CALIFORNIA OCEAN PROTECTION COUNCIL



ITEM 6

**MEMORANDUM**

TO: California Ocean Protection Council

FROM: Daniel Santillano, Ocean Protection Council

Manager, California Seafloor and Coastal Mapping Program

DATE: August 27, 2014

RE: Progress on implementing Issue 1, Task 1 from the OPC strategic plan: Improving the Use and Sharing of Scientific and Geospatial Information

## 1. Overview of Issue 1, Task 1

Members of the Ocean Protection Council (OPC) recently expressed interest in receiving regular briefings from staff on the progress in implementing the OPC's Five-Year Strategic Plan (2012-2017), A Vision for Our Ocean and Coast. To this end, the present staff report seeks to provide an update on progress in implementing a task within Issue Area 1: Science-Based Decision-Making. The stated goal of Issue 1 is to "*improve decision-making through use of best available science by state entities and agencies charged with ocean and coastal stewardship; and Capitalize on and leverage the scientific community to support management and policy directions*." Specifically, this report will cover Task 1: Improving the Use and Sharing of Scientific and Geospatial Information.

With respect to science-based decision-making, much of the focus of OPC staff time leading up to the OPC's Five-Year Strategic Plan (2012-2017) was in implementing AB 2125 passed by the legislature and signed into law in 2010. AB 2125 specifically called for the OPC to take the following actions:

(1) Assess the needs of California's public agencies to gather, manage, use, and share information and support tools;
(2) Increase the amount of baseline information available to agencies in a publicly accessible, electronic and geospatial format;
(3) Support the collaborative management and use of this information; and
(4) Identify and support the creation of decision-support tools that serve the state in implementing ecosystem-based management.

The benefit of improving the use and sharing of scientific and geospatial information is predicated upon having the most-relevant and highest quality information. To this end, the present staff memo will first discuss the California Seafloor and Coastal Mapping Program and then will discuss efforts to improve the use and sharing of information.

## 2. Progress on Mapping California's Coast and Seafloor

**California is poised to be the first large state in the Nation to comprehensively map its terrestrial coast and territorial waters** (from 10 meter elevation on land to 3 nautical miles offshore). This innovative project began with the OPC's commitment of $15 million in 2007, spurred largely by the need for mapping to inform the siting of marine protected areas (MPAs) under the Marine Life Protection Act (California Legislature, 1999). OPC staff was able to leverage OPC's initial investment with additional cash and in-kind contributions from the U.S. Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corp of Engineers, and the California Department of Water Resources (DWR). Active OPC contracts/grants (as of August 2014) are working to complete the bathymetric mapping of the San Francisco Bay and a small near-coastal gap near Camp Pendleton. We expect the data acquisition effort for the entire state (including San Francisco Bay) to be complete and accessible to California state agencies and the public by summer 2015.

**Elevation data will aid local, regional, and state planners to prepare for climate adaptation**

A large goal of the California Seafloor and Coastal Mapping Program (CSCMP) was to create a seamless elevation dataset of both the California coastal topography and its territorial waters (seafloor bathymetry). The coastal elevation data (i.e. topography) collected via plane through a remote-sensing technology known as Light Detection And Ranging (LiDAR), combined with seafloor elevation data collected via ship deployment and sonar technology (i.e. bathymetry) make up the seamless elevation dataset comprised of topography and bathymetry data, also known as OPC's Topo-Bathy dataset. Examples of how these bathymetry and topography data sets have been used by various state, regional, and academic entities are listed in Exhibit 1.

