

CALIFORNIA OCEAN PROTECTION COUNCIL

Staff Recommendation

October 17, 2016

Develop Sea-level Rise and Coastal Hazard Maps for the Central Coast to Inform Climate Vulnerability Assessments, Conduct Statewide Shoreline Change Rate Update, & "Our Coast, Our Future" Online Viewer for the Central Coast

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RECOMMENDED ACTION: Authorization to disburse up to \$800,000 to the United States Geological Survey (USGS) to develop sea-level rise and coastal hazard maps for the Central Coast to inform climate vulnerability assessments, and update shoreline change rates statewide for the outer California coast, as well as to disburse up to \$150,000 to Point Blue Conservation Science to extend the online *Our Coast, Our Future* mapping tool to include the Central Coast.

LOCATION: Central Coast (from Point Conception to Half Moon Bay) and Statewide

STRATEGIC PLAN OBJECTIVE(S): Climate Change, Science-Based Decision Making

EXHIBITS

Exhibit A: Support Letters

Exhibit B: Map of CoSMoS model coverage in California

FINDINGS AND RESOLUTION:

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

"Based on the accompanying staff report and attached exhibits, the Ocean Protection Council hereby finds that:

- 1) The proposed projects are consistent with the purposes of Division 26.5 of the Public Resources Code, the Ocean Protection Act.
- 2) The proposed projects are consistent with the Ocean Protection Council's grant program funding guidelines (Interim Standards and Protocols, August 2013).
- 3) The proposed projects are not 'legal projects' that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378. If they were determined to be 'legal

projects' under CEQA, the proposed projects are categorically exempt from review under CEQA pursuant to 14 Cal. Code of Regulations Section 15306 because the projects involve 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."

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

"The California Ocean Protection Council hereby approves the disbursement of up to \$800,000 to the United States Geological Survey to develop sea-level rise and coastal hazard maps for the Central Coast to inform climate vulnerability assessments, and update coastal change rates statewide for the outer California coast, as well as to disburse up to \$150,000 to Point Blue Conservation Science to extend the online *Our Coast, Our Future* mapping tool to include the Central Coast.

This authorization is subject to the condition that prior to execution of an agreement, the United States Geological Survey (USGS) and OPC shall come to agreement on an indirect cost rate that is consistent with OPC's grant guidelines by December 1, 2016. The disbursement of funds to Point Blue Conservation Science is also contingent upon USGS's agreement with OPC regarding an indirect cost rate that is consistent with OPC's grant guidelines, due to the fact that the utility of the *Our Coast, Our Future* tool is contingent upon the CoSMoS results for the Central Coast of California. Lastly, prior to the disbursement of funds, the United States Geological Survey and Point Blue Conservation Science 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.

PROJECT SUMMARY:

The United States Geological Survey's Coastal Storm Modeling System (CoSMoS: http://walrus.wr.usgs.gov/coastal_processes/cosmos/index.html) is a regionally-specific model that projects coastal flooding and erosion driven by climate change, not only from sea-level rise (SLR) but also from future storms. It takes into account a wide range of SLR scenarios and storms for the 21st century, including all the major components of short-term, dynamic coastal water levels (e.g., tides, storm surge, waves, river flows, seasonal water level anomalies), plus long-term changes to beaches and bluffs. CoSMoS produces hazard projections for coastal regions by downscaling global climate models and adding regional storm factors. CoSMoS

includes scenarios that feature a wide range of SLR scenarios (up to 5 meters/16 feet) and coastal storms (average daily conditions up to 100-year storms) to meet management planning horizons for the next century and to address different degrees of risk tolerance.

The USGS (Principal Investigator: Dr. Patrick Barnard) has been developing CoSMoS with a team of international experts for ten years, which includes scientists from Oregon State University; University of Florida; Scripps Institution of Oceanography; University of Hawaii; University of Illinois-Chicago; the Universities of California, Berkeley and Santa Cruz; Deltares (the Netherlands); and University of Cantabria (Spain). Thus far, CoSMoS has been applied along the North-central California coast (Half Moon Bay to Point Arena), within San Francisco Bay, and will be complete for the South Coast (Mexican border to Point Conception) by the end of 2016 (See Exhibit B for a map of CoSMoS model coverage in California). This project makes CoSMoS available and applicable for the Central Coast of California, from Point Conception to Half Moon Bay, for 40 SLR and storm scenarios, with accompanying socioeconomic impacts, all of which have been applied in the other coverage areas in California. Upon completion there would be continuous CoSMoS coverage from Point Arena south to the Mexican border.

