

CHAPTER 2: ELEVATION/BATHYMETRY



Coordinator:
Henry Wolter
USGS National Mapping Division
hwolter@usgs.gov

Theme Description:

Elevation/Bathymetry refers to a spatially referenced vertical position above or below a datum surface. Elevation/Bathymetry data can be used as a representation of the terrain, depicting contours or depth curves and providing a three-dimensional perspective. The data can also be used for watershed management, watershed mapping, transportation planning and flood hazard mitigation and prevention. In addition, elevation data are often combined with other spatial data layers for regional hydrologic modeling studies.

There are many ways to represent elevation datasets. The standard product that United States Geological Survey (USGS) produces and uses is represented as a digital elevation model (DEM) collected in 30- or 10-meter grid spacing with coverage in 7.5 by 7.5 minute blocks.

Bathymetry, unlike its terrestrial counterpart, elevation, doesn't have National Mapping Standards. The National Oceanic and Atmospheric Administration (NOAA) is drafting metadata standards at this time.

Status:

The National Map Division of USGS (USGS/NMD) has completed 10-meter seamless DEMs, National Elevation Datasets for all the main Hawaiian Islands.

One of the priority initiatives for the Hawai'i Geographic Information Coordinating Council (HIGICC) is to coordinate the development of a seamless high-resolution digital elevation model (DEM) for the entire state. A high-resolution DEM will be produced using Light Detection and Ranging (LIDAR) technology.

The HIGICC intends to develop high-resolution elevation data in collaboration with the USGS National Elevation Dataset (NED) initiative. The proposed high-resolution dataset will meet (Federal Emergency Management Agency (FEMA) specifications for the Digital Flood Insurance rate Map (DFIRM) products, having a vertical resolution of 2 feet statewide. The data will also be incorporated in the USGS TNM (The National Map).

While the NGDC (National Geophysical Data Center) serves as a clearinghouse for Bathymetry data, much of the Bathymetry data collected has been on a project-by-project basis and has not been archived by NGDC. There is no coordinating body that has

identified priority-mapping needs for Hawai'i. There is no overall clearinghouse or coordinating body for Bathymetry Data. NOAA National Marine Fisheries Service (NOAA/NMFS) is in the process of establishing a clearinghouse for Bathymetry data using Arc/IMS.

Data Sources:

In Hawai'i, the primary source for 10-meter DEMs is the USGS. The HIGICC is coordinating with the USGS/NMD to post the USGS 10-meter DEMs to the HIGICC web site. (<http://www.higicc.org/>) The primary source for bathymetry data is NGDC (www.ngdc.noaa.gov) and NOS.

Standards:

FEMA Base Map Standards for new Digital Flood Insurance Rate Map (DFIRM) products – vertical RMSE of 18.5 centimeters; horizontal RMSE of 1 meter; and DEM point spacing of 5 meters. http://www.fema.gov/mit/tsd/mm_lidar.htm.

Federal Geographic Data Committee (FGDC), Geospatial Positioning Accuracy Standards, and Part 3: National Standard for Spatial Data Accuracy (NSSDA). See FGDC-STD-007.3-1998. http://www.fgdc.gov/standards/status/sub1_3.html.

Federal Geographic Data Committee (FGDC), Draft Standard for Digital Elevation Data. <http://www.fgdc.gov/standards/documents/proposals/prodigel.html>.

Priority:

The development of a high-resolution elevation and bathymetry dataset is a high priority for the HIGICC.

Estimated total investment in this theme:

The estimated *total* investment for elevation data is **\$350,000**. This is the amount that USGS/NMD has spent on the 30 & 10 meter DEMs.

There is no way to tell how much has been invested in bathymetry data. At this time it is estimated the NOAA has invested at least \$3 million in this data set for the main Hawaiian Islands and the Northwestern Hawaiian Islands.

Estimated current state and local contributions:

The State of Hawai'i, HIGICC has currently not budgeted any funds for the elevation dataset. NOAA plans to spend \$3 to \$6 million in the next 3 to 5 years for bathymetry datasets.

What is needed:

A coordinated approach by Federal, State, County, local and private partners, and the HIGICC, to identify all entities that will benefit from high-resolution elevation and bathymetry data and to develop a streamlined funding mechanism for the cost-share contributions.

What is the likely source:

U.S. Army Corp of Engineers
U.S. Federal Emergency Management Agency
U.S. National Oceanographic and Atmospheric Administration
U.S. Environmental Protection Agency
U.S. Department of Transportation
U.S. Department of Interior (USGS, United States Fish and Wildlife Service, National Parks Service) thru OMB Circular A-16
State of Hawai'i Planning Department
City and County of Honolulu
Maui, Hawai'i and Kauai Counties.

Total investments needed to complete this theme:

At 2 ft contours it will take about \$2,750,000 million to re-do the elevation data set for the Hawaiian Islands. (Note: This cost is exclusive of ground survey required, typically priced at \$2,000 per day: Deliverables are for bare earth Digital Elevation Models, DEM's. Pricing does not include mobilization and ferry cost, which could be significant for Hawai'i.

Possible ways to overcome this gap:

As part of the NED initiative, the USGS has developed a program of partnering with state governments to improve the quality of existing elevation data. This partnership could be to include FEMA.

Most appropriate data steward:

Elevation: USGS/NMD
Bathymetry: NOAA/NMFS

Maintenance Process:

As needed.

Estimated Maintenance cost: