calculations. The methodology for calculating WQBELs using the dynamic model is discussed in subsection IV.C.4.f, below.

b. Effluent Concentration Allowance. For each water quality criterion/objective, the ECA is calculated using the following steady-state mass balance equation from Section 1.4 of the SIP:

$ECA = C + D(C - B)$ *where C>B, and*
$ECA = C$ *where C≤B*

where:
ECA = effluent concentration allowance
D = dilution credit
C = the priority pollutant criterion/objective
B = the ambient background concentration.

According to the SIP, the ambient background concentration (B) in the equation above shall be the observed maximum with the exception that an ECA calculated from a priority pollutant criterion/objective that is intended to protect human health from carcinogenic effects shall use the arithmetic mean concentration of the ambient background samples. For ECAs based on MCLs, which implement the Basin Plan's chemical constituents objective and are applied as annual averages, an arithmetic mean is also used for B due to the long-term basis of the criteria.

and averaging period (e.g., acute criteria are typically based on a 1-hour average exposure and chronic criteria are based on a 4-day exposure).

(3) The LTA and CV are used to derive MDELs and AMELs using the steady-state procedures described in Step 5 of Section 1.4 of the SIP. WQBELs are calculated using the LTA_{acute} and $LTA_{chronic}$ and the more stringent WQBELs are applied.

Summary of Final Effluent Limitations
Discharge Point No. EFF- 001

Table F-~~20~~14. Summary of Final Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Conventional Pollutants						
Biochemical Oxygen Demand, 5-day @ 20°C	mg/L	10	15	20	--	--
	lbs/day[1]	15,100	22,700	30,200	--	--
	% Removal	85	--	--	--	--
Total Suspended Solids	mg/L	10	15	20	--	--
	lbs/day[1]	15,100	22,700	30,200	--	--
	% Removal	85	--	--	--	--
pH	standard units	--	--	--	6.0	8.5
Priority Pollutants						
Bis(2-ethylhexyl)phthalate	µg/L	--	--	13		
Carbon Tetrachloride	µg/L	--	--	5.3	--	--
Chlorodibromomethane	µg/L	--	--	2.2/12[11]	--	--
Copper, Total Recoverable	µg/L	~~7.3~~7.4	--	~~9.3~~10	--	--
Cyanide	µg/L	--	--	11	--	--
Dibenzo(ah)anthracene	µg/L	0.2	--	0.4	--	--
Dichlorobromomethane	µg/L	--	--	3.4/35[11]	--	--
Methylene Chloride	µg/L	4.7	--	11	--	--
Mercury, Total Recoverable	lbs/year	2.3[10]	--	--	--	--
Pentachlorophenol	µg/L	--	--	18	--	--
Tetrachloroethylene	µg/L	--	--	4.4	--	--
Non-Conventional Pollutants						
Settleable Solids	ml/L	0.1	--	0.2	--	--
Aluminum, Total Recoverable[2]	µg/L	~~503~~470	~~--~~683	~~750~~--	--	--
Ammonia Nitrogen, Total (as N) (Apr-Oct)	mg/L	1.5	--	2.0	--	--
	lbs/day[1]	2264	--	3019	--	--
Ammonia Nitrogen, Total (as N) (Nov-Mar)	mg/L	2.4	--	3.3	--	--
	lbs/day[1]	3622	--	4981	--	--

The Monitoring and Reporting Program of this Order requires quarterly chronic WET monitoring for demonstration of compliance with the narrative toxicity objective. In addition to WET monitoring, the Special Provision in section VI.C.2.a. of the Order requires the Discharger to submit to the Central Valley Water Board an updated TRE Workplan for approval by the Executive Officer. The provision also includes a numeric toxicity monitoring trigger, requirements for accelerated monitoring, and requirements for TRE initiation if toxicity is demonstrated.

D. Final Effluent Limitations

1. Mass-based Effluent Limitations

40 CFR 122.45(f)(1) requires effluent limitations be expressed in terms of mass, with some exceptions, and 40 CFR 122.45(f)(2) allows pollutants that are limited in terms of mass to additionally be limited in terms of other units of measurement. This Order includes effluent limitations expressed in terms of mass and concentration. In addition, pursuant to the exceptions to mass limitations provided in 40 CFR 122.45(f)(1), some effluent limitations are not expressed in terms of mass, such as pH and temperature, and when the applicable standards are expressed in terms of concentration (e.g., CTR criteria and MCLs) and mass limitations are not necessary to protect the beneficial uses of the receiving water.

