CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2013-XXXX

AMENDING WASTE DISCHARGE REQUIREMENTS
ORDER R5-2010-0081 (NPDES PERMIT NO. CA0083771)

CITY OF RIO VISTA
NORTHWEST WASTEWATER TREATMENT PLANT
SOLANO COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Central Valley Water Board) finds that:

1. On 29 July 2010, the Central Valley Water Board adopted Waste Discharge Requirements (WDR) Order R5-2010-0081 (NPDES No. CA0083771), prescribing waste discharge requirements for the City of Rio Vista Northwest Wastewater Treatment Plant, Solano County. For the purposes of this Order, the City of Rio Vista is hereafter referred to as "Discharger" and the Northwest Wastewater Treatment Plant is hereafter referred to as "Facility."

2. The Discharger provides sewerage service to a small development northwest of the City of Rio Vista and serves a population of approximately 3,400. The design average dry weather flow capacity of the Facility is 1.0 million gallons per day (mgd) and the Facility discharges tertiary-level treated wastewater to the Sacramento River, within the Sacramento – San Joaquin Delta (Delta), a water of the United States.

3. The Facility includes membrane biological reactors followed by an Ultraviolet (UV) Disinfection System. Order R5-2010-0081 includes UV Disinfection System Operating Specifications and monitoring requirements to ensure the Facility provides adequate disinfection for protection of the contact recreation beneficial use of the Delta. The UV Disinfection System Operating Specifications require a minimum UV dose of 100 mJ/cm^2 with turbidity not to exceed 2 nephelometric turbidity units (NTU) as a daily average, and 10 NTU, at any time.

   The UV System specifications were established based on recommendations by the California Department of Public Health (DPH) for facilities using UV disinfection when producing Title 22 disinfected tertiary recycled water[1]. The National Water Research Institute and American Water Works Association Research Foundation developed a guidance document for meeting the disinfection requirements for Title 22 disinfected tertiary recycled water using UV disinfection, titled, "*Últraviolet Disinfection Guidelines for Drinking Water and Water Reuse"* (NWRI Guidelines) first published in December 2000 and revised as a Second Edition dated May 2003.

4. Order R5-2010-0081 does not require equivalent to Title 22 disinfected tertiary recycled water, because the discharge receives a minimum dilution of 1000:1. Due to

[1] Title 22 disinfected tertiary recycled water defined in section 60301.230 of the California Code of Regulations

the significant dilution, DPH recommends disinfection equivalent to Title 22 disinfected secondary-23 recycled water[2], which is a lower level of disinfection. Order R5-2010-0081 includes total coliform organism effluent limits based on DPH's Title 22 disinfected secondary-23 recycled water. Therefore, the UV Disinfection System Operating Specifications in Order R5- 2010-0081 are overly stringent.

5. The UV disinfection system was designed to meet disinfection equivalent to Title 22 disinfected secondary-23 recycled water, which requires the 7-day median concentration of total coliform bacteria in the disinfected effluent not exceed a most probable number (MPN) of 23 per 100 milliliters and the number of total coliform bacteria does not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30 day period.

6. The recommended design parameters governing the UV disinfection system were based on empirical equation that is commonly referred to as Chick's Law. Chick's Law is based on a kinetic model developed to determine the rate of bacterial kill with respect to time and the concentration of disinfectant used. Based on the model, a UV dose of 21.6 mJ/cm^2 is required to ensure the disinfected wastewater does not exceed a total coliform organism concentration of 23 MPN/100 mL and a UV dose of 11.6 mJ/cm^2 is required to meet a total coliform organism concentration of 240 MPN/100mL. Based on these design specifications, the UV Disinfection System Operating Specifications have been modified to include the appropriate UV dosage to meet the total coliform organism effluent limitations. The revised UV dosage includes a 7-day median UV dose of 22 mJ/cm^2, and a minimum UV dose of 12 mJ/cm^2. In addition, the modeling assumed the membranes were operating properly, which can be determined based on the turbidity of the wastewater exiting the membranes. Therefore, the UV Disinfection System Operating Specifications have been modified to require a maximum turbidity entering the UV reactor of 0.5 NTU, and a daily average turbidity of 0.2 NTU, which demonstrates the membranes are operating properly.

7. Order R5-2010-0081 contains a reopener provision (Section VI.C.1.a.ii) based on Code of Federal Regulations Title 40 part 122.62(a)(2) that allows the permit to be reopened for modification when new information, that was not available at the time of permit issuance, would have justified different permit conditions at the time of issuance. The new information provided by the Discharger meets this requirement.

8. Issuance of this Order is exempt from the provisions of the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) ("CEQA") pursuant to Water Code section 13389, since the adoption or modification of a NPDES permit for an existing source is statutorily exempt and this Order only serves to modify a NPDES permit (*Pacific Water Conditioning Ass'n, Inc. v. City Council of City of Riverside* (1977) 73 Cal.App.3d 546, 555-556.).

[2] Title 22 disinfected secondary-23 recycled water defined in section 60301.225 of the California Code of Regulations

9. The Central Valley Water Board has notified the Discharger and interested agencies and persons of its intent to amend Waste Discharge Requirements for this discharge and has provided an opportunity to submit public comments for Central Valley Water Board consideration.

IT IS HEREBY ORDERED THAT:
Waste Discharge Requirements Order R5-2010-0081 (NPDES No. CA000083771) is amended as shown in Items 1 -11, below. This Order is effective upon adoption.

1. Change the Order number throughout to R5-2010-0081-01.

2. **Limitations and Discharge Requirements, Section II – Findings** – Modify Section II.G. as shown below in underline/strikeout format:

   G. **Water Quality-Based Effluent Limitations (WQBELs**). Section 301(b) of the CWA and 40 CFR 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards. ~~This Order contains requirements, expressed as a technology equivalence requirement, that are necessary to achieve water quality standards. The Regional Water Board has considered the factors listed in CWC section 13241 in establishing these requirements. The rationale for these requirements, which consist of tertiary treatment or equivalent requirements, is discussed in the Fact Sheet.~~

3. **Limitations and Discharge Requirements, Section VI.C.4 – Construction, Operation, and Maintenance Specifications** - Modify Section VI.C.4.a (Ultraviolet (UV) Disinfection System Operating Specifications) as shown below in underline/strikeout format:

   a. **Ultraviolet (UV) Disinfection System Operating Specifications**. <u>This Order implements recommendations by the California Department of Public Health for removal of pathogens, which includes effluent limitations for total coliform organisms (Section IV.A.1.e). The Discharger shall operate the UV Disinfection System to ensure adequate disinfection, and shall meet the following UV Disinfection System Operating Specifications:</u>
   ~~The Discharger shall operate the UV disinfection system to provide a minimum UV dose of 100 millijoules per square centimeter (mJ/cm2) at peak daily flow, unless otherwise approved by the California Department of Public Health, and shall maintain an adequate dose for disinfection while discharging to the Sacramento River, unless otherwise approved by the California Department of Public Health~~<u>.</u>

      i The Discharger shall provide continuous, reliable monitoring of flow, UV transmittance, UV ~~power~~<u>dose</u>, and turbidity.

ii **UV Dosage.** The Discharger shall operate the UV disinfection system to provide a minimum hourly UV dose of 12 mJ/cm^2, and a minimum 7-day median UV dose of 22 mJ/cm^2.

iii **Turbidity.** The Discharger shall operate the treatment system to ~~insure that~~ provide a turbidity prior to disinfection ~~shall~~ not to exceed ~~2.0~~ 0.2 NTU as a daily average~~, and 5 NTU more than 5 percent of the time within a 24-hour period~~, and 0.5~~10~~ NTU, at any time.

iv The UV transmittance (at 254 nanometers) in the wastewater exiting the UV disinfection system shall not fall below 55 percent of maximum at any time.

v. The quartz sleeve and cleaning system components must be visually inspected per the manufacturer's operations manual for physical wear (scoring, solarization, seal leaks, cleaning fluid levels, etc.) and to check the efficacy of the cleaning system.

vi. The sleeves must be cleaned periodically as necessary to meet the requirements.

vii. Lamps must be replaced per the manufacturer's operations manual, or sooner, if there are indications the lamps are failing to provide adequate disinfection. Lamp age and lamp replacement records must be maintained.

viii. The Facility must operate in accordance with an operations and maintenance program that assures adequate disinfection.

