

## COASTAL CONSERVANCY

Staff Recommendation  
June 20, 2013

### COASTAL STORM MODEL FOR SOUTHERN CALIFORNIA

Project No. 13-007-01  
Project Manager: Moira McEnespy

**RECOMMENDED ACTION:** Authorization to disburse up to \$300,000 to the U.S. Geological Survey and the University of Southern California Sea Grant Program to provide a coastal storm model to support coastal hazard and sea level rise vulnerability assessments in the Southern California area.

**LOCATION:** Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties

**PROGRAM CATEGORY:** Climate Change

---

#### **EXHIBITS**

- Exhibit 1: [Project Location Map](#)
- Exhibit 2: [Schematic of Model Approach](#)
- Exhibit 3: [Example of Model Application](#)
- Exhibit 4: [Project Letters](#)

---

#### **RESOLUTION AND FINDINGS:**

Staff recommends that the State Coastal Conservancy adopt the following resolution pursuant to Sections 31111 and 31113 of the Public Resources Code:

“The State Coastal Conservancy hereby authorizes disbursement of up to \$300,000 to the U.S. Geological Survey and the University of Southern California Sea Grant Program to develop a coastal storm model to support coastal hazard and sea level rise vulnerability assessments in the Southern California area.”

Staff further recommends that the Conservancy adopt the following findings:

“Based on the accompanying staff report and attached exhibits, the State Coastal Conservancy hereby finds that:

1. The proposed authorization is consistent with the purposes and objectives of Chapter 3 of Division 21 of the Public Resources Code regarding addressing the potential impacts of climate change on coastal resources.

2. The proposed project is consistent with the current Project Selection Criteria and Guidelines.
3. The University of Southern California is an organization existing under Section 501(c)(3) of the Internal Revenue Code, and whose purposes are consistent with Division 21 of the Public Resources Code.”

---

**PROJECT SUMMARY:**

Staff recommends that the Conservancy authorize disbursement of up to \$300,000 to the U.S. Geological Survey (USGS) and the University of Southern California (USC) Sea Grant Program to develop a coastal storm model to support coastal hazard and sea level rise vulnerability assessments in the Southern California area (See Exhibit 1).

**Need and Approach:** The National Research Council’s 2012 report *Sea-level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* confirms that California has already seen sea levels rise and is likely to see significant increases in sea level over the next century. The report also concludes that over the next several decades the most significant impacts will come from the combined effects of sea-level rise and storms, “...particularly the confluence of large waves, storm surges, and high astronomical tides during a strong El Nino.”<sup>1</sup> Critical state infrastructure is at risk, such as roads, hospitals, schools, emergency facilities, wastewater treatment plants, and power plants, as well as wetlands and other natural systems. The cost of replacing property at risk of coastal flooding under a 1.4 meter sea-level rise (SLR) scenario could reach \$100 billion (in year 2000 dollars).<sup>2</sup>

Comprising Ventura, Los Angeles, Orange, and San Diego counties, the South Coast is a vast and populous region that contains much of this critical infrastructure (airports, road systems, passenger rail systems, ports, power plants), as well as numerous national and state parks, tourism-generating beaches, and heavily-urbanized population centers.<sup>3</sup> As a result of sea-level rise, 45 percent more land in Los Angeles County, 40 percent more land in San Diego County, 35 percent more land in Ventura County, and 28 percent more land in Orange County will be vulnerable to 100-year floods.<sup>4</sup>

A recurring theme in reports on climate adaptation is that planning must occur at local and regional scales.<sup>5</sup> Many communities in the South Coast region have begun identifying

---

<sup>1</sup> El Nino events of 1982 and 1997 caused temporary increases in sea level that, combined with storm surges, caused significant coastal flooding and erosion; these impacts will likely be amplified as sea level rises.

<sup>2</sup> *The Impacts of Sea-level Rise on the California Coast* (A paper from the California Climate Change Center, prepared by The Pacific Institute, May 2009), funded in part by the Ocean Protection Council.

<sup>3</sup> The South Coast region supports a population of 16,747,468 according to the U.S. Census Bureau in 2010.

<sup>4</sup> [Cal-Adapt](#) projections under a 55-inches by 2100 scenario, on p. 86 of the *California Adaptation Planning Guide, Understanding Regional Characteristics* (California Emergency Management Agency and the California Natural Resources Agency, July 2012).