Mass-based effluent limitations were calculated based upon the design flow (Average Dry Weather Flow) permitted in section IV.A.1.h. of this Order.

2. Averaging Periods for Effluent Limitations

40 CFR 122.45 (d) requires average weekly and average monthly discharge limitations for publicly owned treatment works (POTWs) unless impracticable. However, for toxic pollutants and pollutant parameters in water quality permitting, USEPA recommends the use of a maximum daily effluent limitation in lieu of average weekly effluent limitations for two reasons. "*First, the basis for the 7-day average for POTWs derives from the secondary treatment requirements. This basis is not related to the need for assuring achievement of water quality standards. Second, a 7-day average, which could comprise up to seven or more daily samples, could average out peak toxic concentrations and therefore the discharge's potential for causing acute toxic effects would be missed.*" (TSD, pg. 96) This Order utilizes maximum daily effluent limitations in lieu of average weekly effluent limitations for ~~aluminum,~~ ammonia, manganese, MTBE, bis(2-ethylhexyl)phthalate, carbon tetrachloride, chlorpyrifos, diazinon, copper, cyanide, chlorodibromomethane, dichlorobromomethane, dibenzon(a,h)anthracene, methylene chloride, pentachlorophenol and tetrachloroethylene as recommended by the TSD for the achievement of water quality standards and for the protection of the beneficial uses of the receiving stream. Furthermore, for BOD_5, TSS, pH, chlorine residual, and total coliform organisms**,** weekly average effluent limitations have been replaced or supplemented with effluent limitations utilizing shorter averaging periods. The

rationale for using shorter averaging periods for these constituents is discussed in section IV.C.3. of this Fact Sheet.

For effluent limitations based on Secondary MCLs, this Order includes annual average effluent limitations. The Secondary MCLs are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis, when sampling at least quarterly. Since it is necessary to determine compliance on an annual average basis, it is impracticable to calculate average weekly and average monthly effluent limitations.

3. Satisfaction of Anti-Backsliding Requirements

The effluent limitations in this Order are at least as stringent as the effluent limitations in Order No. 5-00-188, with the exception of effluent limitations for chloroform, lindane, silver, lead, zinc and cyanide. The effluent limitations for these pollutants are less stringent than those in Order No. 5-00-188. The effluent limitations in this Order for N-nitrosodimethylamine (NDMA), chlorodibromomethane (CDBM), and dichlorobromomethane (DCBM) are less stringent than those in Order R5-2010-0114-01. This relaxation of effluent limitations is consistent with the anti-backsliding requirements of the CWA and federal regulations. The effluent limits for copper in this Order are less stringent than the limits contained in previous Order R5-2010-0114.

Order No. 5-00-188 included effluent limitations for chloroform, lindane, silver, lead, zinc and cyanide. Based on monitoring data collected from June 2005 – July 2008, the discharge does not indicate reasonable potential to exceed water quality objectives for chloroform, lindane, silver, lead and zinc. Therefore, effluent limitations for these parameters were not included in this Order. The lack of effluent limitations in this Order does not constitute backsliding.

CWA section 402(o)(1) prohibits the establishment of less stringent water quality-based effluent limits "*except in compliance with Section 303(d)(4).*" For attainment waters, CWA section 303(d)(4)(B) specifies that a limitation based on a water quality standard may be relaxed where the action is consistent with the antidegradation policy. The Sacramento River is considered an attainment water for copper, and as discussed in section IV.D.4, below, relaxation of the effluent limits complies with federal and state antidegradation requirements. Thus, relaxation of the effluent limitations for copper from Order R5-2010-0114 meets the exception in CWA section 303(d)(4)(B).

CWA section 402(o)(2) provides several exceptions to the anti-backsliding regulations. CWA 402(o)(2)(B)(i) allows a renewed, reissued, or modified permit to contain a less stringent effluent limitation for a pollutant if information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance.

40 CFR § 122.44(l) further clarifies what constitutes an exception of the CWA statutory provisions, and states that material and substantial alterations or additions to the permitted facility that occur after permit issuance may justify the application of a less stringent effluent limitation.

As described further in section IV.C.3 of this Fact Sheet, updated information that was not available at the time the previous permits were issued indicates dilution is available to calculate WQBELs for cyanide, insufficient information is available to conduct the reasonable potential analysis for NDMA, and oil and grease does not exhibit reasonable potential to cause or contribute to an exceedance of water quality objectives in the receiving water. Additionally, updated information indicates that less stringent effluent limitations for CDBM and DCBM due to proposed facility changes, and less stringent limits for copper based on updated hardness data for calculating the hardness-dependent CTR criteria for copper. This new information satisfy requirements in CWA section 402(o)(2). The updated information that supports the relaxation of effluent limitations for these constituents includes the following:

~~ii.~~i. **Cyanide.** Order No. 5-00-188 established effluent limitations for cyanide of 10.8 µg/L as a daily average with a trigger of 6.1 µg/L. The cyanide limitation of 10.8 µg/L was based on the MEC of 9.0 µg/L times a safety factor of 1.2 (which was proposed by the Discharger and accepted by the Central Valley Water Board). A trigger concentration exceedance results in an investigation and Central Valley Water Board notification with the Central Valley Water Board may require an action plan to address the cause of the exceedance. The Central Valley Water Board found that the trigger concentration would be protective and appropriate if established as the 95th percentile value assuming that historical data follows a lognormal probability distribution which was 6.1 mg/L. The Discharger performed a dynamic model for cyanide which resulted in a chronic LTA of 13.9 mg/L. The calculated limit is 11.0 mg/L as an AMEL with a MDEL of 22.0 mg/L. As discussed in Section IV.C.2.d, the dynamic model represents a more accurate picture of the mixing zone concentrations. This Order relaxes the effluent limitation for cyanide from Order No. 5-00-188. The dynamic model data submitted by the Discharger is considered new information by the Central Valley Water Board.

~~iii.~~ii. **Oil and Grease.** Order No. 5-00-188 established effluent limitations for oil and grease. As discussed further in section IV.C.3, monitoring data over the term of Order No. 5-00-188 indicated that the discharge no longer exhibits reasonable potential to exceed water quality objectives for oil and grease. Therefore, the effluent limitation is not retained in this Order. The monitoring data submitted by the Discharger is considered new information by the Central Valley Water Board.

~~iv.~~iii. **NDMA.** Order R5-2010-0014-01 included WQBELs for NDMA of 0.69 ng/L and 1.4 ng/L, as a AMEL and MDEL, respectively, because it was determined that the effluent had reasonable potential to cause or contribute to an

~~vii.~~vi. **Total Recoverable Copper**. Amended Order R5-2010-0114-04 includes revised effluent limitations for total recoverable copper that are less stringent than the effluent limitations adopted in Order R5-2010-0114. The revised effluent limitations are based on updated receiving water hardness data since adoption of R5-2010-0114. The new receiving water hardness data submitted by the Discharger is considered new information by the Central Valley Water Board.

The revision of the cyanide, CDBM, DCBM, ~~and~~ total coliform organisms, and copper effluent limitations, and the removal of effluent limitations for NDMA, oil and grease, chloroform, lindane, silver, lead and zinc are consistent with the antidegradation provisions of 40 CFR 131.12 and State Water Board Resolution No. 68-16. Any impact on existing water quality will be insignificant.

4. Satisfaction of Antidegradation Policy

~~This~~ Order R5-2010-0114 does not allow for an increase in flow or mass of pollutants to the receiving water with the exception of cyanide, chlorodibromomethane and dichlorobromomethane as discussed in section D.3 of the Fact Sheet. The amended permit, Order R5-2010-0114-04, allows for an increase in the discharge of copper from that allowed in Order R5-2010-0114. Antidegradation analyses were completed prior to adoption of the ~~existing~~ 2000 NPDES permit~~s~~ that grants a discharge capacity of 181 mgd. However, conditions in the Sacramento River and Delta downstream of the discharge have significantly changed since prior antidegradation analyses were conducted, so for the 2010 permit renewal it was~~it is~~ required that a new antidegradation analysis be conducted for the existing discharge.

