CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

INITIAL STATEMENT OF REASONS

for the

Hexavalent Chromium Maximum Contaminant Level (MCL) Regulation

Title 22, California Code of Regulations

May 4, 2023

Division of Drinking Water
State Water Resources Control Board

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Abbreviations for

BAT – Best Available Technology

BEA – Bureau of Economic Analysis

BAU – Business as Usual

CCR – California Code of Regulations

CDPH – California Department of Public Health

CEM – Cost Estimating Methodology

CEQA – California Environmental Quality Act

CER – Cost-Effectiveness Ratio

CPI – Consumer Price Index

CWS – Community Water System

DAC – Disadvantaged Community

DDW – Division of Drinking Water

DLR – Detection Limit for Purposes of Reporting

DWSRF – Drinking Water State Revolving Fund

ELAP – California Environmental Laboratory Accreditation Program

ELTAC – Environmental Laboratory Technical Advisory Committee

GPM – Gallons per Minute

HFPO-DA – Hexafluoropropylene Oxide Dimer Acid

HR2W – Human Right to Water

HSC – California Health and Safety Code

MCL – Maximum Contaminant Level

MCER – Marginal Cost-Effectiveness Ratio

MG – Million Gallons

mg/L – Milligrams per Liter

MRL – Minimum Reporting Level

MUL – Maximum Use Level

NAICS – North American Industry Classification System

NDMA – N-nitroso-dimethylamine

NTNCWS – Non-transient Non-community Water System

O&M – Operations and maintenance

OEHHA – Office of Environmental Health Hazard Assessment

PFBS – Perfluorobutane Sulfonic Acid

PFHxS – Perfluorohexane Sulfonic Acid

PFNA – Perfluoro-nonanoic Acid

PFOA – Perfluoro-octanoic Acid

PFOS – Perfluoro-octane Sulfonic Acid

PHG – Public Health Goal

POE – Point-of-Entry

POU – Point-of-Use

PWS – Public Water System

RCF – Reduction/Coagulation/Filtration

RIMS – Regional Input-Output Modeling System

RO – Reverse Osmosis

SADW – Safe and Affordable Drinking Water

SBA – Strong Base Anion Exchange

SC – Service Connection

SDAC – Severely Disadvantaged Community

SDWIS – Safe Drinking Water Information System

SRIA – Standardized Regulatory Impact Analysis/Assessment

SWRCB – State Water Resources Control Board

TNCWS – Transient Non-community Water System

U.S. EPA – United States Environmental Protection Agency

µg/L – Micrograms per Liter

WBA – Weak Base Anion Exchange

WQIR – Water Quality Information Replacement

1. PROBLEM STATEMENT

[Gov. Code, §11346.2(b)(1)]

The California State Water Resources Control Board (State Water Board or SWRCB) establishes drinking water standards to ensure that drinking water provided by public water systems (PWS) is at all times safe, pure, wholesome, and potable.[1] All suppliers of domestic water to the public are subject to regulations adopted by the United States Environmental Protection Agency (U.S. EPA) under the Safe Drinking Water Act of 1974, as amended (42 U.S.C. §300f et seq.). California PWS are also subject to regulations adopted by the State Water Board under the California Safe Drinking Water Act (Health & Saf. Code, div. 104, pt. 12, ch. 4, §116270 et seq.). Health and Safety Code (HSC) 116270(f) declares California's intent to improve upon the minimum requirements of the federal Safe Drinking Water Act Amendments of 1996 and to establish a program that is more protective of public health than the minimum federal requirements. HSC 116350(b) establishes the State Water Board's responsibility to adopt regulations to implement the California Safe Drinking Water Act.

HSC 116365(a) and 116365(b) require the State Water Board to adopt primary drinking water standards for contaminants, specifying that each standard must be set at a level as close as feasible to the corresponding public health goal (PHG), placing primary emphasis on the protection of public health, and meeting, to the extent technologically and economically feasible, the conditions of HSC 116365. Primary drinking water standards are expressed as either a maximum contaminant level (MCL) or treatment technique, along with associated monitoring and reporting requirements, as described in HSC 116275.

Pursuant to HSC 116365(c), the Office of Environmental Health Hazard Assessment (OEHHA) prepares and publishes an assessment of public health risks posed by each contaminant for which the State Water Board proposes a primary drinking water standard. This risk assessment includes an estimate, the PHG, of the drinking water contaminant level that is not anticipated to cause or contribute to adverse health effects, or that does not pose any significant health risk. In 2011, OEHHA published a hexavalent chromium PHG of 0.02 micrograms per liter (µg/L) based on cancer effects and identified a health-protective concentration of 2 µg/L based on liver toxicity (OEHHA, 2011). HSC 116365.5 specifically requires establishment of a hexavalent chromium MCL that complies with the HSC 116365 criteria by January 1, 2004. California does not currently have a hexavalent chromium MCL.

HSC 116370 requires the State Water Board to adopt a finding of the best available technology (BAT) for each contaminant for which a drinking water standard has been adopted at the time of adoption. HSC 116375 requires the State Water Board to adopt

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[1] In 2018, the State Water Board "succeeded to and is vested with all of the authority, duties, powers, purposes, functions, responsibilities, and jurisdiction of the State Department of Public Health, its predecessors, and its director for purposes of" implementing the Safe Drinking Water Act, among other things (Health & Saf. Code 116271).

regulations necessary to carry out the purposes of California’s Safe Drinking Water Act, including monitoring of contaminants and reporting of results and requirements for notifying the public of delivered water quality.

HSC 116450 requires PWS to provide notice to water users when primary drinking water standards and monitoring requirements are not met, requires the notices to include information on possible human health effects of the subject contaminant, and requires the State Water Board to approve the content of such notices.

HSC 116470 requires each PWS to prepare and deliver annual consumer confidence reports to their customers containing information on each detected regulated contaminant, a statement of health concerns that resulted in regulation of that contaminant.

The State Water Board proposes to establish a primary drinking water standard for hexavalent chromium in the form of an MCL of 10 µg/L or 0.010 milligrams per liter (mg/L); an associated detection limit for purposes of reporting (DLR), as defined in 22 California Code of Regulations (CCR), section 64400.34, of 0.1 µg/L or 0.0001 mg/L, consistent with HSC 116275. The State Water Board further proposes to adopt BAT and human health effects language for public notification and consumer confidence reports. The State Water Board has determined that the proposed regulations are necessary to carry out the purposes of California’s Safe Drinking Water Act. The State Water Board has the responsibility and authority to adopt the subject regulations.

2. SUMMARY OF PROPOSAL

The primary purpose of the proposed regulations is to adopt a primary drinking water standard for hexavalent chromium, consistent with and meeting the requirements of HSC 116365, and associated requirements.

The proposed regulation would implement, interpret, or make specific HSC sections 116275, 116365, 116365.5, 116370, 116375, 116385, 116390, 116450, and 116470. Pursuant to HSC sections 116270, 116271, 116275, 116350, 116365, 116365.5, 116375, and 116385, the State Water Board proposes the below noted changes to title 22, chapter 15:

Article 2. General Requirements

- Amend section 64415 (Laboratory and Personnel) as follows:
    - The addition of paragraph (3) to incorporate by reference approved analytical methods (U.S. EPA methods 218.6 and 218.7) for the analysis of hexavalent chromium; and
    - to reorganize text to accommodate the new paragraph (3).

Article 4. Primary Standards—Inorganic Chemicals

- Amend section 64431 (Maximum Contaminant Levels – Inorganic Chemicals) as follows:
    - Table 64431-A to adopt a hexavalent chromium MCL of 10 µg/L; and

  - Table 64431-A to specify chromium as chromium (total).
- Amend section 64432 (Monitoring and Compliance – Inorganic Chemicals) as follows:
  - Table 64432-A to adopt a hexavalent chromium DLR of 0.1 µg/L;
  - Table 64432-A to specify chromium as chromium (total);
  - (p) to adopt a compliance schedule based on water system size;
  - (q) to adopt a requirement for submission and implementation of a Hexavalent Chromium Compliance Plan and to specify minimum required elements; and
  - (r) to adopt a requirement for a Hexavalent Chromium Operations Plan and to specify minimum required elements.

Article 12. Best Available Technologies (BAT)

- Amend section 64447.2 (Best Available Technologies (BAT) – Inorganic Chemicals) as follows:
  - Table 64447.2-A to adopt BAT for hexavalent chromium;
  - Table 64447.2-A to specify chromium as chromium (total); and
  - Key to BATs in Table 64447.2-A to add Reduction/Coagulation/Filtration as the 14th BAT.

Article 18. Notification of Water Consumers and the State Board

- Amend section 64465 (Public Notice Content and Format), Appendix 64465-D to adopt public notification health effects language for hexavalent chromium and to specify chromium as chromium (total).

Article 20. Consumer Confidence Report

- Amend section 64481 (Content of Consumer Confidence Report) as follows:
  - (p) to adopt a requirement specifying language for water systems to include in Consumer Confidence Reports for hexavalent chromium detections for dates prior to the applicable hexavalent chromium MCL compliance date;
  - Table 64481-F to adopt specific Consumer Confidence Report language for hexavalent chromium MCL exceedance prior to the applicable hexavalent chromium MCL compliance date;
  - Appendix 64481-A to adopt Consumer Confidence Report major origins in drinking water language for hexavalent chromium; and
  - Appendix 64481-A to specify chromium as chromium (total).

The State Water Board also proposes a number of nonsubstantive changes, which are not discussed in detail due to their minor nature. The nonsubstantive changes would correct upper/lower case usage, punctuation, and grammar, re-locate text to accommodate additions and improve readability, specify chromium as total chromium for clarity, and aid style.

3. BACKGROUND

3.1 About Hexavalent Chromium

Chromium is a naturally occurring heavy metal deposited throughout the environment. The trivalent form, commonly known as “trivalent chromium” or “chromium 3 (III),” is a required nutrient and has low toxicity. The hexavalent form, commonly known as “hexavalent chromium” or “chromium 6 (VI),” is more toxic and is known to cause cancer when inhaled. In scientific studies in laboratory animals, hexavalent chromium has also been linked to cancer when ingested; hexavalent chromium has also been found to have noncancer effects in the form of liver toxicity (OEHHA, 2011).

The presence of hexavalent chromium found in California drinking water sources is attributed to both its natural occurrence and industrial activities (Hausladen et al., 2018). Hexavalent chromium has been measured in California groundwater at levels up to, and in some cases exceeding, 100 µg/L. Between January 1, 2010, and June 21, 2021, hexavalent chromium was found, to some extent, in 53 of 58 counties in California and is principally found—listed by highest occurrence—in the counties of Los Angeles, San Bernardino, Fresno, Riverside, Stanislaus, Sacramento, Santa Clara, Monterey, Kern, San Joaquin, and Tulare; these counties each have 100 or more PWS sources with detectable levels of hexavalent chromium (SWRCB, 2021b; SWRCB, 2021c).

There are areas of contamination in California from industrial activities that used hexavalent chromium, such as the manufacturing of textile dyes, wood preservation, leather tanning, and anti-corrosion processes, where hexavalent chromium contaminated waste has migrated into groundwater (Hausladen et al., 2018; McNeill et al., 2012). Leakage, inadequate contaminant storage, or improper industrial waste disposal practices have also contributed to chromium release into the environment (U.S. EPA, 2021a). Additionally, naturally occurring trivalent chromium present in groundwater can oxidize into hexavalent chromium by natural process or by human activity, such as the injection of oxidants in groundwater to treat volatile organic compounds (Hausladen et al., 2018). Hexavalent chromium sampling shows that the presence and concentration of hexavalent chromium in surface water sources is less than that found in groundwater sources (SWRCB, 2021b).

3.2 Regulatory History

Hexavalent chromium is indirectly regulated under the total chromium MCL of 50 µg/L (0.05 mg/L) at section 64431 in title 22 of the CCR. California’s MCL for total chromium was established in 1977, when the “National Interim Drinking Water Standard” for total chromium was adopted (U.S. EPA, 1977). The total chromium MCL was established to address exposures to hexavalent chromium. U.S. EPA adopted the same standard for total chromium, but in 1991 raised the federal MCL to 100 µg/L (0.1 mg/L) (U.S. EPA, 1991). California retained its 50 µg/L MCL for total chromium. Subsequently in 2002, HSC 116365.5 required the California Department of Health Services (the predecessor to the California Department of Public Health (CDPH)) to establish a primary drinking water standard for hexavalent chromium by January 1, 2004.

In July 2011, OEHHA established a hexavalent chromium PHG of 0.02 µg/L (0.00002 mg/L). In August 2013, CDPH proposed an MCL for hexavalent chromium of 10 µg/L (0.010 mg/L) and a DLR of 1 µg/L (0.001 mg/L).

On May 28, 2014, the Office of Administrative Law approved the regulations submitted by CDPH, and the MCL became effective on July 1, 2014.

On July 1, 2014, the administration of California's drinking water program was formally transferred from CDPH to the State Water Board (Health & Saf. Code, § 116271).

On May 31, 2017, the Superior Court of Sacramento County issued a judgment invalidating the hexavalent chromium MCL for drinking water. The court ordered the State Water Board to take the necessary actions to delete the hexavalent chromium MCL from the CCR. The deletion took effect on September 11, 2017. The court's primary reason for finding the MCL invalid was that CDPH "*failed to properly consider the economic feasibility of complying with the MCL*." In its conclusion, the court ordered the State Water Board to "*…comply with the Legislature's directive to consider the economic feasibility of compliance, paying particular attention to small water systems and their users, and to set the MCL as close as economically feasible to the public health goal of 0.02 ppb [parts per billion]*" (*California Manufacturers and Technology Association et al.*, 2017).

4. MCL DEVELOPMENT FRAMEWORK

Drinking water MCL development follows a specific framework to ensure that all statutory requirements are met. The following sections detail the statutory and policy requirements and the process of setting an MCL.

4.1 Statutory and Other Policy Requirements

In addition to Administrative Procedure Act (APA) requirements set forth chapter 3.5 of part 1 of division 3 of title 2 of the Government Code (§11340 et seq.), and chapter 1 of divisions 1 of title 1 of the CCR, the State Water Board is subject to additional specific statutory and regulatory requirements related to major regulations (Gov. Code, §§11342.548, 11346.2, 11346.3; Health & Saf. Code §57005), establishment of primary drinking water standards (Health & Saf. Code, §116365) and associated requirements (Health & Saf. Code, §§116370, 116375, 116450, 116470), the California Environmental Quality Act (Pub. Resources Code, §§ 21000 et seq.), and external scientific peer review (Health & Saf. Code §57004).

The State Water Board considered practical factors, such as capacity of the current market to supply goods and services in response to the proposed regulation and the potential need for a compliance schedule to accommodate those factors.

The State Water Board also considered policy-related factors, including the State Water Board's Racial Equity Plan (SWRCB, 2023b), Tribal Consultation Policy (Public Resources Code, 21080.3.1; SWRCB, 2019a), and relevant Executive Orders (Exec. Order No. B-10-11, 2011; Exec. Order No. N-15-19, 2019).

Primary drinking water standards are defined at HSC 116275(c) as (1) MCLs that, in the judgment of the State Water Board, may have an adverse effect on the health of persons, (2) specific treatment techniques adopted by the State Water Board in lieu of MCLs pursuant to HSC 116365(j), and (3) the monitoring and reporting requirements as specified in regulations adopted by the State Water Board that pertain to MCLs. These are legally enforceable standards that apply to PWS and protect drinking water quality by limiting the level of specific contaminants that may adversely affect public health and are known or anticipated to occur in water.

HSC 116365(a) and (b) require the State Water Board to adopt primary drinking water standards for contaminants at levels as close to the corresponding PHG as is technologically and economically feasible, placing primary emphasis on the protection of public health, and no less stringent than national primary drinking water standards adopted by U.S. EPA (Health & Saf. Code §116365, subd. (a)). HSC 116365 requires the State Water Board to consider:

1. What concentration is it possible (technologically feasible) to measure to?
2. What concentration is it possible (technologically feasible) to treat to?
3. What level of treatment is economically feasible, considering the costs of compliance to public water systems, customers, and other affected parties with the proposed primary drinking water standard, including the cost per customer and aggregate cost of compliance, using best available technology?

HSC 116365(b)(1) requires the State Water Board to consider the PHG published by OEHHA. The hexavalent chromium PHG, released by OEHHA in 2011, determined that hexavalent chromium is carcinogenic by ingestion as well as by inhalation. The PHG of 0.02 µg/L is protective against all identified toxic effects from both the oral and inhalation exposure routes, corresponding to a cancer risk of one in one million. OEHHA also determined that 2 µg/L is protective against non-carcinogenic effects, which are based on liver toxicity.

HSC 116365(b)(2) requires the State Water Board to consider the national primary drinking water standard, if any, adopted by U.S. EPA. While the U.S. EPA has not adopted a standard specific to hexavalent chromium, it has adopted a standard of 100 µg/L for total chromium (the sum of trivalent and hexavalent chromium). However, the California total chromium MCL is 50 µg/L, so as a practical matter, the hexavalent chromium MCL cannot be higher than 50 µg/L.

HSC 116365(b)(3) requires the State Water Board to consider the technological and economic feasibility of compliance with the proposed standard, including the costs of compliance to public water systems, customers, and other affected parties, including the cost per customer and aggregate cost of compliance, using BAT. Analyses of the technological and economic feasibility of the proposed MCL and associated requirements are found, respectively, in sections 10 and 11 of this document.

HSC 116370 requires the State Water Board to adopt a finding of the BAT for each contaminant for which a primary drinking water has been adopted at the time the standard is adopted. In adopting BAT, HSC 116370 requires that the State Water Board take into consideration the costs and benefits of BAT that have been proven effective under full-scale field applications. HSC 57004 requires boards within the California Environmental Protection Agency to have an external scientific peer review conducted of the scientific basis for any rule proposed for adoption. A scientific peer review was conducted through the External Scientific Peer Review Program, and looked at whether the proposed BAT could treat hexavalent chromium. More information about the technologies considered for BAT can be found in section 4.3.

HSC 116365(g) requires review of each primary drinking water standard at least once every five years. If changes in technology or treatment techniques permit materially greater protection of public health or attainment of the PHG, then the State Water Board must amend the standard.

HSC 116375 mandates that the State Water Board adopt regulations for the monitoring of contaminants, including the type of contaminant, frequency and method of sampling and testing, and the reporting of results.

HSC 116385 requires any person operating a public water system to obtain and provide at that person’s expense an analysis of the water to the State Water Board, in the form, covering those matters, and at intervals prescribed by the State Water Board. HSC 116385 further requires that the analysis be performed by a laboratory duly certified by the State Water Board. HSC 116390 requires that laboratories performing tests required pursuant to the California Safe Drinking Water Act be accredited for that testing by the California Environmental Laboratory Accreditation Program (ELAP).

4.1.1 Racial Equity

The State Water Board released a Racial Equity Action Plan on January 18, 2023 (SWRCB, 2023b). One action item within that Plan is to “[i]*ncorporate racial equity analysis when developing maximum contaminant levels using available data and as data and methods allow*.” Data and methods do not allow for such analysis to be incorporated into MCL development at this time. Staff continue to investigate and develop methods for racial equity analysis that can be incorporated into the development of future MCLs.

4.1.2 Tribal Consultation

The State Water Board is actively seeking consultation with California Native American tribes consistent with its Tribal Consultation Policy (Assembly Bill 52, Public Resources Code 21080.3.1), Executive Order B-10-11, and Executive Order N-15-19 (SWRCB, 2021f).

4.1.3 CEQA

At the time of adoption of a rule or regulation requiring the installation of pollution control equipment, establishing a performance standard, or establishing a treatment requirement, the State Water Board must perform an environmental analysis of the reasonably foreseeable methods by which compliance with that rule or regulation will be achieved (14 CCR 15187, subd. (a)). The State Water Board prepared a programmatic environmental impact report, considering the potential environmental impacts of the proposed regulations, including the reasonably foreseeable environmental impacts of the methods of compliance, an analysis of reasonably foreseeable mitigation measures, and an analysis of reasonably foreseeable alternative means of compliance with the regulation. Prior to adoption of the proposed regulations, the State Water Board will certify the EIR, consider the potential impacts of the project, and make any necessary findings, including any findings of overriding consideration.