This project would also update statewide sandy beach and cliff erosion rates (short and long-term) through supporting USGS to interpret LIDAR¹ topographic data spanning the 2015-2016 El Niño impacts. These erosion rates will feed into the CoSMoS coastal change projections and related flooding projections, as well as serve to validate storm impacts modeling. This will be useful for many cities and counties that are conducting sea-level rise vulnerability assessments and adaptation plans using the CoSMoS model and associated erosion rates and coastal change projections in their analyses.

Thirdly, this project would extend the *Our Coast, Our Future* online viewer to include the Central Coast. *Our Coast, Our Future* is a collaborative, user-driven approach to provide coastal decision-makers with locally relevant, online tools – using the Coastal Storm Modeling System (CoSMoS) – in order to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms. Point Blue Conservation Science (www.pointblue.org) developed the *Our Coast, Our Future* web tool (ourcoastourfuture.org) that has been serving up the CoSMoS model results through an accessible, intuitive online viewer throughout the state since 2011. Point Blue has 140 scientists that work hand-in-hand with habitat, wildlife and natural resource managers to conserve wildlife and ecosystems through science and partnerships, including developing the *Our Coast, Our Future* web tool. Point Blue is a leader in testing and

¹ LIDAR (light detection and ranging) is a remote sensing method that uses light to measure variable distances to Earth in order to generate 3-dimensional information about the shape of the Earth and its surface characteristics.

implementing collaborative climate-smart conservation for multi-benefit solutions.

This project will build off of the CoSMoS model for the Central Coast by supporting the development and extension of the associated *Our Coast, Our Future* online viewer for the Central Coast, which allows users to easily and intuitively interact with a complex dataset and up to 40 sea level rise and storm scenarios. In addition, the *Our Coast, Our Future* tool allows users to compare different sea-level rise scenarios, which enables users to partition the impacts from sea-level rise and storms, as well as to determine the different magnitudes of each. This project will also include extensive outreach and stakeholder engagement; this drives localized corrections, improves features that increase tool usability, and informs design enhancements. By using this adaptive development process, the *Our Coast, Our Future* tool builds regional and local buy-in from the user community. The sophisticated *Our Coast, Our Future* web tool will directly support the implementation of federal and state-supported climate change guidance as well as coastal vulnerability assessments, such as Local Coastal Program (LCP) updates in Central California.

Specific objectives of the overall project include:

- Complete CoSMoS coverage and all 40 scenarios of SLR and storms for the Central California coast from Point Conception to Half Moon Bay (\$500,000).
- Produce a socioeconomic web tool for the region that will translate the physical vulnerability due to flooding and erosion for each scenario into asset, economic and population exposure (funded by USGS).
- Use of the 2014-2016 series of LIDAR collection efforts, pre-and post El Niño, to update short and long-term coastal change rates across the state of California, which will improve the predictive capabilities of the coastal change and flood models within CoSMoS (\$300,000).
- Model results from CoSMoS sea-level rise and storm modeling served up on the *Our Coast, Our Future* online viewer in order to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms (\$150,000).

Overarching goal of project:

The goal of this project is to apply USGS's Coastal Storm Modeling System to deliver a single robust and consistent methodology and set of maps to inform climate vulnerability assessments for cities and counties from the Mexican border to Pt. Arena, including all coastal embayments and harbors. Through extensive outreach, this work will directly support federal and state-supported climate change guidance and vulnerability assessments (such as Local Coastal Program (LCP) updates) across the state². In addition, the project team will use the

² In November 2012, the Ocean Protection Council approved disbursement of up to \$2.5 million for a competitive grant program to assist local governments in updating their LCPs.

CoSMoS results to assess socioeconomic exposure to SLR, storms and shoreline change.

This project will provide the best available science to allow decision-makers to assess the vulnerability of coastal ecosystems and communities to flooding and erosion across the entire state from a wide range of climate change scenarios using a state-of-the-art modeling system. This assessment, in turn, will promote effective and responsible coastal management actions that will ensure healthy and resilient beaches and estuaries. This project will also support local and state decision-makers to develop and implement flexible approaches for a range of future options, to make the best choices for today and in the future.

Deliverables:

- Full, consistent coverage of CoSMoS SLR/storm modeling across the region, including 40 flooding scenarios integrated with long-term coastal change and vertical land motion for Central California (USGS)
- Socioeconomic web tool extended to Central California (funded by USGS)
- Outreach, stakeholder engagement and science support (USGS)
- *Our Coast, Our Future* online viewer extended to include the Central Coast (Point Blue)
- Outreach, stakeholder engagement and long-term data serving and web tool support (Point Blue)

Outcomes:

- Coastal planners throughout most of the state will have access to hazard maps developed with a consistent methodology and set of scenarios, which will increase the opportunity for more coordinated and regional-scale sea-level rise adaptation planning.
- Vulnerabilities of at risk communities and ecosystems will be reduced through effective adaptation planning using the *Our Coast, Our Future* tool
- Efficient expenditure of public resources for sea-level rise adaptation that is focused on priority natural resources and areas with high socioeconomic vulnerabilities. Planners and managers at a local and regional scale will be able to analyze trade-offs between adaptation options for coastal communities.
- Coastal communities and natural resource managers are prepared to respond to low-frequency but high impact events by assessing and developing responses to the range of future scenarios available to view and analyze through the *Our Coast, Our Future* tool

Site Description: The outer coast of Central California, including all harbors and embayments, from Half Moon Bay to Point Conception; the update to the coastal change rate is statewide.