A complete antidegradation analysis "Antidegradation Analysis for Proposed Wastewater Treatment Plant discharge Modification" was submitted by the Discharger with the Report of Waste Discharge in February 2005. The Discharger's antidegradation analysis was based on the incremental increase of the SRWTP capacity expansion from 181 mgd to 218 mgd. This antidegradation analysis was updated and revised based on the Central Valley Water Board staff's comments and more recent water quality data in the Discharger's "Antidegradation Analysis for Proposed Discharge Modification for the Sacramento Regional Wastewater Treatment Plant" dated 20 May 2009. Along with the 37 mgd increase in capacity, the antidegradation analysis also modeled the worst-case concentrations at the discharge of 181 mgd and for 154 mgd (baseline data for the EIR).

The Discharger's Antidegradation Analysis (ADA) identified the constituents of concern and categorized them as Category 1, Category 2, and Category 3 pollutants (see Table F-18). Category 1 pollutants are of concern regionally and have potential impacts on the Delta ecosystem and its water quality. Category 2 pollutants are constituents that may cause localized impacts, but negligible impacts in far-field receiving waters. Category 3 pollutants are constituents that were detected in the discharge, but have no history of contributing adverse impacts in the Sacramento River.

The Discharger evaluated background river concentrations and effluent concentrations and determined which constituents were of concern for impacting beneficial uses or of concern by stakeholders. Those constituents were placed into three categories. The first category includes constituents that are of regional concern and could impact the beneficial uses both locally (near field) and in farther reaches of the Delta (far field). Those constituents are: ammonia, total nitrogen, nitrate plus nitrite, total Kjeldahl nitrogen (TKN), total phosphorus, electrical conductivity (EC), total dissolved solids (TDS), chloride, total organic carbon, mercury, and dissolved oxygen.

The second category includes constituents that may impact within 700 feet downstream of the diffuser or the near field. These constituents include: aluminum, cadmium, copper, zinc, total coliform organisms and temperature. The antidegradation analysis performed in support of the Central Valley Water Board's adoption of Order R5-2010-0114 is applicable to the new effluent limits for copper in Order R5-2010-0114-04. The increase in the effluent limits for copper in the amended permit (Order R5-2010-0114-04) is minor. The Central Valley Water Board's finds that the prior antidegradation analysis and findings apply to this minimal increase (0.1 µg/L). The Central Valley Water Board finds that any lowering of water quality will be de minimus and will accommodate important economic or social development in the Sacramento area. Further, any change to water quality will not unreasonably affect present and anticipated beneficial uses and will not result in water quality less than prescribed in State Water Board policies or the Basin Plan. As outlined below, the measures implemented by the Discharger and required by this Order constitute BPTC. Any change in water quality complies with the antidegradation provisions of 40 CFR 131.12 and State Water Board Resolution No. 68-16.

The third category includes constituents of concern that generally had no history of impacts to the Sacramento River. The constituents evaluated in the ADA are shown in Table F-18, below.

The Near Field and Far Field models previously described were used to determine reasonable worst-case impacts on the receiving waters. In the ADA, the focus was on the incremental increase from an average dry weather discharge flow of 181 mgd to 218 mgd. However, due to a legal challenge of the Discharger's EIR and due to an overall slow down in the economy and growth in the Sacramento area, the Discharger withdrew its request for an expansion of discharge flow. Therefore, the information provided in the ADA was used by Central Valley Water Board staff to evaluate the impacts of the discharge at the permitted discharge flow of 181 mgd. For each pollutant the amount of reduced assimilative capacity was calculated to determine whether the increased pollutant loading was significant. Table F-18, below, summarizes the antidegradation impacts for the constituents of concern. The constituents with the largest impacts include ammonia, salinity (e.g., electrical conductivity, total dissolved solids, and chloride), copper, cyanide, bis(2-ethylhexyl)phthalate, dichlorobromomethane, chloroform, and chlorpyrifos.