4.2 Technological Feasibility: Limits of Hexavalent Chromium Measurement

The technological feasibility analysis for the proposed DLR (section 10.1) concludes that hexavalent chromium can be measured with a high level of accuracy to 0.1 µg/L.

4.3 Technological Feasibility: Limits of Hexavalent Chromium Treatment

The technological feasibility analysis for the proposed MCL (section 10.2) concludes that hexavalent chromium can be treated down to at least 1 µg/L by ion exchange, reduction/coagulation/filtration (RCF), and reverse osmosis (RO). These treatment technologies and stannous chloride were reviewed in the external scientific peer review required by HSC 57004 that considered the costs and benefits of treatment technologies that had been proven effective under full-scale[2] field applications (SWRCB, 2021e). The following sections contain a summary of that information as well as additional cost information that has been obtained since the peer review.

4.3.1 Ion Exchange

Studies conducted with strong base anion exchange (SBA) and weak base anion exchange (WBA) resins have demonstrated the efficacy of using ion exchange technology to remove hexavalent chromium from drinking water to levels less than 1 µg/L (Hazen and Sawyer, 2013; Seidel et al., 2014, Blute et al., 2015a; Parks et al., 2017). Najm et al. (2014) and U.S. EPA (2021b) provide treatment plant details and cost estimates for hexavalent chromium removal using ion exchange.

The peer reviewers agreed that ion exchange should be a BAT for hexavalent chromium.

4.3.2 Reduction/Coagulation/Filtration (RCF)

Studies show that a reducing agent such as ferrous sulfate or stannous chloride can be combined with filtration to remove hexavalent chromium from drinking water to levels less than 1 µg/L (Gumerman et al., 1979; Hazen and Sawyer, 2013; Blute et al., 2015b). Najm

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[2] One peer reviewer questioned whether 100 gpm should be considered full-scale for purposes of complying with HSC 116370. Of the CWS sources with hexavalent chromium detections, 41% are estimated to have flows below 100 gpm. Of the CWS sources that are expected to need treatment for the proposed MCL of 10 µg/L, 46% are estimated to have flows below 100 gpm (SWRCB, 2021b). Therefore, the State Water Board considers a flow of 100 gpm to be full-scale and took into consideration the costs and benefits of treatment that has been proven effective at flows below and above 100 gpm when setting BAT for hexavalent chromium.

et al. (2014) and Aqua Metrology Systems (2022) provide treatment plant details and cost estimates for hexavalent chromium removal using RCF.

The peer reviewers agreed that RCF should be a BAT for hexavalent chromium.

4.3.3 Reverse Osmosis (RO)

RO is a mature and viable technology for hexavalent chromium removal. RO performance can be optimized to achieve the desired level of hexavalent chromium removal in finished drinking water to less than 1 µg/L (Brandhuber et al., 2004; Rad et al., 2009; Seidel et al., 2013; Parks et al., 2017; SWRCB, 2021b). However, RO has challenges unrelated to its performance, such as high costs (high capital costs and high operations and maintenance (O&M) costs due to high energy use) and large amounts of reject water.[3] For these reasons, even though RO removes hexavalent chromium from drinking water, it is not expected to be widely implemented as centralized treatment.

The peer reviewers agreed that RO should be a BAT for hexavalent chromium.

4.3.4 Stannous Chloride

For stannous chloride to be considered a BAT, additional information on the capability of the technology to meet the proposed MCL will be necessary, including information on reoxidation in the distribution system and the ability to meet a potential MCL without exceeding the stannous chloride maximum use level (MUL). The fate of hexavalent chromium when stannous chloride is used is not well understood; the State Water Board intends to request additional evaluation of the distribution system water quality should this technology be proposed for use by a PWS.

Two of the reviewers agreed that stannous chloride should not be made BAT for hexavalent chromium until the MUL and distribution system water quality concerns could be addressed. The third reviewer agreed that the concerns were valid, but believed there may still be conditions under which stannous chloride could be a viable technology for decreasing hexavalent chromium concentrations. He also pointed out that any technology could fail under the right conditions. The State Water Board agrees that there may still be conditions under which stannous chloride could be a viable technology for decreasing hexavalent chromium, and PWS can use stannous chloride under the correct conditions. The lack of a BAT designation does not prevent the use of stannous chloride to treat hexavalent chromium. BAT designation is for the purpose of identifying effective technologies that can be broadly and reliably applied. Without more research to understand the MUL exceedance and the reoxidation and fate of hexavalent chromium in

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[3] Reject water can constitute 40% or more of the water volume treated by reverse osmosis. Also called concentrate or wastewater, reject water is a byproduct of the treatment process and may contain chemicals, such as antiscalant and washing solutions, as well as heavy metals and organic and inorganic compounds. Up to one third of the total reverse osmosis treatment costs could be to dispose of the reject water (Mohamed et al., 2005).

the distribution system, the State Water Board cannot be sure of reliability if broadly applied.

Therefore, the State Water Board is not adopting stannous chloride as a BAT for hexavalent chromium at this time.

4.4 Cost of Compliance at the Proposed MCL

The requirement to consider cost led the State Water Board to review:

- The availability and cost of single sample analysis for determining the presence of hexavalent chromium;
- The estimated cost to the regulated water systems for contaminant monitoring caused by the proposed MCL;
- The availability and cost of appropriate treatment technologies for removing the contaminant to levels below the proposed MCL; and
- The estimated cost of treatment to all PWS with sources that may violate the proposed MCL and be treated to comply with the proposed MCL.

The State Water Board reviewed analytical method availability, evaluated treatment technologies, and conducted a comprehensive cost estimate using monitoring data in the State Water Board's Water Quality Information Replacement (WQIR) database (SWRCB, 2021c)[4]. The State Water Board estimated costs associated with 21 possible MCLs (1 to 15, 20, 25, 30, 35, 40, and 45 µg/L) using analytical methods identified in section 64415 and either SBA, WBA, or RCF as the treatment technology, depending on which was more cost effective for each individual source (see the Cost Estimating Methodology (CEM) in section I of the Standardized Regulatory Impact Analysis/Assessment (SRIA, Attachment 2) for more details). While RO is a BAT, associated costs were not developed because it is expected to be more limited in use due to its higher cost and production of large quantities of reject water, which must then be disposed. In the absence of treatability data below the previous DLR, 1 µg/L was set as the lower boundary of the analysis. The upper boundary of the analysis was set at 45 µg/L.

A PWS is not limited to using the treatment identified by the State Water Board. The most appropriate treatment or means of compliance best suited for a PWS will be determined on a case-by-case basis.

4.4.1 Determination of Monitoring Costs

Total costs of monitoring statewide will be a function of the costs of the testing, the frequency of the testing, and the number of sources that must be treated. Actual costs for

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[4] The State Water Board recognizes that additional monitoring data may have been more recently submitted. However, it is necessary, as a practical matter, to conduct analyses against a static rather than dynamic data set. Due at least in part to the nature of state rulemaking procedures, the development of estimated costs cannot be a dynamic process, where the most recent data can be used to continually update the cost estimates during the regulatory process. Thus, a certain point in time has to be chosen that will define the data set for the purposes of estimating costs.

any particular water system will vary depending on many site-specific parameters, such as the level of hexavalent chromium in the source at the time of treatment, physical qualities of the water to be treated, any other regulated chemicals present, the type and method of disposal, availability of land, future cost of construction, and cost of water treatment plant operating staff.

4.4.1.1 Analytical Costs

Surveys of laboratories accredited by ELAP to perform analyses of hexavalent chromium in drinking water were conducted to determine testing costs. Twenty laboratories provided sample analysis cost information for individual samples. The average cost per sample was $78.63, with the sample costs ranging from $30 to $140 per sample. The average value of $78.63 per sample was used to estimate monitoring costs. In addition, a more sensitive method (EPA Method 218.7) with a longer holding time has become available for accreditation in California since the previous hexavalent chromium MCL rulemaking.

4.4.1.2 Testing Frequency

There are four types of monitoring costs under the existing inorganic chemical regulations. The number of PWS needing to conduct each type will differ.

- Routine: A PWS with drinking water sources showing hexavalent chromium equal to or below the proposed MCL would be required to monitor those sources once every three years (groundwater) and once every year (surface water) [22 CCR 64432(c)].
- Increased: A PWS with one or more drinking water sources showing hexavalent chromium above the proposed MCL would be required to monitor those sources quarterly [22 CCR 64432(g)(1)]. A decrease in monitoring frequency may be requested from the State Water Board after systems have completed two (for groundwater) or four (for surface water) consecutive quarters of monitoring showing results below the proposed MCL [22 CCR 64432(j)].
- Treated: A PWS treating a drinking water source for hexavalent chromium to comply with the proposed MCL would be required to monitor the treated water monthly [22 CCR 64432.8(a)].
- Reduced: A PWS that has conducted at least three rounds of monitoring (three periods (nine years) for groundwater sources or three years for surface water sources) may apply for a monitoring waiver if all previous analytical results have been below the MCL. This reduced monitoring would only require one sample per source every 9 years [22 CCR 64432(m)]. While some sources are likely to apply for and be granted reduced monitoring frequencies in the future, the State Water Board did not use this monitoring frequency to calculate costs because it does not have the data to predict how many sources will be granted this monitoring frequency. Because some PWS may be granted reduced monitoring in the future, routine monitoring costs are likely to decrease from what has been estimated.

Initial monitoring would be required for community water systems (CWS), non-transient non-community water systems (NTNCWS), and wholesalers with drinking water sources not monitored in the previous two years with an analysis capable of reaching the proposed

DLR of 0.1 µg/L. Most of the previous hexavalent chromium testing did not meet the 0.1 µg/L DLR, so the assumption was made that all sources will test in the first 6 months after the effective date of the regulation. [5]

Transient non-community water systems (TNCWS) are PWS that do not regularly serve at least 25 of the same persons more than six months of the year, such as a campground or highway rest stop. Because TNCWS are required to monitor for inorganic chemicals (including hexavalent chromium), only if they are using surface water sources with an average daily population greater than 1,000 people or if they are subject to potential contamination based on a sanitary survey, few have monitoring results. Out of the 3,520 TNCWS sources currently in the state, 326 (9.3%) have reported hexavalent chromium sampling results (SWRCB, 2021c). Therefore, more TNCWS sources may be contaminated than current data shows, which could increase the cost of compliance. Nevertheless, a cost analysis is included for systems that sampled sources for hexavalent chromium. A conservative assumption was made that any TNCWS surface water source sampled for hexavalent chromium in the past will be required to continue sampling, and any contaminated source vulnerable to hexavalent chromium must also be sampled. Any TNCWS source required to sample must follow the same sampling frequency as CWS sources.

A water system treating a drinking water source for hexavalent chromium to comply with the proposed MCL would be required to monitor the treated water monthly.

4.4.1.3 Number of Sources Tested for Hexavalent Chromium

A review of monitoring data (Table 1) shows the number and percent of CWS and NTNCWS sources that have monitored for hexavalent chromium since January 1, 2010, broken down by service connections. The same monitoring data shows that 54% of wholesaler sources and 9.3% of TNCWS sources have monitored for hexavalent chromium. Monitoring requirements specific to the previous hexavalent chromium MCL were effective July 1, 2014, and deleted May 31, 2017, and sources subject to monitoring requirements for inorganic chemicals ought to have completed initial monitoring pursuant to 22 CCR 64432.

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[5] The number of sources that have monitored in the two years before the regulation is expected to take effect (1/1/2022 to 1/1/2024) cannot be estimated because this time period falls outside of the data set used in this rulemaking. Because of the time required to prepare the rulemaking and complete the public process, a reasonable projection of the sources expected to meet this requirement cannot be made. A conservative assumption was made that all sources will begin initial monitoring after the regulation takes effect.

Table 1. Sources monitored for hexavalent chromium between January 1, 2010, and June 21, 2021, by CWS service connections and NTNCWS population

Service Connections	Percent CWS Sources Sampled (Sample / Total)	Population	Percent NTNCWS Sources Sampled (Sampled / Total)
Less than 100	93.0% (2,144/2,306)	Less than 50	81.9% (412/503)
100 to 200	95.5% (633/663)	50 to 100	72.7% (325/447)
200 to 1,000	92.8% (1,016/1,095)	100 to 200	76.9% (367/477)
1,000 to 5,000	91.9% (1,284/1,397)	200 to 400	83.1% (305/367)
5,000 to 10,000	100% (559/559)	400 to 1,000	91.3% (210/230)
10,000 or more	98.7% (3,120/3,162)	1,000 or more	84.5% (125/148)
Total	95.4% (8,757/9,182)	Total	80.3% (1,744/2,172)

4.4.1.4 Number of Sources Requiring Hexavalent Chromium Testing

To estimate the number of sources required to test for hexavalent chromium, the State Water Board used the number of active sources with hexavalent chromium detections from the WQIR database for the period of January 1, 2010, through June 21, 2021, excluding standby and emergency sources (emergency or standby sources are assumed to be taken offline and not treated). The WQIR dataset was generated from the State Water Board's database of statewide drinking water source quality data, and therefore contains a comprehensive identification of all affected public water sources in California at the time of data acquisition (June 21, 2021).

Sources previously not monitored (e.g., sources that came online after the deletion of the previous MCL or sources that did not sample when the previous MCL was active) and sources with hexavalent chromium below the proposed MCL will need to initiate routine monitoring (22 CCR 64432(c)), sources in violation of the proposed MCL will need to perform increased monitoring and treated sources must be monitored monthly (22 CCR 64432(g); 22 CCR 64432.8). Data cleanup and corrections are made as analytical or data entry errors are identified, so there may be changes made to the data after the time the data was pulled. Table 2 summarizes the number of sources requiring sampling for the proposed MCL of 10 µg/L.

Table 2. Number of sources estimated to require type of monitoring

PWS Type	Routine (GW)	Routine (SW)	Increased and Treated (GW)	Increased and Treated (SW)
CWS	7,952	818	409	3
NTNCWS	1,994	106	71	1
TNCWS	263	19	7	0
Wholesalers	453	106	9	1

4.4.1.5 Monitoring Cost Estimates

The source monitoring results in the WQIR data were evaluated to obtain annual running averages of hexavalent chromium concentrations for each active source. The highest annual running average concentration for each source was then compared to each potential MCL to estimate the monitoring that would have been required for each source under each potential MCL.

The estimated source monitoring costs, broken down by water system size and source water type, are shown in Tables 4.1A and 4.1B (routine monitoring), Tables 4.2A and 4.2B (increased monitoring), and Tables 4.3A and 4.3B (treated monitoring) in Attachment 1 for CWS and NTNCWS, respectively. Estimated monitoring costs for TNCWS and wholesalers are shown in Attachment 1 Tables 17C and 17D, respectively.

Costs differ with each MCL evaluated since the number of affected sources vary. For the proposed MCL of 10 µg/L, the estimated total statewide annualized costs for routine monitoring are approximately $272,741, $60,598, $22,174, and $20,208 for CWS, NTNCWS, TNCWS, and wholesaler sources, respectively. The total estimated statewide annual costs for increased monitoring are approximately $129,582, $22,645, $2,202, and $3,145 for CWS, NTNCWS, TNCWS, and wholesaler sources, respectively. The estimated total statewide annual costs for treated monitoring are approximately $388,747, $67,936, $6,605, and $9,436 for CWS, NTNCWS, TNCWS, and wholesaler sources, respectively.

These costs correspond to annual monitoring costs of $1,258 and $31 per source for sources impacted and not impacted at the proposed MCL, respectively.

Routine and increased monitoring costs are expected to start during the first year and continue in subsequent years. The treated monitoring costs are expected to start during the year in which each system is required to comply with the MCL, according to the compliance schedule, and are expected to continue in subsequent years. Increased monitoring costs may increase or decrease depending on the routine monitoring results. Treated water monitoring costs may increase or decrease depending on the results of the increased monitoring.

At a proposed hexavalent chromium MCL of 10 µg/L, estimated monitoring costs would total $1,006,018 per year. This cost is the sum of all additional testing by all PWS in California, not the additional cost for each individual system or source.

4.4.2 Determination of Treatment Costs

A water system with a drinking water source in violation of the hexavalent chromium MCL would be required to either remove the source from service or treat the source to come into compliance. Other compliance options, such as blending contaminated water with an uncontaminated water source, may be available to water systems. However, the data needed to evaluate the feasibility and likelihood of these options is not available, so it is assumed that all sources will need treatment for the purpose of estimating costs. For each treated source, a water system would incur both capital and O&M costs. The term *treatment costs* refers to the combination of capital and O&M costs. A full list of assumptions can be found in the CEM (Attachment 2, section I).

For each source, the costs of SBA, WBA, and RCF treatment were estimated as described in the CEM. Each source was assumed to use the least expensive treatment of the three options. The individual cost estimates for all sources affected at the proposed MCL are included in Attachment 5 as intermediate calculations. Treatment costs incurred by a given water system will vary depending on many site-specific parameters (e.g., the concentration of hexavalent chromium in the source; physical qualities of the water; any other regulated chemicals present; the type and method of treatment and waste disposal; availability of land; and cost of construction labor and water treatment plant operating staff) and variability of time to plan, design, permit, and build the treatment system. The State Water Board did not include adjustments for local economies, site-specific conditions, or other unique costs or savings that may impact some PWS. However, the State Water Board did adjust the labor costs to account for California-specific salaries using the 2020 Occupational Employment and Wage Statistics from the Bureau of Labor Statistics. The assumptions, sources, and methodology used to estimate treatment costs are available in the CEM. All costs were converted to June 2022 dollars.

At the proposed MCL of 10 µg/L, there are 501 sources that would require treatment, and RCF was calculated to be the least expensive for all but 11 sources. WBA treatment was calculated to be the least expensive for the remaining 11 sources, and SBA treatment was never the least expensive option for any source at the proposed MCL. Because the costs of each treatment type were calculated for each source, it is possible to compare costs across treatment types and sources to identify cost trends. For example, the higher a source's hexavalent chromium concentration, the higher the calculated WBA resin and disposal costs were, which was likely due to the assumption that WBA resins were not regenerated, so their use would be directly proportional to the amount of hexavalent chromium removed from the source water. Comparatively, SBA resins may or may not be regenerated, and the volume of resin used annually for treatment also depended on the amount of sulfate and nitrate in the source water, so the same resin and disposal cost trends were not observed. Following the WBA trend, the 11 sources for which WBA treatment was calculated to be the least expensive are some of the least contaminated sources (the highest influent concentration among them was 11.3 µg/L). When comparing the selected WBA annualized costs, the alternative RCF costs were estimated between $917 and $33,815 higher and the alternative SBA costs were estimated between $88,577 and $271,816 higher. Across all sources, SBA was generally the most expensive treatment option, accounting for 70% of the highest calculated costs. Disposal costs were often a driver for SBA costs, and resin and disposal costs were often a driver for WBA costs. In comparison, RCF costs were driven by capital costs and chemical costs.

The estimated total capital costs, annualized capital costs, and annual O&M costs broken down by water system size are shown in Tables 5.1A and 5.1B, 5.2A and 5.2B, and 5.3A and 5.3B in Attachment 1 for CWS and NTNCWS, respectively. The same costs are shown for TNCWS and wholesalers in Attachment 1 Tables 17C and 17D, respectively. For the proposed MCL of 10 µg/L, the State Water Board estimates from review of the Safe Drinking Water Information System (SDWIS) and WQIR databases that 412 CWS, 72 NTNCWS, 7 TNCWS, and 10 wholesaler sources would need treatment to come into compliance with the proposed MCL. Some of these water systems may be able to meet the MCL by other means, such as blending, at lower costs than treatment. However, if all the sources anticipated to be out of compliance with the MCL were treated, the estimated statewide annualized treatment (capital and O&M) costs, including any existing treated sources, are approximately $171,874,959, $5,043,233, $452,465, and $1,191,508 for CWS, NTNCWS, TNCWS, and wholesalers, respectively.

