CITY OF CALISTOGA

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Mr. Vince Christian
Water Resources Control Engineer
California Regional Water Quality Control Board,
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
By Email: vchristian@waterboards.ca.gov

Subject: City of Calistoga Comments on the Revised Tentative Order for the Town of Yountville/California Veterans Home Joint Wastewater Reclamation Facility (NPDES Permit No. CA0038121)

Dear Mr. Christian:

The City of Calistoga (City) has reviewed the Revised Tentative Order issued on March 8, 2010 for the Town of Yountville/California Veterans Home Joint Wastewater Facility (Joint WWRF). The City submits the following comments to address the copper mass balance calculation process used to derive a minimum river-to-effluent flow ratio for Yountville Joint WWRF discharges (Fact Sheet, page F-10). Use of this calculation process, with the proposed input values, would have a significant effect on operation of the City of Calistoga Wastewater Treatment Plant (Calistoga WWTP) which is located upstream from Yountville. The Regional Board's draft equation and analysis results in a minimum ratio of Napa River flow to the Joint WWRF effluent flow of 69:1, as measured upstream of Calistoga. The calculated minimum river-to-effluent flow ratio was directly incorporated as proposed Discharge Prohibition III.B. (Page 10 of the Joint WWRF Tentative Order). When the results are applied to Calistoga WWTP discharges, the minimum river-to-effluent flow ratio would be 46:1, as shown below:

$$Q_{RivUpstrm}/Q_y = 69/1$$

Where: Q_y = Yountville Joint WWRF effluent discharge
$Q_{RivUpstrm}$ = Napa River flow upstream of Calistoga
Q_c = Calistoga WWTP effluent discharge ($Q_c = 1.51Q_y$ or $Q_y = 0.662Q_c$)

$$Q_{RivUpstrm}/0.662Q_c = 69/1$$
$$Q_{RivUpstrm}/Q_c = 46/1$$

The current NPDES permit for the Calistoga WWTP (Order No. R2-2006-0066) allows discharge of Calistoga's tertiary-treated effluent when the river-to-effluent ratio is at least 10:1. The City will request a continuation of this requirement in its upcoming NPDES permit renewal. Lower river flowrates are often necessary and utilized at the start of the

discharge season, when recycled water use sites do not require irrigation and watershed runoff has not yet made a substantial contribution to river flows. There have been no incidents of adverse impacts to the Napa River from any Calistoga WWTP discharges. Recent modeling conducted by the City (based on the 10:1 flow ratio) indicates that under all critical discharge conditions, the mixing zone length (below the Calistoga WWTP) ranges from just 109 to 525 ft, with a travel time of 2.3 to 5.2 minutes.

The City understands the rationale behind assessing and allocating assimilative capacity of the Upper Napa River. However, the process used for the Joint WWRF Tentative Order contains input values that are incorrect and/or overly conservative. The City makes the following suggestions to eliminate these problems, while still providing a conservative approach for allocating assimilative capacity.

Wastewater Discharge Flowrates

The use of *total* annual influent flows for each Napa River discharger (Calistoga, St. Helena, and Yountville) does not reflect the existing dry season effluent discharge prohibition for each City. Use of influent flows also does not reflect the actual volume of effluent discharge to the Napa River, because each Napa River discharger recycles a significant portion of its effluent. The table shown below includes flowrates for each Napa River discharger during the 2007-2008 discharge season.

The amount of influent that is recycled or discharged by each agency varies, depending on the amount of rainfall received and recycled water user requirements. The City understands this limitation and the Regional Water Board's need to ensure sufficient capacity is present in the river during the discharge season. As such, the City suggests the very conservative approach of using total influent flow during the discharge season (represented by the 2007/8 season), instead of the total annual influent flow (during the 2008 calendar year) for the mass balance equation.

Discharger	Discharge Season	Total Influent Flow (MG)	Total Effluent Flow to River (MG)	% Discharged to Napa River
City of Calistoga WWTP	12/01/07-06/15/08	154	113	73%
City of St. Helena WWTRF	12/01/07-04/30/08	106	0	0%
Town of Yountville/Veterans Home Joint WWRF	10/01/07-05/15/08	104	46	44%

Wastewater Effluent Copper Concentration

The mass balance equations used in the Joint WWRF Tentative Order were based on the same effluent copper concentration from each of the three Napa River dischargers. The assumption was made because of the "similarities between service areas." While the service areas are similar, effluent copper concentrations are not similar, due to the different types of wastewater treatment processes utilized by the three plants. During the

2007/08 discharge season, 92% of the effluent discharged from the Calistoga WWTP was filtered prior to discharge. The City strives to filter as much of its effluent as possible, resulting in much lower copper concentrations than measured in the Joint WWRF discharges. The City of St. Helena WWTRF uses an integrated oxidation pond system with very long detention times that also results in lower copper concentrations. Effluent copper from the three Napa River dischargers is summarized in the table shown below. The 95th percentile concentration is based on recent datasets compiled for NPDES permit renewal. Use of the 95th percentile to represent effluent copper concentrations is a conservative approach for the mass balance equation.