Table F-~~21~~15. Antidegradation Analysis

Constituent	Units	Mean Effluent Conc.[1]	Mean R-1 Conc.[1]	Median 181 mgd Conc @ Hood[2]	Mean 181 mgd Conc @ 700 ft[2]	Applicable Water Quality Objective	Percent Assimilative Capacity Used
Category 1 Pollutants							
Ammonia (summer)	mg/L	24	0.1	0.25	0.64	1.55-6.7	2.3%-10.3%
Ammonia (winter)	mg/L	24	0.1	0.31	0.85	1.55-6.7	3.2%-14.5%
Total Nitrogen (summer)	mg/L	24	0.39	0.64	0.94	--	--
Total Nitrogen (winter)	mg/L	24	0.39	0.7	1.15	--	--
Nitrate plus nitrite	mg/L	0.13	0.16	0.12	0.16	10	0.0%
TKN	mg/L	26	0.35	0.57	0.95	--	--
Total Phosphorus	mg/L	2.34	0.11	0.08	0.18	--	--
EC	µmhos/cm	764	163	157	182	700	3.5%
TDS	mg/L	410	98	--	108	450	2.8%
Chloride	mg/L	91	5.1	5.7	7.81	106	2.7%
TOC	mg/L	17.5	2.34	2.3	2.82	--	--
Mercury	ng/L	4.1	5.6		5.54	--	--
Category 2 Pollutants							
Aluminum	µg/L	23.3	969	--	327.3	200	--
Cadmium	µg/L	0.023	0.0081	--	0.009	1.5	0.1%
Copper	µg/L	4.31	1.47	--	1.56	5.62	2.2%
Zinc	µg/L	21.2	0.57	--	1.22	74.5	0.9%
Temperature		23	15.5	--	--	--	--
Total Coliform		7.8	1983	--	--	--	--
Category 3 Pollutants							
Antimony	µg/L	0.32	0.066	--	0.074	6	0.1%
Arsenic	µg/L	1.64	1.35	--	1.36	10	0.1%
Chromium	µg/L	0.69	0.15	--	0.176	--	--
Lead	µg/L	0.25	0.03	--	0.037	1.38	0.5%
Molybdenum	µg/L	2.83	0.51	--	0.584	10	0.8%
Nickel	µg/L	2.37	0.67	--	0.72	32.8	0.2%
Selenium	µg/L	0.79	0.21	--	0.23	5	0.4%
Silver	µg/L	0.063	0.014	--	0.016	1.35	0.1%
BOD	mg/L	7.59	<2.13	--	--	--	--
Manganese	µg/L	64.2	3.7	--	---	50	
Cyanide	µg/L	5.12	3.92	--	3.95	5.2	2.3%
TSS	mg/L	6.68	29.4	--	28.6	--	--
1,4-Dichlorobenzene	µg/L	0.68	<0.27	--	0.28	5	0.2%
Bis(2-ethylhexyl)phthalate	µg/L	2.6	0.11	--	0.19	1.8	4.7%
Dichlorobromomethane	µg/L	0.95	<0.37	--	0.39	0.56	10.5%
Chloroethane	µg/L	0.28	<0.42	--	0.42	75	0.0%
Chloroform	µg/L	15	0.93	--	1.38	80	0.6%
Diethyl Phthalate	µg/L	1.46	0.047	--	0.095	23000	0.0%
Di-n-butyl Phthalate	µg/L	1.35	0.072	--	0.21	2700	0.0%
Methyl Chloride	µg/L	0.73	0.47	--	0.48	3	0.4%

Constituent	Units	Mean Effluent Conc.[1]	Mean R-1 Conc.[1]	Median 181 mgd Conc @ Hood[2]	Mean 181 mgd Conc @ 700 ft[2]	Applicable Water Quality Objective	Percent Assimilative Capacity Used
Methylene Chloride	µg/L	1	<0.69	--	0.7	4.7	0.2%
Tetrachloroethylene	µg/L	0.13	0.38	--	0.37	0.8	--
Toluene	µg/L	0.25	0.36	--	0.36	150	0.0%
Chlorpyrifos	µg/L	0.015	0.006	--	0.01	0.015	44.4%
Dibromochloromethane	µg/L	0.14	<0.42	--	--	0.41	--
n-Nitrosodimethylamine	µg/L	0.72	<2.69	--	--	0.00069	--

[1] Table 5-2, "Antidegradation Analysis for Proposed Discharge Modification for the Sacramento Regional Wastewater Treatment Plant" 20 May 2009

[2] Chapter 5, ibid. The constituent concentrations at Hood are representative of the completely mixed conditions, whereas, the constituent concentrations at 700 feet downstream of the outfall is representative of the average concentration of the plume.