Project Timeline: January 2017-June 2018 (USGS); March 2018-February 2019 (Point Blue)

PROJECT FINANCING:

Staff recommends that the Ocean Protection Council (OPC) authorize disbursement of up to \$800,000 to the United States Geological Survey (USGS) to develop sea-level rise and coastal

hazard maps for the Central Coast to inform climate vulnerability assessments, and update coastal change rates statewide for the outer California coast, as well as to disburse up to \$150,000 to Point Blue Conservation Science to extend the online *Our Coast, Our Future* mapping tool for the Central Coast.

Ocean Protection Council	\$950,000 (\$800,000 to USGS; \$150,000 to Point Blue)
United States Geological Survey (USGS)	\$600,000 in-kind match
TOTAL	\$1,550,000

The anticipated source of funds will be from the Ocean Protection Council's appropriation of the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84). Proposition 84 authorizes the use of funds for purposes consistent with Section 35650 of the Public Resources Code, establishing the California Ocean Protection Trust Fund (Pub. Res. Code § 75060(g)). Under Section 35650(b), Ocean Protection Trust Fund monies may be expended for projects authorized by the OPC that are identified as appropriate Trust Fund purposes, as specified. The project is consistent with the Trust Fund purposes as discussed in the following section.

Leverage of OPC funds

This project would build upon previous funding by the California Natural Resources Agency (CNRA). CNRA contributed funding for the development of the CoSMoS model and the *Our Coast, Our Future* tool, for the South Coast of California, as well as the development of 4 extreme sea-level rise and storm scenarios (out of 40 total scenarios) for the Central Coast, through the 4th California Climate Change Assessment. This project will complete the funding gap for this effort for the Central Coast (Half Moon Bay to Pt. Conception) and provide a robust and complete set of scenarios, with accompanying socioeconomic impacts, for Central Coast coastal planners and managers to analyze and perform climate change vulnerability assessments. Upon completion there would be continuous coverage from Point Arena south to the Mexican border.

The USGS is heavily leveraging the proposed Central Coast CoSMoS modeling work with internal funds (\$500,000), as well as contributing \$100,000 to support the LIDAR data analysis portion of the project for a total in-kind match of \$600,000. Further, the USGS has already contributed \$400,000 for post El Niño LIDAR data collection in spring 2016. The USGS has invested over \$2.5 million of internal funds to date in the development of CoSMoS for the North-Central Coast,

San Francisco Bay, and South Coast of California.

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) as projects which:

- Improve management, conservation, and protection of coastal waters and ocean ecosystems
- Provide monitoring and scientific data to improve state efforts to protect and conserve ocean resources
- 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, including, but not limited to, the effects of sea-level rise, changes in ocean productivity, and ocean acidification on coastal and ocean habitat, wildlife, fisheries, chemistry, and other key attributes of ocean ecosystems and to increase the state's understanding of the ocean's role in carbon sequestration. Adaptive management strategies, planning, research, monitoring, or other activities shall be designed to improve the management of coastal and ocean resources or aid the state to adapt to climate change impacts

This proposed project will provide the scientific foundation for coastal managers and planners along the Central Coast to protect and conserve coastal resources and communities through using the CoSMoS model which projects climate-related coastal flooding and erosion, not only from sea-level rise (SLR) but also from short-term, dynamic coastal water levels (e.g., tides, storm surge, waves, river flows, seasonal water level anomalies), plus long-term changes to beaches and bluffs. This proposed project has the potential to improve the management of coastal waters and ecosystems through providing the best available science to allow decision-makers to assess the vulnerability of coastal ecosystems and communities to flooding and erosion in the Central Coast from 40 possible climate change scenarios using a state-of-the-art modeling system.

In addition, the *Our Coast, Our Future* online web viewer and tool allows coastal managers to implement effective adaptive management planning through developing responses to the range of future scenarios available on the *Our Coast, Our Future* viewer. This project will promote coordination among coastal planners and managers by delivering a single, robust and consistent methodology and set of maps, as well as an online tool, for assessing coastal vulnerability to climate change from the Mexican border to Pt. Arena, including all coastal embayments and harbors.

