

Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California

Draft



June 2006

Division of Water Quality
STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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Acronyms

CFR	Code of Federal Regulations
CPO	Chlorine-Produced Oxidants
ND	Non-Detect
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
QRL <u>QRR</u>	Quantification/Reporting Limit <u>Requirement</u>
SSO	Site-Specific Objective
TRC	Total Residual Chlorine
U.S. EPA	United States Environmental Protection Agency

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TOTAL RESIDUAL CHLORINE AND CHLORINE-PRODUCED OXIDANTS POLICY OF CALIFORNIA (Policy)

Introduction-

Chlorine is extremely toxic to aquatic life in both *freshwater*¹ and *saltwater*. Thus, every discharger ~~that uses of~~ chlorine has the potential to cause *acute toxicity*. Although a chlorination-*dechlorination* process can be used and maintained, it can be incomplete, leaving *total residual chlorine* (TRC) in freshwater, or *chlorine-produced oxidants* (CPO) in saltwater. Consequently, TRC and CPO in wastewater discharges must be regulated.

The approach for addressing TRC and CPO currently varies ~~between among~~ Regional Water Quality Control Boards ~~Quality Control~~, (Regional Water Boards) and enforcement of violations has become difficult. A statewide chlorine Policy for TRC and CPO is needed to protect aquatic beneficial uses, promote consistency, and improve clarity for dischargers and ~~water~~ Water board ~~Board~~ permit writers.

This Policy establishes:

1. TRC and CPO objectives that apply to all *inland surface waters* and *enclosed bays* and *estuaries* throughout the State to protect aquatic life beneficial uses;
2. Consistent procedures to regulate TRC ~~& and~~ CPO discharges that apply to *National Pollutant Discharge Elimination System* (NPDES) permits, ~~with certain exceptions that contain one or more numeric water quality based effluent limitations~~; and
3. A basis for equitable compliance determinations to adequately enforce violations of TRC or CPO effluent limitations in ~~non-storm water~~ NPDES permits.

Policy Applicability –

This Policy establishes, in Part I, TRC and CPO objectives that apply to all inland surface waters and enclosed bays and estuaries in California. The objectives apply to waters with beneficial uses including: warm freshwater habitat; cold freshwater habitat; inland saline water habitat; estuarine habitat; rare, threatened, or endangered species; migration of aquatic organisms; and spawning, reproduction and/or early development. Part II of this Policy establishes

¹ Italicized words throughout this document have attached definitions located in section titled “Definition of Terms”.

implementation procedures for the objectives. Part II of this Policy applies only to point source discharges subject to regulation under an NPDES permits that contain one or more numeric water quality-based effluent limitations.

Part II does not apply to NPDES permits that contain only requirements for best management practices, in lieu of numeric water quality-based effluent limitations, as authorized under 40 Code of Federal Regulations (CFR) section 122.44(k), revised as of July 1, 2005⁴. In addition, Part II does not apply to NPDES permits for which the State Water Resources Control Board (State Water Board) or Regional Water Boards have determined that numeric effluent limits for chlorine are infeasible, as provided in the Calculation section of Part II of this Policy. The Policy supersedes any and all numeric TRC or CPO objectives and implementation provisions for TRC or CPO in regional water quality control plans (Basin Plans) for the same waters. Although Part II does not apply in these circumstances, the Regional Water Boards may exercise their existing authority to require appropriate monitoring or other measures to ascertain whether the best management practices are effective.

Because this Policy establishes objectives that apply only to inland surface waters and enclosed bays and estuaries, the Policy does not apply to the direct reuse of recycled water that is conveyed to the use site without entering surface waters of the State. The Policy does apply to the indirect reuse of recycled water that is conveyed to the use site through inland surface waters of the State.

The Policy supersedes any and all numeric TRC or CPO objectives and implementation provisions for TRC or CPO in Regional Water Quality Control Plans (Basin Plans) for the same waters.

PART I

Objectives-

The following objectives apply to all inland surface waters and enclosed bays and estuaries to protect freshwater and saltwater aquatic life:

~~Continuous~~ Chlorine Residual Discharge

	1-hr average (ug/L)	4-day average (ug/L)
TRC (freshwater)	19	11
CPO (saltwater)	13	7.5

Intermittent Chlorine Residual Discharge

	Instantaneous Maximum ($\mu\text{g/L}$)
TRC (freshwater)	$C = \frac{1070}{T^{0.740}}$
CPO (saltwater)	$C = \frac{63.1}{T^{0.43}}$
C = TRC or CPO instantaneous maximum objective ($\mu\text{g/L}$).	
T = Sum of intermittent discharge times (in minutes) during a 24-hour period, not to exceed 120 minutes.	

PART II

Determining the Need for Water Quality-Based Effluent Limits-

Except as provided below, if a discharger uses chlorine in its processes, the discharger's NPDES permit must include an numeric water quality-based effluent limit or limits for TRC or CPO, except as provided below.

Calculation Effluent Limits-

It is the Water Boards intent that, in its operations, the discharger shall control processes to reduce chlorine residual processes as close to zero as practicable. Effluent limitations for the continuous discharge of chlorine residual concentrations shall be expressed as the objectives above, in *1-hour average* and *4-day average*, rather than a weekly or monthly average. Because chlorine residual can be acutely toxic to fish and other aquatic life within minutes of exposure, weekly and monthly limits are not adequately protective, protective and are, therefore, impracticable.

For freshwater discharges into saltwater receiving waters, CPO effluent limits will be set at CPO Objectives. However, the permit shall require CPO must to be measured using analytical methods that include quantification of TRC. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria. However, the Regional Administrator may approve the use of the alternative freshwater or saltwater criteria if scientifically defensible information and data demonstrate that on a site-specific basis the biology of the water body is dominated by freshwater aquatic life and that freshwater criteria are more appropriate; or conversely, the biology of the water body is dominated by saltwater aquatic life and that saltwater criteria are more appropriate.

~~For intermittent discharges of chlorine residual concentrations less than two hours per day, the objectives for intermittent discharges apply in lieu of the 1-hour and 4-day averages². Intermittent discharges shall not exceed two hours in a 24-hour period. The combined length of time for all intermittent discharges within a 24-hour period cannot exceed 2 hours, and the combined discharge time shall be used in the intermittent discharge calculation in Part I above. For example a 15-minute discharge, which occurs 4 times in a 24-hour period will have a T of 60 minutes.~~

The State Water Board has determined that, at the present time, it is infeasible to use numeric effluent limits for TRC and CPO are infeasible to regulate potable water discharges that occur in the field due to the activities of drinking water utilities or agencies. These activities include, but are not limited to, dewatering pipelines and reservoirs, flushing distribution system piping, and flushing fire hydrants. Numeric effluent limits are infeasible because these discharges occur at disperse locations in the field, there are no stationary treatment facilities at these locations, and field monitoring equipment does not currently achieve the necessary level of precision performance. The Regional Water Boards permitting authority must regulate the discharge of TRC and CPO in these discharges through requirements for appropriate best management practices.

In addition, a Regional Water Boardthe permitting authority may include effluent limitations requiringexpressed as best management practices, in lieu of numeric effluent limits, for TRC or CPO for discharges other than the drinking water discharges described in the preceding paragraph, where authorized under 40 C.F.R. §122.44(k), revised as of July 1, 2005. a chlorine

Compliance Schedules-

Where an *existing* discharger demonstrates to the satisfaction of the permitting authority that it is *infeasible* to promptly comply with a new or more restrictive effluent limit or other provision of this Policy, the discharger may request a compliance schedule from the permitting authority. ~~A c~~Compliance schedules can should be grantedare appropriate for to existing dischargers, for example, to investigate the feasibility of acquiring new equipment, hire or train staff, ~~or~~ reconfigure treatment processes to help achieve compliance with this Policy, or optimize the performance of the analytical method and continuous monitoring equipment to achieve the required sensitivity.

A schedule of compliance shall require actions to be undertaken for the purpose of achieving compliance with this Policy. These actions shall demonstrate

²~~Dischargers using chlorine in its processes greater than 2 hours in a 24-hour period must comply with continuous chlorine discharge requirements.~~

reasonable progress toward attaining TRC and/or CPO effluent limitations or other provisions of this Policy.

~~For any compliance schedule requests, the discharger must provide justification for the allowance of a compliance schedule, which shall include including~~ the following:

1. Documentation of efforts to control chlorine residual;
2. Documentation that facility upgrades are underway, if applicable;
3. Documentation of an overall plan to gain, and adequately demonstrate, compliance; and
4. A demonstration that the proposed schedule is as short as practicable.

Compliance schedules ~~shall~~ will be as short as practicable, but in no case exceed five years from the date that the permit is issued, reissued, or modified to include the new or more stringent effluent limits or other Policy requirements. The compliance schedule ~~shall~~ will include interim TRC or CPO limitations that apply during the compliance period. Compliance schedules ~~shall are~~ not be allowed in permits for *new dischargers*.

Monitoring Requirements –

Dischargers must measure chlorine residual either directly or *indirectly*. The Regional Water Board shall require *continuous monitoring* of chlorine residual ~~and/or~~ dechlorination agent residual concentrations for all facilities unless an exemption is granted. Continuous monitoring is defined as monitoring that produces one or more data points every minute. Maintenance of continuous monitoring equipment ~~shall be upheld per~~ the manufacturer's specifications will be required. The ~~Regional Water Board~~ permitting authority may, however, exempt facilities on a case-by-case basis from the continuous monitoring requirement where the discharger demonstrates, and the ~~Regional Water Board~~ permitting authority determines that continuous monitoring does not appropriately characterize the discharge, and the exemption is adopted by the ~~Regional Water Board~~ permitting authority through the NPDES permitting process. For example, facilities with intermittent chlorine residual discharges ~~above 2 hours per 24-hour period~~ could be exempted from the continuous monitoring requirement, if appropriate. In such cases, ~~the permitting authority~~ Regional Water Boards must require that dischargers conduct monitoring that is appropriate for the discharge ~~would become responsible for intermittent chlorine discharge monitoring to provide appropriate monitoring requirements.~~

~~Intermittent chlorine discharge monitoring must adequately characterize the discharge. Grab samples shall be collected at least every 15 minutes during~~

~~each intermittent period of chlorination. In addition, regardless of the duration of the intermittent chlorination event, at least one grab sample shall be collected when the discharge concentration is expected to be at the maximum of a chlorination event.~~

Quantification/Reporting Requirements –

On-line chlorine residual devices must have the ability to record measurements at no less than one per minute and record concentrations in parts per billion (ug/L or ppb). ~~On-line devices must have a manufacturer's stated detection limit, scale range, or sensitivity below the permitted effluent limit. All standard calibration concentrations shall be within the detection range reported by the manufacturer. The minimum calibration concentration shall not be above the lowest effluent limit in the permit. The maximum calibration concentration must not be above the reported detection range for the instrument, or 500 mg/L if no upper detection bound is provided by the manufacturer. Calibration methods should follow the manufacturer's recommendations. On-line devices must have a manufacturer-stated sensitivity corresponding to 10 ppb. Facilities Dischargers should also follow-utilize~~ manufacturer's recommendations regarding reagent replenishment, ~~and reagent shelf life, and calibration. Facilities Dischargers must verify the concentration of all standard solutions concentration used for calibration and quality control purposes for TRC or CPO continuous monitoring devices using~~ Method 4500-Cl E as found in Standard Methods for the Examination of Water and Wastewater, 20th edition, whose stated detection limit is 0.010 part per million. All off-line measurements of chlorine residual shall be performed using this analytical method.

~~Each discharger shall meet the applicable quantification/reporting limit requirements (QRRL), shall not exceed the be met by each facility's effluent limit. However, if the Regional Water Board determines on a case-by-case basis that a discharger cannot meet the QRL set at the effluent limit and that it is infeasible for the discharger to show compliance via the presence of residual dechlorination agent or by another means (see the Compliance Determination section of this Policy), the Regional Water Board may establish a QRL, provided that the discharger completes and submits a QRL study. Based on this Policy's Compliance Determination provisions, facilities have various flexibility in meeting the QRR.~~

All analytical readings of TRC and CPO at or above the QRL 10 ppb shall be recorded as ug/L and all readings below the QRL 10 ppb shall be recorded as non-detects (ND) for averaging purposes. To determine compliance, the discharger shall do the following:

Compliance with the One-Hour Limit

All readings recorded beginning with the hour and for 59 minutes afterwards ~~shall~~ will be collected. All ND readings within this time frame shall be converted to zero. From the readings, the discharger shall compute the arithmetic mean, which shall be the value that is compared with the permit effluent limit. A new determination shall be made for the next hour time period beginning with the next hour. There shall be 24 determinations per day.

