Staff Recommendation
February 29, 2024

Item 5

Action Item:
Consideration and Approval to Augment Funds to Advance Modeling of Ocean Acidification Drivers and Impacts on the Central Coast

Christine Sur, Water Quality Program Manager

Recommended Action: Authorization to disburse up to $561,072 to the Southern California Coastal Water Research Project (SCCWRP) to advance an integrated earth system model to assess the effects of anthropogenic nutrients on ocean acidification and hypoxia and the biological impacts of these conditions on the San Francisco and Monterey coasts. The authorization will provide a budget augmentation to an existing grant to SCCWRP previously approved by the Council on June 19, 2020.

Location: San Francisco and Monterey coast

Strategic Plan Goals and Objectives: Goal 1: Safeguard coastal and marine ecosystems and communities in the face of climate change; Objective 1.2: Minimize causes and impact of ocean acidification and hypoxia.

Equity and Environmental Justice Benefits: Climate resilience; improved water quality and habitat management

Findings and Resolution:

Staff recommends that the Ocean Protection Council (OPC) adopt the following findings:

"Based on the accompanying staff report and attached exhibit(s), OPC hereby finds that:

1. The proposed projects are consistent with the purposes of Division 26.5 of the Public Resources Code, the California Ocean Protection Act;
2. The proposed projects are consistent with the Budget Act of 2022 which included a $50 million General Fund appropriation for grants or expenditures for resilience projects that

conserve, protect, and restore marine wildlife and healthy ocean and coastal ecosystems; and

3. The proposed projects are not 'legal projects' that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section, section 15378."

Staff further recommends that OPC adopt the following resolution pursuant to Sections 35500 *et seq.* of the Public Resources Code:

"OPC hereby approves the disbursement of up to $561,072 to the Southern California Coastal Water Research Project (SCCWRP) to advance an integrated earth system model to assess the effects of anthropogenic nutrients on ocean acidification and hypoxia and the biological impacts of these conditions on the San Francisco and Monterey coast.

This authorization is subject to the condition that prior to disbursement of funds, the Southern California Coastal Water Research Project shall submit for the review and approval of the Executive Director of the OPC detailed work plans, schedules, staff requirements, budgets, and the names of any contractors intended to be used to complete the projects, as well as discrete deliverables that can be produced in intervals to ensure the projects are on target for successful completion. All projects will be developed under a shared understanding of process, management, and delivery."

Executive Summary:

Staff recommends that OPC approve the disbursement of $561,072 to provide a budget augmentation to an existing grant with SCCWRP approved at the June 19, 2020 Council meeting. The augmentation will advance the original integrated earth system modeling application to assess the effects of anthropogenic nutrients on ocean acidification and hypoxia (OAH) and the biological impacts of these conditions on the San Francisco and Monterey coasts. This funding will provide for higher resolution modelling to assess model uncertainty; understand the role of local nutrient inputs, riverine inputs, and climate variability; and identify when and where nutrient effects and biological impacts occur in the region. The project results will expand the scope of existing OAH modelling efforts outside of the Southern California Bight and assist the state in considering management or regulatory actions, as appropriate.

Project Summary:

Background:

The California coast is vulnerable to OAH, which are driven by global climate change. Decisions on management of local pollution sources, which can exacerbate these stressors, is a key line of

inquiry to address OAH in OPC's Strategic Plan and highlighted as a management need by the California Ocean Acidification and Hypoxia Science Task Force (2020). OPC has previously invested substantial resources, with leveraged funding from the National Oceanic and Atmospheric Administration, to develop a coupled physical-biogeochemical OAH model for the entire West Coast. The model is considered a state-of-the-art global example and has resulted in numerous peer-reviewed scientific publications. In the Southern California Bight (Bight), this effort demonstrated that coastal anthropogenic nutrients, primarily from wastewater treatment plant effluent, are having a significant impact on OAH in the region.

