WEDA EASTERN CHAPTER MEETING

GLDD'S ATB ELLIS ISLAND & TUG D.B. MACKIE

Eastern Shipbuilding Group
Panama City Florida

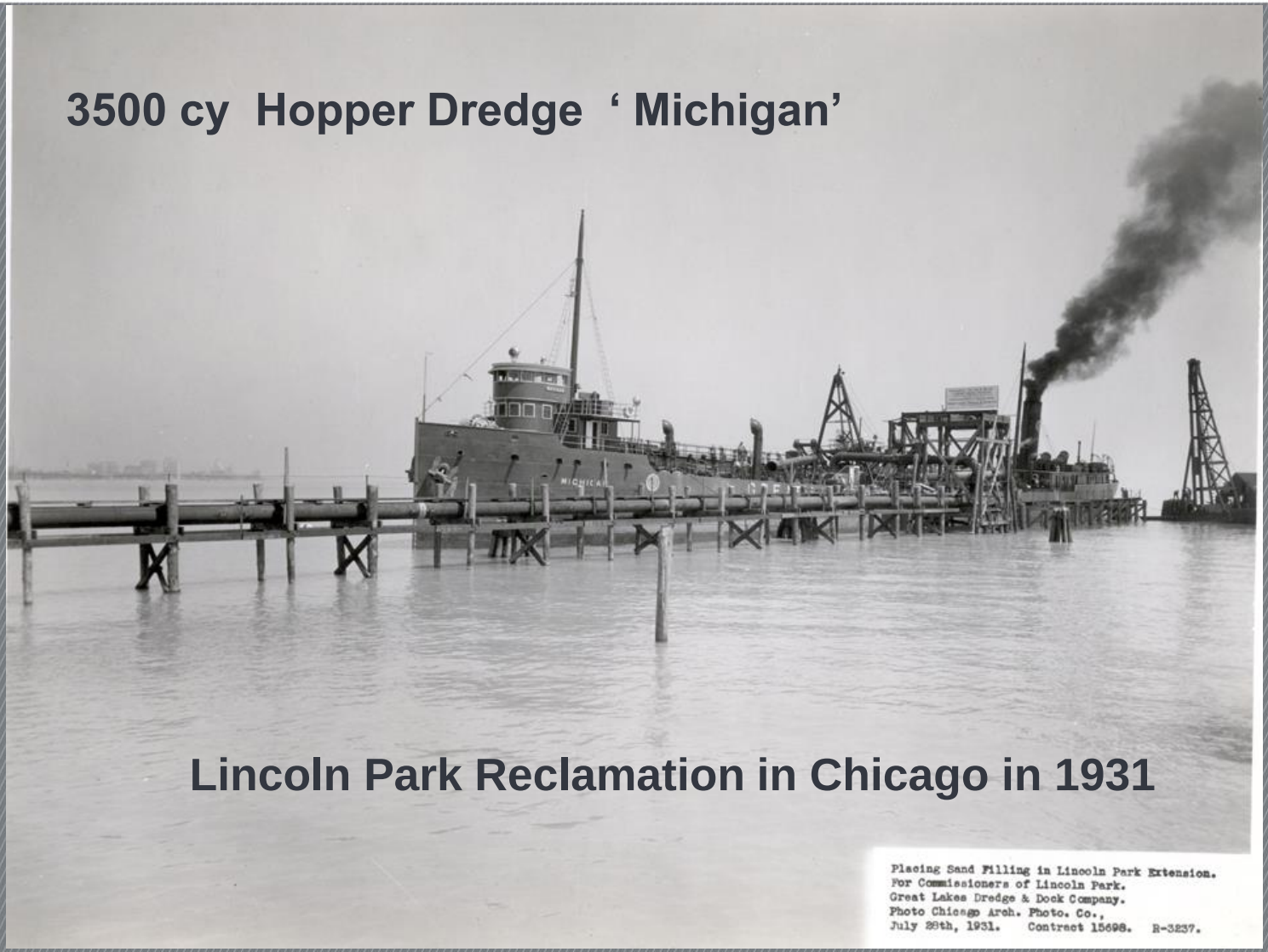
October 2017

