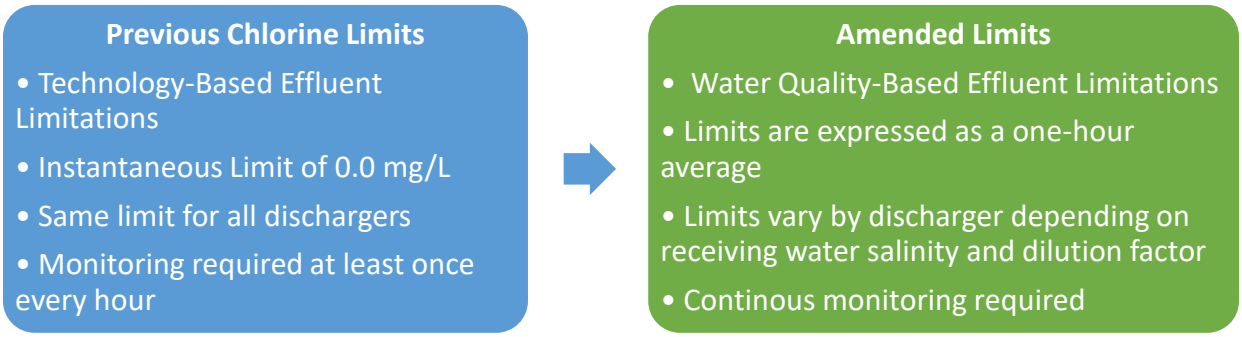
COMPLYING WITH AMENDED NPDES PERMIT REQUIREMENTS for RESIDUAL CHLORINE

December 20, 2023

Background

On November 8, 2023, the San Francisco Bay Regional Quality Control Board (Regional Water Board) adopted Order R2-2023-0023[1], *Amendment of Waste Discharge Requirements for Municipal Dischargers to Update Total Residual Chlorine and Oil and Grease Requirements*. The order amended municipal wastewater dischargers' individual NPDES permits to update effluent limits and monitoring requirements for total residual chlorine. Previously, dischargers that used chlorine for disinfection were subject to a technology-based effluent limit for total residual chlorine set as an instantaneous maximum of 0.0 mg/L. Under the new requirements, dischargers will be subject to a water quality-based effluent limit implemented as a one-hour average. A brief comparison of the previous chlorine limits and the amended limits is shown in the figure below.



Objective

The objective of this document is to provide dischargers whose NPDES permits were modified by Order R2-2023-0023 with practical suggestions related to permit compliance. Guidance is provided for the following topics:

A. Chlorine Process Control Plans
B. Compliance with Minimum Level requirements
C. Reporting continuous monitoring results to CIWQS
D. Exceptions to Continuous Monitoring for Chlorine

[1] Available online at https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2023/R2-2023-0023.pdf. Accessed November 27, 2023.

A. Chlorine Process Control Plans

Provision 4 of Order R2-2023-0023 requires a Chlorine Process Control Plan, as described below:

> **4.** Each Discharger listed in Table 2 shall implement a Chlorine Process Control Plan by January 1, 2024. The Chlorine Process Control Plan shall ensure that each Discharger adds sufficient dechlorinating chemicals to target a chlorine residual of 0.0 mg/L at the discharge points described in the individual orders listed in Table 1. Each Discharger's Operation and Maintenance Manual shall include the information necessary to implement a Chlorine Process Control Plan.

The requirement to maintain an updated Operations and Maintenance Manual is an existing requirement in Attachment G (Standard Provisions*)*. Relevant sections of Attachment G[2] related to the Operations and Maintenance Manual are excerpted below:

> **1.4.** Proper Operation and Maintenance – Supplement to Attachment D, Provision 1.4
> **1.4.1.** Operation and Maintenance Manual. The Discharger shall maintain an Operation and Maintenance Manual to provide the plant and regulatory personnel with a source of information describing all equipment, recommended operational strategies, process control monitoring, and maintenance activities. To remain a useful and relevant document, the Operation and Maintenance Manual shall be kept updated to reflect significant changes in treatment facility equipment and operational practices. The Operation and Maintenance Manual shall be maintained in usable condition and be available for reference and use by all relevant personnel and Regional Water Board staff.

