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Jo Anne Kipps
Fresno, California

Patrick Pulupa, Executive Officer
Central Valley Regional Water Quality Control Board

Via email to: CentralValleyFresno@waterboards.ca.gov and Nicolette.Dentoni@waterboards.ca.gov

Comments on Tentative Waste Discharge Requirements Order, NPDES Permit CA0079219 for City of Merced, Merced Wastewater Treatment Facility, Merced County

The subject tentative order, issued 19 June 2025, proposes to renew NPDES Permit CA0079219 and rescind and replace Waste Discharge Requirements (WDR) Order R5-2020-0014 for the City of Merced (City or Discharger) Merced Wastewater Treatment Facility (WWTF or Facility). My comments transmitted herein pertain to the tentative order's effectiveness in protecting the designated beneficial uses of affected groundwater and its adequacy in characterizing site-specific groundwater conditions and groundwater impacts attributable to the Facility's past and current discharges of waste to land.

The current order authorizes the discharge of equivalent disinfected tertiary disinfected municipal wastewater to Hartley Slough, a water of the United States; the Merced Wildlife Management Area (WMA), specifically to a 60-acre east pond and 80-acre west pond; and a 670-acre Land Application Area (LAA) planted with a winter crop of triticale or rye and a summer crop of Sudan grass. The LAA includes a 90-acre area that occupies the footprint of two former wastewater treatment ponds (Abandoned Ponds 5 and 6). The current and tentative orders authorize biosolids applications to the LAA, excluding the area of Abandoned Ponds 5 and 6.

Facility Map. The current order's Map (Attachment B) depicts the Facility's major features, including the following (lengths and acreages from Google Earth): treatment works (30 acres) labeled WWTP for Wastewater Treatment Plant; Outfall Structure (0.5 acre); unlined Emergency Storage Basin (3.8 acres); unlined Effluent Channel (2,700-feet long, 40-feet wide, 2.5 acres); Old Sludge Drying Beds (50 acres); Abandoned Ponds 5 & 6 (100 acres); LAA (580 acres); and WMA (360 acres). The Map does not depict the lined Equalization Basin (2.8 acres) or the Stormwater Retention Basin and Stormwater Detention Basin, which are both identified in the tentative order's Flow Schematic (Attachment C). Google Earth shows a 6-acre surface impoundment between the Emergency Storage Basin and Equalization Basin. The Map also depicts the locations of 11 of the Facility's 12 groundwater monitoring wells (MW-1 through MW-11). The location depicted for MW-7 is not the same as that identified in groundwater gradient maps submitted pursuant to the current order's Monitoring and Reporting Program (MRP).

The Map labels the Facility's sole surface water discharge point as "Effluent Discharge Into Hartley Slough (R-002)" and locates it immediately west of the Outfall Structure in the approximate location of MW-12, which is not depicted on the Map. The latitude and longitude coordinates for Discharge Point 002 (D-002) identified in the tentative order's title page places it about 500 feet north of the Outfall Structure. The Fact Sheet (II.A.) identifies the Outfall Structure as a "re-aeration outfall." Google Earth shows the Outfall Structure includes 11 square- or rectangular-shaped areas separated by concrete pavement that are almost always green in color. The green-colored areas do not appear to contain effluent, unless effluent always contains substantial algae growth. Without a description of the Outfall Structure, I am not sure whether this feature is the "re-aeration outfall" identified in the Fact Sheet.

The Map depicts the location of Discharge Point 003 to the WMA as a point in the northeast corner of the western pond, and Discharge Point 004 as a point within Field 4, possibly to more-or-less represent the centroid of the 580-acre LAA.

The Map depicts major features with different color and pattern fills. The pattern for Abandon Ponds 5 & 6 is dissimilar from the LAA that receives biosolids and is not identified in the legend; presumably the different pattern indicates this area does not receive biosolids. Also, the LAA's southern border is depicted as coinciding with Owens Creek, which is 60 to 380 feet south of the 580-acre LAA. Google Earth depicts the 580-acre LAA as divided into seven rectangular-shaped fields of about 80 acres each.

Comment: Revise the tentative order's Map to:

- label the treatment works area "WWTF" and revise legend to Wastewater Treatment Facility
- depict the lined Equalization Basin
- depict the two stormwater basins identified in the Flow Schematic
- revise the location and label for Discharge Point 002
- depict MW-12
- revise the location of MW-7 to reflect that in Discharger groundwater gradient maps
- identify in the legend the fill pattern for Abandoned Ponds 5 & 6 (or simply use the same pattern as the 580-acre LAA)
- depict the 580-acre LAA that receives biosolids as being rectangular in shape

Additional Comment: If Discharge Points 003 and 004 are not located at the points where effluent is discharged to the WMA ponds and LAA fields, respectively, revise the Map and latitude and longitude coordinates to reflect the actual point locations of effluent discharge (i.e., effluent delivery outfalls), or justify the accuracy of the currently identified coordinates. And, revise the Fact Sheet's Facility Description to provide a description of (1) the 0.5-acre Outfall Structure and (2) the liner installed in the Equalization Basin (i.e., installation year, hydraulic conductivity, invert elevation, and vertical separation distance between basin invert and highest anticipated groundwater), the manner and frequency of liner inspection, and any past liner repair work. Also identify the construction and function of the 6-acre surface impoundment located between the Equalization Basin and Emergency Storage Pond.

Solids Treatment and Handling. The current order describes Facility solids handling and treatment as including a dissolved air flotation thickener, primary digesters, digester gas holder, solids dewatering facility, centrate pump station and equalization tank, and lined active solar dryers. The tentative order carries over this list except it refers to an equalization basin, not tank.

Comment: Revise Fact Sheet section II.A. second paragraph to read: "…solids dewatering facility, ~~centrate pump station, and equalization basin,~~ ***centrate station and equalization tank,*** and lined active solar dryers."

The tentative order's MRP carries over the current MRP's incorrect description of the biosolids monitoring location, BIO-001, as "Biosolids at the sludge drying beds, before removal for storage or disposal." Google Earth indicates the Facility's active solar dryers were constructed between 7/24/2011 and 6/17/2013, and its sludge drying beds were abandoned between 6/18/2013 and 3/31/2015, when the sludge drying beds appear disked and leveled, but not disked deep enough to obscure the remnants of berms separating individual beds.

Comment: Revise the tentative MRP to correct the description of BIO-001 (e.g., ***at the active solar dryers, before removal for storage or disposal***").

For the first few years during my employment with the Central Valley Regional Water Quality Control Board, Fresno Office, from 1998 to 2010, I was personally involved in the regulatory oversight of this Facility. During one of my Facility inspections, the chief operator revealed to me that Facility staff routinely discharged digester supernatant to the sludge drying beds. Due to shallow groundwater conditions, the use of unlined sludge drying beds for sludge dewatering and supernatant disposal has adversely impacted underlying groundwater. This is evident in monitoring data from wells installed in and around the Old Sludge Drying Beds area (i.e., MW-5, MW-6, and MW-7).

The Old Sludge Drying Beds area is immediately west of the unlined Effluent Channel, which also effectively functions as a 2.5-acre linear effluent percolation pond. The Effluent Channel's invert elevation is 139.5 feet above mean sea level (ft amsl), according to vertical profile data available from the USGS 3D Viewer website.[1] Groundwater gradient maps submitted pursuant to the current MRP shows groundwater elevations in monitoring wells installed in and around the Old Sludge Drying Beds routinely approach or exceed this elevation, indicating that the invert of the unlined Effluent Channel extends into groundwater. This represents a direct discharge of effluent to groundwater. Effluent directly discharged into groundwater from the unlined Effluent Channel threatens to exacerbate the horizontal and possibly vertical spread of groundwater polluted by arsenic and manganese, as well as nitrate. Polluted groundwater moving offsite eventually surfaces in Hartley Slough. The tentative order, like the current order, does not acknowledge this condition of arsenic and manganese pollution in groundwater passing under the sludge drying beds (and elsewhere, as discussed below). It does, however, recognize that past discharges to the drying beds have caused or contributed to groundwater containing nitrate-N in concentrations exceeding the WQO of 10 mg/L.

To its credit, the tentative order includes a special provision (VI.C.2.b) requiring the Discharger to address groundwater impacts caused by past discharges to the sludge drying beds:

> **Former Sludge Drying Beds Closure.** Within **<1 Year from Effective Date>**, the Discharger shall submit for review, a Former Sludge Drying Beds Closure Work Plan, proposing actions to permanently decommission the former sludge drying beds. The work plan shall provide a timeline for a proper characterization of the extent of nitrogen compounds in soils beneath the former sludge drying beds compared to background concentrations, an evaluation of potential risks to groundwater quality from residual nitrate and total Kjeldahl nitrogen in soils, a plan for closure, potential repurposing, and long-term maintenance and use of the site, and a Final Technical Report containing an evaluation that demonstrates that the former sludge drying beds do not pose a threat to groundwater quality. The timeline for implementation of the work plan shall not exceed seven years from the effective date of this Order.