<sup>5</sup> See the following examples: (1) The “Ocean and Coastal Resources” chapter of the *2009 California Climate Adaptation Strategy* recommends support for regional and local planning to address sea-level rise impacts; (2) the March 2011 Ocean Protection Council resolution on sea-level rise states support for development of regional sea-level rise adaptation plans; (3) the 2009 Pacific Institute study concludes that local governments or regional planning agencies should conduct detailed studies to better understand the potential impacts of sea-level rise in their communities; (4) the 2012 *California Adaptation Planning Guide* prepared by the California Emergency

vulnerabilities related to a changing climate, and have started adaptation planning processes. For example, the City of Los Angeles is leading a climate change preparedness effort called “Adapt-LA.” Potential SLR vulnerabilities are being identified using an early version of a USGS coastal storm model (sometimes referred to as “CoSMoS 1.0”) that is based on a single large storm in 2010. In another example, a SLR adaptation strategy for San Diego Bay<sup>6</sup> was prepared; although it factored in storm surge, it did not account for bathymetry and the effects of wave run-up, erosion, precipitation, and riverine flooding.

Various climate change-related planning efforts, such as Adapt-LA, are already underway, led by organizations such as the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC), the Tijuana River National Estuarine Research Reserve (TRNERR), the San Diego Foundation (SDF), the Port of San Diego, the south coast region of the Department of Fish and Wildlife, and the National Parks Service. Those working on these efforts have been considering the need for better region-specific tools to help agencies and communities make informed planning decisions.

In response to this need, Coastal Conservancy staff has helped facilitate further development of a coastal storm model (CoSMoS) for Southern California by identifying potential partners, users, and needs, and by leading discussions to develop the most useful approach. CoSMoS will support coastal hazard and sea-level rise vulnerability assessments that can underpin a range of planning decisions and adaptation strategies. Results will be available for communities from Point Conception to the U.S.-Mexican border, including the Channel Islands and coastal embayments.

CoSMoS is also intended to support the upcoming grant round funded by the Ocean Protection Council (OPC) for Local Coastal Program updates, and there will be close coordination with Coastal Commission staff throughout model development.

**Potential South Coast Applications:** The proposed model will potentially be useful in the following efforts started or anticipated to date:

- Adapt-LA: Adapt-LA used CoSMoS “1.0” to develop preliminary SLR vulnerability assessments for the City of Los Angeles. As the Adapt-LA process moves into identification of appropriate adaptation strategies for the identified vulnerabilities, it would benefit from the more sophisticated CoSMoS “2.0” model on which to base its engineering studies.
- A Greater LA: LARC may adopt the Adapt-LA process for a regional climate action plan for the Greater L.A. region. Sophisticated coastal impacts modeling, such as from CoSMoS 2.0, will bolster this effort.
- Tijuana River Valley: The TRNERR may use the model to conduct a climate change vulnerability assessment and design an adaptation strategy for the Tijuana River Valley which encompasses the Tijuana Estuary, one of the last intact coastal wetlands in

---

Management Agency and the California Natural Resources Agency is structured to provide guidance at the local and regional scale.

<sup>6</sup> *Sea Level Rise Adaptation Strategy for San Diego Bay* (Prepared by ICLEI-Local Governments for Sustainability for the project’s Public Agency Steering Committee, with support of The San Diego Foundation and the Tijuana River National Estuarine Research Reserve Coastal Training Program, January 2012).

southern California. This effort is supported by NOAA's Coastal and Ocean Climate Applications program, and is one of two focal areas across the National Estuarine Research Reserve system.

- San Diego: Coastal cities and others may use the model to conduct vulnerability assessments on the outer coast; the Port, the SDF, and surrounding cities may use the model to update the adaptation strategy for San Diego Bay.
- Local Coastal Program (LCP) Updates: Local governments may use the model to update LCPs, particularly in conjunction with the \$2.5M OPC-funded competitive grant round to help local governments plan for adaptation to SLR and associated climate change impacts along the open coast of California.
- California Department of Fish and Wildlife (CDFW): CDFW is planning to use the model to conduct exposure and vulnerability assessments of listed and rare coastal plants, and ultimately to develop and prioritize conservation strategies.
- National Parks Service (NPS): The NPS may use the model to support planning for Channel Islands National Park and Cabrillo National Monument, particularly to identify potential risks to critical habitat for intertidal communities, sea and shore birds, and pinnipeds, archaeological sites subject to erosion, and some infrastructure.
- Supplement to FEMA Flood Insurance Rate Map (FIRM) Updates: The model could be used by communities who want to build on FEMA's current FIRM update process by planning for a broader range of flood scenarios that take into account future climate change and SLR.