Discharger	Data Period	Concentration Range (µg/L)	95th Percentile Concentration (µg/L)
City of Calistoga WWTP	01/2005-04/2009	1.9 – 9.2	8.2
City of St. Helena WWTRF	01/2006-04/2006	3.7 – 9.4	9.8
Town of Yountville/Veterans Home WWRF	02/2006-04/2008	8.0 – 25	28

Copper Water Quality Objective

The right side of the proposed mass balance equation in the Joint WWRF Tentative Order should incorporate the downstream water quality objective for copper, since it is the downstream Napa River flow that is being used to estimate the downstream copper load. The equation shown in the Joint WWRF Tentative Order includes the upstream water quality objective. From the Napa River Collaborative Monitoring Study (2003-2009), the adjusted geometric mean hardness for the Napa River downstream of Yountville is 143 mg/L (as $CaCO_3$) with a range of 103-232 mg/L as $CaCO_3$. As a conservative estimate, the minimum hardness of 103 mg/L (as $CaCO_3$) could be used to calculate the downstream copper water quality objective. Using minimum hardness, the downstream water quality objective is 9.6 µg/L.

Background Copper Concentration

The maximum ambient copper concentration measured in the Napa River upstream of Calistoga was 3.1 µg/L. This value was measured on 2/13/09 as part of the Napa River

Collaborative Monitoring Study. An incorrect value of 4.1 µg/L was used for C_b in the Joint WWRF Tentative Order.

Safety Factor for Other Potential Sources

The mass balance equation includes a "safety factor for other potential pollutant sources" to the Napa River. That safety factor was set equal to the combined flow volume of all three dischargers to the Upper Napa River and a copper concentration equal to the Joint WWRF 95th percentile effluent concentration (28 µg/L). The Napa County General Plan

specifies an annual growth limit of 1%, based on the Slow Growth Initiative (Measure A), first approved by voters in 1980. This limitation, continued and substantial voter sentiment, and the value of land maintained in agriculture (world-class viticulture) will preclude any substantial development of this area.

The City accepts the flow volume used to estimate the safety factor (Q_{trib}), but suggests the value be used to actually represent watershed contributions, not additional wastewater treatment plants or additional residential/commercial development which would not be permitted by the Napa County General Plan and other agricultural preservation and growth-limiting ordinances. To correspond with this designation, a tributary copper concentration (C_{trib}) may be utilized to represent watershed copper loading. Because copper is a conservative element, the City suggests using the maximum ambient Napa River copper concentration (downstream of Joint WWRF outfall) of 4.9 µg/L, measured by the Napa Sanitation District on July 22, 2008 (as reported in the Napa Sanitation District Report of Waste Discharge). This concentration is a conservative approach for assessing "watershed contribution," because it accounts for all drainage, including runoff and wastewater effluent from the Upper Napa River watershed.

Using the changes suggested above, the minimum river-to-effluent flow ratio for Calistoga WWTP discharges is calculated as follows. (Using the formula derived for the Joint WWRF Tentative Order.)

$$\text{Eq. 1 } Q_{RivUpstrm} + Q_c + Q_{sh} + Q_y + Q_{trib} = Q_{RivDnstrm}$$

$$\text{Eq. 2 } Q_{RivUpstrm}\, C_b + Q_c\, C_c + Q_{sh}\, C_{sh} + Q_y\, C_y + Q_{trib}\, C_{trib} = Q_{RivDnstrm}\, C_o$$

Where

$Q_{RivUpstrm}$ = Napa River flow upstream of Calistoga
C_b = Maximum ambient pollutant concentration at Napa River upstream of Calistoga
Q_c = 2007-2008 discharge season (12/01/07-06/15/08) total influent flow at Calistoga
C_c = 95th percentile effluent copper concentration at Calistoga
Q_{sh} = 2007-2008 discharge season (12/01/07-04/30/08) total influent flow at St. Helena
C_e = 95th percentile effluent copper concentration at St. Helena
Q_y = 2007-2008 discharge season (10/01/07-05/15/08) total influent flow at Yountville
C_e = 95th percentile effluent copper concentration at Yountville
Q_{trib} = Tributary or other source flow
C_{trib} = Tributary or other source copper concentration
$Q_{RivDnstrm}$ = Napa River flow downstream of Yountville
C_o = Napa River downstream water quality objective