The special provision limits the characterization of sludge discharge impacts to soil (and groundwater) to only nitrogen. Groundwater monitoring data from wells installed in and around the former sludge drying bed area indicates that the organic loading from past sludge (and supernatant) discharges has created a condition of groundwater pollution from arsenic and manganese.

[1] https://apps.nationalmap.gov/viewer/

Comment: Revise Special Provision VI.C.2.b to address risks to groundwater quality from excessive organic loading that has caused a condition of groundwater pollution for arsenic and manganese. Additionally, please explain why the Discharger still uses the Effluent Channel, which historically conveyed effluent to Discharge Point 001 at the approximate location of latitude 37°14'39" N longitude -120°32'31" W. Consider revising the special provision, or including a separate special provision, to require the Discharger to implement corrective measures to mitigate the groundwater impacts resulting from its use of the unlined Effluent Channel. Include a requirement in the work plan to either cease effluent discharges to the Effluent Channel or equip it with a liner meeting a hydraulic conductivity standard of at least 1 x 10^{-6} centimeters per second (cm/sec). Also please revise the tentative order's Fact Sheet to elaborate on what staff means by the term, "proper characterization," as used in the special provision. To this end, consider consulting with staff in the Non-15 Discharges of Waste to Land Program to develop an Information Needs attachment to the tentative order that identifies the minimum technical information requirements of an acceptable Former Sludge Drying Beds Closure Work Plan.

WMA and LAA Effluent Discharges. While the tentative order authorizes the discharge of Facility effluent to the WMA and LAA, it does not disclose the annual hydraulic loadings associated with these discharges. Effluent flow data in eSMR Analytical Reports for the WMA (WMA-003) and LAA (LAA-004) indicate effluent discharges in 2023 and 2024 totaled 561 and 417 million gallons per year (MG/yr) to the WMA, respectively. The WMA's two ponds have a combined area of 140 acres. The hydraulic loadings associated with the effluent discharges to these two ponds in 2023 and 2024 were 14 feet per year (ft/yr) and 11 ft/yr, respectively. Google Earth indicates several linear trenches within and outside of the WMA's ponds that appear to extend into groundwater (e.g., see the image dated 5/2/2017). It would appear that effluent discharges to the ponds represent a direct discharge to groundwater, similar to the Effluent Channel. The tentative order does not disclose this apparent direct groundwater discharge, let alone explain why it reflects best practicable treatment or control. Effluent discharges to the LAA totaled 604 and 657 MG/yr in 2023 and 2024, respectively. Assuming effluent was discharge uniformly across the entire 670 acres of authorized LAA, the hydraulic loading associated with the LAA discharge was 3.2 and 3.5 ft/yr, which appears reasonable for the types of crops grown on LAA fields.

The worst-case nitrogen loadings associated with these effluent hydraulic loadings can be approximated by assuming an effluent total nitrogen concentration of 10 mg/L (typically effluent nitrate-N concentrations are less than 10 mg/L). The total nitrogen loadings to the WMA ponds in 2023 and 2024 were 330 and 250 pounds per acre per year (lb/ac/yr), respectively. Because the vadose zone underlying the ponds appears to be very thin or, at times, non-existent, the nitrogen in the effluent is released directly to groundwater. Monitoring data indicate groundwater passing through MW-9 and MW-10 contains nitrate-N in concentrations below the WQO of 10 mg/L. Apparently, the effluent contains sufficient organic carbon to sustain denitrification in groundwater passing under the WMA ponds. However, like groundwater passing under the Old Sludge Drying Beds, groundwater passing through MW-9 and MW-10 contains arsenic in concentrations exceeding the WQO of 10 µg/L. Data from 2018 through 2024 yield average arsenic concentrations of 15 µg/L in MW-9 and 19 µg/L in MW-10. Similarly, data for this period indicate an average manganese concentration of 0.930 mg/L in groundwater passing through MW-9, which is closest to the pond discharge. This average value is over 18 times the WQO of 0.05 mg/L. This means that the amount of oxygen-demanding substances in effluent discharged to the WMA exceeds that required for denitrification and is causing reducing conditions in groundwater conducive to the mobilization from soil particles of naturally-occurring arsenic and manganese. The tentative order does not disclose that the effluent discharge to the WMA ponds has created a condition of groundwater pollution for arsenic and manganese.