Ellis Island length 433 ft. Breadth 92 ft
Installed power 11,300 hp

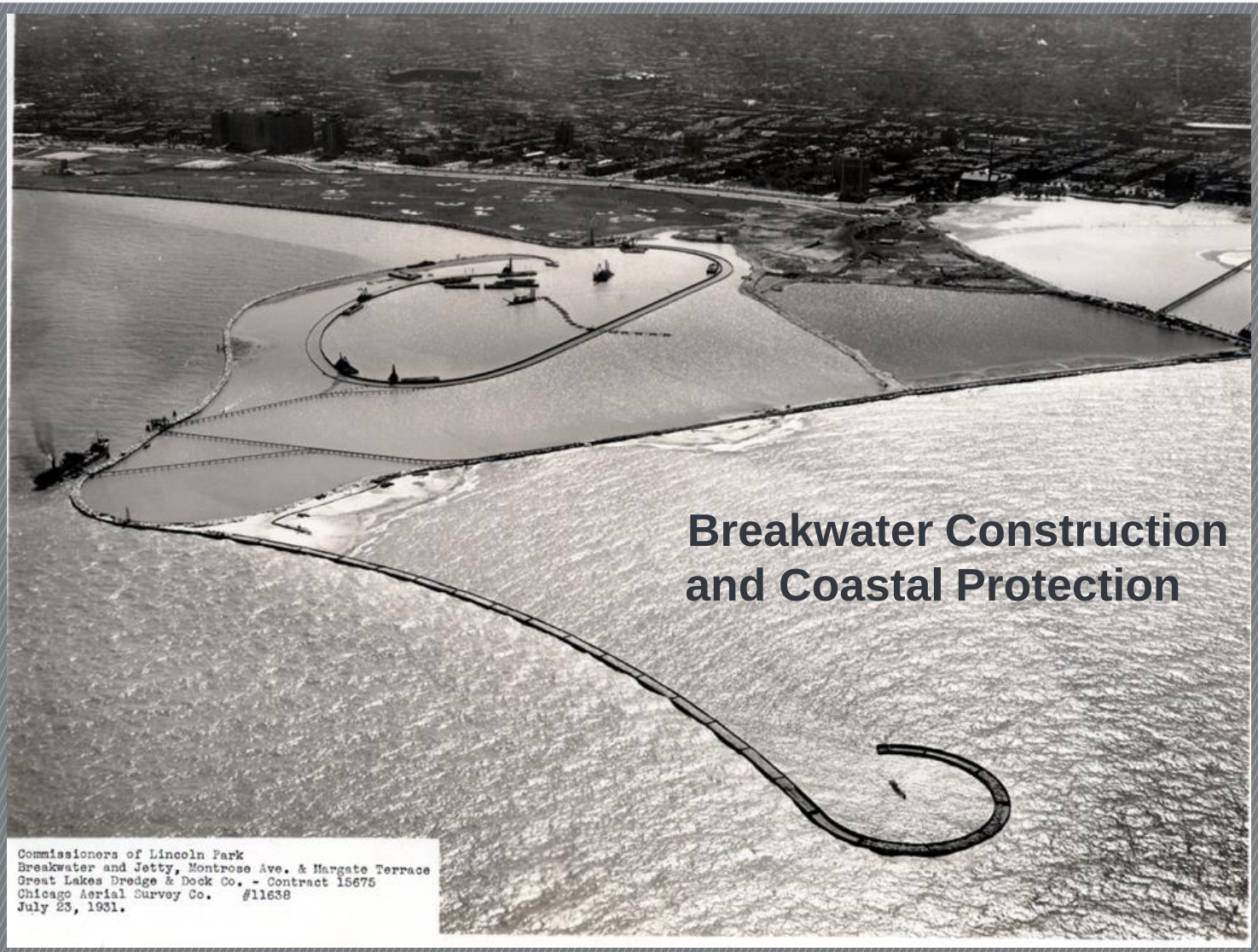
D. B. Mackie length 158 ft. Breadth 52 ft.
Installed power 17,300hp

15,000 cubic yard hopper capacity
(largest hopper dredge in US Market)

GREAT LAKES HOPPER DREDGE BEGINNINGS



MONTROSE AVENUE CHICAGO 1931



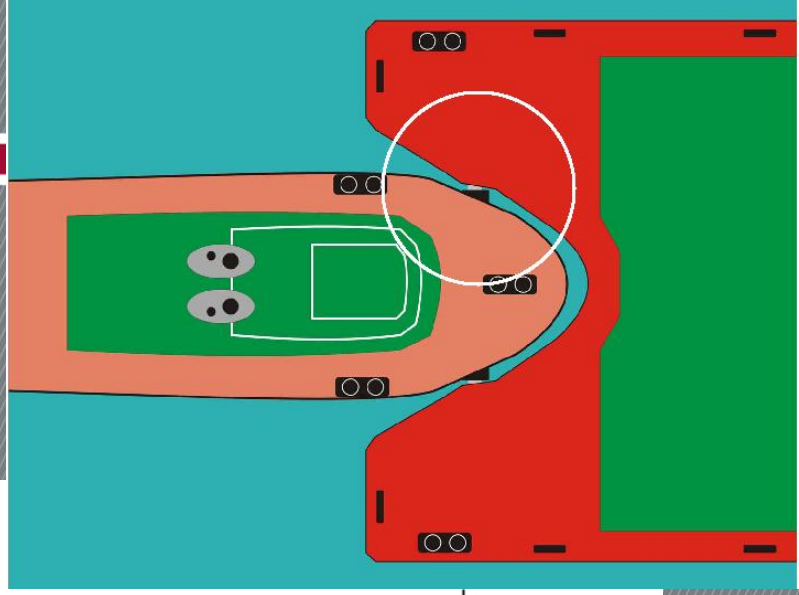
MANHATTAN ISLAND 1ST SPLIT HULL HOPPER DREDGE