**Project Details:** Model development will be led by Dr. Patrick Barnard at USGS and will take into account various SLR scenarios, physical factors (e.g., tides, wind, waves, fluvial discharge), shoreline change, fluvial input, and the latest global climate models. Model conditions (e.g., waves, wind, atmospheric pressure) and inputs (global climate models) will be specifically selected for and downscaled to the southern California region. Exhibit 2 provides a schematic of the model approach. Exhibit 3 shows an example of results in the northern California area using the CoSMoS method, which takes into account physical factors and SLR, versus the "bathtub" method. USGS will work with other scientists and agencies such as NOAA Coastal Services Center, Scripps, UCLA, UCSC, OSU, PRBO, ESA-PWA, and Deltares. Modeling will be carried out in two phases:

- Phase I will combine a worst-case storm scenario (the 100-year storm event) with a range of plausible SLR projections for 2100 (e.g., 0.5m, 1.0m, 1.5m, and 2.0 m). Results in the form of kmz and ArcGIS files will be available by December 2014, and will allow communities and local governments to get started with their planning processes. Phase I is the subject of this authorization request.
- Phase II will develop more robust and refined results, and will provide a full user interface by July 2015.

It will be possible to add other options and modules after Phase II, if desired by communities and resource managers, such as for tidal marsh evolution and socioeconomic impacts.

The USC Sea Grant Program will ensure the model meets user needs and effectively supports policy and planning decisions. The Sea Grant Program has a long history of conveying complex information to the public and to users at all levels of government, as part of its mandate to fund relevant science and to make sure that information coming from the science community is accessible for policy and management. Conservancy staff, TRNERR staff, and others will participate in the outreach programs, which work most effectively when partnerships and collaborations are put into place, especially in a region as vast and densely-populated as Southern California. The Sea Grant Program has already partnered with the NERRs programs on the west coast (most notably, Tijuana River) to develop and manage workshops on SLR adaptation. The Sea Grant Program, the OPC and the TJNERR, for example, recently collaborated on the “Beyond Bathtub” workshop to work with users on understanding the different models now being used for SLR adaptation planning, and the Sea Grant Program worked with local governments through the South Bay Council of Governments to bring NOAA-led SLR adaptation training to local communities.

Development of Phase I is the subject of this authorization request; Conservancy staff will work with partners to raise funds to complete Phase II.

**Grantee and Contractor Appropriateness and Qualifications:** The Conservancy proposes contracting with **USGS** through an intergovernmental agreement whereby USGS will provide model development services to the Conservancy. USGS is committed to developing tools to help coastal communities anticipate and adapt to change.<sup>7</sup> Under its “natural hazards” mission area, USGS provides scientific information and tools to ensure that decisions about land and resource use, and future development in the coastal zone and adjacent watersheds can be evaluated with a complete understanding of the probable effects of hazards on coastal ecosystems and communities. Under its “climate and land use change” mission area, USGS recognizes that understanding onshore and nearshore impacts of global change is crucial to people who live in or are dependent on services of coastal regions. Dr. Patrick Barnard will be the lead scientist in developing the CoSMoS model, and he has extensive experience in developing research tools to assess the physical impacts of SLR and climate change, including coastal storm models, at many regional levels.<sup>8</sup>

In addition, the Conservancy proposes making a grant to the **USC Sea Grant Program** to support its purpose of connecting science to policymakers, particularly under its “hazard resilient coastal communities” focal area. The Sea Grant Program seeks to use its integrated research, training, and technical assistance capabilities, and its presence in coastal communities, to play a major role in helping local citizens, decision-makers, and industries plan for hazardous events and optimize the ability of their communities to respond and rebuild. The USC Sea Grant Program has been extensively involved in working with local and state governments to help coastal managers adapt to the impacts of climate change.<sup>9</sup> Principals who helped implement the Adapt-LA process, Phyllis Grifman and Dr. Juliette Hart, will also guide the communications

---

<sup>7</sup> [http://www.usgs.gov/start\\_with\\_science/](http://www.usgs.gov/start_with_science/)

<sup>8</sup> Research bio: <https://profile.usgs.gov/pbarnard>. Examples: (1) Project leader, *Climate Change Impacts to the U.S. Pacific and Arctic Coasts* study (USGS, Pacific Coastal and Marine Science Center); (2) Our Coast Our Future (<http://data.prbo.org/apps/ocof/>).