…

> **5.3.1.6.** Annual Self-Monitoring Reports. By the date specified in the MRP, the Discharger shall submit an annual self-monitoring report covering the previous calendar year. The report shall contain the following:

…

> **5.3.1.6.4.** Results of facility report reviews. The Discharger shall regularly review, revise, and update, as necessary, the Operation and Maintenance Manual, Contingency Plan, Spill Prevention Plan, and Wastewater Facilities Status Report so these documents remain useful and relevant to current practices. At a minimum, reviews shall be conducted annually. The Discharger shall describe or summarize its review and evaluation procedures, recommended or planned actions, and estimated time schedule for implementing these actions. The Discharger shall complete changes to these documents to ensure that they remain up-to-date.

As noted in the Fact Sheet of Order R2-2023-0023 (page F-16), the new requirement to implement a Chlorine Process Control Plan supports compliance with antidegradation policy. The new requirement affects shallow and deep water dischargers differently, as explained below.

[2] *Attachment G - Regional Standard Provisions, and Monitoring and Reporting Requirements (Supplement To Attachment D)* is a standard attachment to NPDES permits for municipal wastewater dischargers in the San Francisco Bay Region. Available online at: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/npdes/ATTACHMENT_G.pdf. Accessed November 13, 2023. Permits reissued since 2020 use the section numbering shown above.

Shallow water dischargers: The previous instantaneous limit of 0.0 mg/L has been replaced by a one-hour average of 0.013 mg/L for marine or estuarine dischargers and 0.019 mg/L for freshwater dischargers. The revised effluent limits are effectively *lower* than the previous limit of 0.0 mg/L and the new Chlorine Process Control Plan target of 0.0 mg/L, so there is minimal risk of water quality degradation. For shallow water dischargers, the Operation and Maintenance Manual may need to be updated to address the requirement for continuous monitoring. Shallow water dischargers should include a line item in their 2023 Annual Self-Monitoring Report that states the Operation and Maintenance Manual was reviewed and modified to ensure that the facility complies with Order R2-2023-0023 by providing continuous monitoring (if applicable) and by providing sufficient dechlorination chemicals to comply with the revised effluent limitations.

Deep water dischargers have one-hour average limits that are higher than the previous instantaneous limit of 0.0 mg/L because they incorporate dilution in the receiving water. The Chlorine Process Control Plan requirement was included mainly for deep water dischargers to address a potential concern with water quality degradation. Deep water dischargers should review and adjust their dechlorination procedures to target a chlorine residual of 0.0 mg/L at the discharge point. Overdosing with dechlorination chemicals to ensure that all instantaneous residual chlorine readings are lower than 0.0 mg/L is not required and not encouraged. There are no monitoring or reporting requirements associated with the target of 0.0 mg/L; it is merely meant to be used as a factor in setting dechlorination chemical dosing. Dischargers should not mis-interpret the 0.0 mg/L target as a legally enforceable effluent limitation. Deep water dischargers should include a line item in their 2023 Annual Self-Monitoring Report that states the Operation and Maintenance Manual was reviewed and modified to ensure that the facility complies with Order R2-2023-0023 by providing continuous monitoring (if applicable) and by providing sufficient dechlorination chemicals to target a residual chlorine of 0.0 mg/L at a discharger-specified location (upstream of the point of discharge).

B. Compliance with Minimum Level Requirements

Provision 6 of Order R2-2023-0023 requires the following:

> **6.** For continuous monitoring, the minimum level for total residual chlorine analysis shall be no greater than 0.05 mg/L. To document compliance with the minimum level, Dischargers shall calibrate continuous total residual chlorine analyzers against grab samples as frequently as necessary to maintain accurate control and reliable operation.

