



# **Marine Spatial Data The Cornerstone of Marine Spatial Planning**

**Environmental Law Institute  
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## **What is Marine Spatial Data?**

- **Seabed surveying to generate digital maps**
- **Oceanographic measurements**
- **Coastal Zone surveying and analysis**
- **Digital Data Base to generate maps, Google Earth/Ocean images**
- **Undersea Visualization in a digital domain**

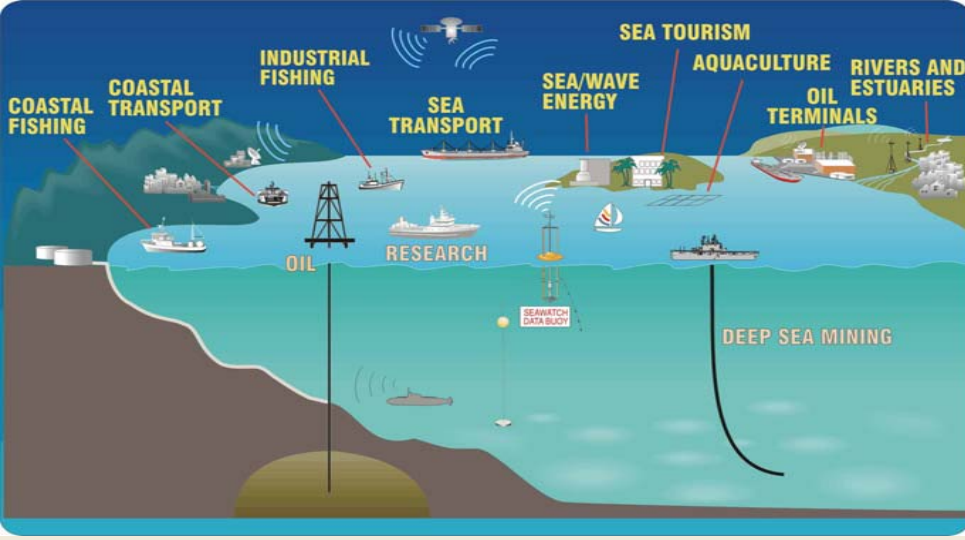


## **How does Marine Spatial Data support Marine Spatial Planning?**

**“The need is essentially a land use planning effort in the coastal waters, to survey and ultimately generate maps of existing resources and usage, and use this as a basis to sort out where things should and should not be allowed, to avoid ‘conflicting uses.’”**

**“In order to Manage something, you must to be able to measure it”**

# What's a typical day, today?



- **Navigational safety issues**
  - Shipping lanes, ferry routes
  - Recreational boating/sailing
- **Impacts commercial fishing industry,**
  - Recreational fishing interests
- **Military use needs**