Previous investments have focused on model application and management decision support to better understand the relative impact of coastal anthropogenic sources and different management strategies, including increased water recycling and reduced nutrient loading, on OAH and biological impacts at different spatial and temporal scales in the Bight. The project has centered on three questions in the Bight:

- What is the effect of anthropogenic nutrients on algal blooms, oxygen, and pH?
- What are the biological effects of these changes?
- What are the effects of nitrogen management alone or in combination with potable water recycling?

Initial findings from the project have indicated that anthropogenic, land-based nutrients drive measurable changes in ocean chemistry (reduction of subsurface pH and oxygen, and production of persistent algal blooms) and that these changes have the potential to cause vertical compression of viable ocean habitat for fish and shelled organisms over a quarter of the Bight (approximately 278,400 square kilometers) during 3 months of the year in late summer to early fall. The research has also demonstrated that these OAH and habitat effects decrease when dissolved inorganic nutrients are reduced from ocean outfalls.

These results can improve understanding regarding the consequences of management decisions, including no action. One ongoing line of inquiry is whether these phenomena are limited to the Bight, or if such effects are also evident on the San Francisco and Monterey coasts (SFMC).

Funding approved by the Council on June 19, 2020 extended this effort to the SFMC, another region with a significant coastal population and anthropogenic nutrient loading. Preliminary results suggest a substantial effect of San Francisco Bay nutrient flow dynamics and riverine inputs on algal production and OAH in the SFMC. However, higher resolution data is needed to improve understanding of the contributions of land-based nutrients and inform potential management strategies that can mitigate OAH impacts.

Project Summary:

Addressing nutrient pollution is a priority within the Central Coast region, a unique region influenced by both urban and agriculture-dominated watersheds. Current OPC funding has supported foundational model development, model testing, completion of initial model simulations, and preliminary validation for the SFMC. This proposed augmentation will provide necessary research to improve the characterization of riverine inputs from agriculture-dominated rivers, extend model simulations to understand the effects of nutrient inputs and climate variability on OAH, comprehensively validate the model, and to apply OAH thresholds to quantify biological impacts in the SFMC. Ultimately, the proposed augmentation will provide the required higher resolution work that is needed to understand system dynamics, attribution of local nutrient sources, and biological effects in the SFMC in the same level of detail completed for the Bight.

Rigorous modeled results and improved quantification of nutrient loading from this proposed project have the potential to support decision-making, including the development of a nutrient management standard, potential assessments to support ocean acidification federal Clean Water Act section 303(d) listing determinations, future targeted monitoring, and potential Total Maximum Daily Load development to reduce the impacts of OAH in coastal regions.

Improved understanding of the terrestrial nutrient inputs from the Salinas River Valley, pathways, and impacts to marine life and marine habitat will additionally support the ongoing Biostimulatory, Cyanotoxins, and Biological Integrity Provisions project by the State Water Resources Control Board, focused on assessing and managing nutrients for inland freshwaters statewide.

This proposed project will include the following tasks:

Task 1. Improve the estimates of freshwater and nutrient loading from Central Coast rivers: This task will build on previous efforts to compile monitoring and modeling data to represent anthropogenic nutrient inputs from Central Coast rivers and answer key management questions about nutrient loading. Three nutrient-enriched watersheds provide 70% of direct anthropogenic nitrogen inputs to Monterey Bay, but the processes are highly uncertain. This task will utilize newly validated surface-groundwater model simulations of recharge, water use, and discharge dynamics in this system, in combination with nutrients in surface and groundwaters, to improve the estimate of nutrient fluxes to Monterey Bay. It will answer the following questions: 1) What is the seasonal and spatial variability in flux of surface water versus submarine groundwater nutrients to Monterey Bay from the Salinas River, the Pajaro River, and Elkhorn Slough? 2) Does incorporation of these improved fluxes improve model validation for the SFMC?