The last sentence of this provision was added at BACWA members' request because there is not an established procedure for determining a Minimum Level (ML) for continuous monitoring equipment. Section 4.2 of the Regional Water Board's November 2020 Final Staff Report[3] contains some guidance, stating that "To derive a ML where promulgated MLs are not available, … [use] a multiplication factor of 3.18 and the method detection limit (MDL)." The guidance is based on a 1994 USEPA document, *Draft National Guidance for Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent*

[3] *Basin Plan Amendment: Chlorine Water Quality Objectives and Total Residual Chlorine Water Quality-Based Effluent Limitations for Wastewater Discharges Final Staff Report*. California Regional Water Quality Control Board, San Francisco Bay Region. November 18, 2020. Available online at https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/amendments/chlorinebpa/Chlorine_BPA_Finalstaff_report.pdf. Accessed November 27, 2023.

Limitations. Although the proposed Basin Plan Amendment was not finalized, this guidance remains applicable.

More information about MLs from a Q&A session with Regional Water Board and State Water Board staff is also available in the October 2023 BACWA Laboratory Board Report[4].

The proposed Basin Plan Amendment[5] noted that "In most cases, the minimum level … shall be no greater than 0.05 mg/L and shall be reported along with the arithmetic mean of the total residual chlorine results. Higher minimum levels may be used where justified, for example, if a discharger must rely on field instruments." Although this language was not included in the blanket permit amendment, it may be a consideration for NPDES permit reissuances for individual dischargers who utilize grab sampling or have other unique circumstances.

Member agency laboratories should develop a protocol for developing chlorine residual monitoring MDLs and MLs. Procedures for calibrating chlorine monitoring equipment, including the frequency of calibration and the personnel responsible for the calibration, should also be noted. This information should be referenced in discharger Chlorine Process Control Plans and/or laboratory manuals.

C. Reporting Continuous Monitoring Results to CIWQS

Provision 7 of Order R2-2023-0023 requires the following:

> **7.** To determine compliance with the one-hour average effluent limits, Dischargers shall consider all readings recorded within each hour. The monitoring period shall begin every hour on the hour. All readings below the minimum level shall be treated as zeros for compliance determination. Dischargers shall calculate arithmetic means for each hour using all the readings for that hour. Dischargers shall report through data upload to CIWQS the maximum one-hour arithmetic mean for each calendar day and any other arithmetic mean values that exceed the effluent limit. Dischargers shall retain documentation of chlorine results for at least three years.

The calculation of one-hour averages is fully described in the permit amendment, but the amendment does not provide details about how the results should be reported to CIWQS. For reporting to CIWQS, dischargers should follow this guidance:

- **Rounding.** CIWQS does not round results. To avoid potential compliance confusion due to rounding, dischargers should report at least the number of significant digits as the water quality-based effluent limit (WQBEL) listed in Table 2 of Order R2-2023-0023. For example, for a WQBEL of 0.013 mg/L, the discharger would report 0.000 mg/L. For a WQBEL of 1.1 mg/L, the discharger would report 0.0 mg/L. Also, dischargers should ensure that their SCADA systems record a sufficient number of significant digits prior to averaging and reporting.

- **Qualifiers.** For continuous monitoring results, always report the maximum one-hour-average value with no qualifiers. Do not report a "<" or "DNQ". If there were no values exceeding the minimum level (ML) during the hour, the average will be 0.0, 0.00, or 0.000. If there were any values exceeding the ML during the hour, the average will be greater than zero.

[4] *BACWA Laboratory Committee – October 2023 Board Report*. Available online at https://bacwa.org/wp-content/uploads/2023/11/Lab-Board-Report-2023-10-10.pdf. Accessed November 27, 2023.

[5] See Appendix A, Table 4-2 Footnote "f" of the Basin Plan Amendment (link and citation provided in Footnote 3).

- **Sample Type.** Report the maximum one-hour arithmetic mean for each calendar day as a "1-Hour Average (Mean)" sample type in CIWQS. Do not use the "Daily Maximum" or any other sample type other than "1-Hour Average (Mean)." Use this sample type regardless of whether the sample was in compliance or was an exceedance. Report at least one result per day.