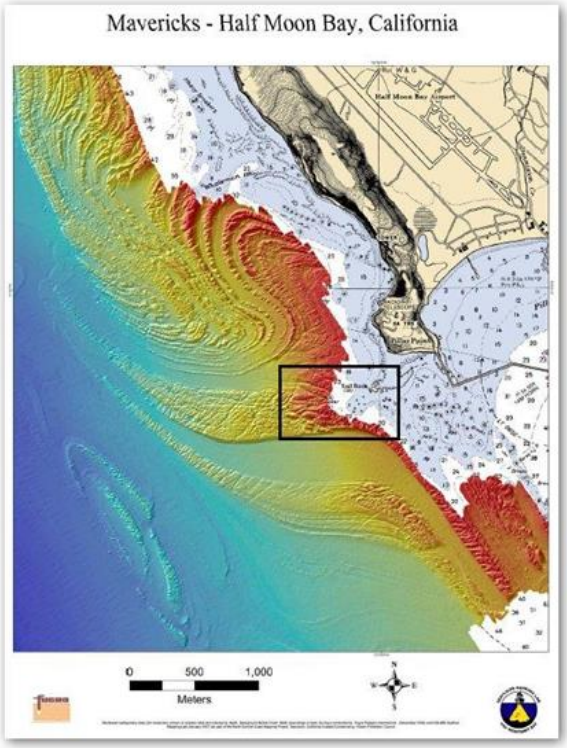
The integration of these two disparate datasets by an OPC-funded contractor was complex, but will increasingly be employed by a diverse audience to enable analyses and modeling of dynamic coastal phenomena (e.g. sea-level rise, beach erosion, earthquakes, etc.).

The mapping data has already changed the management of our ocean and coastal resources (see Appendix 1). For example, the NOAA Coastal Services Center's Sea Level Rise Viewer uses the data as the basis for visualizations of how sea-level rise will impact California's coastal communities. Marin County also integrated this data with other elevation data to update their countywide elevation dataset. On a more fun note, the seafloor data also revealed why the surfing break known as Mavericks near Half Moon Bay has such large waves during certain time of the year (see Figure 1, below)

**Figure 1**. The Mavericks, CA

Seafloor map showing a long narrow geologic ramp leading up to the Mavericks break (see black Box in the graphic to the right) off Half Moon Bay in Central California. Blue = deep water, Red = shallow water, White = break zone

(Geology Image: Seafloor Mapping Lab, CSU Monterey Bay)




In addition to the coastal and seafloor elevation data collected over the entire state, the OPC has funded USGS, the Moss Landing Marine Laboratory (MLML), and the California Geological Survey (CGS) to produce a variety of derivative products such as geology and habitat maps utilizing a combination of the OPC-funded bathymetry data, among other synthesized data sources. USGS has released, thus far, five publically available derivative maps for 5 of approximately 83 California coastal blocks located along the California coast and expects to release the remaining seafloor and coastal interpretive maps by fall 2015, which, when complete, will cover a total of approximately 30% of the California coast. The habitat maps are critical for monitoring of MPAs and for helping to understand the long effects of changing ocean chemistry. Marine geologic maps help regional, state, and federal partners to more effectively gauge marine fault dynamics and tsunami risk areas.

While the OPC's visionary decision to fund exciting and cutting-edge elevation and scientific derivative products, there continue to be opportunities to make the California Seafloor and Coastal Mapping Program even better:

- By late 2015, approximately 70% of California's coastal waters (of a total of approximately 83 coastal blocks) will still lack derivative products produced by our partners at the USGS. To improve this, the OPC is convening a stakeholder meeting in Santa Cruz at the USGS Pacific Research Center (October 23-24, 2014) to discuss how federal and state stakeholders imagine the future of the California Seafloor and Coastal Mapping Program (CSCMP).

## 3. Progress on Mapping California's Coast and Seafloor

The OPC and our partners have made significant progress in improving the use and sharing of scientific and geospatial information, including the seafloor and coastal data discussed above. Most notably, the OPC and the California Department of Technology launched the California Coastal Geoportal in September 2013. The Coastal Geoportal is a component of the California Geoportal that seeks to provide state agency staff and the public with a user-friendly website for finding and downloading high priority coastal and marine datasets, such as aerial photos, marine protected areas, and coastal habitats, with links to the data sources. Users can view the data on a map using the Coastal Geoportal Viewer (see Figure 2, below), and overlay multiple data layers to explore interactions between various data layers. The Coastal Geoportal also includes a list of tools and resources where one can discover other related data holdings and tools, including NOAA's Sea Level Rise Viewer (discussed above) and California's ocean observing data (e.g. CeNCOOS and SCCOOS).