- **Recreation and tourism**

- Cruise industry, whale watching, eco-tourism, surfing, viewshed

- **Oil and gas production and exploration activities**

- **Offshore sand borrow areas**

- Beach replenishment/beach erosion

- **Fisheries habitats, Marine Protected Areas, Sanctuaries**

- **New and emerging uses:**

- Aquaculture, renewable energy (i.e. Windfarms), de-salination plants

- **Municipal waste disposal areas**

- **Native American subsistence and traditional-use areas**

- **Seabed cables:**

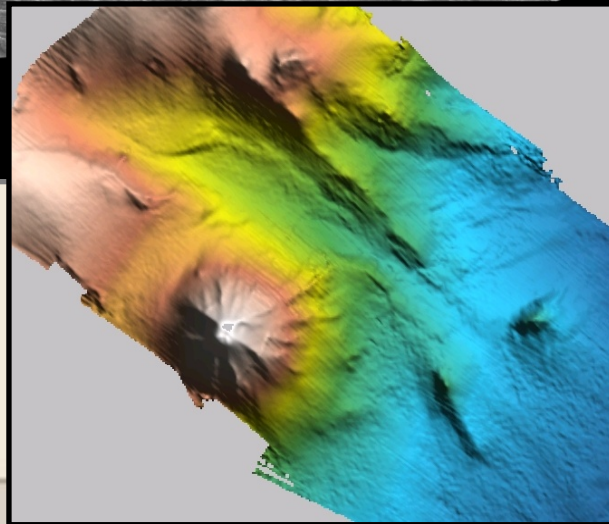
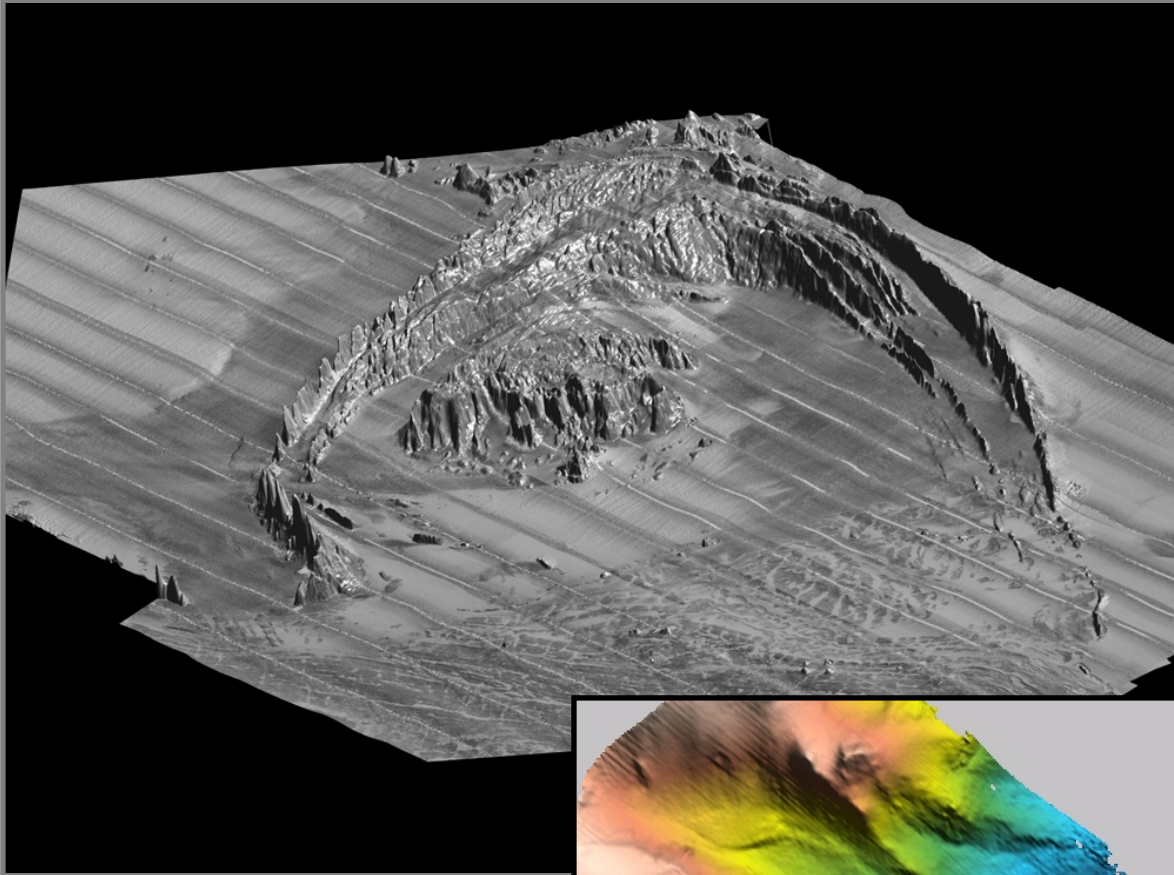
- Telecommunications, power and military

- **USACE projects**

- **Coastal Development; Liquid Natural Gas Facilities, housing, ports/ harbors**