4. **Attachment E, Monitoring and Reporting Program, Table E-1, Monitoring Locations** – Modify the description of monitoring location UVS-001 in Table E-1 as shown below in underline format:

Table E-1. Monitoring Station Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
--	UVS-001	Ultraviolet (UV) disinfection system. A location where a representative sample of the influent to the UV system can be obtained.

5. **Attachment E, Monitoring and Reporting Program, Table E-3 Effluent Monitoring** – Remove the effluent monitoring requirement for turbidity, and remove footnotes 13 and 14 from Table E-3.

6. **Attachment E, Monitoring and Reporting Program, Table E-6. Ultraviolet Disinfection System Monitoring Requirements** – Modify Table E-6, as shown below in underline/strikeout format:

Table E-6. Ultraviolet Disinfection System Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Flow rate	mgd	Meter	Continuous[1]	
Number of UV Banks and Channels in operation	Number	~~Meter~~ Observation	~~Continuous[1]~~ 1/day[2]	
UV Transmittance	Percent (%)	Meter	Continuous[1]	
UV Power Setting	Percent (%)	Meter	Continuous[1]	
UV Dose[2~~3~~]	mJ/cm2	Calculated	Continuous[1]	
Turbidity[4]	NTU	Meter	Continuous[1]	

[1] ~~The total volume of wastewater directed to the basin may be estimated. This requirement is effective 120 days after adoption of this Order to allow the Discharger time to install necessary equipment.~~ For continuous analyzers, the Discharger shall report documented routine meter maintenance activities, including date, time of day, and duration, in which the analyzer(s) is not in operation.

[2] Report daily the number of UV channels and number of UV light banks per channel in operation.

[2~~3~~] Report daily minimum hourly UV dose, daily average UV dose, and ~~weekly average~~ 7-day median UV dose. For the daily minimum hourly UV dose, also report associated number of banks, gallons per minute per lamp, power settings, and UV transmittance used in the calculation. ~~If effluent discharge has received less than the minimum UV dose and is not diverted from discharging, report the duration and dose calculation variables with each incident.~~

[4] Report daily average and daily maximum turbidity.

7. **Attachment F, Fact Sheet, Table F-1. Facility Information –** Modify the Facility Contact and Authorized Person in Table F-1, as shown below in underline/strikeout format:

Facility Contact, Title and Phone	David Melilli, Public Works Director/~~City Manager~~ (707) 374-6747
Authorized Person to Sign and Submit Reports	David Melilli, Public Works Director/~~City Manager~~ (707) 374-6747

8. **Attachment F, Fact Sheet, Section IV.B.2, Applicable Technology-Based Effluent Limitations –** Modify Section IV.B.2.a as shown below in underline/strikeout format:

a. **BOD_5 and TSS**. Federal regulations, 40 CFR Part 133, establish the minimum weekly and monthly average level of effluent quality attainable by secondary treatment for BOD_5 and TSS. Tertiary treatment is not necessary to protect the beneficial uses of the receiving stream. However, the Facility treats to a tertiary level, therefore, ~~and~~ the final effluent limitations for BOD_5 and TSS are based on the technical capability of the tertiary process. BOD_5 is a measure of the amount of oxygen used in the biochemical oxidation of organic matter. The secondary and

tertiary treatment standards for BOD_5 and TSS are indicators of the effectiveness of the treatment processes. The principal design parameter for wastewater treatment plants is the daily BOD_5 and TSS loading rates and the corresponding removal rate of the system. In applying 40 CFR Part 133 for weekly and monthly average BOD_5 and TSS limitations, the application of tertiary treatment processes results in the ability to achieve lower levels for BOD_5 and TSS than the secondary standards currently prescribed; the 30-day average BOD_5 and TSS limitations have been revised to 10 mg/L, which is technically based on the capability of a tertiary system. In addition to the average weekly and average monthly effluent limitations, a daily maximum effluent limitation for BOD_5 and TSS is included in the Order to ensure that the treatment works are not organically overloaded and operate in accordance with design capabilities. In addition, 40 CFR 133.102, in describing the minimum level of effluent quality attainable by secondary treatment, states that the 30-day average percent removal shall not be less than 85 percent. If 85 percent removal of BOD_5 and TSS must be achieved by a secondary treatment plant, it must also be achieved by a tertiary (i.e., treatment beyond secondary level) treatment plant. This Order contains a limitation requiring an average of 85 percent removal of BOD_5 and TSS over each calendar month.

9. **Attachment F, Fact Sheet, Section IV.C.3.e, Constituents with Reasonable Potential** – Modify Section IV.C.3.e.vii.(c) for Pathogens as shown below in underline/strikeout format:

(c) **WQBELs.** The previous Order contained an effluent total coliform monthly median limitation of 23 MPN/100 mL and a daily maximum limitation of 500 MPN/100 mL. The effluent limitations for total coliform have been modified in this Order to be consistent with DPH recommendations. This Order includes effluent limitations for total coliform of 23 MPN/100mL as a 7-day median, and 240 MPN/100 mL, that should not be exceed more than once in any 30 day period. These coliform limits are imposed to protect the beneficial uses of the receiving water, including public health through contact recreation and drinking water pathways.

In addition to coliform limitations, turbidity specifications have been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. The tertiary treatment process~~, or equivalent,~~ utilized at this Facility is capable of reliably meeting a turbidity specification of 0.2 nephelometric turbidity units (NTU) as a daily average and a maximum of 0.5 NTU~~average~~. Failure of the filtration system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. Coliform testing, by comparison, is not conducted continuously and requires several hours, to days, to identify high coliform concentrations. Thus, monitoring turbidity is a good operational check to ensure the treatment system was functioning properly and could meet the limits for total coliform organisms. Therefore, to ensure compliance with DPH recommended ~~Title 22~~ disinfection criteria this Order contains operational turbidity specifications

to be met prior to disinfection (See Special Provisions VI.C.4.a Turbidity Operational Requirements in the Limitations and Discharge Requirements section of this Order), based on the Discharger's UV system design criteria ~~to be consistent with current DPH guidance the operational requirements for turbidity have been established as 2 NTU as a daily average, an instantaneous maximum of 10 NTU, and shall not exceed 5 NTU more than 5 percent of the time within a 24-hour period~~.

This Order also includes UV dosage specifications to ensure adequate disinfection for compliance with DPH recommended disinfection criteria and are established based on the Discharger's UV system design criteria (see Section VII.B.4.a. of the Fact Sheet, for details regarding the UV specifications). ~~This Order contains effluent limitations and a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. The Regional Water Board has previously considered the factors in CWC section 13241 in establishing these requirements.~~

10. **Attachment F, Fact Sheet, Section VII.B.4 – Construction, Operation, and Maintenance Specifications** – Modify Section VII.B.4.a. (Ultraviolet (UV) Disinfection System Operating Specifications) as shown below in underline/strikeout format:

a. **Ultraviolet (UV) Disinfection System Operating Specifications**. UV System specifications and monitoring and reporting are required to ensure that the UV disinfection system is operated in a manner to adequately disinfect the wastewater to inactivate pathogens (e.g., viruses in the wastewater) and to verify that the UV system is operated in accordance with the design criteria recommended by the UV system design engineer.

UV dosage is dependent on several factors such as UV transmittance, UV power setting, wastewater turbidity, and wastewater flow through the UV system. Monitoring and reporting of these parameters is necessary to ensure adequate disinfection and compliance with the water quality-based effluent limitations for total coliform effluent limitations.

The membrane biological reactors (tertiary filtration) utilized at this Facility are capable of reliably meeting the 23 MPN total coliform effluent limit without the UV disinfection system, because the membranes can filter coliform organisms from the wastewater. However, coliform organisms are used as an indicator parameter for all bacteria, viruses, and protozoa, some of which are not removed by the membranes, but instead removed or deactivated via the UV disinfection system. The total coliform organisms effluent limits, alone, are not sufficient to ensure adequate disinfection of the wastewater. Additional operational specifications for the membranes and UV disinfection system are necessary to ensure adequate disinfection.