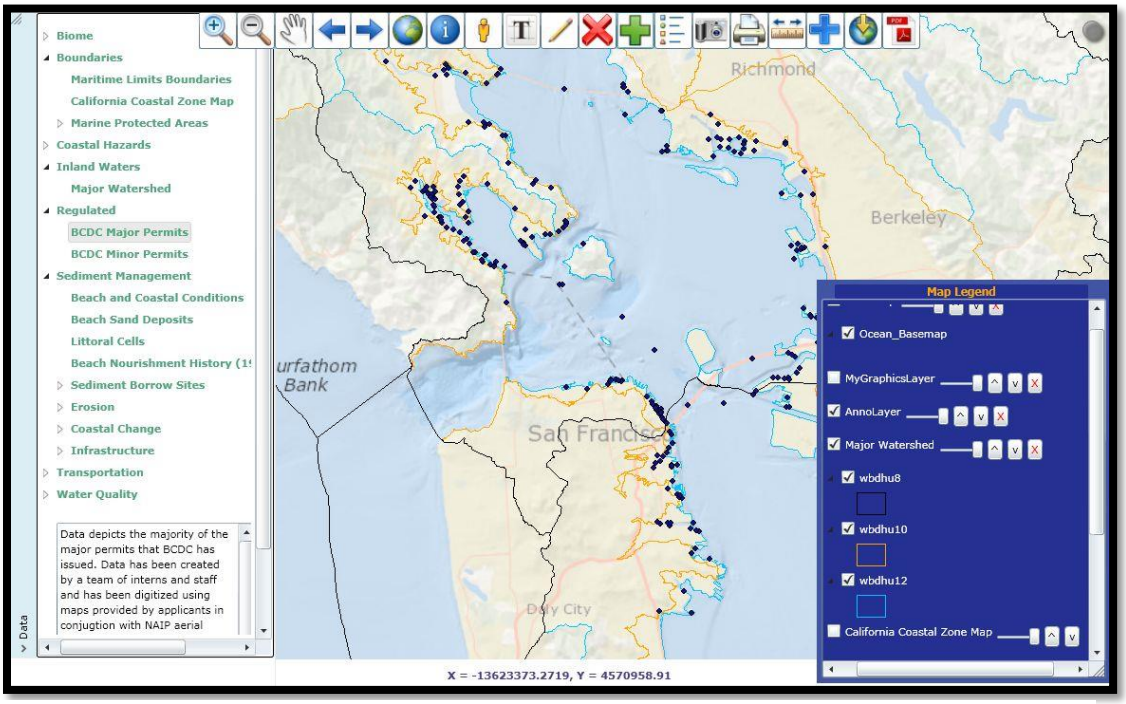



**Figure 2: Screen shot of the Coastal Geoportal Viewer (v. 1.0). Noted as dots are the locations SF Bay Conservation and Development (BCDC) major permits.**

OPC staff spent considerable time meeting with state agency end-users and beta testing the Coastal Geoportal before its public release last September. Staff have created various training videos and attended key conferences for the geospatial information community as a way to increase the use of the Coastal Geoportal.

In light of the fact that the Coastal Geoportal has been available to the public for almost one year, OPC staff believes that it is the appropriate time to query end-users on whether and to what extend they are using the Geoportal and what modifications can be implemented to make it a more useful tool. OPC staff is working with a group of state, federal, and NGO entities (known as the California Coastal and Marine Geospatial Working Group[1] to acquire such feedback. Once the necessary information regarding desired modifications is identified by the end-users, a second significant OPC effort to increase the use of the Calfiornia Coastal Geoportal will be developed by OPC staff for the Council's consideration.

Should you desire more detailed and specific information regarding the initiatives discussed above, please contact me at Daniel.Santillano@resources.ca.gov

[1] It should be noted that the California Coastal and Marine Geospatial Working Group has been instrumental in the development of the California Geoportal.

**Exhibit 1**. Projects using OPC-funded Shoreline Topography (LiDAR) and Seafloor Bathymetry Data

| *Project* | *Description* |
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| **Shoreline Mapping (LiDAR)** | |
| NOAA Coastal Services Center, Sea Level Rise and Coastal Flooding Impacts Viewer | High-resolution elevation data (LiDAR) were used to delineate mean high high water and to develop visualizations of how various levels of sea level rise will impact California's coastal communities. |
| FEMA, California Coastal Analysis and Mapping Projects | LiDAR data used in flood risk mapping of the effects of 1% annual chance flood event for existing flood hazards, including storm surge, wave run-up, overtopping, and overland wave propagation for coastal communities. |
| San Francisco Bay Conservation and Development Commission, Metropolitan Transportation Commission, and CalTrans; Adapting to Rising Tides | LiDAR used in analysis of alignment of shoreline protection features in project area to determine which sea level rise scenarios under evaluation would potentially overtop the shoreline. |
| Marin County, Updated Digital Terrain Model | LiDAR for coastal and San Francisco bay shoreline integrated with other LiDAR datasets to create countywide elevation dataset, and to derive natural and built landscape features. |
| UC Berkeley for California Energy Commission's California Climate Change Center, Impacts of Predicted Sea-Level Rise and Extreme Storm Events on the Transportation Infrastructure in the San Francisco Bay Region | LiDAR data use to complete an assessment of San Francisco Bay Area transportation networks and sea level rise |
| Trinity Associates, Humboldt Bay Shoreline Sea Level Rise Mapping | LiDAR used in GIS mapping and analysis of the artificial and natural shoreline conditions, and the vulnerability of adjacent land to sea level rise. |
| Coastal Ecosystems Institute of Northern California, Humboldt Bay Sea Level Rise Adaptation Plan | The project will complete a sea level rise vulnerability assessment and develop adaptation strategies based on high resolution elevation data to estimate flooding frequency in Humboldt Bay region due to the combination of sea level rise, high tides, storms, and shallow groundwater zone. |
| Salt River Ecosystem Restoration Project, Eel | LiDAR data for Eel River delta used in each of these restoration projects in hydraulic modeling to develop a suite of alternatives |

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| River Estuary Preserve Restoration Project, Ocean Ranch Restoration Project | for restoration of estuarine marshes. |
| Moss Landing Marine Lab, Center for Habitat Studies | LiDAR integrated with other datasets to create seamless onshore-offshore geology and seafloor habitat maps. |
| California Geological Survey | LiDAR used in various topographic analyses and displays, including surface hydrology modeling. |
| Golden Gate National Recreation Area | Aerial photographs taken during LiDAR collection used to map intertidal algae. |
| San Francisco Estuary Institute | High resolution elevation data used to map shoreline change in North San Francisco Bay and head-of-tide on SF Bay tributaries, and as a baselayer for mapping coarse sediment in flood control channels. |
| USGS Pacific Coastal and Marine Science Center, A Seamless, High-Resolution Digital Elevation Model (DEM) of the North-Central California Coast | LiDAR and bathymetry data were integrated to create a high resolution elevation model to support other analyses, including coastal inundation modeling as part of the Our Coast, Our Future project. |
| UC Berkeley, Modeling sea-level rise effects on tidal wetlands distributions in the San Francisco Bay | High resolution elevation model used to map predicted changes in marsh distribution over the next century in San Francisco Bay. |
| Ocean Imaging, North Central and South Coast MPA Baseline Monitoring | LiDAR used to improve intertidal and subtidal habitat classifications for project mapping seafloor habitats in and around newly established MPAs in North Central and South Coast regions. |
| Bureau of Land Management, California Coastal National Monument | LiDAR used to delineate offshore rocks with 12 nautical miles of shore that are part of California Coastal National Monument. |
| San Francisco Estuary Invasive Spartina Project | Invasive Spartina Project consultants are using the high resolution elevation data to assess appropriate elevations for re-vegetation projects. |
| San Francisco Bay Living Shorelines: Near-shore Linkages | High resolution elevation data being used to assess appropriate elevations for placement of intertidal oyster and eelgrass restoration treatments. |
| **Seafloor Mapping** | |
| Google, Google Ocean | Seafloor relief included in seamless depiction off California's coast in Google Earth |

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| ESRI, Ocean Basemap | Seafloor relief included in reference base layer for use in creating maps in internet map applications |
| CSU Monterey Bay, UC Santa Cruz, NOAA Southwest Fisheries Science Center | Various research projects on habitat suitability and predicted species distribution. |
| USGS Pacific Coastal and Marine Science Center, A Seamless, High-Resolution Digital Elevation Model (DEM) of the North-Central California Coast | LiDAR and bathymetry data were integrated to create a high resolution elevation model to support other analyses, including coastal inundation modeling as part of the Our Coast, Our Future project. |
| Monterey Bay Sanctuary Exploration Center | Seafloor mapping data used in exhibits to enable the public to explore the bottom of the ocean and learn about mapping technologies. |