



May 17, 2024

SUBJECT: Origins of Ocean Acidification and Hypoxia & Regulation of Public Wastewater Facilities

Dear Governor Newsom, California State Agencies, and the California Legislature,

On behalf of the California Association of Sanitation Agencies (CASA) and undersigned agencies and regional organizations, we write to share our views regarding ocean acidification and hypoxia (OAH) and [recent correspondence from non-governmental environmental organizations](#) (NGO Letter).

CASA represents more than 135 public agencies and municipalities that engage in wastewater collection, treatment, recycling, and resource recovery. As organizations charged with protecting public health and the environment, we share the State's and NGOs' goal of protecting coastal water quality. For over a decade, our managers, engineers, and scientists have engaged in extensive research to understand the impact of nutrient inputs on water quality in California.

We are deeply concerned with the call in the NGO Letter for urgent legislative and regulatory action on OAH and nutrients based on limited academic-focused modeling predictions. Unfortunately, it is both premature and unlikely to achieve the stated goals, as further detailed below and in the enclosure. We believe the most important factors for consideration as this work moves forward are:

- [Wastewater generally contributes less than 6% of the estimated nutrients \(in the form of nitrogen\) off the Southern California coast.](#) While nutrients drive algal blooms that can lead to exacerbations in OAH conditions, [more than 90% of the nutrient contributions are from naturally occurring oceanic upwelling.](#)¹
- The predicted "hot-spots" do not occur anywhere near municipal wastewater discharge points and are located 50 miles offshore. The presence of these predicted "hot spots" has not been correlated with biological data for the species that are present in this area. The predicted outcomes could vary substantially due to uncertainty in model predictions. As the research team has acknowledged, significantly more work is needed to understand how nutrients are transported through ocean currents and impact OAH conditions.
- The Legislature does not need to impose an artificial deadline on the State Water Resource Control Board's (SWRCB) important and ongoing work for which [their executive management are actively engaged in an independent review of the science scheduled to conclude this summer.](#)² Further, the SWRCB is [proposing updates regarding OAH to the California Ocean Plan this year and next](#)³, and then [will begin assessing the ocean for OAH indicators](#)⁴.
- Southern California wastewater agencies have extensive, longstanding ocean monitoring programs that consistently document healthy and diverse ecosystems and ocean waters within water quality objectives specified by the California Ocean Plan. While climate change poses daunting challenges, including threats of OAH, there is not a "crisis" in Southern California coastal waters because of wastewater effluent. Rather, the NGO Letter relies on preliminary research predictions of a complex model that has not been validated for regulatory purposes. There is much work left to do, including developing more realistic and relevant modeling scenarios and model output validation with appropriate and sufficient empirical data.

¹ <https://aslopubs.onlinelibrary.wiley.com/doi/epdf/10.4319/lo.2014.59.1.0285> (see Table 3)

² <https://www.nwri-usa.org/socal-coastal-model-review>

³ https://www.waterboards.ca.gov/board_info/exec_dir_rpts/pol_per_view.html

⁴ https://www.waterboards.ca.gov/water_issues/programs/tmdl/2023_2024state_ir_reports/2024-integrated-report-final-staff-report.pdf#page=79