<sup>9</sup> <http://www.usc.edu/org/seagrant/research/climatechange.html>

component of the CoSMoS effort. Nonprofit status has been conferred on the USC, making the USC Sea Grant Program an appropriate grantee under the Conservancy’s enabling legislation.

The Conservancy has built very successful partnerships with both USGS and the USC Sea Grant Program, most notably in developing, staffing, and administering OPC-funded seafloor mapping and research rounds—projects in which state investment sought to bring the best available science to support resource and planning decisions.

**Site Description:** Coastal communities from Point Conception to the U.S. border with Mexico, including the Channel Islands and coastal embayments.

**Project History:** The proposed project was developed in response to a need identified by local, regional, state, and national organizations and agencies (see “Need and Approach” section above). Conservancy staff filled a coordination role, and helped facilitate development on a south coast regional scale.

**PROJECT FINANCING**

<b>Coastal Conservancy</b>	<b>\$300,000</b>
USGS <sup>1</sup>	52,500
California Department of Fish and Wildlife	20,000
Tijuana River National Estuarine Research Reserve	5,000
<i>Amount needed<sup>2</sup></i>	<i>235,400</i>
<b>TOTAL<sup>3</sup></b>	<b>612,900</b>

<sup>1</sup>USGS cash match for travel and model/data subcontracts; significant in-kind support is listed below.

<sup>2</sup>Note that Conservancy funds will not be encumbered until the remaining funds necessary are secured.

<sup>3</sup>\$574,800 for USGS-led portion; \$38,100 for USC-SG portion.

The anticipated source of funds is an appropriation to the Conservancy from 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 these funds to protect beaches, bays, and coastal waters and watersheds (Section 75060 of the Public Resources Code). Consistent with this authorization, the proposed project will protect coastal resources by developing a region-specific coastal storm model that will enable coastal communities to assess potential impacts from SLR and climate change, and develop plans based on the best available science. In addition, Section 75060(b) of the Public Resources Code specifically allocates funding to the Conservancy for expenditure pursuant to the Conservancy’s enabling legislation, Division 21 of the Public Resources Code. As discussed in the section found immediately below, the project is consistent with Section 31113 of Division 21 of the Public Resources Code.

There will also be significant in-kind contributions:

- USGS: Staff time in the amount of \$346,291.
- USC Sea Grant Program: Staff time in the amount of \$6,564; coverage of approximately one-third of travel, and materials for workshops.
- TRNERR: Staff time to help ensure model results are integrated into various ongoing planning and assessment efforts, particularly as they relate to the Tijuana River Valley

and work under a Science Collaborative grant from NOAA; support as needed from the Coastal Training Program.

- Coastal Commission: Staff time to ensure model development is consistent with Local Coastal Program grant round and other needs.
- National Park Service: Travel to/from and lodging on the Channel Islands if field work is necessary; NPS field staff assistance; data from various GIS databases (geology, shoreline, etc).

### **CONSISTENCY WITH CONSERVANCY'S ENABLING LEGISLATION:**

The proposed project would be undertaken pursuant to Sections 31111 and 31113 of the Public Resources Code.

Section 31111 authorizes the Conservancy to fund and undertake plans and feasibility studies, and to award grants to public agencies and nonprofit organizations for these purposes. Consistent with this section, the proposed project involves the Conservancy disbursing funds to USGS via an intergovernmental agreement to develop a coastal storm model, and granting funds to the USC Sea Grant Program, a program within a nonprofit organization, to convey the model's findings to potential users. The model will support coastal hazard and sea level rise vulnerability assessments in the Southern California area.

Section 31113(a) authorizes the Conservancy to address the potential impacts of climate change on resources within its jurisdiction, and undertake projects that address extreme weather events, sea level rise, storm surge, beach and bluff erosion, flooding, and other coastal hazards that threaten coastal communities, infrastructure, and natural resources. Consistent with this section, the proposed project will allow the Conservancy to draw upon the scientific resources of USGS to help coastal communities address the potential impacts of climate change on coastal resources by developing a region-specific coastal storm model that will use the best available science to help assess potential impacts. The model will take into account physical factors such as tides, wind, waves, and fluvial discharge; shoreline change; fluvial input; and the most current global climate models.

Section 31113(b) enables the Conservancy to award grants to public agencies and nonprofit organizations for activities authorized pursuant to Section 31113(a), prioritizing projects that, among other things, maximize public benefits. Consistent with this section, the Conservancy will grant funds to the USC Sea Grant Program, a program within a nonprofit organization, to ensure the coastal storm model meets user needs and effectively supports policy and planning decisions.

### **CONSISTENCY WITH CONSERVANCY'S 2013 STRATEGIC PLAN GOAL(S) & OBJECTIVE(S):**

Consistent with **Goal 7** of the Conservancy's 2013-2018 Strategic Plan, the proposed project seeks to enhance the resiliency of coastal communities and ecosystems to the impacts of climate change. Consistent with **Goal 7 Objective A**, the proposed project involves cooperating with public agencies, universities, and others to identify significant climate-related threats (particularly from SLR combined with storm surge) and provide technical assistance to assess this threat and prepare appropriate adaptation strategies. Consistent with **Goal 7 Objective B**, the proposed project will provide a coastal storm model that will enable communities to conduct

regional vulnerability assessments from SLR and extreme storm events, and develop adaptation strategies to address threats to communities, public infrastructure, and natural resources.

**CONSISTENCY WITH CONSERVANCY'S  
PROJECT SELECTION CRITERIA & GUIDELINES:**

The proposed project is consistent with the Conservancy's Project Selection Criteria and Guidelines, last updated on November 10, 2011, in the following respects:

**Required Criteria**

1. **Promotion of the Conservancy's statutory programs and purposes:** See the "Consistency with Conservancy's Enabling Legislation" section above.
2. **Consistency with purposes of the funding source:** See the "Project Financing" section above.
3. **Support of the public:** The proposed project is supported by many communities and collaboratives in the south coast region (see the "Project Summary" section, above, and Exhibit 4).
4. **Location:** The proposed project would be relevant for locations within the coastal zone from Point Conception to the U.S.-Mexican border.
5. **Need:** The work proposed under this authorization requires state-of-the art modeling which exceeds the funding capacity of local and regional planning efforts. Therefore, the Conservancy's funds and larger jurisdiction are necessary in order to provide a model that will meet all potential users' identified needs.
6. **Greater-than-local interest:** The proposed project will serve communities from Point Conception to the U.S.-Mexican border.
7. **Sea level rise vulnerability:** The proposed project will develop a coastal storm model for use within the south coast region that combines a worst-case storm scenario (the 100-year storm event) with a range of plausible SLR projections for 2100. This model can be used to reduce vulnerability to sea-level rise along the entire south coast.

**Additional Criteria**

8. **Urgency:** Various vulnerability assessments, hazard assessments, and adaptation and other planning processes are already underway or planned in the south coast region. Furthermore, the OPC's LCP grant round is anticipated to start in mid-2013. It is therefore imperative to get the coastal storm model underway as quickly as possible to ensure that these efforts are based on the best available science.
9. **Resolution of more than one issue:** The results of a region-specific coastal storm model can underpin many different assessment and planning efforts, ranging from those focusing on infrastructure to public access to coastal habitat to population centers.
10. **Leverage:** See the "Project Financing" section above.
11. **Innovation:** The proposed project will result in a cutting-edge coastal storm model.
12. **Cooperation:** See the "Project Summary" and "Funding" sections, above.

**CONSISTENCY WITH CALIFORNIA COASTAL ACT POLICIES:**

The California Coastal Act states that each local government lying in whole or in part within the coastal zone shall prepare an LCP for that portion of the coastal zone within its jurisdiction. See Section 30500(a) of the Public Resources Code. LCPs are basic planning and regulatory tools used by local governments to guide development in the coastal zone, in partnership with the Coastal Commission. LCPs specify appropriate location, type, and scale of new or changed uses of land and water.

Impacts of climate change such as sea-level rise and increased storm frequency will affect existing property and infrastructure in the coastal zone. Therefore, LCP and other<sup>10</sup> coastal plan policies, ordinances and standards may need to be updated and revised as new information about the impacts of climate change is developed.

Consistent with the intent of Section 30500(a), the proposed project will develop a coastal storm model for use by entities in Southern California to capture the best available science in assessing vulnerabilities and hazards related to SLR, higher tides, and increased storm surge, and to ultimately update their LCPs and other coastal plans.

**COMPLIANCE WITH CEQA:**

The proposed project is categorically exempt from review under the California Environmental Quality Act (CEQA) pursuant to 14 California Code of Regulations Section 15306 because the project involves only 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.

---

<sup>10</sup> For example, Port Master Plans and University Long-range Development Plans.