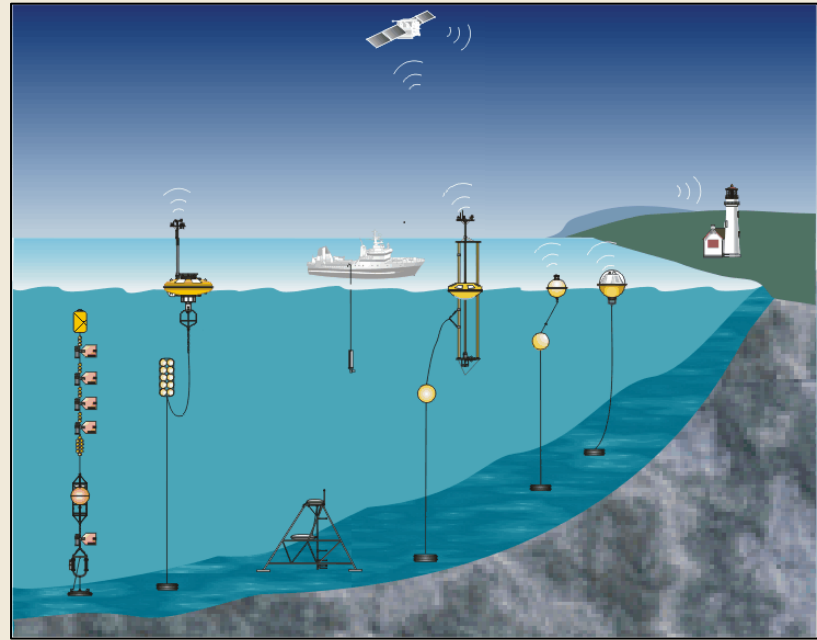


# MBES Seafloor Mapping Examples



## Measuring Metocean Conditions

- Current speed and direction
- Wind speed and direction
- Air and water temperature
- Water salinity
- CTD profiles
- Air pressure
- Tidal elevation
- Directional waves
- Tsunami early warning buoys





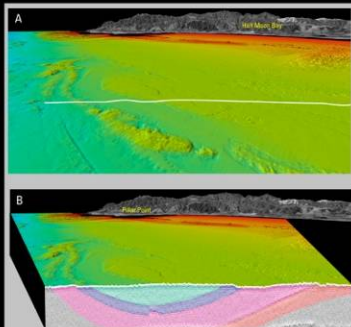
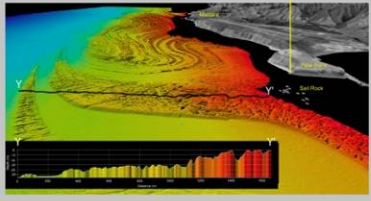
## California Mapping Project (CMP)

- Goal is to establish a Marine Spatial Data Base
  - Support the understanding of seabed conditions as listed previously
  - Specifically targeted for MPAs, Benthic Habitats, Sciences
  - Dozens of Stakeholders and end-users
- Partnership of Agencies (State and Federal), Academia and Industry
- Regional Applications
  - Meets the goals of the West Coast Governors' Agreement on Ocean Health
  - Supports the scientific studies of the California Current Large Marine Ecosystem (CCLME)
  - Includes coastal surveying to generate digital maps on climate change, sea-level rise, estuaries, flood-plain information

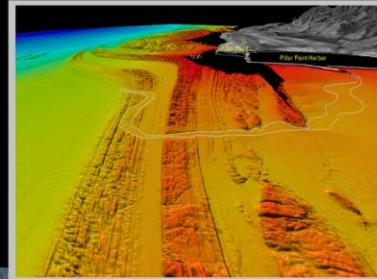


1.1 km. The vertical exaggeration of profile X-X' is about 5x.

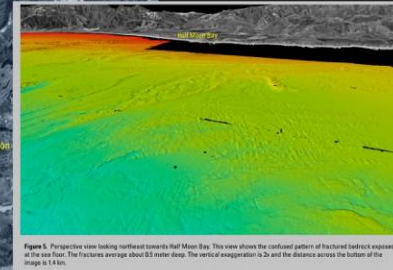
**Figure 2.** Aerial photograph and sea floor perspective view looking north over the Meares bank break offshore Pillar Point. The photograph shows the white water from the breaking waves west of Salt Rock while the perspective view shows a similar view with the water removed. Profile Y-Y' shows the undulating "hump" under the reef track. Water depths range from about 20 m at the western limit of rock outcrops to less than 5 m just west of Salt Rock. The vertical exaggeration of the perspective view is 2x and the distance across the bottom of the image is approximately 1.3 km. Profile Y-Y' has 5x vertical exaggeration. Aerial photograph downloaded from <http://calmap.usgs.gov>. bathymetry from <http://www.earthdata.nasa.gov>.