- While the SWRCB and the Southern California Coastal Waters Research Project (SCCWRP) are investigating the driving cause of OAH impacts to develop nutrient regulations, California is targeting an additional one million acre-feet of water recycling capacity by 2040 to align with the Governor's 2022 Water Supply Strategy. The costs of implementing the new OAH nutrient regulations at coastal southern California and San Francisco Bay wastewater facilities are likely to be of similar magnitude, resulting in as much as \$50 billion for new wastewater treatment and water recycling facilities that ratepayers will have to fund. Nutrient reduction projects are already in planning stages at some agencies to either enhance or re-engineer their facilities to support new water recycling projects. Regulations that override or force significant modifications to existing, planned, or future projects would ignore the state's need and effort to secure long-term climate resilient water supplies. This, along with new regulations related to PFAS and other issues like aging infrastructure, will exacerbate affordability challenges that already pose a major challenge for water and wastewater ratepayers in California.
- The Administration and Legislature must consider nutrient management policies holistically. Associated regulatory actions need to be based on sound science, a reasonable cost-benefit expectation, and a thorough assessment of potential adverse consequences. Nutrient treatment processes will require a significant increase in electricity demand which leads to increases in greenhouse gas (GHG) emissions until the grid is clean, as well as increased demand for energy-intensive chemicals and increased treatment process emissions (i.e., removing nitrogen from the effluent stream may shift nitrogenous emissions to the atmosphere.) Thus, it is critical to consider the tradeoffs between nutrient management and life cycle emissions – the primary driver of OAH – when evaluating nutrient management solutions to ensure those solutions achieve the intended impact to provide meaningful benefits.

The POTW community is heavily regulated to safeguard public health and the environment. This objective drives our work and is the reason we work tirelessly to operate wastewater collection systems and treatment facilities that provide essential public services 24/7/365. Our respective systems' performance is proven through timely and comprehensive environmental monitoring in oceans, streams, lakes, and all other receiving waters. Our efforts reflect significant and ongoing public investment in critical infrastructure, and we strive to fulfill our duties through sound science, responsible fiscal policy, community engagement, and rigorous engineering.

In closing, we wholeheartedly support the good-faith effort among SCCWRP, state and regional regulators, environmental organizations, and wastewater agencies to proactively address impacts from nutrients and OAH. We anticipate the ongoing and planned OAH modeling efforts may produce critical information to support management decisions. We recognize the state's current fiscal constraints and believe legislation, regulation, and additional funding at this time is unnecessary since very important and relevant activities are underway at the SWRCB and due to conclude in the next couple of years, at which time the State will have adopted a statewide coastal nutrient policy. However, should the funding outlook improve, we recommend investment and support of further work to evaluate and improve the academic model's accuracy, precision, specificity, and applicability to regulatory management decisions. We look forward to receiving any questions you may have on this matter. To coordinate on these issues or if you have questions, please contact Jared Voskuhl, CASA's Director of Regulatory Affairs, at jvoskuhl@casaweb.org or (916) 446-0388.

Thank you,



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ENCLOSURE

The SCCWRP Science Team's Work to Date to Support the SWRCB and OPC

The SCCWRP research team that has been modeling how land-based nutrient discharges into California coastal waters influence OAH is now seeking to demonstrate that the Regional Ocean Modeling System and Biogeochemical Elemental Cycling model (known as ROMS-BEC) can reliably estimate how coastal OAH conditions would be affected if these discharges were reduced.

The modeling has predicted that nitrogen reductions would result in a reversal of subsurface oxygen and pH losses, an expansion of simulated habitat volume for shelled organisms that are sensitive to pH losses, and an expansion of aerobic habitat for fish. The findings, which are undergoing review by an independent panel of scientific experts convened to review the OAH modeling work, mark a key first step toward understanding the certainty in the modeling to date for answering management questions about the role of land-based nutrient discharges, if any, in exacerbating coastal OAH conditions.

The next step is to run modeling simulations with more realistic nutrient-reduction scenarios – scenarios informed by modern changes that managers at each outfall could realistically make to their water recycling and nutrient management practices. Researchers also need to weigh the potential benefits of taking short-term actions to reduce nutrients against the pace with which OAH is intensifying in Southern California coastal waters.

Status of OAH Modeling and Scientific Review Process

The NGO Letter is based on the results of a developing oceanographic model created for academic research purposes that has not been verified with field studies. ROMS-BEC is an impressive endeavor, and its purpose is to simulate physical, geochemical, and biological conditions in the Southern California Bight. This work by a scientific team at SCCWRP focuses on determining how land-based nutrient discharges into Southern California coastal waters influence OAH and predicting how coastal OAH conditions would be affected if these discharges were reduced. However, it is important to understand that its outputs to date involve screening-level predictions based on past conditions, and the modeled impacted areas have either not been observed through actual monitoring data or verification efforts are still ongoing. The process of comparing model results with actual monitoring is important to “ground-truth” to assess the accuracy of the model. Numerous efforts are underway to determine the degree of accuracy and certainty in these predictions. The NGO Letter claims that there is an urgent need to implement OAH regulatory requirements, and they are urging the Newsom Administration and Legislature to expedite development of these regulations. However, the model results to which their letter refers are currently undergoing independent review by a panel of international oceanographers and experts.

The National Water Research Institute (NWRI) is administering the independent panel review, which is led by a Project Steering Committee (PSC) consisting of multiple State agency representatives, the Executive Director of the Southern California Coastal Waters Research Project (SCCWRP), the Executive Director of California Coastkeeper Alliance, and several wastewater agency representatives. The independent review panel was convened, in part, to address questions regarding the accuracy and readiness of the model for use in setting regulatory standards for OAH. This consensus-based independent expert review of the research model was asked by the PSC to address three primary questions:

1. Are the model formulation, domain, set up and forcing, and predictions appropriate for the water quality management applications that are being considered?
2. What is the uncertainty in the predictions the model is producing that are relevant for water quality applications?
3. What investments would most enhance model performance and improve model certainty?

For context, some of the experts charged with developing and refining the model have expressed significant concerns about its use now for making regulatory management decisions without further calibration and analysis and have not endorsed such use at this time. They have acknowledged there

is much work left to do on this topic, including running more relevant model scenarios coupled with field studies to empirically measure the rate of ocean acidification and its effects. In addition, the SCCWRP scientific team have clearly expressed to the independent review panel the need to work with stakeholders to determine remaining questions that must be answered before management actions and regulations can be determined.

More specifically, the experts responsible for developing this model are not prepared to endorse it for regulatory management actions before critical steps are taken to advance it from a research-based model to a regulatory tool. Thus, to claim as the NGO Letter asserts, that “[t]he best science in the world has concluded that land-based nutrients from wastewater facilities are harming the California coast and making our ocean uninhabitable for California’s economically-critical marine life” is, at best, premature, and, at worst, simply untrue. While there is a shared concern regarding OAH in coastal waters, more work must be done to verify the results they cite and determine the path forward.

The Proposed Action Targets Less Than 6% of the Nitrogen Loadings to the Southern California Bight

To understand the practical ability of the SWRCB to manage ocean acidification through standard setting and regulatory action, it is important to highlight the relationship between the levels of nutrients, specifically nitrogen, occurring naturally in the ocean from processes such as natural upwelling, and the nutrients contributed from wastewater discharges. Nitrogen is often a limiting nutrient for phytoplankton blooms in the coastal ocean which, in excess, can lead to lower oxygen conditions as the bloom decays. As shown in Figure 1, the scientific team at SCCWRP has previously documented that wastewater effluent contributed less than 6% of the estimated nitrogen loading in the Southern California Bight. In other words, more than 90% of the nitrogen contributions were from natural oceanic upwelling, which is unrelated to activities of wastewater dischargers. Moreover, as the NGO Letter acknowledges, the vast majority of impacts to ocean organisms comes from increasing carbon dioxide (CO₂) in the atmosphere and the resulting impacts on ocean acidification. Simply put, reducing ocean acidification impacts that are primarily occurring due to atmospheric concentrations of CO₂ cannot be accomplished by setting water quality standards that only target ocean wastewater dischargers in the state. Furthermore, the largest wastewater agencies are actively operating, constructing, or designing the most economically feasible treatment upgrades in the next decade that will continue reducing nutrients, even prior to the adoption of new OAH water quality standards. Given these realities, it would be more beneficial to incentivize early actions such as these, rather than rushing to finalize new -- potentially draconian -- state regulations that may actually result in delays in reductions.

Finally, the NGO Letter demanded actions within this fiscal year, not only without consideration of the dire state budget fiscal projections for FY2025, but also without any consideration of the independent expert panel review that will be concluded this summer. This report will expressly address the degree of accuracy and certainty of the current model predictions, what investments are needed to improve the model, and which model scenarios are needed to determine whether additional reductions of nutrients from wastewater will avert adverse ocean water quality impacts. These are essential questions to answer before pursuing water quality regulations, as all parties involved in the review panel acknowledge. In addition, the SWRCB is already intimately involved in the project (serving as a member of the PSC). Additionally, a recent update to the SWRCB’s [Significant Statewide Policies calendar](#)⁵ indicates they are initiating the multi-year review and amendment of the Ocean Plan later this year in parallel with the scientific advancement of the modeling research. During the short interim, the SWRCB’s [2024 staff report on impaired water bodies acknowledges and explains how ocean](#)

Sources of Nitrogen Loadings to Southern California Bight
SCCWRP et al (2014)

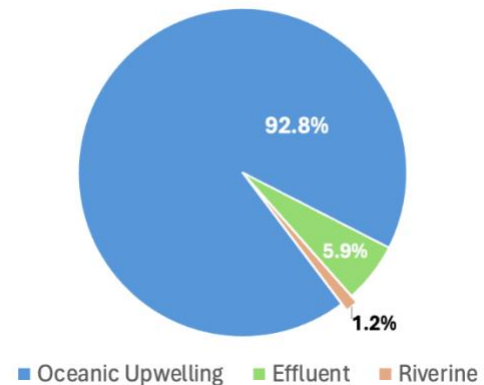


Figure 1: [SCCWRP et al 2014, Table 3](#)

⁵ https://www.waterboards.ca.gov/board_info/exec_dir_rpts/pol_per_view.html

[acidification and hypoxia \(OAH\) currently are being assessed across the state and the role of the ROMS-BEC model in the future](#)⁶.

The San Francisco Bay Region Serves as an Example of a Collaborative Model, and the Potential Costs/Benefits of Requiring Wide-Spread Upgrades at Wastewater Facilities

When considering regulatory tools and management options, it is important to consider lessons available from other similar efforts to maximize outcomes. [In 2022, the United States Environmental Protection Agency \(US EPA\) guided states to pursue watershed approaches for managing nutrients](#)⁷. The SF Bay Area has been a key forerunner in this regard, evaluating the impacts of nutrients on the San Francisco Bay. The Bay Area Clean Water Agencies (BACWA), an organization whose members include the 37 wastewater agencies permitted to discharge to the San Francisco Bay, have built and fostered partnerships to invest in science-based data-driven solutions to support innovation and implementation by successfully collaborating over a decade with regulators, environmental organizations, and researchers— including US EPA, Baykeeper, San Francisco Estuary Institute, and the San Francisco Regional Water Quality Control Board.

To comply with nutrient limits proposed in the new draft regional watershed permit issued by the San Francisco Regional Water Quality Control Board, [BACWA has estimated it will cost \\$11 billion dollars](#)⁸ to comply with the limits. Much of the Bay Area's progress and understanding around the issue of nutrients has been informed by [the 2018 assessment BACWA initiated in collaboration with the engineering firm HDR](#)^{9,10}, which served as the basis for developing a long-term watershed nutrient strategy, including estimating costs for achieving various levels of nutrient removal through various treatment approaches.

The Bay Area's estimates from 2018 can help policymakers better understand the prospective range of costs in southern California for implementing different management strategies. Notably, CASA and southern California coastal agencies are working with HDR, an engineering firm, to initiate a comparable evaluation in collaboration with the SWRCB and SCCWRP. The data gathered from this study will also be an essential resource to the SCCWRP scientific team to accurately quantify municipal wastewater nutrient inputs as they are updating the model and to understand cost estimates for further potential wastewater treatment facility upgrades to achieve nutrient reductions. These efforts are important so that policymakers can make informed decisions about the potential costs of the impending OAH and nutrient regulations and how these costs may impact the affordability of wastewater services for millions of ratepayers, particularly in light of other major cost drivers such as aging infrastructure, PFAS, and water recycling.

Technology-Based Limits Will Impose Massive Financial Burdens on Communities Without Corresponding Environmental Benefits

The NGO Letter recommends implementing technology-based standards in order to uniformly eliminate nutrients from wastewater effluent. However, requiring technology-based standards in this instance is a one-size-fits-all strategy that may not make sense, and could result in massive investments in infrastructure by local communities. A technology-based approach to regulatory limits for OAH would almost certainly require local wastewater agencies to steeply raise rates in order to achieve very low nutrient levels. This may turn out to be necessary in some places but not necessarily everywhere. The San Francisco Regional Water Quality Control Board has recognized that such an approach forces local wastewater agencies to shift resources away from other priorities. Moreover, mandating a uniform technology-based approach would preclude more creative and potentially more cost-effective approaches. This approach would also stall voluntary efforts underway within the region because mandated nutrient reductions would draw resources away from other important projects.

⁶ https://www.waterboards.ca.gov/water_issues/programs/tmdl/2023_2024state_ir_reports/2024-integrated-report-final-staff-report.pdf#page=79

⁷ <https://www.epa.gov/system/files/documents/2022-04/accelerating-nutrient-reductions-4-2022.pdf>

⁸ <https://bacwa.org/wp-content/uploads/2024/03/BACWA-Algal-Blooms-Infographic-March-2024.pdf>

⁹ https://bacwa.org/wp-content/uploads/2018/06/BACWA_Final_Nutrient_Reduction_Report.pdf

¹⁰ https://bacwa.org/wp-content/uploads/2024/05/BACWA_CostEscalation_Memo_20240507.pdf

Additionally, the NGO Letter recommends requiring wastewater denitrification treatment as a prerequisite for a project to receive future bond funding. Denitrification is complex, costly, and energy-intensive per unit of flow treated. Many agencies are already struggling to pay for the large-scale water recycling projects under development, and adding an across-the-board denitrification requirement would significantly increase costs, increase carbon dioxide emissions, and may delay or stop progress on these important water recycling efforts. Moreover, until the science shows that the denitrification treatment option is the most appropriate approach, we strongly recommend against this requirement for project funding. This would deny local wastewater agencies a necessary source of infrastructure financing by shifting existing resources away from other priorities.

The OAH Independent Expert Panel Needs to Complete its Review so Policymakers and Stakeholders May Evaluate Alternative Options

In closing, we would like to take this opportunity to highlight the current collaborative approach underway in southern California as part of the NWRI independent expert review of the ROMS-BEC model. As this process concludes in the coming months, its recommendations should guide and inform the next steps. The independent expert review panel will be wrapping up its work this summer and is expected to advise the next phase of work that should be done. If the State is able to provide funding toward OAH-related items as requested in the NGO Letter, investment in improving the model to ensure that the SWRCB can use it to conduct their upcoming regulatory process would be appropriate and the most beneficial investment that the State could make. This investment would also result in enhancing the results from the funding (\$560,000) that [the OPC allocated in February to SCCWRP](#)¹¹ for the SCCWRP scientific team to do model scenarios with ROMS-BEC along the central coast region of California up to the Russian River north of San Francisco. Before those new model runs and analyses are performed, the existing research model needs to be improved and refined so that a statewide coastal nutrient strategy has the confidence of regulators and stakeholders alike and that the desired benefits will indeed be achieved.

¹¹ <https://opc.ca.gov/wp-content/uploads/2024/02/Item-5-OAH-Modeling-Central-Coast-508.pdf>