Monitoring data from 2018 to 2024 indicate that groundwater passing through monitoring wells in LAA fields that receive biosolids applications (MW-2, MW-3, and MW-4) typically contains nitrate-N in concentrations less than the WQO of 10 mg/L. While groundwater passing through these wells contain arsenic in concentrations typically less than the WQO, groundwater passing through MW-3 also contains manganese in concentrations exceeding the WQO of 0.05 mg/L. This indicates that the organic loading to the LAA fields that receive biosolids applications is excessive and has created a condition of groundwater pollution for manganese.

MW-7 is downgradient of Abandoned Ponds 5 & 6; MW-8 is located at the eastern border of this area, which is immediately west of the Effluent Channel. Groundwater gradient maps indicate groundwater flows north-northwest from the biosolids LAA fields towards Hartley Slough. Data from 2018 to 2024 for both wells yield average groundwater concentrations of arsenic and manganese exceeding their WQOs. The average nitrate-N concentration in groundwater passing through MW-8 is less than the WQO of 10 mg/L, but from 2018 through 2020 at times exceeded the WQO by a factor of two to three. The average nitrate-N concentration in groundwater passing through MW-7 is 14.4 mg/L. The tentative order does not characterize the nitrogen loading to LAA fields attributable to the effluent and biosolids discharges. It also does not disclose groundwater passing under this area is polluted from arsenic, manganese, and nitrate.

Comment: Revise the tentative order to characterize the hydraulic loading of Facility effluent discharges to the WMA ponds and LAA fields, and the associated nitrogen loadings associated with these discharges, as well as the nitrogen loadings to LAA fields that receive biosolids applications. Disclose whether the annual nitrogen loadings associated with effluent and biosolids discharges to LAA fields are reasonable and do not exceed reasonable agronomic rates. Also, disclose that the discharge to the WMQ and LAA has caused or contributed to groundwater pollution for arsenic, manganese, and nitrate (at least in MW-7). In light of this, explain why authorization to continue this discharge is consistent with the Basin Plan and why Facility discharges to the WMQ and LAA qualify for an exemption from the prescriptive containment standards of Title 27. Further, explain why a direct discharge to groundwater, which appears to be occurring in WMA trenches within and outside its ponds, reflects the implementation of best practicable treatment or control. Consider revising the tentative order to include a special provision requiring the Discharger to fill in these trenches to preclude the direct injection of effluent to groundwater.

Incomplete Characterization of Groundwater Conditions and Impacts. The tentative order exemplifies an all-too-common feature of Central Valley NPDES permits that also authorize discharges of waste to land – namely, the incomplete characterization of the discharge area's setting and land uses, climate, soils, and groundwater conditions (depths, elevations, flow directions, gradients, and quality). This information is always included in WDR orders for discharges to land of waste regulated by the regulatory program cumbersomely referred to as the "Non-15 Discharge to Land Program" (earlier it was also succinctly referred to as the WDR Program).

Many Central Valley WDR orders that serve as NPDES permits authorize discharges of waste to land (e.g., unlined surface impoundments or surfaces for wastewater treatment, effluent storage, and sludge treatment and storage). In my comment letters to such tentative WDR orders, I have remarked how NPDES Program staff routinely do not adequately document groundwater conditions and impacts associated with waste discharges to land authorized under WDR orders that serve as NPDES permits.

Staff justify this approach as reasonable because NPDES permits are subject to renewal every five years, while WDR orders prepared under the Non-15 Discharge to Land Program can be effective for decades. Because NPDES permits are renewed every five years, staff often explain that deficiencies in groundwater protection identified in my comment letters can be addressed in the next permit cycle. This 'we-can-do-it-in-the-next-permit-cycle' attitude of NPDES Program staff makes groundwater considerations a well-dented can that is kicked down the road to effective protection of designated beneficial uses of affected groundwater. All too often, NPDES Program staff appear reluctant to spend the time and effort on documenting groundwater conditions and impacts associated with waste discharges to land authorized under the guise of WDR orders that serve as NPDES permits. In all-too-many instances, NPDES Program staff appear to lack the training and/or experience to adequately evaluate groundwater impacts associated with a facility's discharges of waste to land. On more than one occasion, I have recommended staff to prepare NPDES permits to authorize only discharges of waste to surface waters of the United States, and require dischargers to obtain authorization under the Non-15 Discharge to Land Program to discharge wastes to land associated with facility operations.

Comment: Revise the tentative order to include a description of the Facility's environs, land uses, climate, soils, regional and site-specific groundwater conditions in sufficient detail comparable to WDR orders prepared by staff with the Non-15 Discharge to Land Program. Include in the Fact Sheet a table disclosing information on the Facility's groundwater monitoring well network (i.e., installation year, location, depth, reference elevation, screen interval elevations). Include a discussion of groundwater elevation and gradient data to support the identification of wells as upgradient, downgradient, and cross-gradient. For example, the tentative order, like the current order, confines its discussion of site-specific groundwater information in one table, Table F-3, Historic Groundwater Monitoring Data. Groundwater elevation gradient maps submitted pursuant to the current MRP consistently indicate only one upgradient monitoring well, MW-1. All other wells are downgradient of the Facility's discharges. Yet, Table F-3 in the current and tentative orders identify three wells as upgradient, MW-1 and MW-8 and MW-11. Both MW-8 and MW-11 are consistently downgradient of groundwater passing under LAA fields receiving biosolids applications. Staff would have realized this from examining groundwater flow direction and gradient data submitted during the permit's cycle. Because staff apparently did not do this, the tentative order carries over the same mistaken identification of MW-8 and MW-11 as upgradient wells. This mistake results in an incorrect characterization of adverse impacts to groundwater caused by the Facility's past and current discharges of waste to land.

Comment: Review monitoring data submitted over the current permit cycle for groundwater depth, elevation, and gradient to characterize site-specific groundwater occurrence, flow direction, and gradient. Revise Table F-3 to use data only from MW-1 to characterize upgradient groundwater quality. Based on the revised Table F-3, conclude that past and current discharge practices have created a condition of groundwater pollution for arsenic, manganese and, in places and at times, also for nitrate-N. Cite this characterization as evidence to conclude the Facility's discharges to land are not consistent with the Basin Plan and do not qualify for an exemption from Title 27 prescriptive containment standards. Include a special provision requiring the Discharger to implement corrective measures to achieve and maintain compliance with groundwater WQOs to protect designated beneficial uses.

Monitoring and Reporting Program. The tentative order carries over the current MRP requirements for groundwater, except that it wisely adds total organic carbon to the suite of monitored constituents. Table E-7, Groundwater Monitoring Requirements, requires 2/year monitoring of chemical constituents

and parameters and 1/year monitoring of groundwater gradient and direction (both calculated values). This frequency is reasonable and appropriate for this discharge.

The Fact Sheet, in Section VI.E.7, Land Discharge Monitoring indicates the tentative order carries over the current order's requirement for monitoring and reporting loadings of 5-day biochemical oxygen demand (BOD_5), presumably applicable to LAA fields but possible also to WMA ponds, it is not clear. It indicates that this monitoring requirement is carried over from the current order. In my review of both orders, I could not locate a section specific to BOD_5 loading to the LAA or the WMA. Based on the hydraulic loadings to the LAA, the BOD_5 loadings to LAA fields from effluent discharges should be comparable to surrounding agricultural land uses. However, the BOD_5 loadings to WMA ponds exceed that of surrounding agricultural land uses and should be monitored.

Comment: Revise the tentative order's MRP to clarify whether or not it requires monitoring of BOD_5 loadings associated with effluent discharges to the LAA and WMA. If staff determines monitoring and reporting of BOD_5 loadings to the LAA and WMA are warranted, revise the MRP to include such monitoring and consult with staff with the Non-15 Discharges of Waste to Land Program for how to specify this in the MRP.

Thank you for your time and consideration. The values presented for some average concentrations of some constituents in groundwater are based on my preliminary evaluation of eSMR data and are subject to revision. Because the Discharger sometimes enters into eSMR results using different units, the values contained in eSMR Analytical Reports may not be accurate. In some instances, values reported in units of µg/L appear to reflect values that should have been reported using units of mg/L. For these values, I converted the reported values to µg/L (e.g., I converted a manganese result of 5.3 µg/L to 5,300 µg/L if adjoining values are comparably elevated). Confirmation would require careful examination of analytical reports, a task that requires time that I do not have in order to submit this comment letter by today's 5 pm deadline.

Jo Anne Kipps

JO ANNE KIPPS