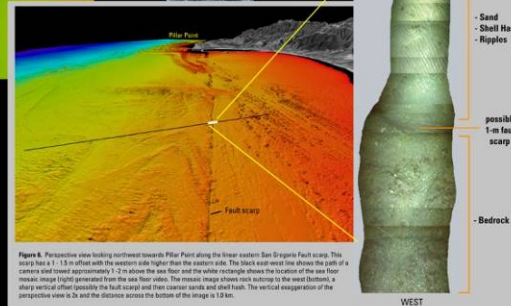
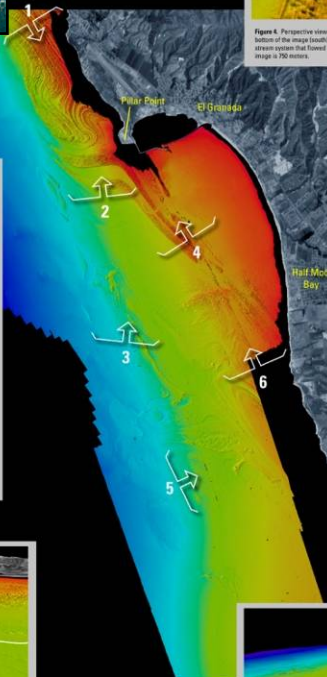
**Figure 3.** A) Perspective view looking north towards Pillar Point. The white line shows the seismic profile transect in 20. The vertical exaggeration is 1.2x and the distance across the bottom of the image is 1.1 km. B) The same view as A) converted to a block diagram combining the bathymetry with a seismic profile along a spindly structure. The bathymetry shows the elliptical shape of the spindly structure on the sea floor while the profile displays the sub-surface structure. Distinguishing four materials (color-coded from blue and red). The rough line along the bottom of the profile is a multiple or second reflection off the sea floor and is not a real sub-surface structure.



**Figure 4.** Perspective view looking northwest towards Pillar Point Harbor. Differentially eroded bedrock trends north to south at the bottom of the image (south) and trends to the left (west) offshore Pillar Point. The white lines outline a possible paleo-channel cut by a stream system that flowed during lower sea level stands. The vertical exaggeration is 2x and the distance across the bottom of the image is 790 meters.



**Figure 5.** Perspective view looking northeast towards Half Moon Bay. This view shows the confused pattern of fractured bedrock exposed at the sea floor. The terrain average about 23 meter deep. The vertical exaggeration is 2x and the distance across the bottom of the image is 1.4 km.



**Figure 6.** Perspective view looking northwest towards Pillar Point along the linear eastern San Gregorio Fault scarp. This block has a 1-1.5 m offset with the western side higher than the eastern side. The block top view shows the path of a camera and travel approximately 1-2 m above the sea floor and the white rectangle shows the location of the sea floor image (image height generated from the sea floor view). The block view shows rock outcrops to the west (bottom), a sharp vertical offset (opposite the fault scarp) and then coarse sands and shell fish. The vertical exaggeration of the perspective view is 2x and the distance across the bottom of the image is 1.0 km.

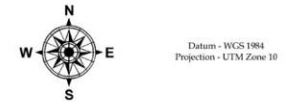


# Central California Mapping Project

## Half Moon Bay Sheet



### Map Information



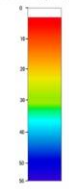
Datum - WGS 1984  
Projection - UTM Zone 10

### Map Sheet 5: Selected Perspective Views of Multibeam Bathymetry, Half Moon Bay, California Sheet

Bathymetry: Shaded relief image color-coded for depth from reds (shallow) to dark blues (deeper). The illumination azimuth is 300 degrees with an angle of 45 degrees from horizontal.