4.4.3 Determination of Costs to Prepare and Review Compliance Plans and Operations Plans

As detailed in the CEM (SRIA section I.3.a.3), it is estimated that 100 hours of an engineer’s time will be needed to prepare a Hexavalent Chromium Compliance Plan, and an associated Hexavalent Chromium Operations Plan with the specified elements, at $76 per hour (including overhead), with the majority of that time spent on the operations plan. The estimated cost to prepare a set of Hexavalent Chromium Compliance and Hexavalent Chromium Operations Plans is $7,619 per system. Similarly, the cost to review a set of compliance and operations plans is estimated based on the high end of the salary range for California’s Water Resource Control Engineer classification at the State Water Board, which is $91 per hour (including overhead). Since the review of a set of compliance and operations plans is expected to take an average of 35 hours, the average cost to the State Water Board to review a set of plans is $3,174. Table 3 shows the total costs associated with compliance and operations plans broken down by PWS type.

Table 3. Hexavalent Chromium Compliance and Operations Plans Preparation and Review Costs

PWS Type	Compliance and Operations Plans Preparation Cost	Compliance and Operations Plans Review Cost
CWS	$1,219,077	$507,864
NTNCWS	$ 472,392	$196,797
TNCWS	$ 53,335	$ 22,219
Wholesaler	$ 30,477	$ 12,697
Total	$1,775,281	$739,577

4.4.4 Breakdown of Costs and Economic Impacts

The State Water Board reviewed the estimated statewide annual cost of monitoring, treatment, and compliance and operations plans costs, and looked at those costs per system, per source, per service connection, per person, and per unit of water. Those costs were further broken down by water system size for CWS and NTNCWS.

4.4.4.1 Estimated Statewide Total Annualized Costs of Compliance

The estimated total annualized monitoring and treatment costs are shown in Attachment 1 Tables 6A and 6B for CWS and NTNCWS, respectively, broken down by water system size. For the proposed MCL of 10 µg/L, the total statewide annualized costs are approximately $172,666,029 and $5,194,412 for CWS and NTNCWS, respectively. The total and annualized monitoring and treatment costs for TNCWS and wholesalers are shown in Attachment 1 Tables 17C and 17D, respectively. For the proposed MCL of 10 µg/L, the total statewide annualized costs are approximately $483,446 and $1,224,297 for TNCWS and wholesalers, respectively.

4.4.4.2 Estimated Annual Cost per System

The estimated number of systems requiring treatment can be found in Attachment 1 Tables 7.1A, 7.1B, 17C, and 17D for CWS, NTNCWS, TNCWS, and wholesalers, respectively. The average estimated annual cost per system, by water system size, is shown in Attachment 1 Tables 7.2A and 7.2B for CWS and NTNCWS, respectively. Table 7.2A from Attachment 1 is copied below as Table 4. For the proposed MCL of 10 µg/L, the average annual cost per system for CWS ranges from $69,732 (systems with less than 100 service connections) to $3,437,549 (systems with more than 10,000 service connections) depending on the system size. The average annual costs per system for NTNCWS are generally smaller due to their sizes, ranging from $48,810 to $217,789. Larger water system costs are generally greater due to the need to treat greater flows to serve more people. For the proposed MCL of 10 µg/L, the average annual cost per system is $69,064 for TNCWS and $306,074 for wholesalers.

Table 4. Estimated average annual cost per CWS by size (SC = service connections) and MCL (Attachment 1, Table 7.2A)

MCL (µg/L)	SC fewer than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000	Average
1	$ 81,600	$192,533	$406,821	$1,656,871	$3,192,589	$9,575,131	$1,902,467
2	$ 75,086	$145,739	$351,900	$1,556,059	$2,542,105	$7,665,810	$1,693,510
3	$ 68,051	$138,210	$324,375	$1,464,079	$2,596,695	$6,653,747	$1,563,808
4	$ 67,773	$139,008	$313,673	$1,374,653	$2,287,666	$5,581,490	$1,419,951
5	$ 67,471	$132,063	$300,637	$1,310,449	$2,200,500	$4,736,179	$1,309,841
6	$ 66,836	$128,131	$298,024	$1,314,533	$2,130,244	$3,853,303	$1,209,691
7	$ 69,112	$126,267	$289,481	$1,268,297	$1,981,612	$3,523,134	$1,156,677
8	$ 70,305	$120,948	$299,574	$1,217,619	$2,007,553	$3,633,045	$1,188,795

MCL (µg/L)	SC fewer than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000	Average
9	$ 69,666	$115,994	$310,793	$1,274,351	$2,009,105	$3,606,486	$1,138,113
10	$ 69,732	$117,180	$276,817	$1,293,979	$1,861,868	$3,437,549	$1,079,163
11	$ 66,464	$116,391	$253,492	$1,367,878	$1,891,391	$3,617,907	$1,055,169
12	$ 65,321	$130,138	$283,063	$1,336,959	$2,144,753	$3,354,418	$1,049,616
13	$ 65,872	$128,167	$257,269	$1,342,183	$1,963,506	$3,047,842	$1,055,883
14	$ 67,403	$142,239	$285,034	$1,329,544	$1,809,005	$2,683,177	$1,026,087
15	$ 70,117	$ 93,327	$282,105	$1,296,467	$1,901,611	$2,345,712	$1,002,433
20	$ 60,813	$ 93,043	$854,770	$1,044,357	$1,490,941	$1,724,223	$ 853,957
25	$ 62,441	$ 92,423	$837,891	$ 719,690	$ 570,891	$1,721,058	$ 719,841
30	$ 74,196	$ 88,482	$442,656	$ 359,470	$ 621,480	$1,597,256	$ 753,715
35	$ 72,635	$ 85,601	$436,576	$ 435,213	$ 601,902	$1,593,382	$ 840,730
40	$120,028	$ 83,837	$430,496	$ 457,994	-	$1,446,102	$ 897,261
45	-	$ 82,073	$424,416	-	-	$1,098,669	$ 776,901

4.4.4.3 Estimated Annual Cost per Source

The estimated average annual cost per source, by water system size, is shown in Attachment 1 Tables 8A and 8B for CWS and NTNCWS, respectively. For the proposed MCL of 10 µg/L, the average cost per source for CWS ranges from $57,645 (systems with less than 100 service connections) to $620,623 (systems with at least 5,000 but no more than 10,000 service connections). The average annual costs per source for NTNCWS range from $47,889 to $180,364. On average, systems with fewer than 100 service connections treat much less water per source than systems with more than 10,000 service connections, which accounts for the large range of costs. Larger water system costs are generally greater due to the need to treat greater flows.

For the proposed MCL of 10 µg/L, the average annual cost per source is $69,064 for TNCWS and $122,430 for wholesalers (Attachment 1, Tables 17C and 17D).

4.4.4.4 Estimated Annual Cost per Service Connection

The estimated number of service connections in each water system size category can be found in Attachment 1 Tables 9.1A, 9.1B, and 17C for CWS, NTNCWS, and TNCWS, respectively. The estimated average annual cost per service connection, by system size, is shown in Attachment 1 Tables 9.2A and 9.2B for CWS and NTNCWS, respectively. For the proposed MCL of 10 µg/L, the average annual cost per service connection for CWS ranges from $91 (systems with more than 10,000 service connections) to $1,622 (for systems with less than 100 service connections). These costs are higher for smaller water systems due to a lack of economies of scale – meaning that there are fewer households (service connections) among which the cost of the treatment can be shared.

For the proposed MCL of 10 µg/L, the average cost per service connection for NTNCWS ranges from $2,973 (systems 1,000 or more people) to $72,596 (systems with at least 400 but less than 1,000 people). While these costs are large, they are not reflective of costs a family would be asked to pay because NTNCWS do not serve yearlong residents. Instead, these systems consist of agricultural and industrial facilities, schools, churches, prisons, recreational areas, restaurants, and any other public water system that regularly serves 25 or more of the same persons more than 6 months per year. NTNCWS also have few service connections on average; one third of all NTNCWS in the state have only one service connection.

The total number of service connections served by TNCWS is shown in Attachment 1 Table 17C. For the proposed MCL of 10 µg/L, the average annual cost per service connection is $1,667 for TNCWS. As with NTNCWS, TNCWS costs per service connection are not reflective of costs a family would be asked to pay because TNCWS do not serve yearlong residents. According to existing data, TNCWS that would have to treat consist of a raceway, a campground, three churches, a spa, and a packing company.

Wholesaler costs cannot be broken down to the service connection level because wholesalers do not directly serve residents and do not consistently report service connections in the SDWIS database (some report the number of connections through which water is delivered to other systems, some report an estimate of the number of service connections that will eventually be served by their water, and some report the total number of service connections of all the systems to which they sell).

4.4.4.5 Estimated Annual Cost per Person

The estimated number of people served by the systems in each water system size category can be found in Attachment 1 Tables 10.1A, 10.1B, 17C, and 17D for CWS, NTNCWS, TNCWS, and wholesalers, respectively. The estimated average annual cost per person, by system size, is shown in Attachment 1 Tables 10.2A and 10.2B for CWS and NTNCWS, respectively. Table 10.2A from Attachment 1 is copied below as Table 5, showing that for the proposed MCL of 10 µg/L, the average annual cost per person for CWS ranges from $23 (systems with more than 10,000 service connections) to $443 (systems with less than 100 service connections relying on centralized treatment; note point-of-use (POU) device costs in Table 2, above). For NTNCWS, the annual average cost per person the proposed MCL of 10 µg/L ranges from $101 (systems with 1,000 or more people) to $1,596 (systems with less than 50 people). However, NTNCWS are not community systems and do not directly charge households or individuals for the cost of water. Instead, according to State Water Board existing data, these 62 NTNCWS consist of 37 industrial/agricultural businesses (packing companies, farms, etc.), 10 schools, three restaurants, four “other transient areas” (a Christian center, wedding event property, county hauling, and defense distribution center), one army heliport, one medical facility, one church, one winery, one regional park, one Cal Fire conservation camp, one plant nursery, and one migrant center.

For the proposed MCL of 10 µg/L, the average annual cost per person is $442 for TNCWS and $6 for wholesalers. According to State Water Board existing data, the seven TNCWS that would have to treat are a raceway, a campground, three churches, a spa, and a packing company, none of which charge households or individuals for the cost of water.

Table 5. Estimated average annual cost per person for CWS by size (SC = service connections) and MCL (Attachment 1, Table 10.2A)

MCL (µg/L)	SC less than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000	Average
1	$ 383	$215	$175	$174	$112	$63	$75
2	$ 407	$324	$159	$159	$ 89	$47	$57
3	$ 483	$294	$144	$151	$ 90	$38	$49
4	$ 474	$286	$123	$139	$ 74	$31	$40
5	$ 456	$267	$107	$128	$ 74	$24	$32
6	$ 450	$310	$100	$129	$ 71	$19	$26
7	$ 447	$310	$ 86	$129	$ 66	$23	$32
8	$ 466	$297	$ 71	$124	$ 72	$25	$34
9	$ 467	$281	$ 68	$136	$ 72	$23	$32
10	$ 443	$279	$ 60	$136	$ 67	$23	$32
11	$ 448	$273	$ 52	$141	$ 69	$25	$35
12	$ 429	$304	$ 42	$132	$ 79	$22	$32
13	$ 409	$288	$225	$131	$ 73	$19	$29
14	$ 445	$320	$228	$133	$ 67	$17	$26
15	$ 457	$244	$226	$130	$ 65	$15	$23
20	$ 452	$262	$252	$102	$ 54	$ 8	$14
25	$ 424	$246	$247	$ 63	$ 27	$11	$15
30	$ 411	$236	$131	$ 28	$ 26	$10	$12
35	$ 406	$228	$129	$ 29	$ 25	$ 9	$10
40	$3,429	$224	$127	$ 47	-	$ 7	$ 8
45	-	$219	$125	-	-	$ 9	$11

4.4.4.6 Estimated Annual Cost per Unit of Water

The estimated volume of water treated in million gallons (MG) for each water system size category can be found in Attachment 1 Tables 11.1A and 11.1B for CWS and NTNCWS, respectively. The estimated annual cost per MG of treated water is shown in Attachment 1 Tables 11.2A and 11.2B for CWS and NTNCWS, respectively. For the proposed MCL of 10 μg/L, the average cost per MG of treated water for CWS ranges from $2,505 (systems with more than 10,000 service connections) to $9,868 (systems with less than 100 service connections). Costs per MG are generally lower for larger water systems due to the economies of scale of water treatment.

In addition, the estimated annual cost per thousand gallons (kgals) of treated water is shown for each water system size in Attachment 1 Tables 11.3A and 11.3B for CWS and NTNCWS, respectively.

For NTNCWS, the cost per MG of treated water for the proposed MCL of 10 μg/L ranges from $4,826 (systems that serve 1,000 or more people) to $27,795 (systems that serve less than 50 people). For the proposed MCL of 10 μg/L, the average annual cost per MG of water is $8,079 for TNCWS and $5,867 for wholesalers. The smallest NTNCs are likely the most expensive on a unit of water basis because these systems (and therefore their source demand) are small, especially compared to the smallest possible treatment plant size (detailed in the CEM). Of the 166 sources with detections of hexavalent chromium belonging to NTNCs that serve less than 50 people, only one source exceeded the minimum flow for which costs were calculated. This means that the estimated costs for nearly all these sources are much larger than what they would likely pay for compliance for smaller flows. Cost data was not available for small treatment plants (especially those with flows less than 5 gpm), so costs for small sources (and the systems they belong to) are overestimated.

Economies of scale affect PWS in multiple ways. Although total costs are lower for treatment plants with smaller flows, costs are higher on a per unit of water basis because large capital investments are usually needed to install treatment, regardless of flow size. Costs are also higher for smaller systems on a per person or per service connection basis because there are fewer households among which the cost of treatment can be shared. These factors result in higher compliance costs for smaller systems on most bases.

5. SPECIFIC DISCUSSION OF PROPOSED REGULATIONS

[Gov. Code, §11346.2(b)(1)]

The proposed regulations are contained in title 22, division 4, chapter 15, articles 2, 4, 12, 18, and 20 of the CCR. The following provides a detailed discussion of the proposed changes. Development of associated estimated costs is described in detail in the CEM in section I of the SRIA (Attachment 2). Estimated costs are meant to estimate statewide costs and not the actual cost to a particular water system.

5.1 Article 2, Section 64415, Laboratory and Personnel

The purpose of this section is to establish who may perform required analyses, sample collection, and field tests for compliance with the regulations; the analytical methods to use for analyses; and the qualifications of personnel performing sample collection and/or field tests.

Subsection (a)(1) would be revised to add that analyses performed by laboratories use the following U.S. EPA approved methods that are incorporated by reference in 40 Code of Federal Regulations 141.23 through 141.41, 141.66, and 141.89 as prescribed, and to delete text to accommodate the addition of subsection (a)(3). This reorganization of text is necessary to clearly indicate State Water Board direction to perform analyses in accordance with U.S. EPA approved methods. Subsection (a)(2) would also be revised to add that analyses performed by laboratories use the following U.S. EPA approved methods that are incorporated by reference in 40 Code of Federal Regulations of section 141.852 as prescribed, and to revise punctuation to accommodate the addition of subsection (a)(3). This is necessary to clearly indicate State Water Board direction to perform analysis in accordance with U.S. EPA approved methods. The non-substantive changes made to subsections (a)(1) and (a)(2) were for the purposes of aiding style and grammar.

Subsection (a)(3) would be added to specify that analysis for the determination of hexavalent chromium must be performed using the U.S. EPA methods specified in (a)(3)(A) and (a)(3)(B). Subsections (a)(3)(A) and (a)(3)(B) incorporate by reference two analytical methods—EPA 218.6 and EPA 218.7 (U.S. EPA, 1994; U.S. EPA, 2011). Specifying hexavalent chromium analytical methods is necessary because U.S. EPA has not yet added hexavalent chromium analytical methods to the drinking water portions of the Code of Federal Regulations for reference in paragraph (1) because U.S. EPA does not regulate hexavalent chromium, so there are currently no available methods for hexavalent chromium analysis. It is necessary to clearly and efficiently indicate State Water Board direction to use one of these methods to ensure consistent and reliable quantification of hexavalent chromium in drinking water. U.S. EPA methods 218.6 and 218.7 are both currently offered for accreditation by ELAP and, based on a survey of accredited laboratories performing analyses of drinking water for hexavalent chromium (see Attachment 4), both can measure hexavalent chromium to levels at least as low as the proposed DLR. U.S. EPA methods 218.6 and 218.7 are the only two methods mentioned by the U.S. EPA for measuring hexavalent chromium in drinking water (U.S. EPA, 2013). These two methods would be incorporated by reference into subsections (a)(3)(A) and (a)(3)(B) of the regulation text.

5.2 Article 4, Section 64431, Maximum Contaminant Levels – Inorganic Chemicals

The purpose of this section is to list the inorganic chemicals for which drinking water MCLs have been established to protect the health of consumers served by PWS and decrease the risk of adverse health effects. Maximum contaminant levels are established in units of mg/L. At lower concentrations, contaminant concentrations are sometimes referenced using units of µg/L, also known as ppb.

The first paragraph of section 64431 would be revised to correct lower/upper case usage.

Table 64431-A would be revised to adopt a chromium (hexavalent) MCL of 0.010 mg/L (10 µg/L). The primary purpose of establishing this MCL is improving public health, the

details of which are discussed below in section 5.2.1. Rationale for selecting the proposed MCL is provided in the technological and economic feasibility analyses in sections 10 and 11, respectively.

An MCL for hexavalent chromium is proposed to protect public health from both cancer and noncancer effects of exposure to hexavalent chromium in drinking water. While it is not currently feasible to set the MCL at the PHG, establishing a maximum contaminant level for hexavalent chromium would decrease public exposure to this contaminant and decrease the risk of associated adverse health effects. The estimated 5.5 million people affected by this MCL will see the exposure to hexavalent chromium in their drinking water decrease by an average of approximately 30%[6].

An MCL is necessary because HSC 116365 requires the State Water Board to adopt primary drinking water standards for contaminants, specifying that each standard must be set at a level as close as feasible to the corresponding PHG, placing primary emphasis on the protection of public health, and meeting the PHG, to the extent technologically and economically feasible. The hexavalent chromium PHG is 0.02 µg/L, based on cancer effects (OEHHA, 2011). HSC 116365.5 also specifically requires establishment of a hexavalent chromium MCL. Additionally, the Superior Court of Sacramento County judgment invalidating the 2014 hexavalent chromium MCL for drinking water included an order to the State Water Board to adopt a new hexavalent chromium MCL (*California Manufacturers and Technology Association et al.,* 2017).

The State Water Board's decision to regulate hexavalent chromium through an MCL rather than through a treatment technique is discussed in section 7.

As described further in detail in sections 10 and 11, the State Water Board finds the proposed MCL to be technologically and economically feasible.

Table 64431-A would also be revised to specify chromium as chromium (total) for clarity.

5.2.1 Health Benefits

The PHG of 0.02 µg/L represents a risk that is considered negligible (e.g., one excess cancer case in one million people) (OEHHA, 2011). The health risk at the proposed MCL of 10 µg/L is 500 times greater than that at the PHG, and the health risk at an MCL of 45 µg/L is 2,250 times greater than at the PHG. The risk continues to increase as the concentration increases, such that the risk at 45 µg/L is estimated at about one excess cancer case in 444 people (or 2,250 excess cases in one million people). Decreased exposure to hexavalent chromium results in decreased risk of cancer and decreasing that exposure as much as feasible is required by HSC 116365 and is of benefit to public health.

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[6] This value was calculated by determining the reduction of hexavalent chromium after treatment (from the highest annual average to the MCL) as a percent for each impacted CWS, and then weighting by population to determine the overall average of approximately 30%.

This regulation is expected to protect an estimated 5.5 million people[7] who currently receive water that exceeds the proposed MCL from potential illness due to hexavalent chromium. The average percent reduction of hexavalent chromium contamination can be estimated using the following equation:

$$\begin{aligned}&Percent\ Concentration\ Reduction\\ &\quad = \frac{(average\ of\ source\ monitoring\ results - evaluated\ MCL)}{evaluated\ MCL} \times 100\%\end{aligned}$$

The percent concentration reduction was calculated across all CWS, NTNCWS, and wholesalers expected to have at least one source exceed the MCL and found to be an average of approximately 30%. Percent reduction could not be estimated for TNCWS because these systems do not regularly serve at least 25 of the same persons more than 6 months of the year, and consistent consumption of the evaluated water is a foundational assumption of the risk calculation.

The reduction in theoretical excess cancer cases can be estimated with the following equation:

$$\begin{aligned}Reduction\ over\ 70\ years &= (average\ of\ source\ monitoring\ results\ - evaluated\ MCL)\\ &\times (estimated\ population\ exposed) \times (risk)\end{aligned}$$

Risk is defined as the PHG potency factor of one excess cancer case in one million people over 70 years of exposure,[8] divided by the PHG. Theoretical carcinogenic risk for hexavalent chromium was assumed to be linear.

Per source decreases in the number of theoretical excess cancer cases were estimated and totaled for each evaluated MCL. The estimated number of theoretical excess cancer cases reduced for each water system size category is shown in Attachment 1 Tables 12A, 12B, and 17D for CWS, NTNCWS, and wholesalers, respectively. For the proposed MCL of 10 µg/L, the theoretical number of cancer cases reduced over 70 years is 892 for CWS, 5 for NTNCWS, and 1 for wholesalers. Overall, the proposed MCL of 10 µg/L would theoretically lead to an estimated reduction of about 13 cancer cases per year statewide. For the individual consumer, the increase in health protection provided by reducing the level of a contaminant is the same regardless of system size.

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[7] See Attachment 1, Table 24 for a breakdown of population affected by potential MCLs.

[8] The primary risk associated with hexavalent chromium in drinking water is from the ingestion of hexavalent chromium in drinking water. As discussed and noted in OEHHA (2011), ingestion of water via washing fruits and vegetables is taken into consideration in the assumptions used in the exposure assessment. Additionally, OEHHA uses an assumption of 0.8 for the relative source contribution (RSC). This value of the RSC means that 80 percent of the exposure to hexavalent chromium is assumed to come from drinking water. Exposures via other routes are considered to be minor compared to the ingestion route. As OEHHA (2011) states on page 101, "*Little or no Cr VI exposure is expected from air, food, incidental inhalation, dermal and oral exposure to soil and dust*."

Due to the infrequent and uncertain exposure to drinking water from TNCWS, the theoretical excess cancer cases reduced cannot be quantified. One of the assumptions of the above cancer case calculations is the water is consumed consistently (two liters per day for 70 years). However, TNCWS are defined as systems that do not regularly serve at least 25 of the same people more than 6 months of the year. The TNCWS that are anticipated to have to treat to comply with an MCL at 10 µg/L include two churches, a raceway, a campground, a packing company, and a spa.

The treatment for hexavalent chromium may in some cases provide a secondary benefit by incidental removal of other inorganic contaminants in drinking water. For example, treatment through the BAT of ion exchange may remove trace levels of uranium and arsenic. The health concerns associated with such contaminants would be reduced. The magnitude of this secondary benefit of co-contaminant removal would vary with local water chemistry and selected compliance method, and so cannot be quantified based on currently available data.

Adopting an MCL may also improve public perception of the drinking water supply, resulting in decreased consumption of bottled water. The purchase of bottled water is an additional financial burden for economically disadvantaged communities. In addition, increased confidence in the tap water quality may help efforts to reduce childhood consumption of unhealthy substitutes (i.e., sweetened beverages) to drinking water, therefore providing a positive health benefit.

5.3 Article 4, Section 64432, Monitoring and Compliance – Inorganic Chemicals

The purpose of section 64432 is to establish the DLR, monitoring requirements, and compliance determination procedures for inorganic chemicals with an MCL.

Subsections (a), (b), (c), and (d) would be revised to correct upper/lower case usage.

Table 64432-A of subsection (d) would be revised to adopt a DLR for chromium (hexavalent) of 0.0001 mg/L (0.1 µg/L).

DLRs are the designated minimum levels at or above which any analytical finding of a contaminant in drinking water resulting from monitoring must be reported to the State Water Board. DLRs for inorganic contaminants are found in title 22 of the CCR Table 64432-A. The DLR is considered part of the technological feasibility analysis when establishing an MCL and is the lowest concentration at which an MCL can, for all practical purposes, be established. DLRs set above the PHG hinder the State Water Board's ability to evaluate whether technology achieves a materially greater protection of public health and to determine the economic feasibility of lowering the MCL in conducting the review required by HSC 116365(g). To adequately conduct this review and evaluation, and to adequately evaluate health risk, technological feasibility, and economic feasibility in consideration of a revised MCL in the future, it is necessary to acquire water quality data characterizing drinking water source concentrations, ideally, at least as low as the current PHG when technologically and economically feasible. Where confident quantification to a concentration at or below the PHG is infeasible, the DLR should be set to the lowest level technologically and economically feasible.

Based on the laboratory surveys and documented follow-up communication, the State Water Board determined that laboratories could reliably quantify hexavalent chromium in drinking water to 0.1 µg/L (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). In addition, those surveys showed that there is sufficient laboratory capacity (e.g., number of analyses per month, ability to meet proposed DLR) for initial sampling at a hexavalent chromium DLR of 0.1 µg/L. Nineteen (19) laboratories dropped accreditation after the previous hexavalent chromium MCL was deleted, so it is also expected that more laboratories will become accredited for hexavalent chromium analyses as the MCL is re-established. Because commercial laboratories have the availability to perform analyses for the PWS without in-house accredited labs, capacity was determined using commercial lab availability and ability to meet the proposed DLR. Further details about the laboratory surveys, related correspondence, and laboratory capacity can be found in section 10.1.

Table 64432-A would also be revised to specify chromium as chromium (total) for clarity.

Subsection (o) would be revised to correct upper/lower case usage.

Subsection (p) would be adopted to establish a compliance schedule for the hexavalent chromium MCL, detailed in Table 64432-B.

Existing regulations include an implementation period through 22 CCR 64432(b), which allows PWS six months following the effective date of the regulation establishing the MCL to initiate monitoring. In addition, as a chronic (e.g., cancer-based) inorganic contaminant, compliance with the proposed hexavalent chromium MCL would be based on a running annual average as set forth in 22 CCR 64432(i). Consequently, the annual average of a source may not exceed the MCL for up to a year after the initial six-month period, unless hexavalent chromium concentrations are so high as to cause any one sample to exceed the annual average.

In addition to the existing implementation period, the State Water Board is proposing a compliance schedule as follows:

- A compliance date two years after the effective date of the MCL (estimated January 1, 2026) for PWS serving 10,000 service connections or greater, accounting for 87 percent of population served by a contaminated source at the proposed hexavalent chromium MCL;
- A compliance date three years after the effective date of the MCL (estimated January 1, 2027) for PWS serving 1,000 to 9,999 service connections, or 11 percent of the population served by an impacted source at the proposed MCL; and
- A compliance date four years after the effective date of the MCL (estimated January 1, 2028) for PWS serving fewer than 1,000 service connections, or 2 percent of the population served by an impacted source.

As shown in Attachment 2 (section A.2, starting on page 6), hexavalent chromium is a pervasive contaminant in California water sources, with the proposed MCL potentially requiring compliance action in the form of additional treatment for 233 PWS. The expected dominant treatment technologies for hexavalent chromium (i.e., RCF and ion exchange) typically require more tailoring to source water chemistry and integration with existing treatment unit processes than other treatment technologies (e.g., granular activated carbon, packed tower aeration), potentially leading to lengthier timelines for design and pilot studies. In addition, current supply chain delays are estimated at six months for steel pressure vessels needed for treatment of various drinking water contaminants, including hexavalent chromium. Promulgation of a hexavalent chromium MCL will increase demand for these vessels—as well as for other materials and services related to design and construction of treatment facilities—and may outstrip readily available supply. An extended compliance schedule is necessary to stagger demand for material and services related to design and construction of treatment facilities, especially in consideration of the continued supply chain disruptions.

The sequence of the proposed compliance schedule is based on PWS service connections, with PWS serving more connections required to comply ahead of PWS serving fewer connections. Larger PWS usually have more resources (money, staff, etc.) with which to comply with the MCL, and may be able to mobilize and implement treatment more quickly than smaller PWS. An additional benefit of larger systems implementing treatment first is that technologies can be refined and savings discovered before smaller systems are required to implement treatment, which could reduce costs to the PWS with the smallest ratepayer bases over which to distribute costs and least able to realize any economies of scale.

Subsection (q) would be added to require submittal of a Hexavalent Chromium MCL Compliance Plan to the State Water Board no later than 90 days after a hexavalent chromium MCL exceedance prior to the applicable hexavalent chromium MCL compliance date in Table 64432-B. The State Water Board believes 90 days after an MCL exceedance is enough time for systems to prepare and submit a Hexavalent Chromium Compliance Plan consisting of the specified components. The compliance plans help ensure that the additional time will be spent efficiently pursuing compliance with the MCL.

Subsection (q)(1) would be adopted to require that a Hexavalent Chromium MCL Compliance Plan include the proposed method for compliance with the MCL (subparagraph (A)), the date by which the system plans to submit the final plans and specifications for any construction (subparagraph (B)), the dates by which the system plans to start and complete any construction (subparagraph (C)), and the date by which the system plans to complete a treatment operations plan (subparagraph (D)). As lengthy grace periods or compliance schedule allowances have the potential to result in delays in compliance efforts, the State Water Board is proposing to require PWS to prepare and submit a Hexavalent Chromium Compliance Plan to mitigate this potential and ensure efficient use of the time allotted and expeditious attainment of the MCL. Preparation and submission of a Compliance Plan as soon as possible after determination of the need for compliance measures would assist PWS personnel to think through some of the major milestones in working toward compliance and the resources and steps involved in reaching those milestones. A Compliance Plan containing the date by which a PWS plans to submit final plans and specifications, the dates by which construction is anticipated to begin and end, and the date by which an operations plan is anticipated to be submitted would aid State Water Board staff in evaluating PWS progress toward MCL compliance and enable more prompt identification of PWS missing key milestones. This would allow State Water Board staff to focus resources on PWS in need of course correction to timely comply with the MCL.

Subsection (q)(2) would be adopted to allow PWS to make amendments to their Hexavalent Chromium MCL Compliance Plans, as plans may change as new information becomes available, conditions change, or treatment technology advances. Approval of these amendments is dependent on continuing to meet the requirements of subsection (q)(1).

Subsection (q)(3) would be adopted to require that PWS implement their State Water Board approved Hexavalent Chromium MCL Compliance Plan. It is necessary to require PWS to implement approved Compliance Plans (including making the dates therein enforceable) to help ensure timely compliance with the proposed MCL, which benefits public health. Without this provision, enforcement would not be possible until the applicable deadline in subsection (p) was missed, after which point it may take years for a PWS to comply with the MCL, jeopardizing public health.

Subsection (r) would be adopted to require PWS utilizing a new or modified treatment process to comply with the hexavalent chromium MCL to submit a Hexavalent Chromium Operations Plan to the State Water Board for review and approval before serving treated water to the public. An Operations Plan is necessary to safely operate a treatment plant, and requiring PWS to develop such a plan will help ensure that hexavalent chromium treatment is operated as intended, preventing violations of the MCL that may be a risk to public health. Existing regulations at 22 CCR 64556 require PWS to submit to the State Water Board an application for an amended domestic water supply permit prior to any addition or change in treatment process or design capacity. 22 CCR 64001 requires PWS to submit an application for an amended permit pursuant to HSC 116550. HSC 116550 requires that no person operating a PWS modify, add to, or change the method of treatment of a water source as authorized by a valid existing permit issued by the State Water Board unless an application is first submitted to the State Water Board and the State Water Board issues an amended permit.

Development and submittal of a Hexavalent Chromium MCL Operations Plan sufficient to ensure that treated water reliably and continuously meets drinking water standards is necessary because it is critical for the reliable operation of hexavalent chromium treatment and will help ensure that treatment plants are operated safely statewide. Submission of the Operations Plan to the State Water Board in advance of or in conjunction with an application for permit revision would facilitate more rapid review of applications and issuance of revised permits, thereby reducing the time before treated water is served to the public.

Subsection (r)(1) would be adopted to require that the Operations Plan include a performance monitoring program that sets out how and when treatment will be monitored to ensure compliance with the hexavalent chromium MCL. A performance monitoring program is needed to monitor how well the treatment is removing hexavalent chromium, which is directly related to compliance with the MCL (performance must be monitored to determine compliance) and public health.

Subsection (r)(2) would be adopted to require that the Operations Plan include a program for maintenance of treatment process equipment that describes how and when equipment will be maintained and when equipment replacement is needed to ensure treatment is operating as designed. A maintenance program for the treatment process equipment is necessary to ensure operator and maintenance worker safety, that treatment units operate continuously as intended and at peak design efficiency, maximization of the useful operating life of treatment unit components, that infrequently used components are in good operating condition when needed, and prevention of disabled or improperly working components or processes that might result in untreated water or treated water of a noncompliant quality and associated impacts to public health.

Subsection (r)(3) would be adopted to require that the Operations Plan include how and when each treatment unit process is operated. Including how and when each unit process is operated in the plan is necessary to ensure operator safety, that each unit process will be operated correctly, which directly affects compliance with the MCL and public health.

Subsection (r)(4) would be adopted to require that the Operations Plan include procedures used to determine chemical dose rates sufficient to ensure the treatment process is operating as designed. Including procedures for determining chemical dose rates is necessary to help ensure that the treatment plant operates safely and as intended, which directly affects compliance with the MCL and public health.

Subsection (r)(5) would be adopted to require that the Operations Plan include information on reliability features incorporated into the treatment process to ensure operation as designed. Reliability features are necessary to include because they can help ensure that the treatment plant is operating as intended with a lower likelihood of treatment failure, which directly affects compliance with the MCL and public health.

Subsection (r)(6) would be adopted to require that the Operations Plan include a treatment media inspection program sufficient to ensure the media is inspected at intervals and for conditions necessary to ensure compliance with the hexavalent chromium MCL. A treatment media inspection program is necessary (when media is being used) because media can become exhausted over time, causing treatment to become less effective over time, and identifying when media needs to be changed can help ensure the treatment plant continues to operate as intended. A treatment media inspection program directly affects compliance with the MCL and public health.

The technological and economic feasibility analyses for the proposed DLR are in sections 10 and 11, respectively.

5.4 Article 12, Section 64447.2, Best Available Technologies (BAT) – Inorganic Chemicals

The purpose of this section is to identify the BATs for reducing the level of inorganic chemicals in drinking water to comply with the MCL, pursuant to HSC 116370. Table 64447.2-A lists the BATs for inorganic chemicals.

The first paragraph of section 64447.2 would be revised to correct lower/upper case usage.

Table 64447.2-A would be revised to adopt reduction/coagulation/filtration, ion exchange, and reverse osmosis as BAT for chromium (hexavalent).

HSC 116370 requires the State Water Board to adopt a finding of the BAT for each contaminant for which a drinking water standard has been adopted at the time of adoption, taking into consideration costs and benefits of technologies proven effective under full-scale field applications. The primary purpose of the BAT designation is to identify the treatment technologies available at the time of MCL promulgation that can consistently and reliably remove the contaminant to a concentration at or below the proposed MCL. The State Water Board recognizes that there may be other potential treatment technologies being investigated as alternative options for the treatment of drinking water contaminated with hexavalent chromium. The designation of a BAT does not preclude a given PWS from receiving a domestic water supply permit that allows the use of alternative treatment technologies that may, for that PWS, be capable of sufficiently treating drinking water contaminated with hexavalent chromium. Reduction/coagulation/filtration, ion exchange, and reverse osmosis have demonstrated efficient removal of hexavalent chromium from drinking water to concentrations below the proposed MCL. More information about the BATs can be found in section 4.3.

Table 64447.2-A would also be revised to specify chromium as chromium (total) for clarity.

The key to Table 64447.2-A would be revised to specify a 14th BAT, Reduction/Coagulation/Filtration.

5.5 Article 18, Section 64465, Public Notice Content and Format

The purpose of this section is to establish the primary content (information and language) and format requirements of a public notice when an MCL, maximum residual disinfectant level, regulatory action level, or treatment technique has been violated or when there is a contaminant assessment, corrective action, or treatment technique violation. The language is intended to inform the public about the possible health effects associated with the contaminant.

Appendix 64465-D would be revised to adopt public notification health effects language for the hexavalent chromium MCL. HSC 116450(a) and (f) mandate that when any primary drinking water standard specified in the State Water Board's regulations is violated, the person operating the PWS must give notice to the consumers. The U.S. EPA has specific language requirements in regulations for primary MCLs. As mandated, the

State Water Board has adopted language for all federal MCLs and, for consistency, has adopted similar language for non-federal MCLs as well. Required public notification language prescribed by the State Water Board helps ensure brief, plain-language, and consistent statewide quality of information between PWS and their customers and will allow the customers to make informed health decisions. The proposed hexavalent chromium public notification language is consistent with the language for other, similar chemicals with primary MCLs, and would be included in the notice sent to the public if water systems violated the hexavalent chromium MCL. Specifying public health notification language is also a form of pre-approval to ensure expeditious review and approval of public notices and prompt notification of consumers. Specifying accurate, acceptable descriptions of health effects in advance aids in achieving the goal of delivering accurate health information as quickly as possible.

Any costs associated with using the hexavalent chromium MCL public notification content and format in public notices are expected to be negligible.

Appendix 64465-D would also be revised to specify chromium as chromium (total) for clarity.

5.6 Article 20, Section 64481, Content of the Consumer Confidence Report

The purpose of this section is to establish the primary content and format requirements of the Consumer Confidence Report, including the language to be communicated to the public when a contaminant has been detected. The language is intended to inform the public of the major origins, or sources, of the contaminant.

Subsection (o) would be revised to correct upper/lower case usage.

Subsection (p) would be added to clearly and efficiently indicate State Water Board direction to include additional information regarding hexavalent chromium in Consumer Confidence Reports delivered to consumers before the applicable compliance date in proposed Table 64432-B. Without this information, it could be unclear whether information regarding hexavalent chromium should be included in Consumer Confidence Reports before the applicable compliance date in proposed Table 64432-B.

Subsection (p)(1) would be added to affirm the existing requirement for information pursuant to subsections (c) and (d) if hexavalent chromium is detected before the applicable compliance date in Table 64432-B. This requirement is consistent with current Consumer Confidence Report requirements in CCR 64481(d) for other chemicals if they are detected. This information benefits the consumer by allowing them to make informed health decisions in the interim before their system must comply with the hexavalent chromium MCL. Without this provision, it could be unclear whether information regarding hexavalent chromium should be included in Consumer Confidence Reports before the applicable compliance date in proposed Table 64432-B.

Subsection (p)(2) would be added to require that language from proposed Table 64481-F be included in Consumer Confidence Reports if the MCL is exceeded before the applicable compliance date in Table 64432-B. Table 64481-F would be added to specify the required language. Requiring and specifying inclusion of the proposed language in Consumer Confidence Reports is necessary because some water systems will exceed the MCL before they are required to comply with it, and appropriate language regarding hexavalent chromium must be communicated to consumers that may be drinking water exceeding the MCL. The language in Table 64481-F will ensure that water systems are providing clear, consistent information to customers regarding the system's current or planned actions to address the MCL exceedance and to ensure compliance by the applicable date. This will also help consumers make informed health decisions in the interim. Without this information, consumers would not be notified of their water system's compliance date or their steps to come into compliance with the MCL.

Appendix 64481-A would be revised to specify language for the Consumer Confidence Report describing major origins of hexavalent chromium in drinking water. Existing regulations at 22 CCR 64481 require that annual Consumer Confidence Reports contain information on the likely source(s) of any detected contaminants that have an MCL. The proposed hexavalent chromium major origins language includes both naturally occurring and anthropogenic sources (Hausladen et al., 2018; McNeill et al., 2012). The U.S. EPA initiated this specific major origins language requirement in regulations for primary MCLs in 1998 (U.S. EPA, 1998); as mandated, the State Water Board has adopted language for all federal MCLs and, for consistency, has adopted language for state-mandated MCLs as well. If the water system lacks specific information on the likely source, the Consumer Confidence Report must include one or more of the typical sources for the contaminant listed in appendix 64481-A. Contaminant major origins language prescribed by the State Water Board helps ensure consistent statewide quality of information between PWS and their customers.

Appendix 64481-A would also be revised to specify chromium as chromium (total) for clarity.

Any costs associated with the language to be included in the Consumer Confidence Report for hexavalent chromium are expected to be negligible.

6. REASONABLE ALTERNATIVES CONSIDERED AND REJECTED

[Gov. Code, §11346.2(b)(4)(A) and (B)]

Government Code section 11346.2(b)(4) requires that the State Water Board consider reasonable alternatives to the regulation and the agency's reasons for rejecting those alternatives. Reasonable alternatives include alternatives that are proposed as less burdensome and equally effective in achieving the purposes of the regulation in a manner that ensures full compliance with the authorizing statutes, which are HSC sections 116365 and 116365.5.

The State Water Board evaluated 20 alternatives to the proposed MCL for hexavalent chromium of 10 µg/L. These alternatives included hexavalent chromium MCLs of 1 to 15, 20, 25, 30, 35, 40, and 45 µg/L. The results of a higher (less stringent) hexavalent chromium MCL would be fewer systems out of compliance with the MCL. Conversely, a higher hexavalent chromium MCL would result in an increased risk to public health.

Specifically, higher levels of hexavalent chromium in drinking water would increase the number of cancer and noncancer (liver toxicity) cases in California. A lower (more stringent) hexavalent chromium MCL would result in more water systems being out of compliance and thus requiring treatment or other actions to come into compliance with the MCL. Costs would increase, but more people would drink water with lower levels of hexavalent chromium, resulting in a decrease of cancer and noncancer cases related to hexavalent chromium exposure.

The State Water Board's reason for rejecting the alternative MCLs is also incidentally supported by a cost-effectiveness analysis in the SRIA (Attachment 2, section F.4). In summary, alternative MCLs greater than 10 µg/L have similar or lower cost effectiveness (with gradually decreasing marginal cost effectiveness down to 10 µg/L), and MCLs at 9 µg/L and lower have much lower marginal and overall cost effectiveness.

Section 11346.2(b)(4) also requires a description of reasonable alternatives to the regulation that would lessen any adverse impact on small businesses and the agency's reasons for rejecting those alternatives. To the extent that this regulation will have any impact on small businesses,[9] the reasons for rejecting alternatives that may reduce an impact on small businesses is the same as above: a higher MCL is inconsistent with HSC 116365, would be less protective of public health, and would not result in significant cost savings on a unit cost or household cost basis without also significantly reducing health benefits (see sections 11.2.2 and 11.2.3).

Alternatives to the proposed BATs were considered. Ion exchange, RCF, and RO were adopted as BAT; however, stannous chloride was rejected as an alternative because additional information on the capability of the technology to meet the proposed MCL is necessary, including information on reoxidation in the distribution system and the ability to meet the proposed MCL without exceeding the stannous chloride MUL. The fate of hexavalent chromium in the distribution system when stannous chloride is used is not well understood; the State Water Board intends to request additional evaluation of the distribution system water quality should this technology be proposed for use by a PWS. However, PWS are not precluded from using alternative treatment technologies that prove to be effective even if they are not identified as BAT.

The State Water Board considered an alternative DLR of 0.05 µg/L, initially proposed during the April 2022 Public Workshop. The cost of testing would not increase until reporting is required to quantify concentrations below 0.05 µg/L, meaning that reporting limits of 0.05 µg/L and higher are equally economically feasible. While the laboratory surveys indicated that enough statewide capacity for hexavalent chromium testing currently exists at 0.05 µg/L, some labs may experience data quality issues at this level. To avoid testing results with low data quality, the DLR was placed at 0.1 µg/L, which is

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[9] Government Code Section 11342.610(b)(8) explicitly exempts from the definition of "small business" "*a utility, a water company, or a power transmission company...*" Note that some public water systems that are businesses, such as packing companies, may be able to decrease cost of compliance by only treating the water needed for human consumption.

the lowest level that the Environmental Laboratory Technical Advisory Committee (ELTAC) members believe most or all labs could confidently quantify hexavalent chromium using EPA methods 218.6 and 218.7. Alternatives of higher concentrations than the proposed DLR were considered and rejected because it is necessary to set the DLR at the lowest level technologically and economically feasible (if not set at the PHG) to understand public health impacts. The selection of the DLR is discussed in further detail in section 10.

HSC 57005 requires that before adopting any major regulation (regulation with impacts to the state's business enterprises in excess of $10 million), the State Water Board must evaluate alternatives to determine whether there are less costly alternatives to the proposed regulation that would be equally effective achieving environmental protection and full compliance with statutory mandates. Submissions have been made suggesting alternative MCLs at 1 and 25 µg/L. Both levels are already included in the 20 alternatives evaluated. The Notice of Proposed Rulemaking requests additional alternatives, pursuant to Government Code section 11346.5, subdivision (a)(7)(C).

7. PRESCRIPTIVE OR PERFORMANCE STANDARD

[Gov. Code, §§11340.1(a); 11346.2(b)(1);11346.2(b)(4)(A)]

HSC 116365(j) provides for the establishment of primary drinking water standards, as defined at HSC 116275, either as MCLs (performance standards) or as treatment techniques (prescriptive standards), plus monitoring and reporting requirements pertinent to MCLs. HSC 116365 allows the use of a treatment technique in lieu of establishing an MCL for a contaminant only if ascertaining the level of the contaminant is not technologically or economically feasible. As described in detail in sections 10 and 11, The State Water Board finds ascertaining the concentration of hexavalent chromium to be technologically and economically feasible and proposes to regulate hexavalent chromium via an MCL.

The proposed regulation would impose performance standards in the form of an MCL and a DLR. The regulations do not mandate the use of specific technologies or equipment for compliance with the MCL. However, the proposed regulations would prescribe the use of specific analytical methods for the analysis of hexavalent chromium in drinking water to EPA method 218.6 and EPA method 218.7. Both methods are currently offered for accreditation through California's Environmental Laboratory Accreditation Program. Both methods have been validated to meet the DLR in drinking water, and laboratories have proposed no other analytical methods for consideration. For the State Water Board to have confidence in the data produced by laboratories to meet these requirements, it is necessary that laboratories use relevant analytical methods that have been validated as being able to reach the DLR.

The State Water Board invites interested persons to present statements or arguments with respect to alternatives to the proposed methods at the scheduled hearing or during the written comment period.

8. STANDARDIZED REGULATORY IMPACT ANALYSIS/ASSESSMENT (SRIA)

[Gov. Code, §§11346.2(b)(2)(B); 11346.3(a)(3);11346.3(b); 11346.3(c)]

The SRIA is included as Attachment 2 of this document. The standardized regulatory impact analysis is also referred to as a standardized regulatory impact assessment in Department of Finance regulations at 1 CCR sections 2000 through 2004 and may be so referenced elsewhere in rulemaking documentation.

9. UNNECESSARY DUPLICATION WITH EXISTING FEDERAL REGULATIONS

[Gov. Code, §11346.2(b)(6)]

The State Water Board evaluated whether the proposed regulations are duplicative of existing federal regulations and concluded that they are not. There is no existing federal regulation addressing hexavalent chromium specifically. In addition, should U.S. EPA promulgate any drinking water standard for hexavalent chromium, HSC 116270 states California's legislative intent to establish a program that is more protective of public health than the minimum federal requirements. HSC 116365 further requires the State Water Board to adopt primary drinking water standards for contaminants at levels as close as feasible to the corresponding PHG, placing primary emphasis on the protection of public health, and meeting, to the extent technologically and economically feasible, specified conditions. Therefore, differing regulations are not only authorized by state law, but are in certain instances, required.

10. TECHNOLOGICAL FEASIBILITY

HSC section 116365, subdivision (b) requires the State Water Board to consider "*the technological… feasibility of compliance*" with the proposed MCL. This section considers the technological feasibility of monitoring to the DLR with the analytical methods identified in the proposed regulation, including capacity of existing laboratories to conduct all required testing, and the ability of the BAT to treat to the proposed MCL.

10.1 Technological Feasibility of Monitoring

Existing statute (Health & Saf. Code, §116390) and regulations at 22 CCR 64415 require that analysis be performed by laboratories accredited by the State Water Board's Environmental Laboratory Accreditation Program, and "*unless directed otherwise by the State Water Board, analyses shall be made in accordance with U.S. EPA approved methods as prescribed at 40 Code of Federal Regulations parts 141.21 through 141.42, 141.66, and 141.89*."

To obtain analytical cost data and to evaluate laboratory capacity and technological feasibility at potential DLRs, the State Water Board surveyed 40 laboratories that had submitted water quality data for hexavalent chromium between December 2014 and December 2020 to assess both capacity and capability for sample analysis. The 40 laboratories identified had submitted hexavalent chromium data under ELAP accreditation for either or both of EPA methods 218.6 and 218.7 for the determination of hexavalent chromium in drinking water. Of the 40 laboratories surveyed, 21 (12 commercial and 9 municipal) laboratories responded. Laboratories were asked to identify their minimum reporting levels (MRL) and lowest calibration points for EPA methods 218.6 and 218.7. The MRL for each laboratory was used to determine a laboratory MRL range of 0.01 µg/L to 1 µg/L. The results of the surveys are provided in Attachment 4.

In the survey, laboratories were asked to base their responses with confidence that a spike recovery was within the recovery range of 70 to 130 percent. The spike recovery range is not a requirement or criteria for the proposed regulation, but rather was used as one metric for understanding current laboratory technological capabilities. Through an additional survey and follow-up communication with responding laboratories, the State Water Board determined that 0.1 µg/L was the lowest concentration to which the majority of California laboratories could reliably quantify hexavalent chromium in drinking water. This communication discussed the ease or difficulty of quantifying hexavalent chromium in drinking water at low concentrations using EPA methods 218.6 and 218.7. The ELTAC members agreed that while quantification below 0.05 ug/L is possible for some labs, the recovery and accuracy of results decreases from 99 percent confidence with approximately +/- 30 percent recovery to +/- 50 percent recovery, and the ability to detect concentrations below 0.05 µg/L is dependent on the instrument age and maintenance (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). Even with new instrumentation, the signal-to-noise ratios for detections below 0.05 µg/L were low (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). The signal-to-noise ratio is a sensitivity metric that compares the analyte signal to the background noise (Agilent Technologies, Inc, 2023). When signal-to-noise ratios are low, it often means that it is difficult to distinguish the signal of the desired analyte (hexavalent chromium, in this case) from the noise of the background with the given instrument, and that manual interpretation of the instrument data is needed by the laboratory analyst to pick the peaks and baseline points to integrate, which can lead to subjective and nonreproducible results (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). Also, as instruments age, these signal-to-noise ratios decrease, making it harder to achieve lower detections with high confidence (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). One laboratory reported being able to confidently detect hexavalent chromium at 0.05 µg/L using EPA method 218.6 over 10 years ago, but they qualified that a laboratory’s general ability to do this would depend on their instrument age and maintenance (Ghabour, 2020; Ghabour, 2021; Pierri, 2021).

Where confidence and precision decreases for quantifying hexavalent chromium below 0.05 µg/L, comparatively, for detecting 0.1 µg/L, laboratories indicated the same confidence levels with more precise results. One laboratory reported 99 percent confidence with a +/- 15 percent recovery (with both EPA methods), and another lab reported 99 percent confidence with +/- 0 percent recovery (Ghabour, 2020; Ghabour, 2021; Pierri, 2021). While these smaller recovery ranges for precision are not a requirement for the proposed hexavalent chromium DLR, the laboratory responses indicate that the proposed DLR of 0.1 µg/L is technologically feasible with high confidence and low uncertainty.

Currently, hexavalent chromium sampling is not required. However, approximately 2,724 sources and 150 treatment facilities continue to monitor for its presence using EPA methods 218.6 and 218.7, further demonstrating that these sampling methods are feasible.

10.1.1 Laboratory Capacity

The State Water Board estimated that there was sufficient laboratory capacity for monitoring required by the MCL based on the commercial and municipal laboratories' reported MRLs and maximum possible hexavalent chromium samples analyzed per month. Five commercial laboratories located in Northern, Central, and Southern California reported the ability to analyze a range of 300 to 500 hexavalent chromium samples per month at a DLR of 0.1 µg/L for a monthly total nearly 1.5 times the likely required monthly number of samples for monitoring under the proposed hexavalent chromium MCL.

The method holding times for EPA method 218.6 and EPA method 218.7 are 24 hours and 14 days, respectively. As of July 1, 2022, there were 40 laboratories accredited under EPA methods 218.6 (32 laboratories) and 218.7 (26 laboratories), 26 of which were commercial laboratories that accept monitoring samples from PWS (16 of these laboratories were accredited for both EPA methods). Figure 1 shows the locations of commercial and municipal laboratories accredited for hexavalent chromium analyses, specifying which are capable of meeting a DLR of 0.1 µg/L.

Because many laboratories did not respond to the survey (gray map markers), their analytical capabilities in respect to the DLR are unknown. In addition to the mapped laboratories, an additional 19 laboratories were previously accredited for hexavalent chromium analyses (during the period that the previous hexavalent chromium MCL was active), indicating that additional laboratories are capable of these analyses. Some of these 19 laboratories may choose to pursue accreditation once the MCL is active again.

Because the commercial laboratories known to be capable of meeting the DLR are not uniformly geographically distributed throughout the state, some PWS may not be able to use EPA method 218.6 because of its short hold time (24 hours). The 14-day hold time for EPA method 218.7 means it is more likely to be used by PWS not near an accredited laboratory. It is possible that some PWS may ship their monitoring samples to a laboratory, thereby incurring additional expenses, but the data is not available to determine which PWS might choose to do so. The costs to ship samples overnight (including package cost and package pickup) could exceed the average cost of sample analysis ($78.63), if only one sample was shipped at a time from the most remote locations in California (FedEx, 2023). Shipping costs were not included in monitoring cost estimates because data was not available to help determine which PWS would require sample shipping or which laboratories would be able to accept such samples (low survey response rate). In addition, overnight shipping is not necessary because EPA method 218.7 is available and has a much longer hold time (14 days).

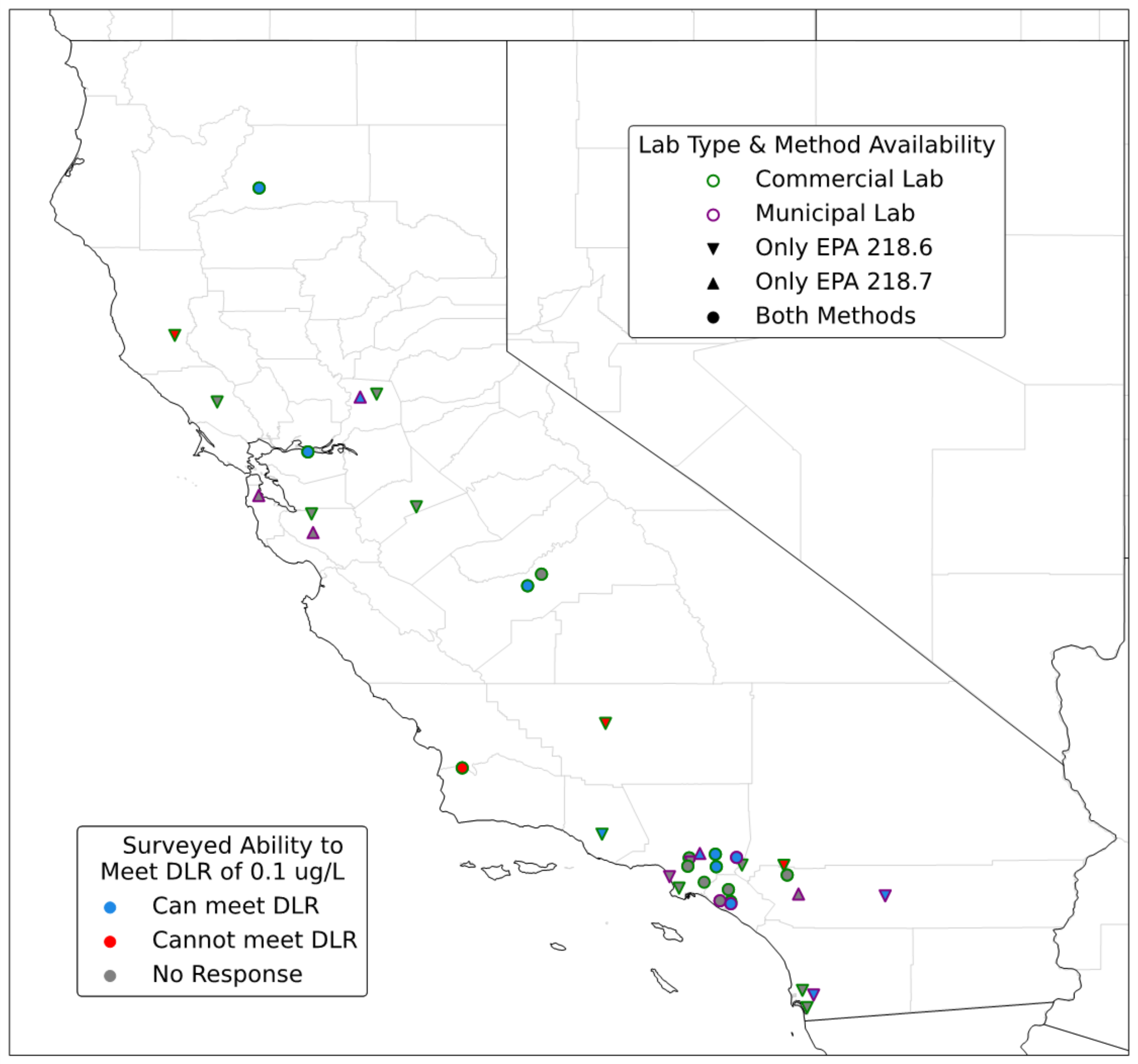

Figure 1. Map of laboratories with ELAP accreditation for EPA methods 218.6 and/or 218.7, showing surveyed ability to meet a DLR of 0.1 µg/L

While the evaluation of technological feasibility relative to analytical limitations was based on survey responses for both municipal and commercial laboratories, evaluation of laboratory capacity considered only commercial laboratories as analytical services at PWS-run laboratories are not typically widely offered outside the PWS itself. The eight commercial laboratories providing information on per-month analytical capacity reported a capacity range of 200 to 500 samples per month, for an average of 390 hexavalent chromium analyses per month or 4,680 analyses per year (Attachment 4). As described in 4.4.1.2, hexavalent chromium analysis demand resulting from the proposed regulation is expected to be as follows:

- 22 CCR 64432(b) requires CWS and NTNCWS to initiate monitoring for inorganic chemicals such as hexavalent chromium within six months following the effective date of the regulation establishing the MCL, for a total of 13,066 hexavalent chromium analyses distributed over the first six months of the regulation.
- 22 CCR 64432(c) requires CWS and NTNCWS to conduct routine monitoring at the following frequencies, for a post-initial monitoring monthly average of 376 analyses:
    - Every three years (groundwater sources): 10,829
    - Every year (surface water sources): 902
- 22 CCR 64432(g) requires PWS exceeding the MCL to monitor quarterly, for a post-initial monitoring monthly average of 445 analyses.
- 22 CCR 64432.8 requires PWS utilizing treatment to comply with an MCL to sample treated water monthly. With 233 PWS estimated to provide treatment, approximately 1,335 analyses of treated drinking water would be required each month.

An MCL of 10 µg/L will require approximately 25,872 samples per year after full implementation, and 14,401 samples in the first six months after the effective date of the regulation while initial monitoring and some quarterly monitoring is occurring. These values were calculated by multiplying the number of surface water and groundwater sources (Attachment 1, Tables 3.1A, 3.2A, 3.1B, and 3.2B) by the number of samples they are expected to need in the first six months and annually after full implementation based on each monitoring frequency (detailed previously in section 4.4.1.2).

There are currently at least 28 commercial laboratories accredited for hexavalent chromium analysis, at least 6 (60% of respondents) of which can achieve 0.1 µg/L (the capabilities of 18 commercial laboratories are unknown). Additionally, some of the 19 laboratories that dropped accreditation after the repeal of the former hexavalent chromium MCL may seek re-accreditation once the new hexavalent chromium MCL is established, thereby increasing overall lab capacity in time for the proposed MCL effective dates. If the laboratories choose to not update their accreditation status, the current commercial laboratory capacity is still capable of meeting sampling requirements of the proposed regulation.

The proposed DLR is achievable within suitable limits of precision and accuracy by a sufficient number of commercial laboratories and is as close to the PHG as is technologically feasible (commercial labs are a focus because most PWS are expected to contract to one rather than run their own municipal lab). The proposed DLR of 0.1 µg/L is adequate for determining, with confidence, the presence of hexavalent chromium and compliance with the proposed hexavalent chromium MCL of 10 µg/L. The statewide regulatory cost of adopting the hexavalent chromium DLR was included in the monitoring cost estimates for the adoption of the hexavalent chromium MCL.

10.2 Technological Feasibility of Treatment

Pursuant to HSC 116370, the State Water Board proposes to identify three treatment technologies as BAT: ion exchange, RCF, and RO. Ion exchange, RCF, and RO are capable of treating hexavalent chromium in water down to at least 1 µg/L. Two types of ion exchange technology can be used to treat hexavalent chromium: SBA and WBA. Ion exchange uses resin to which the hexavalent chromium ion can adsorb, decreasing hexavalent chromium concentrations in finished water. RCF uses a reducing agent, such as ferrous sulfate or stannous chloride, to transform hexavalent chromium into trivalent chromium. Trivalent chromium in water has a low solubility and can be removed with filtration. RO filters hexavalent chromium out of finished water using membranes. Treatment technology capabilities may differ in non-ideal circumstances. Source water quality impacts the treatment efficacy of ion exchange and RCF. High sulfates can reduce the efficiency of strong base ion exchange treatment, and pH has a significant impact on RCF's reduction efficiencies (Parks et al., 2017; Hazen and Sawyer, 2013). The State Water Board considers the proposed MCL of 10 µg/L to be technologically feasible because multiple mature, full-scale treatment technologies have been demonstrated capable of treating to concentrations below this level. Further discussion of the capabilities of each of these BAT is in section 4.3.

Both ion exchange (SBA and WBA) and RCF were used as the basis for estimating costs associated with treating sources in violation of the MCL. Ion exchange was chosen as one of the technologies used to calculate treatment costs because it was the most common treatment installed in the California PWS to treat hexavalent chromium contamination at the time of this rulemaking (seven systems installed SBA, one system installed WBA, and one system installed a RO point-of-entry (POE) device[10]). However, some systems may have water quality constraints (such as high sulfate concentrations) that would make using ion exchange difficult or especially expensive. Therefore, cost estimates for RCF treatment were also developed as an alternative.

11. ECONOMIC FEASIBILITY

In assessing the economic feasibility of the proposed primary drinking water standard, the State Water Board has analyzed the estimated compliance costs in detail, as described in the CEM in section I of the SRIA (Attachment 2), and summarized in section 4, above. The CEM details the costs of compliance, including costs of monitoring, treatment, and creation of compliance and operations plans, and examines these costs according to various types of PWS. The costs are further analyzed per drinking water source, service connection (or customer), person, and quantity of water treated.

As described further below, the State Water Board concludes that for the various types and sizes of PWS, the MCL is as close to the PHG as is economically feasible. Not only will it not have a significant economic impact on most Californians, the State Water Board

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[10] While no residential POE water treatment devices have been registered in California, this system is an NTNC and uses these devices for non-residential treatment.

also concludes that although the economic burden of the regulations may be more substantial on small systems or those that are already having issues with compliance and affordability of rates, the MCL is economically feasible because there are sufficient resources available to potentially mitigate the challenge of compliance for the systems that are already struggling. In addition, the analysis demonstrates that there would not be significant cost savings for small systems at alternative MCL values, without substantial reductions in protections to public health. In addition, the costs are based on conservative assumptions, and for those smallest systems that might find the regulation most economically burdensome, there are ways to mitigate those costs, including the use of POU/POE and consolidations with nearby systems. In addition to the cost of the current proposed regulations, the State Water Board also considered the impact of the future regulations that it will be promulgating in the near-term and the cost-effectiveness of the proposed regulations.

11.1 Assessing Economic Feasibility

Health and Safety Code section 116365, subdivision (b) requires that the State Water Board consider the economic feasibility of compliance with the proposed primary drinking water standards, which include the MCL and associated DLR. Subdivision (b)(3) states that "for the purposes of determining economic feasibility...the state board shall consider the costs of compliance to public water systems, customers, and other affected parties...including the cost per customer and aggregate cost of compliance, using best available technology." As described by the California Third District Court of Appeal, "[t]his language seems to clearly contemplate a feasibility analysis, rather than a cost-benefit analysis." (*California Manufacturers and Technology Association v. State Water Resources Control Bd.* (2021) 64 Cal.App.5th 266, 285). In the environmental context, a feasibility analysis "requires an agency to protect public health to the maximum extent possible, constrained solely by what is economically or technically feasible" (*Id.* at p. 284). Economic feasibility turns on whether compliance with the MCL is "capable of being done given 'the management of domestic or private income and expenditure.'" (*Id.* at p. 282). Importantly, a regulation may be capable of being done even if not every affected entity is capable of compliance. The Court of Appeal in *California Manufacturers and Technology Association* (2021) quoted federal cases interpreting the meaning of economic feasibility in the context of regulations promulgated by the Occupational Health & Safety Administration, where the courts have explained that a regulation is not infeasible simply "because it threatens the survival of some companies within an industry" (*Ibid.*, quoting *United Steelworkers of America, AFL-CIO-CLC v. Marshall* (D.C. Cir. 1980) 647 F.2d 1189, 1265), and that "[a] standard is economically feasible if the costs it imposes do not 'threaten massive dislocation to or imperil the existence of, the industry'" (*Ibid.*, quoting *American Iron & Steel Institute v. Occupational Safety and Health Admin.* (D.C. Cir. 1991) 939 F.2d 975, 980). Because of the multitude and variety of public water systems in California, it is inevitable that the costs of complying with an MCL will vary, and that some systems will struggle due to a lack of financial capacity. This alone – while of concern to the State Water Board and requiring long-term solutions for the realization of the human right to water for all Californians – does not mean that a particular MCL is economically infeasible under the California Safe Drinking Water Act.

11.2 The MCL is Economically Feasible

Tables 6 and 7 show that the majority of the costs of complying with the proposed MCL are going to be borne by water systems that serve 10,000 or more service connections. Because those costs would be recovered from a large number of customers, the median increase in monthly drinking water costs for 94% of the people affected (5 million of the 5.3 million affected drinking water consumers) would be less than $20, which drops to a median cost of $8 for 87% of customers (see Table 10.1A "Estimated Total Number of People Served by Water System Size; and Table 17.1A "Median Monthly Household Cost Increases," Attachment 1). Total annual costs for all PWS are estimated to be $179,568,183, with the majority of that amount ($172,666,029) attributed to costs to CWS. On a statewide per capita cost, this regulation equates to $4.75 per person per year[11] and is economically feasible.

PWS recover costs of providing drinking water through the imposition of fees, rates, and charges on customers, which is the expected means of cost recovery for PWS impacted by the proposed MCL for hexavalent chromium. The economic feasibility of complying with the proposed MCL does not mean that there are no costs to doing so – including costs to PWS customers – nor that those costs will necessarily be de minimis. "[R]egulations are not 'infeasible' because they impose financial burdens on businesses or consumers." (*California Manufacturers and Technology Association, supra,* 64 Cal.App. 5th at p. 282). Although the MCL is economically feasible, any increase in costs of compliance is a challenge for some small systems. The State Water Board is sensitive to the cost recovery challenges that smaller PWS may face with higher per connection cost increases to treat for hexavalent chromium. For example, as shown in section 4.4.4.4, while the average monthly cost per connection of an affected PWS treating to comply with the proposed MCL is $11, and only $8 for persons served by systems with more than 10,000 service connections, the cost rises to $135 for people served by PWS with fewer than 100 service connections. Because these systems are so small, they must recover their costs from very few customers, resulting in potentially high per connection cost increases to install centralized treatment for hexavalent chromium.

In addition, some PWS may already be charging drinking water service fees that are unaffordable. The State Water Board's "2022 Drinking Water Needs Assessment" (SWRCB, 2022a) includes an affordability assessment, which identifies CWS with drinking water fees that may be unaffordable for their consumers. Out of 2,868 community water systems analyzed, 1,566 charge fees that exceed at least one risk indicator threshold for unaffordability.[12] Three hundred twenty-three (323) systems exceed two risk

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[11] This value was calculated by dividing the total cost of this regulation by the number of residents in California (39,029,342), not just the people served by water systems expected to be impacted by this MCL (U.S. Census Bureau, 2022).

[12] Risk indicators included whether average fees exceeded a certain percentage of median household income; whether fees exceeded a percentage of average statewide drinking water fees; whether a high percentage of customers are past-due on their bills; and the amount of residential arrearages accrued during a certain time period, if distributed across the residential rate base.

indicator thresholds and are considered to have a "medium affordability burden", and 89 systems exceed three or more risk indicators and are considered to have a "high affordability burden." Of the 412 public water systems deemed to have a medium or high affordability burden, 19 are presently exceeding the proposed MCL for hexavalent chromium. Because the State Water Board believes that these 19 public water systems' customers are currently facing a medium or high affordability burden, it is possible that these systems will experience difficulty recovering the costs of complying with the proposed MCL for hexavalent chromium through the imposition of rates and charges.

In addition to PWS with medium or high affordability burdens, PWS that are on the State Water Board's HR2W List may experience difficulty recovering costs of complying with the proposed MCL from the imposition of rates and charges. PWS on the HR2W List are community water systems and non-community water systems that serve schools and daycares, and which systems are out of compliance with, or consistently fail to meet, primary drinking water standards (SWRCB, 2021g). To the extent that these systems' non-compliance is due to difficulty paying for needed infrastructure improvements, there is a possibility that these systems will struggle to afford the costs of installing treatment for hexavalent chromium through the imposition of rates and charges.

To further demonstrate that the MCL is economically feasible even for these systems that might have difficulty with compliance, the State Water Board considered how much financial assistance would be required to cover the costs of complying with the proposed MCL by: public water systems with medium or high affordability burden (as determined by the State Water Board's Drinking Water Needs Assessment);[13] public water systems on the State Water Board's Human Right to Water (HR2W) list;[14] and any public water system that would need to recover more than $30 per month per service connection to comply with the proposed primary drinking water standard.[15] PWS needing to recover more than $30 per month from its customers for hexavalent chromium treatment were considered because it is more likely that the customers of these systems will struggle to afford water cost increases, which (without other assistance) may limit the ability of these systems to recover the costs of complying with the hexavalent chromium MCL. The State Water Board did not rely only on Disadvantaged Community (DAC) status to determine how much financial assistance would be required to cover the costs of complying with the proposed MCL because DAC status does not correlate with a medium or high affordability burden (SWRCB, 2022a). Of the 1,366 PWS designated as DAC or Severely Disadvantaged Community (SDAC), 1,128 PWS were categorized as having low to no affordability burden (SWRCB, 2022a).

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[13] (SWRCB, 2022a)

[14] As part of the Human Right to Water in California, the State Water Board identifies PWS that consistently fail to meet primary drinking water standards. More information about the Human Right to Water can be found here: https://www.waterboards.ca.gov/water_issues/programs/hr2w/.

[15] A $30 monthly cost increase is used to approximate financial assistance needs and is not intended to convey that $30 is necessarily an unaffordable value. Higher cutoffs will result in lower funding estimates, and lower cutoffs will result in higher funding estimates. This analysis could be repeated with other cutoff values to determine sensitivity.

The State Water Board then compared the amount of financial assistance necessary to cover those costs of compliance with the amount of financial assistance funding available from the State Water Board's Division of Financial Assistance. The result shows that less than 1% of available funding would be required to cover these costs of compliance with the proposed MCL. The analysis below shows, in detail, the calculation of these costs and the comparison against available funding. While the State Water Board cannot, through this rulemaking process, guarantee financial assistance to any particular recipient, this analysis supports the economic feasibility of the MCL because there are sufficient resources available to mitigate the challenge of compliance for the systems that are already struggling with financial capacity. The discussion also considers how costs for systems within the various size categories would shift at alternative MCL values and demonstrates that costs savings are not significant without substantial reductions in protections to public health.

11.2.1 Monthly Household Compliance Costs Analysis (CWS only)

While it can be informative to evaluate average household (per connection) compliance costs (discussed in section 4.4.4.4), compliance costs for some systems are much higher or lower than the average, and the median costs can sometimes be much different than the average costs. Table 6 shows the median monthly household compliance costs estimated for each potential MCL, and Table 7 shows the maximum monthly household compliance costs estimated for each potential MCL. The values in these tables may be better understood in conjunction with Attachment 1 Tables 7.1A, 9.1A, and 10.1A, which detail the number of systems, connections, and people in each of the water system size categories for each potential MCL.

Table 6. Median Monthly Household (per service connection (SC)) Cost Increases by Water System Size and MCL

MCL (µg/L)	**SC less than 100**	**SC greater than or equal to 100 or less than 200**	**SC greater than or equal to 200 or less than 1,000**	**SC greater than or equal to 1,000 or less than 5,000**	**SC greater than or equal to 5,000 or less than 10,000**	**SC greater than 10,000**	**For All Systems**
1	$172	$95	$ 73	$60	$38	$26	$92
2	$160	$80	$ 61	$53	$30	$19	$78
3	$158	$70	$ 54	$48	$30	$15	$74
4	$154	$63	$ 59	$42	$24	$13	$70
5	$149	$66	$ 55	$40	$22	$10	$66
6	$152	$72	$ 53	$40	$25	$ 7	$63
7	$170	$70	$ 50	$39	$22	$ 6	$61
8	$166	$66	$ 61	$34	$20	$ 6	$59
9	$168	$64	$ 64	$36	$19	$ 6	$59

MCL (µg/L)	SC less than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000	For All Systems
10	$172	$65	$ 45	$31	$18	$ 8	$58
11	$172	$63	$ 43	$36	$22	$10	$65
12	$171	$68	$ 65	$38	$24	$10	$66
13	$171	$67	$ 64	$33	$21	$ 9	$62
14	$168	$71	$ 64	$35	$21	$ 7	$57
15	$149	$66	$ 63	$35	$26	$ 4	$56
20	$168	$62	$111	$29	$16	$ 3	$41
25	$116	$50	$109	$15	$ 7	$ 3	$29
30	$ 97	$48	$ 55	$ 9	$ 8	$ 3	$10
35	$ 71	$46	$ 55	$11	$ 7	$ 3	$11
40	$308	$46	$ 54	$ 7	-	$ 4	$ 7
45	-	$45	$ 53	-	-	$ 4	$ 5

Table 7. Maximum Monthly Household (per connection) Cost Increases by Water PWS Size and MCL

MCL (µg/L)	SC less than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000
1	$1,962	$199	$263	$136	$96	$67
2	$1,794	$159	$251	$108	$64	$60
3	$ 926	$158	$233	$105	$60	$56
4	$ 926	$157	$160	$103	$56	$55
5	$ 537	$156	$126	$100	$55	$55
6	$ 463	$155	$123	$ 96	$54	$54
7	$ 463	$154	$119	$ 93	$53	$54
8	$ 463	$153	$118	$ 90	$52	$54
9	$ 463	$153	$117	$ 77	$51	$54

MCL (µg/L)	SC less than 100	SC greater than or equal to 100 or less than 200	SC greater than or equal to 200 or less than 1,000	SC greater than or equal to 1,000 or less than 5,000	SC greater than or equal to 5,000 or less than 10,000	SC greater than 10,000
10	$ 463	$152	$116	$ 77	$51	$53
11	$ 463	$151	$115	$ 76	$50	$53
12	$ 463	$150	$115	$ 70	$49	$53
13	$ 429	$149	$114	$ 70	$48	$52
14	$ 429	$146	$113	$ 66	$48	$52
15	$ 429	$ 74	$113	$ 66	$47	$52
20	$ 421	$ 69	$111	$ 53	$31	$50
25	$ 308	$ 59	$109	$ 32	$ 8	$38
30	$ 308	$ 55	$ 55	$ 14	$ 8	$34
35	$ 308	$ 52	$ 55	$ 14	$ 7	$26
40	$ 308	$ 51	$ 54	$ 7	-	$15
45	-	$ 49	$ 53	-	-	$ 6

Median cost increases for systems with less than 100 connections range from a minimum of $71 (at 35 µg/L) to a maximum of $308 (at 40 µg/L) across all potential MCLs. For the smallest systems (less than 100 connections), median cost increases are 152% to 676% higher than the next largest systems (100 to 200 connections). Because of the lack of economies of scale, cost increases for systems of this size rarely look affordable. However, a financial burden imposed by regulations on businesses or consumers does not mean it is not economically feasible, and affordability is not the same as economic feasibility. As seen in Table 6, the median cost increases for the smallest systems change very little (less than 14%) for the majority of alternative MCLs (only MCLs at 25 µg/L or higher changed more), meaning that the affordability for the smallest systems does not appreciably change from MCL alternatives from 1 µg/L to 20 µg/L. The following sections are devoted to evaluating monthly household cost increases by system size, combining the information from Table 6 and Table 7, as well as Table 9.2A (average cost increases per connection) from Attachment 1.

11.3 Systems Challenged to Meet a New MCL of 10 ug/L

In the following sections, the State Water Board considered how much financial assistance would be needed for systems with monthly household compliance costs higher than $30, any systems with a medium or high affordability burden, or any systems on the Human Right to Water (HR2W) list. A $30 monthly cost increase is used to approximate financial assistance needs; however, this is not intended to convey that $30 is a significant value. Higher cutoffs will result in lower funding estimates, and lower cutoffs will result in higher funding estimates.

11.3.1 Monthly Household Compliance Costs: 10,000 or More Service Connections

The average compliance costs for this system size range (which consists of 1.2 million households) is $8 per month per household, and the median compliance costs for this system size range is also $8 per month per household. These compliance costs range from less than $1 to $53 per month per household. Of the 31 systems expected to be impacted in this size range, 9 are DACs and one is a SDAC[16] (See Table 7.1A in Attachment 1, setting out "Estimated Number of Systems Requiring Treatment."). While none of these systems are on the HR2W list, one is "At-Risk" of being on the HR2W list, and two are "Potentially At-Risk." According to the 2022 Affordability Assessment (SWRCB, 2022a), none of these systems already have a high affordability burden, and only two of the 31 systems have a medium burden. If these two systems with medium affordability burden passed hexavalent chromium treatment costs to their customers, each household would potentially be looking at additional monthly costs of $12 and $53.

The total financial assistance needed for systems in this size category with a $30 or more increase in monthly household costs (all DAC systems) and all systems with a medium or high affordability burden would be $1,583,749 per year to cover the 51,021 affected households.

Compared to alternative MCLs, the average and median monthly household compliance costs in this size category do not vary much (less than 10% except for at 1 µg/L), and costs would only decrease by up to 5% at any less stringent MCL. Maximum costs increase with lower alternative MCLs and decrease with higher alternative MCLs. While maximum costs decrease with increasing alternative MCLs, they do not decrease quickly. Only alternative MCLs of at least 25 µg/L would experience cost reductions of more than 6%, which would result in an 85% reduction in health benefits. For these reasons, increasing the MCL is not anticipated to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.2 Monthly Household Compliance Costs: 5,000 to 10,000 Service Connections

The average and median household compliance costs for this size range (which consists of 87,467 households) are $21 and $18 per month, respectively. These compliance costs range from $5 to $51 per month per household. Of the 12 systems expected to be impacted in this size range, two are DACs and three are SDACs. While none of these systems are on the HR2W list, two are "At-Risk," and three are "Potentially At-Risk." According to the 2022 Affordability Assessment (SWRCB, 2022a), none of these systems has a high affordability burden, and only one has a medium burden. If the PWS with the

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[16] DACs are defined as a CWS in which the median household income (MHI) is less than 80% of the statewide MHI. SDACs are CWS whose MHI is less than 60% of the statewide MHI.

medium affordability burden passed all additional costs to its customers, the potential additional costs of compliance for that system would be $22 per month per household.

Total financial assistance needed for systems in this category whose monthly household compliance costs exceed $30 and all systems with a medium or high affordability burden would be $1,178,990 per year to cover all costs for the 29,038 affected households.

Compared to alternative MCLs, the average monthly household compliance costs in this size category do not decrease more than 4% until 25 µg/L, and the median costs do not decrease by more than 11% until 25 µg/L. Similarly, the maximum monthly household costs do not decrease by more than 8% until 20 µg/L. Alternative MCLs of 20 µg/L and 25 µg/L would result in 73% and 85% fewer health benefits, respectively. For these reasons, increasing the MCL is not anticipated to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.3 Monthly Household Compliance Costs:1,000 to 5,000 Service Connections

The average and median household compliance costs for this size range (which consists of 72,225 households) are $39 and $31 per month, respectively. These compliance costs range from $8 to $112 per month per household. Of the 26 systems expected to be impacted in this size range, 6 are DACs and 9 are SDACs. Two of these systems (one DAC and one SDAC) are on the HR2W list, 6 of these systems are "At-Risk," and 2 of these systems are "Potentially At-Risk." According to the 2022 Affordability Assessment (SWRCB, 2022a), two of these systems have a high affordability burden (corresponding to an increase in monthly household compliance costs of $22 and $38), and three of these systems have a medium affordability burden (corresponding to increased monthly household costs of $21, $28, and $37).

The total financial assistance needed for all systems within this size category with monthly household compliance costs higher than $30, for all systems with a medium or high affordability burden, and for systems on the HR2W list would be $2,513,146 per year to cover all costs for the 49,648 affected households.

Compared to alternative MCLs, the average monthly household compliance costs in this size category do not decrease by more than 9% until 25 µg/L, and the median costs do not decrease by more than 6% until 25 µg/L. The maximum monthly household costs also decrease slowly for higher MCLs (an alternative MCL at 14 µg/L only experiences a 14% decrease in maximum costs). Alternative MCLs of 14 and 25 µg/L would result in 38% and 85% fewer health benefits, respectively. For these reasons, increasing the MCL is not anticipated to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.4 Monthly Household Compliance Costs: 200 to 1,000 Service Connections

The average and median household compliance costs for this size range (which consists of 6,417 households) are $54 and $45 per month, respectively. These compliance costs range from $16 to $88 per month per household. Of the 15 systems expected to be impacted in this size range, none are DACs and 6 are SDACs. Two of these systems are on the HR2W list, 3 are "At-Risk," and 3 are "Potentially At-Risk." According to the 2022

Affordability Assessment (SWRCB, 2022a), none of these systems already has a high affordability burden, and only one of them has a medium burden (corresponding to one of the systems on the HR2W list with an increased potential monthly household cost of $14).

The total financial assistance needed for systems in this size category with monthly household compliance costs higher than $30, for all systems with a medium or high affordability burden, and for systems on the HR2W list would be $322,579 per year to cover all costs for the 4,884 affected households.

Compared to alternative MCLs, the average monthly household compliance costs in this size category do not ever decrease by more than 5%, and the median costs do not ever decrease by more than 4%. The maximum household compliance costs do not decrease by more than 6% until 30 µg/L, which would result in an 89% reduction in health benefits. For these reasons, increasing the MCL is not expected to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.5 Monthly Household Compliance Costs: 100 to 200 Service Connections

The average and median compliance costs for households in this size range (which consists of 2,030 households) are $67 and $65 per month, respectively. These compliance costs range from $34 to $152 per month per household. Of the 14 systems expected to be impacted in this size range, two are DACs and 9 are SDACs. None of these systems are on the HR2W list, but 8 are “At-Risk,” and 3 are “Potentially At-Risk.” According to the 2022 Affordability Assessment (SWRCB, 2022a), none of these systems already has a high affordability burden, but one of them has a medium burden (corresponding to an “At-Risk” system with an estimated increased monthly household cost of $58).

The total financial assistance needed for systems in this size category with monthly household compliance costs higher than $30, for all systems with a medium or high affordability burden, and for systems on the HR2W list would be $143,883 per year to cover all compliance costs for the 2,030 affected households. Additionally, as described in section 11.9.1, below, systems of this size could also be eligible for use of POU/POE to come into compliance with the hexavalent chromium MCL, the costs for which would be substantially less than centralized treatment.

Compared to alternative MCLs, the average monthly household compliance costs in this size category do not decrease by more than 10% until 25 µg/L, and the median costs do not decrease by more than 5% until 25 µg/L. Similarly, the maximum household compliance costs do not decrease by more than 4% until 15 µg/L. Alternative MCLs of 15 and 25 µg/L would result in 46% and 85% fewer health benefits, respectively. For these reasons, increasing the MCL is not expected to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.6 Monthly Household Compliance Costs: Fewer than 100 Service Connections

The average and median compliance costs for households in this size range (which consists of 2,666 households) are $135 and $172 per month, respectively, ranging from $54 to $463. Of the 62 systems expected to be impacted in this size range, 9 are DACs and 17 are SDACs. Nine of these systems are on the HR2W list, 30 are “At-Risk,” and 11 are “Potentially At-Risk.” According to the 2022 Affordability Assessment (SWRCB, 2022a), none of these systems already has a high affordability burden, and 8 have a medium burden (corresponding to 7 “At-Risk” systems and one HR2W system with estimated increased monthly household costs of $68, $74, $102, $115, $131, $222, $309, and $360). As stated above, 26 of these water systems (42%) are disadvantaged communities and 50 of the systems (80%) are currently on HR2W risk list. In other words, up to 80 of the systems in this size category already face difficulty in operating and maintaining a sustainable public water system even without consideration of complying with a new hexavalent chromium MCL of 10 ug/L.

The total financial assistance needed for all systems in this size category is $393,174 per year, which would cover all compliance costs for the 2,664 affected households. Additionally, as described in section 11.9.1, below, systems of this size could also be eligible for use of POU/POE to come into compliance with the hexavalent chromium MCL, the costs for which would be substantially less than centralized treatment.

Compared to alternative MCLs, the average monthly household compliance costs in this size category do not decrease by more than 9% until 20 µg/L, and the median costs do not decrease by more than 13% until 25 µg/L. Similarly, the maximum household compliance costs do not decrease by more than 9% until 25 µg/L. Alternative MCLs of 20 and 25 µg/L would result in health benefit reductions of 73% and 85%, respectively. For these reasons, increasing the MCL is not expected to significantly reduce household compliance costs for this size category without also significantly reducing health benefits.

11.3.7 Summary of Monthly Household Cost Analysis

The previous sections have detailed the monthly household compliance costs by system size category. The estimated monthly household compliance costs (minimum, maximum, average, and median), HR2W status, and 2022 Affordability Assessment were all considered in this economic feasibility analysis.

As described in previous sections, if financial assistance was needed for all systems with increased monthly household costs higher than $30, any systems with a medium or high affordability burden, and any systems on the HR2W list, a total of $6,135,521 per year would cover all compliance costs for the 139,285 affected households (averaging $45 per household per year). This value is less than 1% of the available state grant, DWSRF principal forgiveness, and SADW funding for the 2022-23 State Fiscal Year ($823 million), indicating that this is not an unreasonable amount when considering financial assistance to treat hexavalent chromium (SWRCB, 2022b; SWRCB 2022e). While these annualized costs are smaller than the total upfront costs needed for treatment,[17] they illustrate the amount of assistance that would be needed annually (assuming annualized capital costs) for hexavalent chromium treatment.

As noted previously, the median monthly cost increases for 94% of the 5.3 million people affected by a hexavalent chromium MCL of 10 µg/L were calculated to be less than $20. This increase in costs is considered economically feasible to the State Water Board, while acknowledging the household compliance costs for some systems may be challenging. In other words, regardless of whether any particular PWS is eligible for funding, because there is the capacity to cover the costs for all of the identified troubled systems for whom compliance may be a challenge with less than 1% of the available state grant and DWSRF principal forgiveness funding, the implementation of the MCL at 10 µg/L is “capable of being done.”

11.4 Unit Costs Variability

In addition, increasing the MCL up from the proposed 10 µg/L is not expected to significantly reduce household compliance costs for any system size category without also significantly reducing health benefits (an MCL at 25 µg/L has 85% fewer health benefits than the proposed MCL at 10 µg/L). Because increasing the MCL does not significantly decrease household costs without significantly reducing health benefits for any system size category, and because HSC 116365 mandates that health protection be maximized if technologically and economically feasible, the MCL must not be set higher than 10 µg/L. This point is further demonstrated below where the unit costs analysis for each category of water system size were considered at various alternatives, and costs were not found to reduce significantly with less stringent alternatives.

11.4.1 Unit Cost Analysis

Health and Safety Code section 116365, subdivision (b)(3) requires that the State Water Board consider cost of compliance to public water systems, customers, and other affected parties with the drinking water standard, including cost per customer and aggregate cost of compliance, using BAT. The State Water Board evaluated these costs in section 4.4.4 using the assumptions in the CEM (Attachment 2, section I). While this section also evaluates the average costs in each size category, this analysis focuses on cost decreases that might be realized by raising the MCL. Costs for some systems were much higher or lower than the average costs, which is a concept that was addressed in detail in section 11.2.1. Because costs differ greatly with system size, this analysis considered system size categories separately.

11.4.1.1 Cost per System

In general, the estimated average annual cost per system (for all systems) increases with decreasing MCLs. However, on average these costs are only 33% lower at any MCL

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[17] Funding applications are likely to be for larger amounts, such as total capital costs (which total $297 million for all except the largest 3 systems discussed in the above section; the three largest systems add $110 million to that value), and these applications are likely to be spread out over several years.

higher than 10 µg/L. When evaluating per system costs across potential MCLs by water system size, the average costs of smaller systems vary much less from 1 to 45 µg/L than the costs of larger systems. This is due to larger systems having a larger range of costs (potentially many sources impacted) compared to smaller systems that may only ever have one or two sources to treat.

For MCLs higher than 10 µg/L, the maximum decreases in annual costs per system were calculated to be $9,000 for systems with less than 100 connections (at 20 µg/L), $35,000 for systems with 100 to 200 connections (at 45 µg/L), and $23,000 for systems with 200 to 1,000 connections (at 11 µg/L). Since increased costs for larger systems are largely due to treating greater amounts of water and more sources, and larger systems have the advantage of economies of scale, this analysis of unit costs will focus on smaller systems. For systems with less than 1,000 connections, increasing the MCL above 10 µg/L would only decrease their annual costs by an average of 13% (at 13 ug/L) for any alternative MCL, and many higher MCLs would be associated with per system cost increases. While 13% may be a significant decrease in costs, it would only be realized at the per system level, which does not directly correspond to customer costs or other metrics that may help determine whether a system could recover the costs of compliance. Changes in costs per system are usually due to differences in system size, including the number of people served and the amount of water treated. Therefore, costs per system were not found to be an important metric for determining economic feasibility or selecting the MCL.

11.4.1.2 Costs per Source

Estimated annual costs evaluated across potential MCLs on a per source basis do not show strong trends. Overall, costs increase for alternative MCLs less than 10 µg/L, and costs mostly decrease for levels greater than 10 µg/L and less than 20 µg/L. At alternative MCLs of 20 µg/L and higher, there are various cost increases even though the MCL also increases. This was due to costs in those categories consisting of only one or two sources that had high levels of hexavalent chromium and large volumes of water that were calculated to need treatment. Across most systems sizes, the highest alternative MCLs do not provide cost savings on a per source basis. The largest per source cost decrease in any size category at a level less stringent than the proposed MCL is 11% for systems with 1,000 to 5,000 connections at 30 µg/L. However, when only evaluating systems with less than 1,000 connections, increasing the MCL above 10 µg/L would only decrease costs per source by an average of 13% (at 15 µg/L) for any one alternative MCL. While 13% may be a significant decrease in costs, it would only be realized at the per source level, which does not directly correspond to customer costs or other metrics that may help determine whether a system could recover the costs of compliance. Changes in costs per source are usually due to differences in the physical size of the source or other physical characteristics (e.g., surface water or groundwater). Therefore, costs per source were not found to be an important metric for determining economic feasibility or selecting the MCL.

11.4.1.3 Costs to Consumers

Estimated costs evaluated on a per connection basis show stronger trends: Decreasing the MCL would cause these costs to increase (by 151% at 1 µg/L) and increasing the MCL would cause these costs to decrease (by 73% at 40 µg/L). Figure 2 shows the average percent increase in per connection costs for each system size category, demonstrating that per connection costs do not decrease rapidly for alternative MCLs above 10 µg/L. Some costs for systems with less than 1,000 connections even increase at some higher MCLs, creating a dip in costs at 10 µg/L. Increasing the MCL above 10 µg/L would only decrease annual per connection costs for systems with less than 1,000 connections by an average of 16% (at 35 µg/L) for any one alternative MCL (except for 45 µg/L, which had a 20% reduction in costs, but did not include any systems in the smallest size category). While 16% may be a significant decrease in costs, it would occur at an MCL that has 93% fewer health benefits. Therefore, increasing the MCL is not anticipated to significantly reduce household compliance costs for this size category without significantly reducing health benefits.

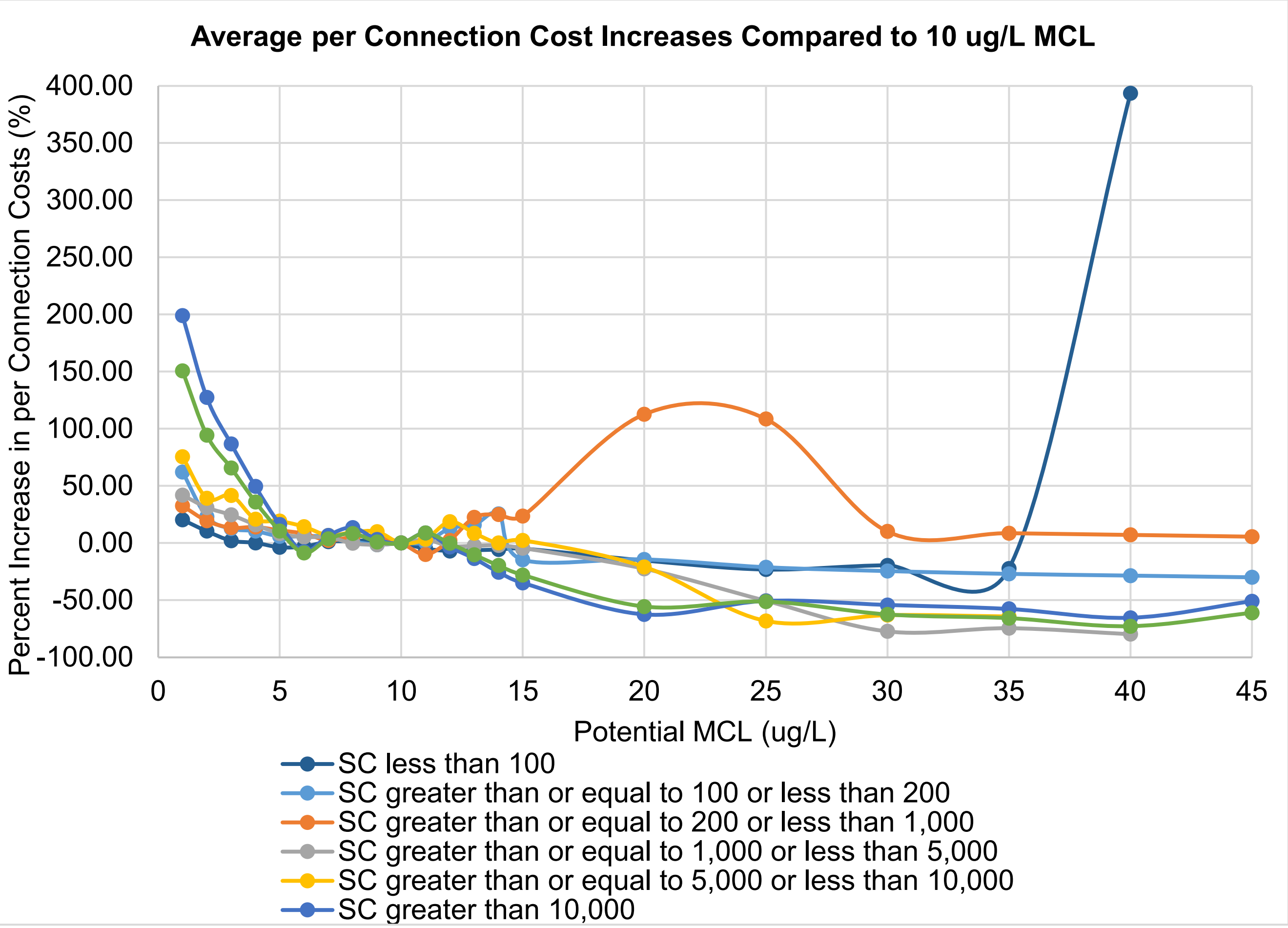

Figure 2. Average per connection percent cost increases compared to 10 µg/L by PWS size and potential MCL

Estimated costs evaluated on a per connection basis are similar to the costs on a per person basis. Decreasing the MCL would cause costs on a per person basis to increase (by 132% at 1 µg/L) and increasing the MCL would cause these costs to decrease (by

75% at 40 µg/L). Some costs for systems with less than 1,000 connections increase at some higher MCLs, creating a dip in costs at 10 µg/L. Increasing the MCL above 10 µg/L would only decrease annual per person costs for systems with less than 1,000 connections by an average of 16% (at 12 µg/L) for any one alternative MCL, which corresponds to a monthly cost of less than $2, which is not found to be significant. Therefore, per capita unit costs do not decrease significantly for smaller systems (less than 1,000 connections) at higher alternative MCLs compared to the proposed MCL.

11.4.2 Conclusions of Unit Cost Analysis

This unit cost analysis focused on the average unit costs of smaller systems (those with less than 1,000 connections). Overall, the analysis showed that smaller system unit costs generally increased for alternative MCLs less than 10 µg/L and did not significantly decrease for alternative MCLs higher than 10 µg/L, except for the case of per connection costs, which at 35 µg/L can be reduced by 16% if health benefits are reduced by 93%. The MCL cannot be set higher than 10 µg/L because increasing the MCL does not significantly decrease unit costs to consumers without significantly reducing health benefits, and HSC 116365 mandates that health protection be maximized if technologically and economically feasible.

11.5 Cost-Effectiveness Alternative for CWS

In addition to being economically feasible, setting the MCL at 10 µg/L is also cost-effective. Cost-effectiveness is a measure of how well costs produce benefits, and the cost-effectiveness ratio is calculated by dividing the costs by the changes in health outcomes. A higher cost-effectiveness ratio means lower cost-effectiveness. For potential MCLs below 14 µg/L, as the MCL decreases, the marginal cost-effectiveness ratio generally increases, indicating lower marginal cost-effectiveness at lower MCLs. However, the marginal cost-effectiveness ratio increases different amounts at each successively lower MCL (see the last column Table 8), with a very large jump from 10 to 9 µg/L. This jump means that the additional costs moving from 10 to 9 µg/L would produce more additional costs and fewer additional benefits relative to other MCLs (except jumps to 1 and 4 µg/L).

Section F.4 of the SRIA (Attachment 2) analyzes the cost-effectiveness of all 21 considered MCL levels, and the table from that section is reproduced below as Table 8 (the higher the cost-effectiveness, the lower the cost-effectiveness ratios).

Table 8. Cost-Effectiveness Analysis (Attachment 2, Table 36)

MCL (µg/L)	Cost-Effectiveness Ratio	Marginal Cost-Effectiveness Ratio	Change in Marginal Cost-Effectiveness Ratio
45	31,237,840	31,237,840	-
40	19,335,524	11,777,990	-19,459,850
35	15,188,801	9,609,622	-2,168,368
30	11,885,880	5,496,124	-4,113,499

MCL (µg/L)	Cost-Effectiveness Ratio	Marginal Cost-Effectiveness Ratio	Change in Marginal Cost-Effectiveness Ratio
25	11,602,979	10,917,620	5,421,497
20	12,531,263	13,747,857	2,830,237
15	12,928,386	13,314,970	-432,887
14	12,832,853	12,145,707	-1,169,263
13	12,935,765	13,686,639	1,540,932
12	13,194,643	15,184,415	1,497,776
11	13,542,933	16,368,382	1,183,967
10	14,002,455	17,793,849	1,425,467
9	15,625,111	29,091,521	11,297,672
8	17,176,369	29,169,510	77,989
7	18,174,742	25,460,683	-3,708,827
6	19,543,647	28,963,919	3,503,236
5	21,420,579	33,651,631	4,687,711
4	24,918,467	45,977,391	12,325,761
3	28,460,725	47,815,821	1,838,430
2	32,321,838	51,203,577	3,387,756
1	39,997,660	71,041,474	19,837,897

The cost-effectiveness analysis in Table 8 shows that overall-cost effectiveness is similar for a large range of potential MCLs, and that marginal cost-effectiveness first has a large drop at 9 µg/L. Therefore, it would not be cost-effective to place the MCL at 9 µg/L or lower, compared to an MCL at 10 µg/L. In addition, the analysis shows that the cost-effectiveness at 10 µg/L is better than or similar to (within 17% of) the cost-effectiveness of higher MCLs. Thus, a higher MCL would not substantially increase cost-effectiveness.

11.6 Economic Feasibility for NTNCWS

Because NTNCWS are usually businesses, institutions, schools, or similar entities, they do not charge users for drinking water. Therefore, the economic impacts of these costs are best understood on an annual per system basis as additional business expenses. The estimated costs for these 62 systems range from $47,709 to $339,767 per system per year, depending on system size, with larger systems usually paying higher costs but also serving more people and treating more water than smaller systems. The highest annual estimated cost was for a high school serving water to 1,127 people. Costs for two other schools are estimated at more than $100,000 per year ($293,938 and $123,649). The other NTNCWS with annual costs estimated to be more than $100,000 per year are industrial/agricultural companies, a defense distribution depot, and a casino.

The estimated annualized statewide monitoring and treatment cost for all NTNCWS is estimated at $5,194,412 for the 62 systems and is considered economically feasible to the state. As the Third District Court of Appeal noted in *California Manufacturers and Technology Association v. California State Water Resources Control Board*, regulations are not "infeasible" because they impose financial burdens on businesses or customers. The court cited a number of cases involving regulations promulgated by the Occupational Health and Safety Administration and found that "[a] standard is not infeasible simply because it is financially burdensome, or even because it threatens the survival of some companies within an industry." (*United Steelworkers of America, AFL-CIO-CLC v. Marshall* (D.C. Cir. 1980) 647 F.2d 1189, 1265). If the costs of a regulation "threaten massive dislocation to, or imperil the existence of, [an] industry" it would be considered economically infeasible (*American Iron & Steel Institute v. Occupational Safety and Health Admin.* (D.C. Cir. 1991) 939 F.2d 975, 980). Here, the range of industries affected is diverse, and the impact of the regulation would not cause "massive dislocation to, or imperil the existence of," any particular industry. Therefore, the State Water Board finds the proposed primary drinking water standard for hexavalent chromium to be economically feasible for NTNCWS.

NTNCWS are only eligible for financial assistance from the Drinking Water State Revolving Fund if they are a non-profit organization, and entities are only eligible for financial assistance from the Safe and Affordable Drinking Water Fund if they are a public agency, nonprofit organization, public utility, mutual water company, California Native American Tribe, administrator, or groundwater sustainability agency. Some of the NTNCWS that would be affected by the proposed MCL for hexavalent chromium are not eligible recipients for either funding source.

NTNCWS that are not eligible for financial assistance from the State Water Board may utilize alternatives to centralized treatment to comply with the proposed MCL, including blending, consolidation with another PWS, purchasing water from another PWS, or using POU/POE treatment (approximately $78 per connection per month for a system with two connections (U.S. EPA, 2007)). In addition, NTNCWS that use large amounts of water for nonpotable purposes (such as washing or industrial processes) may find options that only treat water for human consumption, to be a cost-effective compliance option.[18]

11.7 Economic Feasibility for TNCWS

The TNCWS expected to take action to comply with the MCL consist of three churches, a campground, a spa, a raceway, and a packing company.[19] Because these entities do

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[18] Human consumption is defined in HSC 116275(e) as "the use of water for drinking, bathing or showering, hand washing, oral hygiene, or cooking, including, but not limited to, preparing food and washing dishes."

[19] Note that subsection (o) of 64431 of the CCR requires only those TNCWS that rely on surface water sources for parks and other facilities with an average daily population use of more than 1,000 people or that are determined to be subject to potential contamination based on a sanitary survey must monitor. Currently, only 9.3% of the TNCWS have tested for hexavalent chromium. Estimates of the number of TNCWS that are expected to have to treat are based upon those that have tested. In *California Manufacturers & Technology Association v. State Water Resources Control Board*, the California Third District Court of Appeal rejected arguments that the State Water Board "should have anticipated that

not charge users for drinking water, the impacts of these costs are best understood on an annual per system basis as additional business expenses. The estimated costs for these 7 systems range from $47,709 to $141,690 per system per year, depending on system size, with larger systems usually paying higher costs but also serving more people and treating more water than smaller systems. The highest annual estimated cost was for a church serving water to 500 people. However, the amount of water needing treatment (and therefore the costs) may be overestimated for some of these systems that only serve water to people periodically (rather than daily), such as churches or raceways. The estimated annualized statewide monitoring and treatment costs for all TNCWS with known contamination is estimated at $483,446. The impact of the proposed regulation on these businesses is not considered infeasible because even though there may be an economic burden on some businesses, the regulations do not threaten “massive dislocation to, or imperil the existence of,” any particular industry. Therefore, the State Water Board finds the proposed primary drinking water standard for hexavalent chromium to be economically feasible for TNCWS.

TNCWS are only eligible for financial assistance from the Drinking Water State Revolving Fund if they are a non-profit organization, and entities are only eligible for financial assistance from the Safe and Affordable Drinking Water Fund if they are a public agency, nonprofit organization, public utility, mutual water company, California Native American Tribe, administrator, or groundwater sustainability agency. Some of the TNCWS that would be affected by the proposed MCL for hexavalent chromium are not eligible recipients for either funding source.

TNCWS that are not eligible for financial assistance from the State Water Board may utilize alternatives to centralized treatment to comply with the proposed MCL, including blending, consolidation with another PWS, purchasing water from another PWS, or using POU/POE treatment (approximately $78 per connection per month for a system with two connections (U.S. EPA, 2007)). In addition, TNCWS that use large amounts of water for nonpotable purposes (such as washing or industrial processes) may find options that only treat water for human consumption to be a cost-effective compliance option.

11.8 Economic Feasibility for Wholesalers

Four wholesalers must take action to come into compliance with the new MCL. Because wholesalers have a primary purpose of selling wholesale water to other entities, these costs will likely be passed on to consumers, and so are best understood as costs per person (eventually) served.

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other nontransient noncommunity water systems would be affected,*”* and concluded that the State Water Board complied with the APA when it based its initial determination of the economic impact of the proposed MCL on data available at the time. (California Manufacturers and Technology Association, 2017).

The estimated annualized statewide monitoring and treatment costs for wholesalers is estimated at $1,224,297, which breaks down to $6.21 per person served per year. This economic impact is considered economically feasible by the State Water Board.

11.9 Alternatives to Centralized Treatment

Health and Safety Code section 116365, subdivision (b)(3) requires the State Water Board to consider costs of compliance using BAT when determining economic feasibility. However, as described previously, establishment of BAT does not preclude water systems from pursuing other methods of compliance with the regulations. For example, the proposed regulation does not preclude a public water system from applying for a variance or variances from the hexavalent chromium MCL pursuant to HSC 116430. Public water systems may also pursue other technical options to comply with the MCL, such as blending water that exceeds the MCL with water that is below the MCL if they have additional sources available. Some systems may pursue drilling new wells, buying water from another PWS, or relying more heavily on surface water sources, which may have less hexavalent chromium. Two methods of compliance that may have considerable cost savings, particularly for small public water systems, are POU/POE use and consolidation with another PWS.

11.9.1 POU/POE

Pursuant to Health and Safety Code sections 116380 and 116552 and existing regulations in article 2.5 of chapter 15 of division 4 of title 22 of the CCR, systems with less than 200 service connections may be permitted to use POU and POE treatment rather than centralized treatment if centralized treatment is not immediately economically feasible and the community agrees to the treatment.[20]

POU capital and O&M costs for systems serving fewer than 200 service connections were estimated using U.S. EPA's POU cost estimating tool (U.S. EPA, 2007). The tool's capital cost calculation includes various parameters, such as the cost for treatment device purchase, scheduling and installation, public education materials, and initial water quality monitoring. The O&M costs include equipment maintenance, ongoing public outreach, and water quality monitoring. The tool assumes PWS treating for hexavalent chromium use RO for POU treatment. While non-RO POU devices may exist for hexavalent chromium treatment, there are a greater number and wider selection of POU RO devices currently registered for sale in California (24 different RO devices made by 13 manufacturers and 15 other non-RO devices made by one manufacturer are available). Therefore, RO devices are the focus of the following discussion. POE device costs were not estimated because there are currently no certified and registered residential POE devices for hexavalent chromium treatment. Costs for POU RO devices registered for sale in California were collected from manufacturer websites or online retail websites and averaged to determine the RO system, replacement filter, and membrane cartridge costs

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[20] Although Health and Safety Code section 116552 reference a three-year permit term, this does not mean that a public water system is only able to use POU or POE for three years. Instead, after three years, it is necessary to renew the permit, after considering whether funding for centralized treatment is available.

based on the device's ability to treat hexavalent chromium under laboratory simulated conditions. POU cost development was detailed in CEM Subappendix B (Attachment 2, section I.7). Currently, no POU device using RO and registered for sale in California as of June 2021 can treat below 4 µg/L (SWRCB, 2021d). Based on U.S. EPA case studies and vendor information (U.S. EPA 2007), the POU devices are expected to remain installed and operating for 10 years given regular maintenance (e.g., filter cartridge replacement) before the device needs to be replaced. The estimated POU monthly costs per connection based on MCL level and water system size are shown in Table 9.

Table 9. Monthly POU treatment cost per connection based on MCL and system size compared to monthly centralized treatment costs (Attachment 1, Table 14)

MCL (µg/L)	POU treatment cost for less than 100 service connections	Centralized treatment cost for less than 100 service connections	POU treatment cost for between 100 and 200 service connections	Centralized treatment cost between 100 and 200 service connections
4	$52	$135	$51	$74
5	$52	$130	$51	$71
6	$47	$131	$47	$71
7	$47	$136	$47	$71
8	$46	$138	$44	$68
9	$41	$138	$40	$66
10 to 25	$38	$103 to $135	$37	$67 to $112

While the costs for POU treatment are presented here, they were not used to estimate compliance costs. Compliance costs are estimated based on centralized treatment. These costs are provided for informational purposes to show that PWS with less than 200 connections have additional options that may be more affordable than centralized treatment, further bolstering the economic feasibility of establishing the MCL at 10 ug/L.

11.9.2 Consolidations

Of California's more than 7,500 public water system, 92% serve less than 1,000 connections. Many of these systems struggle to pay for upgrades to their systems necessary to provide safe and affordable drinking water because of their small populations. By contrast, the largest systems (with 3,000 or more customers), which serve more than 90 percent of the state's 39.5 million residents, regularly meet regulatory requirements. Because of this, the Safe and Affordable Funding for Equity and Resilience (SAFER) Program was created to provide a set of tools, funding sources, and regulatory authorities designed to address how to provide safe and affordable drinking water. One of the key solutions to this challenge are consolidations.

Health and Safety Code section 116682 provides the State Water Board with the ability to order public water systems serving a disadvantaged community that fail to meet drinking water standards to consolidate with nearby systems. To support those efforts, including providing necessary technical and planning assistance and money for construction, the Safe and Affordable Drinking Water Fund was created, and is allocated $130 million each year. For small, disadvantaged communities that are located near larger public water systems, consolidations may be a more feasible alternative to installing treatment, especially if they are eligible for funding from the State Water Board.

11.10 Other Economic Feasibility Considerations

In addition to considering the economic feasibility of PWS being able to meet 10 µg/L, the State Water Board considered the potential costs of future regulations. The future development of standards for other drinking water contaminants will, like the proposed MCL for hexavalent chromium, necessitate that public water systems incur costs to come into compliance. The State Water Board is sensitive to the impact of successive drinking water standard improvements on the ability of public water systems to recover their costs from ratepayers and customers. Some future drinking water standards may be costly, such as revisions to the arsenic and trihalomethane MCLs, and new standards for microplastics and PFAS. Attachment 3 provides a list of all chemicals that do not currently have MCLs set at their respective PHGs. These chemicals are also considered in discussions of public health and economic feasibility because they may have health impacts that could be addressed through setting more stringent drinking water standards. Attachment 3 includes the number of sources that exceed the PHG, DLR, and MCL for each chemical, and which can often be used as a proxy for cost (increased occurrence usually means an MCL revision would affect more PWS and, therefore, have a higher cost). It is currently technologically feasible to revise many of these MCLs to provide more protection of public health, but doing so has associated costs. It is necessary to consider these future costs when setting regulatory requirements.

HSC 116365 mandates that health protection be maximized if technologically and economically feasible. However, economic feasibility should not be considered in isolation of both current conditions and other drinking water regulations that are expected in the near term. In March 2023, the State Water Board adopted Resolution No. 2023-0007 for the 2023 Prioritization of Drinking Water Regulations, which include new or revised MCLs for arsenic, perfluoro-octanoic acid (PFOA), perfluoro-octane sulfonic acid (PFOS), N-nitroso-dimethylamine (NDMA), disinfection by products, styrene, cadmium, and mercury; revisions to conform to federal Lead and Copper Rule and its revisions; revised DLRs for metals and organic compounds; and new regulations for financial assurance requirements. In January 2019, the State Water Board requested that OEHHA proceed with development of a 1,4-dioxane PHG (SWRCB, 2019b), and in March 2020, OEHHA provided notice of initiation of PHG development and data call-in. In March 2023, U.S. EPA announced a proposed rule to establish primary drinking water standards for PFOA, PFOS, perfluoro-nonanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA), perfluorohexane sulfonic acid (PFHxS) and perfluorobutane sulfonic acid (PFBS). If the U.S. EPA promulgates primary drinking water standards for these constituents, the

State Water Board will need to adopt standards for these constituents that are at least as stringent.

In consideration of these future drinking water standards and their associated costs on public water systems, and in light of the discussion of cost-effectiveness above, setting the MCL for hexavalent chromium at a level less than 10 µg/L would not be economically feasible.

11.11 Economic Feasibility Conclusions

Of the 5.3 million Californians affected by the proposed hexavalent chromium MCL of 10 ug/L, the median monthly cost increases for 5 million people would be less than $20, and 4.7 million people would only see a monthly cost increase of $8. The State Water Board considers these monthly increases in water bills to be economically feasible. The State Water Board acknowledges that some people served by affected PWS may face a significant financial burden. Many of these small communities already find it financially difficult to maintain a sustainable water supply, regardless of any additional cost imposed by the new regulation. This alone, however, does not make the proposed MCL economically infeasible. In fact, the analysis in section 11.4.1.3 indicated that the cost per connection for centralized treatment does not significantly decrease at higher MCLs without significantly reducing health benefits. Therefore, a PWS serving an economically disadvantaged community would not find a higher MCL to be more affordable to its customers, unless the MCL was set so high that the PWS need not take any action to comply with the MCL.

As the Third District Appellate Court has concluded, "[R]egulations are not 'infeasible' because they impose financial burdens on businesses or consumers." (*California Manufacturers and Technology Association, supra,* 64 Cal.App. 5th at p. 282). Though a small percentage of systems may have difficulty with compliance, nonetheless, to demonstrate the economic feasibility of the regulation for the PWS the State Water Board identified as likely being most challenged in meeting the requirements, the State Water Board considered the amount of financial assistance needed for all CWS with increased monthly household costs higher than $30, for any CWS with a medium or high affordability burden, and for any CWS on the HR2W list. The Board concluded that a total of $6,059,097 per year would cover all compliance costs for the 135,760 affected households (averaging $45 per household per year). This value is less than 1% of the available state grant, DWSRF principal forgiveness, and SADW funding, indicating that regardless of whether any particular PWS is eligible for funding, because there is the capacity to cover the costs for all of the identified troubled systems for whom compliance may be a challenge the implementation of the MCL at 10 µg/L is "capable of being done" and financing compliance costs for systems at or near this scale is "capable of being done," and considered economically feasible.

Only 62 NTNCWS and 7 TNCWS have been identified as potentially being out of compliance with the proposed regulation. The estimated total compliance costs for NTNCWS and TNCWS are $5,194,412 and $483,446, respectively. Although public schools are eligible for funding from the State Water Board, most other NTNCWS and

TNCWS that would be affected by the proposed MCL for hexavalent chromium would likely not be eligible recipients for either the Drinking Water State Revolving Fund or the Safe and Affordable Drinking Water Fund. However, these PWS may utilize alternatives to centralized treatment to comply with the proposed MCL, including blending, consolidation, purchasing water from another PWS, or using POU/POE treatment. The impact of the proposed regulation on these businesses is not considered economically infeasible because even though there may be an economic burden on some businesses, the regulations are affecting very few businesses and do not threaten “massive dislocation to, or imperil the existence of,” any particular industry. Therefore, the State Water Board finds the proposed primary drinking water standard for hexavalent chromium to be economically feasible for NTNCWS and TNCWS.

Wholesalers’ compliance costs average $6.21 per person eventually served per year, which can be passed on to customers. Therefore, the State Water Board finds the proposed primary drinking water standard for hexavalent chromium to be economically feasible for wholesalers.

The State Water Board estimated the cost of using POU devices for compliance with the hexavalent chromium MCL. These costs (found in Table 9 in section 11.9.1) estimate the monthly cost per service connection at $38 and $37 for systems with less than 100 service connections and systems with 100 to 200 connections, respectively. These costs are 3.6 and 1.8 times lower than the average monthly centralized treatment cost per service connection of $135 and $67, respectively (Attachment 1, Table 9.2A). This provides the smallest systems with a much lower cost compliance option.

In addition, the State Water Board manages programs that provide grants and low-interest loans to eligible PWS for financing new infrastructure, programs that provide access to technical assistance providers, and opportunities for small systems to consolidate with larger systems, thereby achieving some economies of scale. Other options that may be available to systems to reduce the cost of compliance include drilling new wells, buying uncontaminated water from other system(s), blending water supplies, and/or seeking a variance from the hexavalent chromium MCL pursuant to HSC 116430.

In addition to an MCL of 10 µg/L being economically feasible, it is also cost-effective. Overall, the household cost analysis, the unit cost analysis, and the cost-effectiveness analysis have shown that alternative MCLs below 10 µg/L are not cost-effective, and that alternative MCLs above 10 µg/L have similar cost effectiveness and do not significantly reduce unit or household compliance costs (average, median, and maximum) without also significantly reducing health benefits.

For the reasons set forth above, the State Water Board finds the proposed primary drinking water standard for hexavalent chromium, which includes an MCL of 10 ug/L, to be economically feasible.

12. ATTACHMENTS INDEX

Attachment 1 – Cost and Data Tables

Attachment 2 – Standardized Regulatory Impact Assessment (SRIA)

Attachment 3 – Other Chemicals Above PHGs Table

Attachment 4 – Summary of Laboratory Surveys

Attachment 5 – Cost Estimates for Individual Sources

13. DOCUMENTS RELIED UPON

[Gov. Code, §11346.2(b)(3)]

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