- **Sample Time.** If there were no 1-hour average values greater than zero (0) observed for the entire day (i.e., all calculated 1-hour values are equal to 0 mg/L), then report a sampling time and analysis time of 0:00. If there were one or more 1-hour average values than exceeded 0 mg/L, then report the actual start time of the hour during which the maximum value was observed (e.g. report 14:00 if the maximum value was from 14:00-14:59).

- **Reporting Exceedances.** If your facility experiences two or more exceedances per day, report the additional exceedances using the "1-Hour Average (Mean)" sample type.

Order R2-2023-0023 requires that residual chlorine results be recorded at a frequency of not less than once every five minutes. A higher recording frequency (for example, once per minute instead of once every four minutes) provides a greater potential benefit to the discharger for "averaging down" anomalously high sample results.

An example calculation is shown below for a facility that records results once every four minutes and has an ML of 0.05 mg/L. As instructed in Provision 7, all results less than the ML of 0.05 mg/L were treated as zeros prior to averaging. If the ML were lower than 0.05 mg/L (for example, 0.04 mg/L), then only those values lower than the ML would be treated as zeros.

Example Calculation for an ML of 0.05 mg/L

Time	***Result from Monitoring Equipment (mg/L)***	***Result Used for Averaging (mg/L)***
1:00	0.00	0
1:04	0.00	0
1:08	0.00	0
1:12	0.00	0
1:16	0.00	0
1:20	0.00	0
1:24	0.00	0
1:28	0.04	0
1:32	0.03	0
1:36	**0.25**	**0.25**
1:40	0.01	0
1:44	0.00	0
1:48	0.01	0
1:52	0.02	0
1:56	0.00	0
	1-Hour Average (Mean)	**0.017**

D. Exceptions to Continuous Monitoring for Residual Chlorine

Substitution of Continuous Monitoring with Grab Sampling

Order R2-2023-0023 requires continuous monitoring of residual chlorine for most dischargers under most circumstances. However, there are exceptions, as follows:

- Grab sampling is required when chlorine residual monitors are offline due to an malfunction, or if they are offline for calibration or other routine maintenance. Dischargers should refer to their individual NPDES permits for the minimum required grab sampling frequency under these conditions. Example language from two individual NPDES permits is shown below:
    - "Effluent residual chlorine concentrations shall be monitored continuously or, if the Facility's continuous monitoring system is offline for essential maintenance, a minimum of once every two hours." (Order R2-2020-0020)
    - "If a continuous chlorine residual monitor malfunctions or is offline for essential maintenance, the Discharger shall substitute grab samples at a frequency of no less than one sample every hour until the continuous chlorine residual monitor is back online." (Order R2-2022-0023)

- Table F-6 of the Order lists five dischargers with an exemption to the continuous monitoring requirement.

The order does not specify a Minimum Level for grab samples.

Provision 9 of the order states that "The Discharger shall report any substitution of grab sampling for continuous sampling in its monthly self-monitoring report." This is a new requirement for most dischargers, and it applies even when the substitution is due to planned maintenance, such as daily essential maintenance.

Monitoring and Reporting for a Discharge Period Less than 24 Hours Per Day

Continuous monitoring of residual chlorine is not required when there is no effluent being discharged to a receiving water. When effluent is discharged for just a portion of a day, there will be fewer than 24 one-hour hourly averages values for residual chlorine. Dischargers should maintain internal documentation to explain the resulting daily data sets with fewer than 24 values.

Continuous Monitoring of Residual Dechlorinating Agent

Provision 8 of the Order R2-2023-0023 states that discharges "may elect to use continuous on-line monitoring systems for measuring or determining that a residual dechlorinating agent (e.g., sodium bisulfite) is present." Per Provision 8, this information can be used to demonstrate compliance with the Order. To substitute continuous chlorine monitoring with continuous dechlorinating agent monitoring, contact your agency's Regional Water Board case manager for additional instructions.