Land: Imagery generated by draping 10-m digital orthophoto quadrangles over 10-m digital elevation models (data from U.S. Geological Survey)

#### Water Depth (m)







U.S. has a history of successful, beneficial Scientific Exploration, which has resulted in notable national economic progress and advances in national defense.

On Land, President Jefferson was the drive behind the Lewis & Clark Journey of the Corps of Discovery

In Space, President Kennedy was the drive behind putting an American on the moon and the continuing breakthroughs in space exploration and commercial development

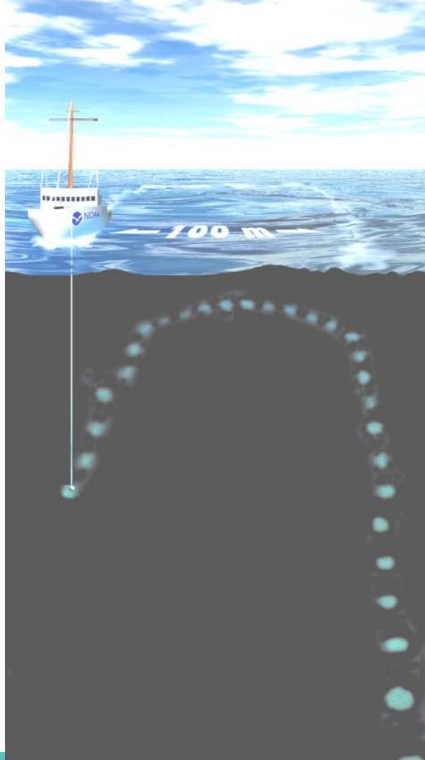
In the Oceans and Great Lakes, President Obama has now stated his drive to accomplish the same, and we now have the technology and the need to do so



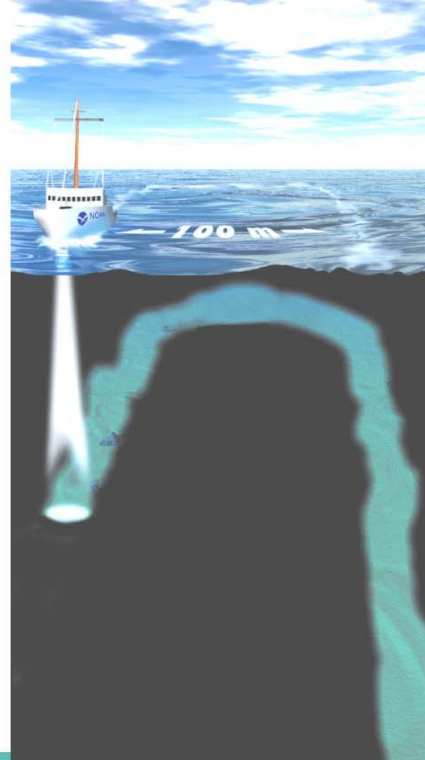
# QUESTIONS?

## Bottom Coverage Comparison by Survey Method

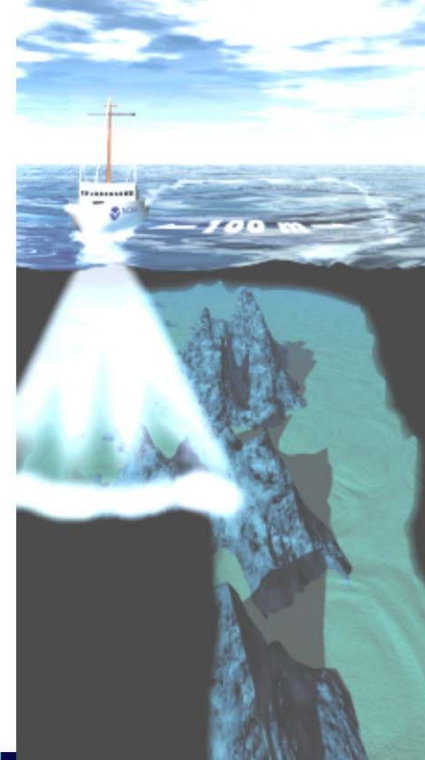
Leadline



Single Beam



Multibeam



Thank You  
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