

NITRATE ALTERNATIVE NO. 1

SACRAMENTO COUNTY SANITATION DISTRICT SACRAMENTO REGIONAL WASTEWATER TREATMENT PLANT SACRAMENTO COUNTY

Proposed Waste Discharge Requirements Renewal and Time Schedule Order (NPDES No. CA0077682)

Regional Water Quality Control Board, Central Valley Region

Board Meeting – 9 December 2010

ITEM # 6

Nitrate is formed when chemicals containing nitrogen, such as ammonia, are oxidized. The SRCSD discharge currently contains very low concentrations of nitrate; however, if ammonia reduction is required, nitrates will be formed when the ammonia is oxidized (nitrified). Nitrates can be removed through a further wastewater treatment process (denitrification). Nitrates have two primary water quality concerns:

- Drinking water – excessive nitrates in drinking water can harm human fetuses and infants. If most of the ammonia is required to be removed, the resultant effluent will likely contain nitrates in excess of the State Drinking Water Standard (Primary MCL: 10 mg/L). There is sufficient dilution available in the Sacramento River that the river after mixing will not exceed the nitrate drinking water standard.
- Nutrients – nitrogen is an essential nutrient to life. Nitrogen in nitrates is readily available for use by plants. As with ammonia, excessive nitrogen can contribute to excessive or changed growth in a water body, changing the ecology of the water body. There are theories that changing the ratio of nitrogen to phosphorus can change the ecology of a waterbody, so removal of nitrogen from the effluent would keep the nitrogen to phosphorus ratio from changing, however, adverse impacts from changed nitrogen:phosphorus ratios in the Delta have not been demonstrated. The overall impact of the nitrogen on the Delta is not understood.

The proposed permit includes effluent limitations for nitrate based on State Drinking Water Standards without the allowance for dilution. No human health dilution was allowed for nitrate due to concerns regarding the nitrogen-to-phosphorous ratio effects on the aquatic ecology in the Delta and is based on best practicable treatment or control of the discharge.

NITRATE ALTERNATIVE NO. 1

NITRATE EFFLUENT LIMITS BASED ON STATE DRINKING WATER STANDARD AND HUMAN HEALTH DILUTION GRANTED

If it is determined that human health dilution for nitrate is allowed, this alternative increases the effluent limitation for nitrate by applying a human health dilution credit. This alternative **MUST** be combined with the dilution alternatives that allow a Human Health mixing zone.

This permit alternative results in the following changes to the NPDES Permit:

1. NPDES Permit. Modify the final effluent limits for Nitrate in Table 6 of the Limitations and Discharge Specifications, as shown in underline/strikeout format below:

Table 6. Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Conventional Pollutants						
Nitrate, Total (as N)	mg/L	40 <u>127</u>	--	--	--	--

2. NPDES Permit. Modify section IV.C.2.d.v of the Fact Sheet (Attachment F) as shown in underline/strikeout format below:

(1) Shall not compromise the integrity of the entire waterbody - The TSD states that, “If the total area affected by elevated concentrations within all mixing zones combined is small compared to the total area of a waterbody (such as a river segment), then mixing zones are likely to have little effect on the integrity of the waterbody as a whole, provided that the mixing zone does not impinge on unique or critical habitats.”¹ The Sacramento River is a very large waterbody and the human health mixing zone is not applicable to aquatic life criteria. ~~Except as noted for nitrate in subsection vi., below,~~ The human health mixing zone does not compromise the integrity of the entire waterbody.

(4) Shall not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws – The human health mixing zone is not applicable to aquatic life criteria. ~~Except as noted for nitrate in subsection vi., below,~~ The mixing zone will not impact biologically sensitive or critical habitats.

(5) Shall not produce undesirable or nuisance aquatic life; result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; cause nuisance – ~~Except as noted for nitrate (see subsection vi., below),~~ The allowance of a human health mixing zone will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity; cause objectionable bottom deposits; or cause nuisance.

3. NPDES Permit. Modify section IV.C.2.d.vi of the Fact Sheet (Attachment F) as shown in underline/strikeout format below for nitrate:

Nitrate – Currently, the Discharger’s effluent contains very low concentrations of nitrate, ranging from 0.016 to 1.4 mg/L with an average of 0.13 mg/L. However, this Order requires the Discharger nitrify its effluent, therefore, the ammonia will convert to nitrate and the nitrate concentrations will increase. Consequently, the Facility will not be able to

1 TSD, pg. 33

meet end-of-pipe effluent limits for Nitrate, based on the primary MCL of 10 mg/L (as N). ~~Although a~~Assimilative capacity and dilution is available in the receiving water for compliance with the primary MCL, and, as discussed above, the human health mixing zone meets the requirements of the SIP and Basin Plan. Therefore, the WQBELs for Nitrate have been developed considering the allowance of non-human carcinogen dilution credits., ~~a human health mixing zone for nitrate does not meet the mixing zone requirements of the SIP. The SIP requires, in part, that mixing zones do not;~~

- ~~(1) — compromise the integrity of the entire water body;~~
- ~~(2) — adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws; and~~
- ~~(3) — produce undesirable or nuisance aquatic life;~~

~~The allowance of a human health mixing zone for nitrate does not meet these requirements, because elevated nitrogen 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 zone. The allowance of the requested mixing zone for nitrate would compromise the integrity of the entire water body, adversely impact biologically sensitive or critical habitats, and produce undesirable or nuisance aquatic life.~~

~~Human health dilution credits for nitrate have not been granted. This Order requires denitrification for removal of nitrate to meet the primary MCL at the end-of-pipe. See Section IV.C.3 of the Fact Sheet for a detailed discussion.~~

4. NPDES Permit. Modify section IV.C.3.d.xix of the Fact Sheet as shown in underline/strikeout format below:

- (c) **WQBELs.** ~~As discussed in Section IV.C.2.d no dilution is allowed for nitrate. Therefore, this Order requires the wastewater is denitrified to meet the primary MCL at the end-of-pipe. The receiving water contains assimilative capacity for nitrate for compliance with the primary MCL. Since nitrate is not a human carcinogen, the non-human carcinogen dilution credit of 29:1 was allowed in the development of the WQBELs for nitrate. Based on the allowable dilution credit, A~~an average monthly effluent limit of 40127 mg/L for nitrate (as nitrogen) is included in this Order. This is based on the primary MCL of 10 mg/L (as N).

5. NPDES Permit. Modify the effluent limits for Nitrate in Table F-16 (Summary of Final Effluent Limitations) of the Fact Sheet as shown in underline/strikeout format below:

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Conventional Pollutants						
Nitrate, Total (as N)	mg/L	40 <u>127</u>	--	--	--	--

6. NPDES Permit. Modify section IV.D.4. of the Fact Sheet as shown beginning in the 9th paragraph in underline/strikeout format below:

As shown in Table F-18, the existing permitted discharge is degrading the receiving water. Therefore, the Discharger must use best practicable treatment or control (BPTC) of the discharge in accordance with State Water Board Resolution 68-16. The Sacramento River and Sacramento-San Joaquin Delta are high quality waters of exceptional recreation, economical, and ecological significance to the people of the State of California. As discussed below, the Central Valley Water Board finds that in order to maintain and enhance the water quality of the Sacramento River and Sacramento-San Joaquin Delta, the Discharger must implement BPTC. For the following reasons, BPTC for this facility includes implementation of nitrification; ~~denitrification~~, and the equivalent of Title 22 filtration with ultraviolet light, ozone or chlorine disinfection treatment.

- o The Sacramento River and Sacramento-San Joaquin Delta at the vicinity of the outfall are home to at least nine state and federally protected threatened or endangered species².
- o The Sacramento River and Sacramento-San Joaquin Delta support a trillion dollar economy with \$27 billion economy for agriculture.³
- o The Sacramento River and Sacramento-San Joaquin Delta provide drinking water to 25 million people of the State.⁴
- o The Sacramento River and Sacramento-San Joaquin Delta support 12 million recreational user days per year, including 290 shoreline recreational areas, 300 marinas and half a million boaters.⁵
- o Ammonia, along with BOD, from the SRWTP reduces the dissolved oxygen in the Sacramento River and Sacramento-San Joaquin Delta for nearly 40 miles below

² Comment letter from USFWS to Kathy Harder dated 15 June 2010.

³ http://www.delta.ca.gov/res/docs/Sacto-SanJoaquin_fact.pdf

⁴ Id.

⁵ Id.

its discharge⁶. The oxygen depleting constituents from the SRWTP use or will use all the assimilative capacity of the River and Delta leaving no assimilative capacity available to other communities that currently reduce oxygen demanding constituents by implementing advanced treatment processes.

- The ammonia from the SRWTP contributes to the water quality problems in the Suisun Bay⁷.
- The ammonia from the SRWTP is acutely and chronically toxic to species, including copepods⁸ and freshwater mussels that reside in the Sacramento River and Sacramento-San Joaquin Delta.
- Ammonia in the SRWTP effluent combined with chlorine disinfection creates nitrosoamines at levels 100 times greater than the primary MCL. Nitrosoamines are highly mutagenic and potentially carcinogenic.
- At times the risk of illness or infection from pathogenic protozoans nearly quadruples between upstream and downstream of the SRWTP discharge⁹.
- Filtration of disinfected SRWTP effluent will result in reduction of total organic carbon, copper, mercury, phosphorus, TSS, BOD₅ and possibly Constituents of Emerging Concern (CECs)¹⁰.
- Reduction or elimination of ammonia, nitrate and protozoans will reduce impacts to the beneficial uses of the Sacramento River and Sacramento-San Joaquin Delta from the SRWTP discharge.
- Other existing wastewater treatment plants that discharge directly or indirectly to the Sacramento River and Sacramento-San Joaquin Delta are or will be implementing advanced treatment processes to reduce or eliminate ammonia, ~~nitrate~~ and pathogens.
- The costs per capita to implement advanced treatment processes at other POTWs are similar to the projected costs per capita for advanced treatment at the SRWTP. Project costs can vary greatly depending on how much existing treatment facilities can be incorporated into the advanced treatment process. In some cases, the cost is for a new treatment facility, differing treatment processes and/or the costs are based on construction completed several years ago.

⁶ Memorandum from Mitchell J. Mysliwiec (LWA) to Bob Seyfried, SRCSD "Response to Tetra Tech Comments on the LDOPA", 26 August 2010.

⁷ Letter from Bruce Wolfe, SFRWQCB to Kathy Harder, dated 4 June 2010.

⁸ Swee Teh, Presentation at Contaminants Workshop, July 6, 2010

⁹ Gerba, Charles P., "Estimated Risk of Illness from Swimming in the Sacramento River", 23 February 2010.

¹⁰ Technical Memorandum: Analysis of Costs and Benefits of Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant, LWA, May 2010.