CONSISTENCY WITH THE OPC'S STRATEGIC PLAN:

This project implements Focal Area A: Science-based decision making and Focal Area B: Climate

change. This project will improve decision-making through developing a regionally-specific, comprehensive model for the Central Coast which will provide the best available science for coastal managers and planners to analyze various climate impacts on the coastline. Further, this project will allow for coastal managers and planners to use an intuitive online tool to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms. This project will prepare for and reduce harmful impacts of climate change on coastal development and infrastructure, public health and safety, the economy, and ecosystems by encouraging adaptation to climate change and engaging decision makers at all levels of government.

Specifically, this project will develop the CoSMoS model for the Central Coast, update coastal change rates statewide that feed into the CoSMoS model, and extend the *Our Coast, Our Future* online viewer to include the Central Coast. This project will inform coastal management decisions regarding climate related impacts such as sea-level rise and erosion, as well as inform cities and counties in their development of sea-level rise and climate adaptation strategies that protect people, infrastructure, and natural lands.

CONSISTENCY WITH PROPOSITION 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006; Public Resources Code §75060(g))

This project is consistent with the purposes outlined in Proposition 84, specifically it includes the development of scientific data needed to adaptively manage the state's marine resources and reserves. This project develops the CoSMoS model for the Central Coast, which projects coastal flooding and erosion from sea-level rise, tides, storm surges, waves, river flows, and seasonal water level anomalies, as well as long-term changes to beaches and bluffs. This project would also update statewide sandy beach and bluff erosion rates (short and long-term) through interpreting LIDAR topographic data from the 2015-2016 El Niño impacts. This data will allow coastal planners and managers to adaptively manage the state's coastal resources.

CONSISTENCY WITH THE OPC'S GRANT PROGRAM FUNDING GUIDELINES:

The proposed project is consistent with the OPC's Grant Program Funding Guidelines for Proposition 84 funds, in the following respects:

Required Criteria

1. Directly relate to the ocean, coast, associated estuaries, or coastal-draining watersheds:
This project directly relates to the coast and associated estuaries because it develops sea-level rise and storm modeling, including 40 flooding scenarios integrated with long-term coastal change and vertical land motion for Central California, that will be useful for coastal managers when planning and adapting to climate impacts on the coast. Coastal managers and planners can use the Our Coast, Our Future online viewer to facilitate their decision-making.
2. Support of the public: *See Exhibit A*

3. Greater-than-local interest: *This is a region-wide model for the Central Coast of California. Upon completion of this project, the CoSMoS model will be available from Pt. Arena to the Mexican border. The coastal change rates will be updated statewide and will feed into the CoSMoS model's coastal change projections and related flooding projections, as well as serve to validate storm impacts modeling. The Our Coast, Our Future viewer will be extended to include the Central Coast of California.*

Additional Criteria

4. Improvements to management approaches or techniques: *The CoSMoS model incorporates other important considerations for climate vulnerability assessments, in addition to sea-level rise, such as the effect of waves, storms, tides, river flows, and seasonal water level anomalies. CoSMoS also incorporates long-term changes to beaches and bluffs. USGS will also develop a socioeconomic web tool for the Central Coast. This will allow Central Coast planners to pair a climate vulnerability assessment, informed by the CoSMoS model, with socioeconomic information in order to make informed coastal management decisions. An locally relevant, online tool will allow coastal managers to visualize and plan for vulnerabilities related to sea-level rise and storms.*
5. Leverage: *See the "Project Financing" section above*
6. Timeliness or Urgency: *Many cities and counties are in the process of updating their Local Coastal Programs (LCPs) in order to guide short- and long-term conservation and use of coastal resources in their coastal zone. This project would make the CoSMoS model and Our Coast, Our Future tool available and applicable to Central Coast cities and counties. USGS and Point Blue have developed CoSMoS and Our Coast, Our Future, respectively, for other regions of the state in a timely manner and have the capacity and knowledge to develop them for the Central Coast.*
7. Coordination: *OPC, a state agency, will support USGS, a federal agency, to develop the CoSMoS model for the Central Coast and to update the coastal change rate statewide. USGS will coordinate with Point Blue to conduct further outreach to spread awareness and conduct trainings on how to use the best available science and associated online viewer. Local cities and counties will use the Our Coast, Our Future viewer, which is based on the CoSMoS model, to develop their Local Coastal Program (LCP) updates, climate vulnerability assessment and adaptation plans.*

COMPLIANCE WITH CEQA:

The proposed projects are not 'legal projects' that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378. If it were determined to be a 'legal project' under CEQA, the 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. Staff will file a Notice of Exemption upon approval by the OPC.