

# ENGINEERING CONSIDERATIONS DESIGN AND CONSTRUCTION



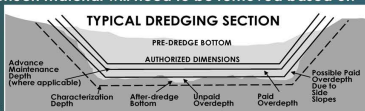
## DREDGING

Dredging equipment used to deepen or widen a channel is determined by many considerations, such as site characteristics including the type and location of sediments along a channel bottom. Dredging is simply the removal and disposal of materials necessary to provide the authorized depths and widths within a project footprint. Geotechnical surveys, additional field measurements such as bathymetric surveys, and modeling are critical components of the project design and analysis.

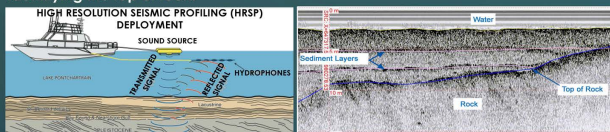
## GEOTECHNICAL CONSIDERATIONS & DATA GATHERING

- 1) **HYDROGRAPHIC SURVEYS** provide information about the characteristics of the channel bottom and offer insight into how much material will need to be removed based on existing conditions.

**BATHYMETRIC AND VOLUMETRIC SURVEYS** define the location of the channel bottom and the volume of material to be removed to meet project depths.

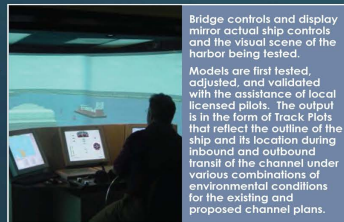


- 2) **SUB-BOTTOM PROFILING** uses powerful low frequency echo-sounders to map the subsurface layers of the ocean floor, river beds, or channel. The diagrams below illustrate sub-bottom data collection, as well as an example of a sub-bottom profile, identifying the top of rock.



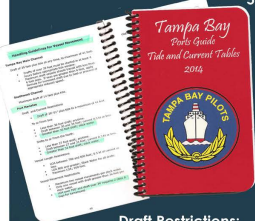
- 3) **CORE BORINGS** provide information about the character of sediments and rock underneath the ocean floor, river bed, or channel. Only limited information is currently available for Manatee Harbor and shows soft to firm sands, silty sands, clayey sands, clays, and silts. The sands are mostly fine to medium quartz with minor amounts of phosphate and varying amounts of shell. It is common for these materials to be interbedded with moderately weathered soft to hard sandstone, dirty limestone (marl), and hard-cemented silt. Testing of rock strength has not been completed. Rock strength greater than 5000 psi may require pretreatment and blasting.

- 4) **SHIP SIMULATORS** are used to:
  - Evaluate proposed modifications for improvements to navigation such as deepening and widening.
  - Portray currents, wind and wave conditions, shallow-water effects, bank forces, ship handling, ship-to-ship interaction and use of tug assistance.
  - Optimize the channel design for purposes of providing the safest and most efficient channel to construct and maintain.



- 5) **NAVIGATION GUIDELINES AND RESTRICTIONS** outlined in the 2014 Tampa Bay Pilots Ports Guide:

- Vessel length restrictions:**
- LOA between 700 and 800'; 0.5 kt of current or less.
  - LOA 800' and greater; slack water for all drafts.
  - Maximum LOA of 900'.
- Vessel movement restrictions:**
- Maximum 2-vessel movements per slack water.
  - Only 1 vessel with draft > than 36' per slack water.
  - LOA over 700 ft and draft over 34' requires 2 class A tugs for turnaround.



**Draft Restrictions:**  
Draft of 38' - 01" plus tide to a maximum of 41'.

**Draft and Current Restrictions - to or from the north:**

- < 27' draft, anytime
- Draft between 27 & 33'; current 0.3 kt or less.
- > 33' draft; slack water.

**Draft and Current Restrictions - to or from the Gulf:**

- < 30' draft, anytime.
- Draft between 30 & 35'; current 0.5 kt or less.
- > 35' draft; slack water.

**SLACK WATER** is a short period in a body of tidal water when the water is completely unstressed, and therefore no movement either way in the tidal stream, and occurs before the direction of the tidal stream reverses. In Manatee Harbor, this ~ 1-hour period occurs four times a day.

### LEGEND

- Manatee Harbor (Includes Existing Non-Federal Areas)
- Deepening & Widening of the Entrance Channel & Turning Basin (Existing Federal Channel)
- Non-federal Areas
- South Channel (Existing Non-federal Area; Separate Study Evaluating Channel for Federal Participation)
- 5 - 14: Berth locations

### CONTACT INFORMATION

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## DREDGING METHODOLOGIES

Various dredging methodologies can be employed to remove material based on its particular characteristics. Ultimately, the contractor will determine the combination of plant and equipment that will be used to accomplish the construction in the most efficient manner, and in accordance with environmental guidance.

### HYDRAULIC DREDGING



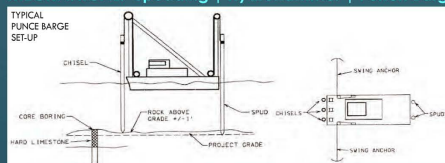
### MECHANICAL DREDGING



## PRETREATMENT OF ROCK

Rock pretreatment is necessary in order to remove rock with unconfined compressive strength greater than 5000 psi. Methodologies include:

**MECHANICAL:** Spudding | Hydrohammer | Punch Barging | Rigging | Dredging

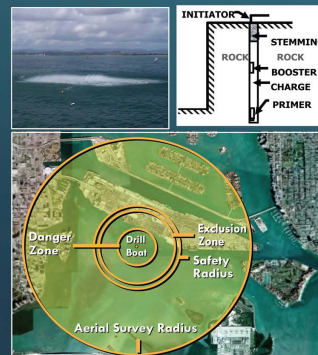


- Typically used in isolated locations of limited rock extent.
- Generally creates more sound and for a longer duration than confined blasting.

## CONFINED BLASTING

The borehole (the hole in which the explosive material is placed) is capped with inert material, such as crushed rock (stemming). Studies have shown that stemmed blasts have a greater than 90% decrease in the strength of the pressure wave released compared to unconfined blasts of the same charge weight.

**SAFETY MEASURES:** A confined blasting plan includes a complex array of safety measures including operations limited to a time of year when protected species are least likely to be in the project area; aerial and vessel-based observers to monitor marine species; fish scares; as well as regulated safety radii (pictured to the right) to protect marine species during blasting activity.



## POTENTIAL DISPOSAL OPTIONS

- Offshore Disposal (Tampa ODMDS)
- Existing Dredged Material Management Area
- Beneficial Use of Dredged Material (e.g., fill dredge holes in Tampa Bay)
- Regional Sediment Management (e.g., Egmont Key beach placement)