5. Stringency of Requirements for Individual Pollutants

This Order contains both technology-based effluent limitations and WQBELs for individual pollutants. The technology-based effluent limitations consist of restrictions on flow and percent removal requirements for BOD_5 and TSS. The WQBELs consist of restrictions on ammonia, copper, cyanide, chlorpyrifos, diazinon, aluminum, carbon tetrachloride, dichlorobromomethane, chlorodibromomethane, bis(2-ethlyhexyl) phthalate, methylene chloride, tetrachlorethylene, pentachlorophenol, dibenzo(ah)anthracene, manganese, methyl-tertairy-butyl-ether, nitrite, nitrate, chlorine residual, settleable solids, mercury and electrical conductivity. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this Order includes new effluent limitations for BOD_5, total coliform and TSS to meet numeric objectives or protect beneficial uses. The rationale for including these limitations is explained in the Fact Sheet. In addition, the Regional Water Board has considered the factors in CWC section 13241 in establishing these requirements.

WQBELs have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant WQBELs were derived from the CTR, the CTR is the applicable standard pursuant to 40 CFR 131.38. The scientific procedures for calculating the individual WQBELs for priority pollutants are based on the CTR-SIP, which was approved by USEPA on 18 May 2000. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by USEPA prior to 30 May 2000. Any water quality objectives and beneficial uses submitted to USEPA prior to 30 May 2000, but not approved by USEPA before that date, are nonetheless "applicable water quality standards for purposes of the CWA" pursuant to 40 CFR 131.21(c)(1). Collectively, this Order's restrictions on individual pollutants are no more stringent than required to implement the requirements of the CWA.

summary statistics are calculated from the detected data points and the fill-in values for non-detect data. An estimated mean and standard deviation are used to calculate the 99.9th percentile performance-based effluent limitation, as described above.

Table F-~~22~~16. Performance-based Effluent Limitations Statistics

Parameter	Units	MEC	# of Samples	% Detected	Mean	Std. Dev.	Performance-based Effluent Limitation
Ammonia[1,2]	mg/L	45	1124	100	27.2	4.11	39, 43, 47
Copper[9]	µg/L	~~6.34~~10	~~114~~108	100	4.~~16~~62	~~0.803~~1.06	~~6.8~~8.1
Cyanide[3]	µg/L	10	176	58.5	4.85	1.89	11.1
Aluminum[3,9]	µg/L	~~35.2~~38	~~61~~104	~~93.4~~90.4	~~17.6~~14.4	~~5.39~~5.10	~~35.4~~46.9
Carbon Tetrachloride[4]	µg/L	1.7	101	5.9	--	--	5.3
Chlorodibromomethane[4]	µg/L	0.7	101	16.8	--	--	2.2
Chlorodibromomethane (after nitrification)	µg/L	8.3	12	100	2.9	1.9	12[8]
Dichlorobromomethane	µg/L	3.4	101	91.1	1.10	0.583	3.4
Dichlorobromomethane (after nitrification)	µg/L	25	12	100	14.6	5.3	35[8]
Bis(2-ethylhexyl) phthalate[5]	µg/L	8.1	115	99.1	0.854	0.506	12.5
Methylene Chloride[1,3]	µg/L	5.4	101	91.1	1.18	0.901	5.4
Tetrachloroethylene[4]	µg/L	1.4	101	13.9	--	--	4.4
Pentachlorophenol[4]	µg/L	5.7	115	0.9	--	--	17.7
Dibenzo(ah)antharacene[4]	µg/L	0.51	145	0.7	--	--	1.6
Manganese[1,5,6]	µg/L	270	51	100	4.28	0.25	270
Methyl Tertiary Butyl Ether[4] (MTBE)	µg/L	5.8	128	2.3	--	--	18.0

Note: Data set are based on data collected between 12 June 2005 and 10 October 2009 unless noted.

1 Average monthly, average weekly, and maximum daily interim limits established for ammonia and calculated as described in Technical Memorandum from Airy Krich-Brinton to Robert Seyfried dated 9 May 2014 "Ammonia Interim Limits Re-Calculation for Regional San"..