Task 2. Simulate the response of the coastal ocean to land-based nutrient inputs and climate variability and validate these responses compared to ocean observations: This task will conduct a suite of five-year simulations of "ocean only" and "ocean plus land-based nutrients" to provide the key scenarios for a definitive anthropogenic effects assessment. It will answer the question: What is the uncertainty in model predictions of SFMC physics, biogeochemistry, and lower ecosystem responses?

Task 3. Assess the contribution of point source and non-point source anthropogenic nutrient inputs on OAH in the SFMC: This task will document the relative importance of point source anthropogenic nutrient inputs, non-point sources of anthropogenic nutrient inputs, and natural oceanic variability on algal production and OAH. It will answer the question: What is the effect of SF Bay exchanges (water versus materials), coastal publicly owned treatment works outfalls, and coastal riverine sources of nutrients, organic matter, and acidity on SFMC shelf nutrient mass balance, productivity, carbonate chemistry, and oxygen?

Task 4. Assess the biological effects of changes in productivity and OAH on SFMC habitats. This task will document the impacts of land-based inputs on OAH and biological effects to answer the following questions: 1) What is the spatial and temporal extent of these impacts over seasons and interannual climate cycles, and how does this correspond to National Marine Sanctuary and California Marine Protected Area habitat? 2) To what extent are anthropogenic, land-based inputs reducing the amount of habitat available for oxygen dependent fish and invertebrates and calcifying habitat for shelled organisms, and leading to other biological effects?

Equity and Environmental Justice Benefits:

This project will improve the management and conservation of coastal waters and will support actions to minimize the impacts of climate change on coastal water quality and ocean ecosystems. Effective management and conservation of coastal waters provides benefits for all communities and individuals that rely on healthy ocean ecosystems, particularly in the face of climate change. The impacts of OAH on California's biodiversity and coastal water quality affect current and future generations of Californians that rely on a healthy ocean for subsistence, livelihoods, recreation, and other uses.

About the Grantee:

The Southern California Coastal Water Research Project (SCCWRP) is a public research and development agency that develops and applies next-generation science to improve management of aquatic systems in Southern California and beyond. Since its founding in 1969, SCCWRP has been developing strategies, tools and technologies that the region's water-quality management

community relies on to more effectively protect and enhance the ecological health of Southern California's coastal ocean and watersheds.

Project Timeline:

June 2024 – December 2026

Project Financing:

Staff recommends that OPC authorize encumbrance of up to $561,072 to SCCWRP to advance an integrated earth system model to assess the effects of anthropogenic nutrients on ocean acidification and hypoxia and the biological impacts of these conditions on the San Francisco and Monterey coast. Including the previously approved $998,600 for the original modeling research, this brings the total funding authorized for this project to $1,559,672.

Ocean Protection Council	$561,072
TOTAL	**$561,072**

The anticipated source of funds will be from the Budget Act of 2022, which included a $50 million General Fund appropriation to OPC for grants or expenditures for resilience projects that conserve, protect, and restore marine wildlife and healthy ocean and coastal ecosystems. This project addresses the resiliency of California's coasts and oceans in the face of climate change and is an appropriate use of this General Fund appropriation to increase the State's understanding and inform management of OAH drivers and impacts on marine wildlife and ocean and coastal ecosystems.

Consistency with California Ocean Protection Act:

The proposed project is consistent with the Ocean Protection Act, Division 26.5 of the Public Resources Code, because it is consistent with trust-fund allowable projects, defined in Public Resources Code Section 35650(b)(2) as projects which:

- Improve the management of fisheries and/or foster sustainable fisheries.
- Improve coastal water quality.
- Improve management, conservation, and protection of coastal waters and ocean ecosystems.

- Provide funding for adaptive management, planning coordination, monitoring, research, and other necessary activities to minimize the adverse impacts of climate change on California's ocean ecosystem.

Compliance with the California Environmental Quality Act (CEQA):

The proposed project is not a 'legal project' that triggers the California Environmental Quality Act pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378.
proposed project is categorically exempt from review under CEQA pursuant to 14 Cal. Code of Regulations Section 15306 because the project involves information collection, consisting of data collection, research, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource.