Salt River from Summit to Seafloor
A Study of Shaded Relief Techniques for Coastal Environments

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Hartdale Maps, 2023
COASTAL MAPPING
SALT RIVER BAY
ST. CROIX, USVI
TOPOGRAPHIC CONTEXT

- The Wall
- Salt River Canyon
- Salt River Bay
- Mangroves
- Salt River
- Mon Bijou Settlement
GATHERING BATHYMETRIC DATA

Digital Coast: Data Access Viewer

Bathymetric Data Viewer

Keep Track of Zero

Bathymetric data typically uses mean-low-low-water (MLLW) for 0. Topobathy data, which combines land topography and bathymetry, typically uses mean-high-water (MHW) for 0.

Where there is a significant tidal range, there can be a large difference between the water line at MLLW vs MHW.
TOPOBATHY DATA

Topobathy data extent

An enlarged view of the topobathy data*

*For visual clarity, I will use a simple hillshade to represent a DEM throughout my presentation.
DEEPWATER BATHYMETRY OPTIONS

Early-2022 CUDEM download
Lower resolution but consistent.

Late-2022 CUDEM download
Better resolution in some areas but inconsistent across the project area.

Weighted Average
Raster calculator equation:
\[ \text{FINAL DEM} = \frac{66\% \text{DEM}_1 + 33\% \text{DEM}_2}{3} \]
CONSIDERING DEEPWATER LIGHT

Using multi-directional hillshades to emphasize shadows

Even though it is completely dark below 1000 meters, we still use the principles of light and shadow to depict the ocean floor.

By the time sunlight descends to about 200 meters, all but the indigo blues of the color spectrum have been absorbed.
Tom Patterson’s tutorial, “See the light: How to make illuminated shaded relief in Photoshop 6.0.”
www.shadedrelief.com/illumination/

DEEPWATER SHADED RELIEF
A Multi-Directional Approach Based on Tom Patterson’s Illuminated Shaded Relief Workflow

The azimuth:elevation of the five hillshades

PHOTOSHOP LAYERS
Stack of hillshade masking layers
DEEPWATER SHADED RELIEF

- **Hypsometric tint**
- **Adjusted hillshade**
- **Hypsometric tint**
- **Inverted hillshade**

**MASKED HYPsomETRIC TINT LAYER**
DEEPWATER SHADED RELIEF
Masked Layers Blended and in Place

200 meters ➔
High-energy system: 3-meter tides, moderate river flow and currents

Low-energy system: 30-centimeter tides, minimal river flow, reef-protected.
SHALLOW-WATER COLOR & STRUCTURES

Hillshades masking a grey-green layer

Layered with multiply blend mode
TERRESTRIAL SHADED RELIEF

Increasing the visual prominence of the tallest summit while yielding the dominant position in the visual hierarchy to the mangroves.
Hydro-flattening note:
USGS 3DEP DIGITAL ELEVATION MODELS

Hillshade showing hydro-flattened surface.
REPRESENTING WETLANDS

The Great Marsh shown with the classic wetland symbol.

Leveraging digital elevation models to represent the Great Marsh.
Cartographically, mangroves are one of the many types of wetlands that defy a clean hydrological boundary.
SALT RIVER BAY MANGROVES

1958 USGS topographic map

Alternate mangrove symbol
Datasets connected from seafloor to summit by form and color.