2 Data set ranges from January 2005 to January 2014.

3 Regression on order statistics (ROS) method used.

4 Performance-based effluent limit estimated as 3.11 times the MEC because the amount of detected data is less than 20%

5 Mean and standard deviation are expressed as natural logarithms because the log-normal distribution is the best fit for the dataset.

6 Data set ranges from 19 April 2009 to 8 June 2011.

7 Data set ranges from 5 June 2005 to 6 October 2009.

8 For chlorodibromomethane and dichlorobromomethane the performance-based effluent limitations increase after nitrification facilities are operating. The performance-based effluent limitations were calculated based on estimated maximum effluent concentrations from pilot study data results plus a process scale-up factor of 40% to take into consideration uncertainties and variability. The potential need for further adjustment based on full scale implementation is not known at this time.~~,~~

9 Data set ranges from 1 January 2012 to 31 December 2014.

VII. RATIONALE FOR PROVISIONS

A. Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with 40 CFR 122.41, and additional conditions applicable to specified categories of permits in accordance with 40 CFR 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under 40 CFR 122.42.

40 CFR 122.41(a)(1) and (b) through (n) establish conditions that apply to all State-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order. 40 CFR 123.25(a)(12) allows the state to omit or modify conditions to impose more stringent requirements. In accordance with 40 CFR 123.25, this Order omits federal conditions that address enforcement authority specified in 40 CFR 122.41(j)(5) and (k)(2) because the enforcement authority under the CWC is more stringent. In lieu of these conditions, this Order incorporates by reference CWC section 13387(e).

B. Special Provisions

1. Reopener Provisions

a. Temperature ~~Study~~Requirements. ~~There are uncertainties that the discharge may impact aquatic life in the vicinity of the discharge as regulated under the existing thermal exemption conditions.~~ When Order 2010-0114 was adopted the USFWS and the NMFS requested studies to characterize fish behavior in the affected river reach to determine how fish behave in response to the discharge field, and whether predator concentrations are elevated in the thermal discharge field. ~~This~~ Order R5-2010-0114 ~~requires~~ required the Discharger to complete a study of temperature's potential effect in the receiving water. The Discharger submitted the required studies in March 2013 and May 2015. Based on a review of those studies, the Central Valley Water Board has determined that exceptions to the Thermal Plan requirements may be granted in compliance with 40 CFR § 125.73 (a). This reopener provision allows the Central Valley Water Board to reopen this Order for modification of effluent limitations and receiving water limitations and requirements for temperature, as appropriate. ~~if after review of the study results it is determined that the discharge impacts beneficial uses~~.

b. Pollution Prevention. This Order requires the Discharger prepare pollution prevention plans following CWC section 13263.3(d)(3) for ammonia and mercury. This reopener provision allows the Central Valley Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for these constituents based on a review of the pollution prevention plans.

c. Whole Effluent Toxicity. This Order requires the Discharger to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity

b. Temperature Study. ~~The Discharger shall submit a workplan and time schedule for Executive Officer approval for determining whether permitted conditions are protective of aquatic life beneficial uses in the Sacramento River. This~~ Order R5-2010-0114 ~~requires~~ required the Discharger to submit a workplan and time schedule for Executive Officer approval for development of a temperature study to evaluate the thermal effects of the discharge, including ~~determining whether permitted conditions are protective of the aquatic life beneficial uses of the Sacramento River. The work plan shall be implemented upon approval by the Executive Officer. The study will include~~ an evaluation of: (1) the existing Thermal Plan Exception and its effects on aquatic life, and (2) any proposed request for new Thermal Plan Exception(s). The Discharger ~~must~~ was also required to consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the California Department of Fish and Game, to consider additional issues (such as fish attractively to mixing zone areas) in development of the workplan for the Study. The Discharger submitted the study in March 2013.

c. **Municipal Water Supply Annual Report**. The Discharger shall submit an annual report characterizing the water supply water quality. The water supply characterization will include data from the water purveyors and other public databases. The water supply characterization report will provide a weighted average of groundwater and surface water TDS and EC. The purpose of this monitoring is to evaluate the efficacy of salt minimization plans.