And assuming:

$Q_{trib} = Q_c + Q_{sh} + Q_y$ *{Note: This assumption is very conservative, since the quantity of 'clean' water running off the mostly undeveloped watershed area is very substantial. Each of the three cities has minimum dilution requirements, ranging from10:1 (Calistoga) to 40:1 (Yountville), which confirms the very substantial quantities of non-effluent waters are in the Napa River at all times when discharges of effluent occurs. The watershed area above Yountville is about 3.5 times larger than at Calistoga.}*

$Q_{Dnstrm} = Q_{Upstrm} + Q_c + Q_{sh} + Q_y + Q_{trib}$

Given 2007-2008 discharge season influent treatment plant flows of

Calistoga = 154 million gallons = Q_c
St. Helena = 106 million gallons = $0.69Q_c$
Yountville = 104 million gallons = $0.68Q_c$

Eq. 2 (in terms of Calistoga WWTP flows) results in

$$Q_{RivUpstrm}\, C_b + Q_cC_c + 0.69Q_cC_{sh} + 0.68Q_cC_y + Q_{trib}C_{trib} = Q_{RivDnstrm}\, C_o$$
$$Q_{RivUpstrm}\, C_b + Q_cC_c + 0.69Q_c\, C_{sh} + 0.68Q_cC_y + (Q_c + Q_{sh} + Q_y)C_{trib} = (Q_{Upstrm} + Q_c + Q_{sh} + Q_y + Q_{trib})\, C_o$$
$$Q_{RivUpstrm}\, C_b + Q_cC_c + 0.69Q_cC_{sh} + 0.68Q_cC_y + (2.37Q_c)C_{trib} = (Q_{Upstrm} + 4.74Q_c)\, C_o$$

Using copper as a pollutant with the least amount of assimilative capacity (i.e., both background and effluent concentration closest to the objective), yields

$$Q_{RivUpstrm} * 3.1 + Q_c * 8.2 + 0.69Q_c * 9.8 + 0.68Q_c * 28 + (2.37\, Q_c) * 4.9 = (Q_{RivUpstrm} + 4.74\, Q_c) \times 9.6$$

Because
C_b = 3.1 µg/L
C_o = 9.6 µg/L, which is based on a minimum downstream (Napa River downstream of Yountville) hardness of 103 mg/L as $CaCO_3$
C_y = 28 µg/L (95th percentile value of Yountville's effluent; 25 ug/L is the maximum measured)
C_{sh} = 9.8 µg/L (95th percentile value of St. Helena's effluent; 9.4 ug/L is the maximum measured)
C_c = 8.2 µg/L (95th percentile value of Calistoga's effluent; 9.2 ug/L is the maximum measured)
C_{trib} = 4.9 µg/L (maximum receiving water copper concentration in the Napa River downstream of Yountville Joint WWRF effluent discharge, NSD station CC-1)

Solving for the ratio of $Q_{RivUpstrm}$ to Q_c results in

$Q_{RivUpstrm}/Q_c$ = 0.009/1
Or <1:1 as a minimum river-to-effluent flow ratio for Calistoga WWTP discharges

The analysis reveals that < 1:1 river-to-effluent flow ratio (as measured upstream of Calistoga) is required to maintain assimilative capacity for copper in the Upper Napa River. However, the San Francisco Bay Water Quality Control Plan (Basin Plan) prohibits "Any wastewater which has particular characteristics of concern to beneficial uses at any point at which the wastewater does not receive a minimum initial dilution of at least 10:1." To comply with the Basin Plan, the Calistoga WWTP is not permitted to discharge until the Napa River flowrates are ten times greater than the effluent flow. The Basin Plan requirement and the above assessment of assimilative capacity demonstrate that the current permitted discharge regime for the Calistoga WWTP is sufficient to protect the Upper Napa River. Similar safety factors are built into the minimum river-to-effluent flow requirements for the downstream discharges of St. Helena WWTRF (25:1 as measured at the St. Helena River Gage) and the Yountville Joint WWRF (40:1 as measured at the Napa River near Napa Gage).

The City is requesting that the Regional Water Board utilize the values and approach detailed in this letter to assess the assimilative capacity of the Upper Napa River and determine minimum river-to-effluent flow ratios during the upcoming NPDES permit renewals. Please contact me if you have any questions or need additional information.

Sincerely,

Dan Takasugi
Public Works Director/City Engineer

Cc. Jim Smith, City of Calistoga
Warren Schenstrom, City of Calistoga
John Madigan, Regional Water Quality Control Board
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