Compliance with the Four-Day Limit

All readings recorded beginning at 12 a. m. on the first day until 11:59 p.m. of the fourth day shall be collected. All ND readings within this time frame shall be converted to zero. From the readings, the discharger shall compute the arithmetic mean, which shall be the value that is compared with the permit effluent limit. A new determination shall be for the next four-day period beginning at midnight.

~~Compliance with the Intermittent Limit~~

~~A single grab sample cannot exceed the instantaneous maximum effluent limitation for TRC or CPO. If the analytical result of a single grab sample is higher than the instantaneous maximum effluent limitation for TRC or CPO, a violation will be flagged, and the discharger will be considered out of compliance for that single sample. Non-compliance for each sample will be considered separately.~~

Compliance Determination –

Continuous monitoring analyzers for chlorine residual ~~and/or~~ for dechlorination agent residual in the effluent are appropriate methods ~~offor process control~~ compliance determination. A positive residual dechlorination agent in the effluent indicates that chlorine is not present in the discharge, which demonstrates compliance with the effluent limits. This type of monitoring can also prove that some chlorine residual exceedances are false-positives. ~~Reporting~~ Continuous monitoring data showing either a positive dechlorination agent residual ~~and or~~ a zero chlorine residual at or below the prescribed limit are sufficient to show compliance with the chlorine residual effluent limit, as long as the instruments are maintained and calibrated in accordance with the manufacturer's recommendations.

When continuous monitoring systems are off-line, such as for calibration, and maintenance, and troubleshooting, a back-up system must be in place to show compliance. These systems can include, but are not limited to, monitoring for dechlorination residual (bisulfite or sulfite analyzer), redundant analyzers, *stoichiometry* method, or grab samples (in 40 CFR 136.3 Table 1B, revised as of

July 1, 2004) using U.S. Environmental Protection Agency approved methods. However, if grab samples are used they must adequately characterize the discharge. This means collecting at least one sample at 15 minute intervals of the discharge prior to its release into the receiving water and until the continuous monitoring system is back on-line. If the system is off-line less than 15 minutes, at least one sample must be obtained.

If grab samples taken at the end-of-pipe show chlorine residual above the stated effluent limit, the discharger must begin monitoring receiving water ~~monitoring~~ to adequately characterize and assess impacts to aquatic life within the receiving water. During situations where sampling the receiving water becomes a safety hazard, such as during the night in a swift moving river, the discharger can develop an alternative method to assess impacts to the receiving water and aquatic life. The Regional Water Board must approve the alternative method, however, prior to the exceedance.

Any excursion over the 1-hour average, ~~or 4-day average, or instantaneous maximum of the intermittent discharge~~ is a violation. If a discharger conducts continuous monitoring and the discharger can demonstrate, through data collected from the discharger's back-up monitoring system, that a chlorine spike recorded by the continuous monitor was not actually due to chlorine then a ~~purported~~ any excursion resulting from the recorded spike will not be considered an actual exceedance, but rather reported as a false-positive described at the beginning of this section.

Mixing Zones and Site Specific Objectives –

To the extent authorized by the applicable Basin Plan, a ~~Regional Water Board~~ permitting authority may grant a *mixing zone* for a discharge of TRC or CPO. Allowance of a mixing zone is discretionary. If a Regional Water Board grants a mixing zone, the objectives for TRC and CPO shall be met throughout the receiving water except within the mixing zone.

A Regional Water Board or State Water Board may develop a site-specific objective (SSO) for TRC and CPO, or both, whenever it determines, based on its best professional judgment, that the objectives in this Policy are inappropriate for a particular water body. Any ~~site-specific objectives~~ SSO must be developed in compliance with State and federal laws and regulations.

Definition of Terms

Acute Toxicity

Refers to a stimulus severe enough to rapidly induce an effect; in aquatic toxicity tests, an effect observed in 96 hours or less is typically considered acute. When referring to aquatic toxicology or human health, an acute ~~effect~~ effect is not always measured in terms of lethality.

Chlorine Produced Oxidants (CPO)

Refers to the sum of oxidative products [hypobromous acid (HOBr), hypobromous ion (OBr-), and bromamines] in salt water.