3. Best Management Practices and Pollution Prevention

a. Salinity Evaluation and Minimization Plan. An Evaluation and Minimization Plan for salinity is required in this Order to ensure adequate measures are developed and implemented by the Discharger to reduce the discharge of salinity to Sacramento River.

b. 2,3,7,8-TCDD and Other Dioxin and Furan Congeners Source Evaluation and Minimization Plan. The Discharger will be required to prepare a 2,3,7,8-TCDD and other dioxin and furan congeners evaluation and minimization plan to address sources of detectable dioxins (OCDD and 1,2,3,4,6,7,8-HpCDD) and furans (OCDF) from the Facility. The plan is required in this Order to ensure adequate measures are developed and implemented by the Discharger to reduce the discharge of dioxin and furan congeners to the receiving water.

4. Construction, Operation, and Maintenance Specifications

a. Emergency Storage Basin Operating Requirements. The operation and maintenance specifications for the emergency storage basin are necessary to ensure proper operation of the emergency storage basin and minimize the potential for impacts to groundwater quality.

b. Turbidity. Operations specifications for turbidity are included as an indicator of the effectiveness of the treatment process and to assure compliance with effluent

ATTACHMENT G – SUMMARY OF REASONABLE POTENTIAL ANALYSIS

Constituent	Applicable Water Quality Objective/Criteria {Basis} (C)	Maximum Effluent Concentration (MEC)	Receiving Water Concentration (Sacramento River @ Freeport) (B)	Reason for Reasonable Potential
Copper	~~7.7~~8.0~~/3.0~~[1] {CTR Aquatic Life}	~~6.34~~10	~~20.4~~5.8	MEC~~B~~ > C
Mercury[2]	0.05 {CTR Human Health}	0.01	0.0892	B > C
Cyanide	5.2 {CTR Aquatic Life}	10	5	MEC > C
Carbon Tetrachloride	0.25 {CTR Human Health}	0.5	<0.1	MEC > C
Chlorodibromomethane	0.41 {CTR Human Health}	0.7	<0.18	MEC > C
Dichlorobromomethane	0.56 {CTR Human Health}	2.5	<0.14	MEC > C
Methylene Chloride	4.7 {CTR Human Health}	5.4	<0.35	MEC > C
Tetrachloroethylene	0.8 {CTR Human Health}	0.9	0.21	MEC > C
Pentachlorophenol	0.28 {CTR Human Health}	5.7	0.026	MEC > C
Bis(2-Ethylhexyl) Phthalate	1.8 {CTR Human Health}	8.1	0.57	MEC > C
Dibenzo(ah) anthracene	0.0044 {CTR Human Health}	0.51	0.0026	MEC > C
Aluminum	200 {Secondary MCL}	~~44.4~~38	~~8800~~900	B > C
Ammonia (mg/L)	1.23[3] {USEPA NAWQC}	45	1.3	B > C & MEC > C
Manganese	50 {Basin Plan}	270	130	B > C & MEC > C
MTBE	5 {Secondary MCL}	5.8	1.9	MEC > C
Chlorpyrifos	0.025 (Basin Plan)	0.039	0.0058	MEC>C

[1] Effluent copper criteri~~a~~on~~a~~ is ~~7.7~~8.0 µg/L based on a ~~minimum effluent~~receiving water hardness of ~~80~~ 84 mg/L (as $CaCO_3$) ~~and background copper criteria is 3.0 µg/L based on a minimum upstream receiving water hardness of 26 mg/L (as $CaCO_3$)~~. Default EPA translators were used.

[2] Receiving Water concentration from Coordinated Monitoring Program (CMP) @ Freeport Summary 1992-2008

[3] Water quality criteria (chronic criterion) calculated using the maximum upstream receiving water pH of 8.8 and corresponding temperature of 15.1C^{o} that occurred on 10/21/1998

General Notes:

- Effluent data from June 2005-July 2008 from discharger self-monitoring reports (SMRs); Receiving water data from 1992-2008 from SMRs & CMP; manganese data updated to April 2011; aluminum and copper data from January 2012 to December 2014.~~.~~
- All units in µg/L unless specified
- All metals criteria is expressed as total recoverable
- MCL = Maximum Contaminant Level
- NAWQC = National Ambient Water Quality Criteria
- CTR = California Toxics Rule