The recommended design parameters governing the UV disinfection system were based on empirical equation that is commonly referred to as Chick's Law. Chick's

Law is based on a kinetic model developed to determine the rate of bacterial kill with respect to time and the concentration of disinfectant used. Based on the model, a UV dose of 21.6 mJ/cm^2 is required to ensure the disinfected wastewater does not exceed a total coliform organism concentration of 23 MPN/100 mL and a UV dose of 11.6 mJ/cm^2 is required to meet a total coliform organism concentration of 240 MPN/100mL. Based on these design specifications, the UV Disinfection System Operating Specifications have been modified to include the appropriate UV dosage to meet the total coliform organism effluent limitations consistent with the averaging periods of the effluent limitations. The required UV dosages are a 7-day median UV dose of 22 mJ/cm^2, and a minimum UV dose of 12 mJ/cm^2.

Turbidity is included as an operational specification as an indicator of the effectiveness of the treatment process and to assure compliance with effluent limitations for total coliform organisms. Failure of the treatment system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity and could impact UV dosage. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. The modeling assumed the membranes were operating properly, which can be determined based on the turbidity of the wastewater exiting the membranes. Therefore, the UV Disinfection System Operating Specifications require a maximum turbidity entering the UV reactor of 0.5 NTU, and a daily average turbidity of 0.2 NTU, which demonstrates the membranes are operating properly. ~~UV System specifications and monitoring and reporting are required to ensure that adequate UV dosage is applied to the wastewater to inactivate pathogens (e.g., viruses in the wastewater). UV dosage is dependent on several factors such as UV transmittance, UV power setting, wastewater turbidity, and wastewater flow through the UV system. Monitoring and reporting of these parameters is necessary to determine compliance with minimum dosage requirements established by the California Department of Public Health (DPH) and the National Water Research Institute (NWRI) and American Water Works Association Research Foundation NWRI/AWWRF's Últraviolet Disinfection Guidelines for Drinking Water and Water Reuse" first published in December 2000 and revised as a Second Edition dated May 2003. In addition, a Memorandum dated 1 November 204 issued by DPH to Regional Board executive offices recommended that provisions be included in permits to water recycling treatment plants employing UV disinfection requiring Dischargers to establish fixed cleaning frequency if quartz sleeves as well as include provisions that specify minimum delivered UV dose that must be maintained (as recommended by the NWRI/AWWRF UV Disinfection Guidelines).~~

~~Turbidity is included as an operational specification as an indicator of the effectiveness of the treatment process and to assure compliance with effluent limitations for total coliform organisms. The (tertiary filtration) utilized at this Facility is capable of reliably meeting a turbidity limitation of 2 nephelometric turbidity units (NTU) as a daily average. Failure of the treatment system such that~~

~~virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity and could impact UV dosage. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. The operational specification requires that turbidity prior to disinfection shall not exceed 2 NTU as a daily average; 5 NTU, more than 5 percent of the time within a 24-hour period, and an instantaneous maximum of 10 NTU.~~

~~Minimum UV dosage and turbidity specifications are included as operating criteria in Section VI.C.4.a of this Order and Section IX.C of the Monitoring and Reporting Program (Attachment E) to ensure that adequate disinfection of wastewater is achieved to protect beneficial uses.~~

~~The Discharger currently does not have the ability to measure turbidity for the effluent. The Discharger is allowed up to 120 days after the adoption of the Order to obtain and install the necessary equipment to measure effluent turbidity~~

11. **Attachment F, Fact Sheet, Section VIII.G – Additional Information** – Modify Section VIII.G. as shown below in underline/strikeout format:

Requests for additional information or questions regarding this order should be directed to ~~Elizabeth Lee~~ James Marshall at (916) 464-~~4787~~4772.

Any person aggrieved by this action of the Central Valley Water Board may petition the State Water Board to review the action in accordance with CWC section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date that this Order becomes final, except that if the thirtieth day following the date that this Order becomes final falls on a Saturday, Sunday, or state holiday (including mandatory furlough days), the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on XX January 2013.

PAMELA C. CREEDON, Executive Officer