Continuous Discharge

~~For the purpose of this Policy, continuous discharge of chlorine residual is defined as any discharge of pollutants that occurs without interruption throughout the operation hours of facilities that use chlorine in treatment or industrial processes, except for infrequent shutdowns for maintenance, process changes, or other similar activities. For the purpose of this Policy, continuous discharge is defined as the ongoing discharge of effluents from facilities that use chlorine in treatment or industrial processes.~~

~~Any discharge that does not fit the definition of intermittent discharge. Therefore, a discharge that uses chlorine in its processes greater than 2 hours in a 24-hour period must comply with continuous chlorine discharge objectives found in Part I of this Policy and continuous monitoring implementation provisions found in Part II of this Policy.~~

Continuous Monitoring

For the purpose of this Policy, continuous monitoring is defined as reporting one ~~or more~~ data point(s) every minute or more every minute.

Dechlorination

A process by which residual chlorine is neutralized, usually through the addition of a sulfite or bisulfite reductant.

Direct Reuse

The use of recycled water that has been transported from a wastewater treatment plant to a reuse site without passing through a ~~natural body of~~ either surface ~~or~~ water or groundwater.

Enclosed Bays

Indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, and San Diego Bay. ~~Enclosed bays do not include inland surface waters or ocean waters. (California Water Code §1339.5(a))~~

Estuaries

Water, including coastal lagoons, located at the mouths of streams that serve as ~~areas-zones~~ of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and sea water. Estuarine waters include, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code Section 12220, Suisan Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. ~~(California Water Code §1339.5(b)) Estuaries do not include inland surface waters or ocean waters.~~

Existing Discharger

Any discharger that is not a new discharger. An existing discharger includes an "increasing discharger" (i.e., an existing facility with treatment systems in place for its current discharge that is or will be expanding, upgrading, or modifying its existing permitted discharge after the effective date of this Policy).

Four (4)-day Average

For the purpose of this Policy, four-day average is an average of a discrete data set in four-day intervals.

Freshwater

Waters in which the salinity is equal to or less than 1 part per thousand 95 percent or more of the time. The applicable criteria for these waters are the freshwater criteria. ~~For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater and saltwater criteria unless defensible information and data demonstrate that on a site specific basis the biology of the water body is dominated by freshwater aquatic life and that freshwater criteria are more appropriate; or, conversely, saltwater criteria are more appropriate.~~

Indirect

For the purpose of this Policy, an indirect way to measure for compliance is to use a dechlorination agent analyzer.

Indirect Reuse

The use of recycled water indirectly after it has passed through ~~a natural body of water ground water or surface water~~ after discharge from a wastewater treatment plant.

Infeasible

Means not capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

~~Intermittent Discharge~~

~~An intermittent discharge is a discharge, or series of discharges for which the combined length of time for all discharges does not exceed two hours in a 24-hour period.~~

Inland Surface Waters

All surface waters of the State that do not include the ocean, enclosed bays, or estuaries.

Mixing Zone

A limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

National Pollutant Discharge Elimination System

A permit program authorized under ~~Section 402 of the~~ Clean Water Act §402.

Point Source

~~Any discernable, confined and discrete conveyance, as defined in Clean Water Act §502(14).~~

New Dischargers

Includes any building, structure, facility, or installation from which there is, or may be, a discharge of pollutants, the construction of which commenced after the effective date of this Policy.

One (1)-hour Average

For the purpose of this Policy, one-hour average is the average of at least 60 discrete data points in each one-hour interval.

Point Source

Any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture. (Clean Water Act §502(14))

Quantification/Reporting Limit (QRL)

~~For the purpose of this Policy a quantification/reporting limit is the lowest concentration of chlorine that could be reported when instrument operating conditions and inherent sample chemical and physical properties are taken into account.~~

Recycled Water

Water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource. (California Water Code § 13060(n))~~Wastewater that is suitable for a beneficial use as a result of treatment.~~

Saltwater

Waters in which the salinity is equal to or greater than 10 parts per thousand 95 percent or more of the time. The applicable criteria for these waters are the saltwater criteria. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater and saltwater criteria, unless defensible information and data demonstrate that on a site-specific basis the biology of the water body is dominated by freshwater aquatic life and that freshwater criteria are more appropriate; or, conversely, saltwater criteria are more appropriate.

Sensitivity

The lowest concentration that can be distinguished from background noise.

Stoichiometry

The calculation of quantitative (measurable) relationships of the reactants and products in chemical reactions (chemical equations).

Total Residual Chlorine (TRC)

Refers to the sum of free chlorine and combined chlorine in fresh-water.

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