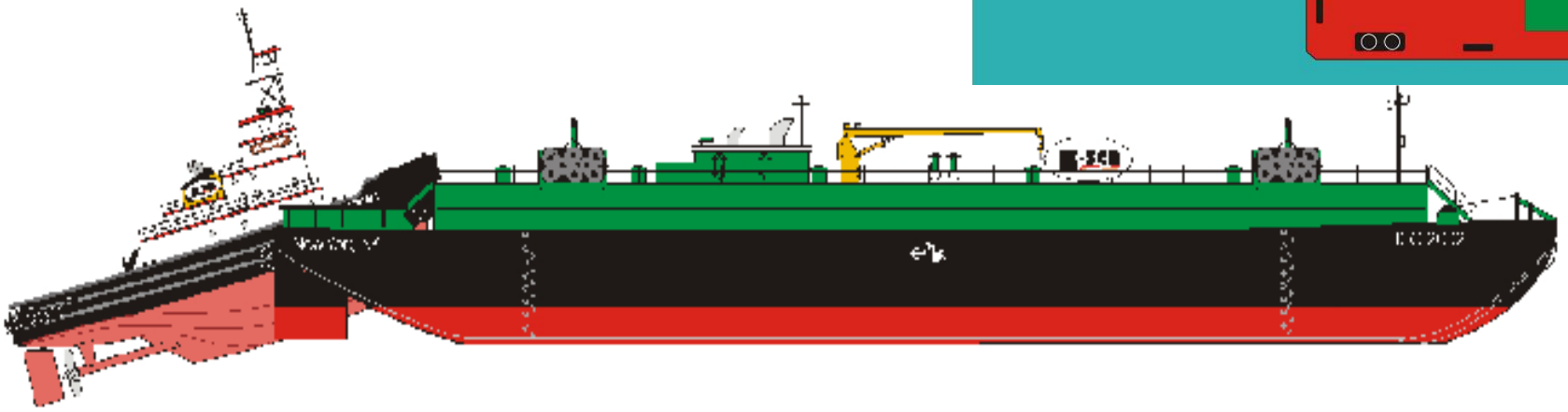
GREAT LAKES HOPPER DREDGE BEGINNINGS

GREAT LAKES HOPPER FLEET IN 2017

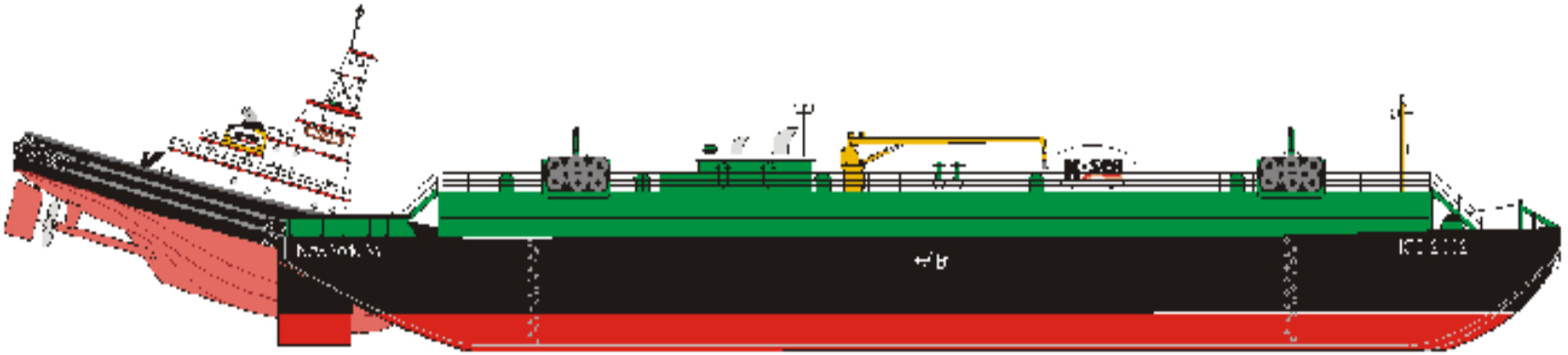
WHAT IS AN ARTICULATED TUG & BARGE?

ARTICULATED MOTION

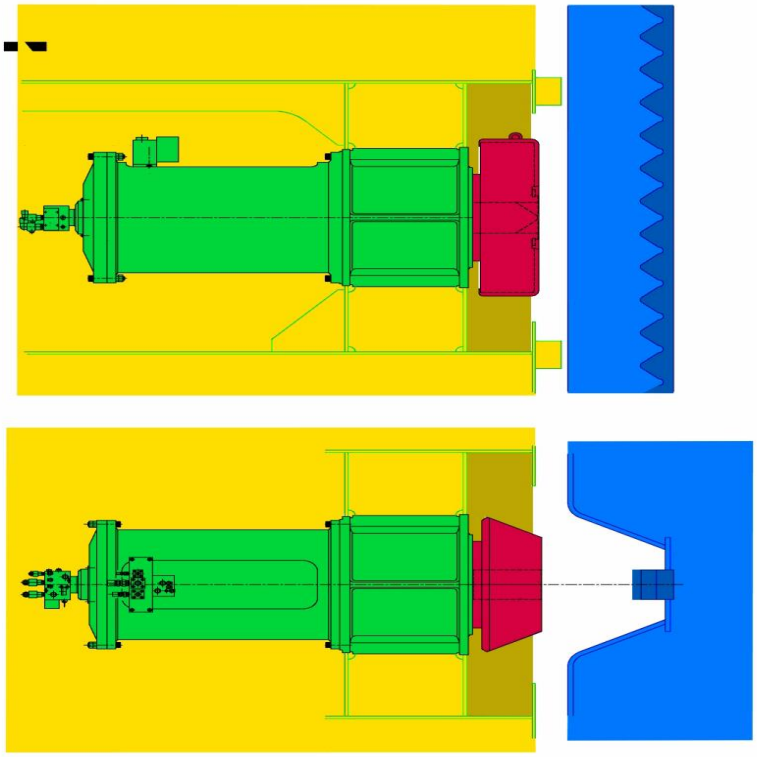




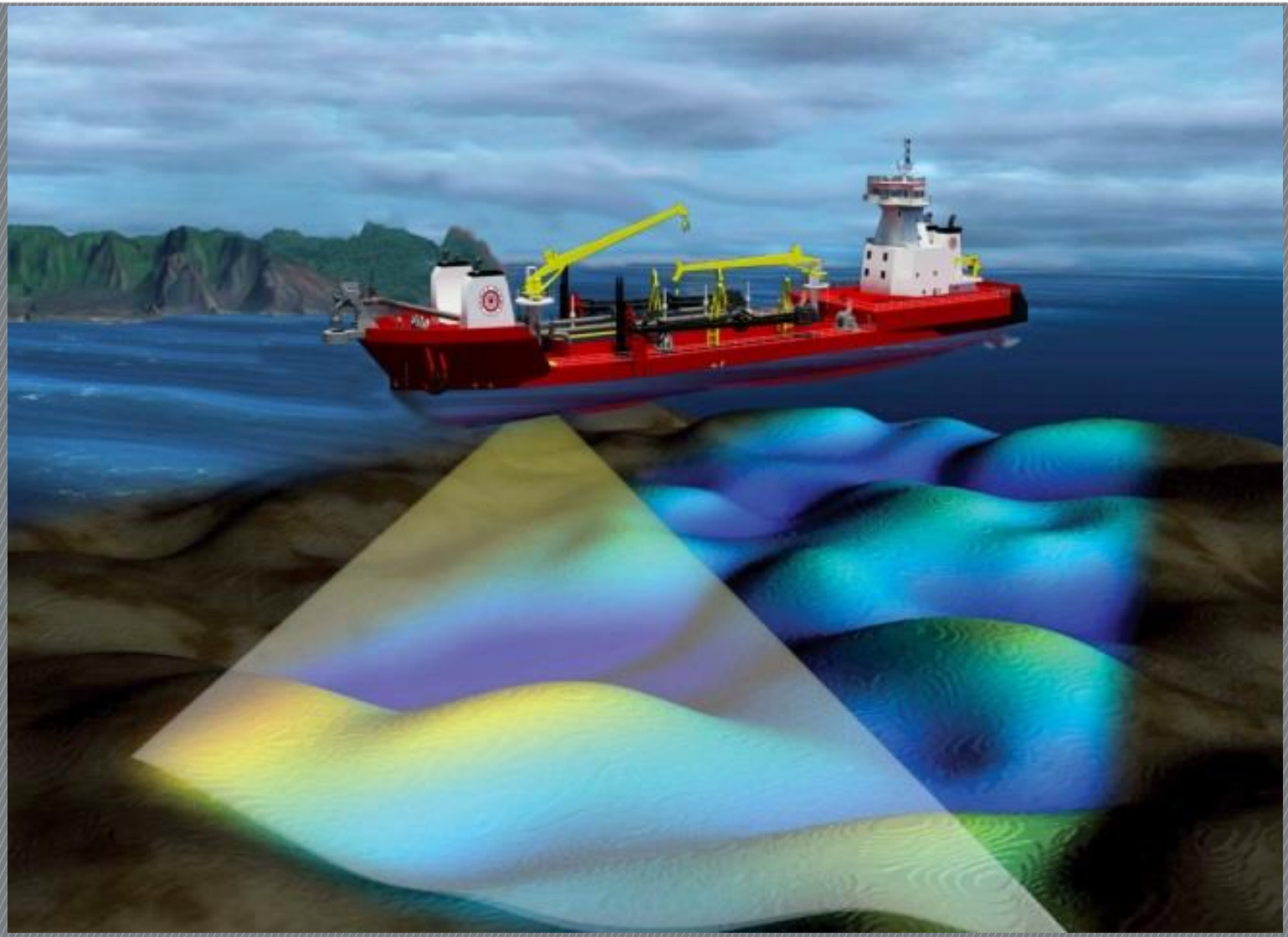
Designed to operate nominally at 15 degrees



PIN CONNECTION



AN ATB IN DREDGING SERVICE???



CHALLENGES FOR AN ATB IN DREDGING SERVICE

Dual Mode - Connect and disconnect - typically done while in port, in relatively calm waters.

In dredging by contrast, the tug and barge need to stay connected at all times, but the barge draft needs to be able to change as the barge is loaded or unloaded, and all of the foregoing needs to take place in up to moderate seas

- Can the ATB connection handle offshore wave conditions during loading and unloading
- ATBs typically 1 to 1.5kt slower speed than a similar sized ship. Can this be overcome?
- Can the ATB maneuver as easily as a ship?
- Will the longer length of the ATB compared to a ship prevent its use in certain channels?

SOME ATB ADVANTAGESb

- ✓ Cargo capacity - The cargo capacity of a hopper dredge is based on the vessel's displacement and its lightship weight which includes propulsion engines, generators, accommodations structure, fuel and other ship installations. This weight deducts from the cargo carrying capacity of the dredge.

  In an ATB hopper dredge, these components and their associated weight are built into the tug and therefore do not deduct from the cargo carrying capacity of the barge. The tug's draft remains constant as the barge increases its load and draft.

- ✓ The manning requirements on this size tug typically result in a crew of 7-10 personnel. The license requirements are lower, i.e. tug license not ship license

- ✓ The manning requirements on the barge are typically zero, since the barge is considered unmanned; the owner crews to meet his *operational requirement*, not an imposed *regulatory requirement*.

- ✓ Today's trend in the U. S. Coastwise-Qualified (Jones Act) trade is to build an ATB instead of a ship for any route where the transit distance is short enough for the positive construction and operating cost economies to offset the negative cycle economies of the somewhat smaller size ATB.

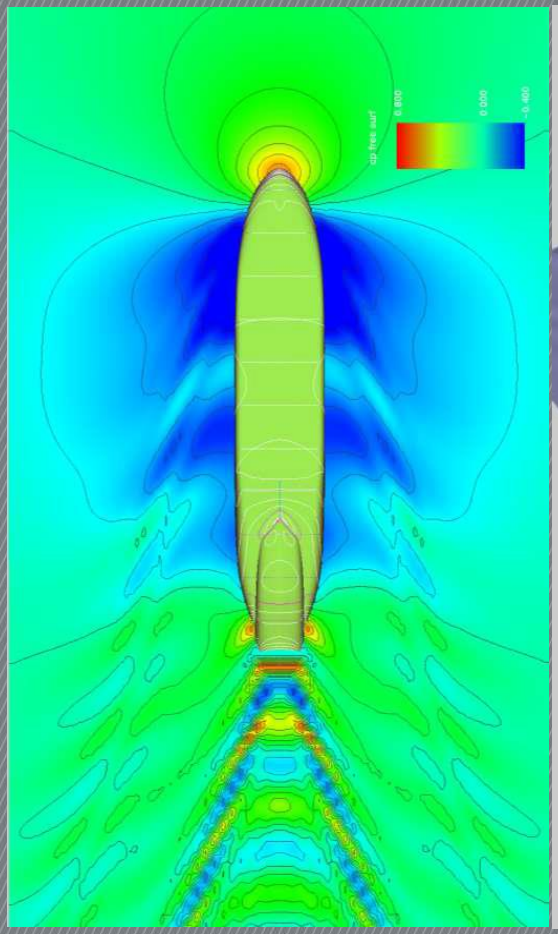
GREAT LAKES' OBJECTIVES

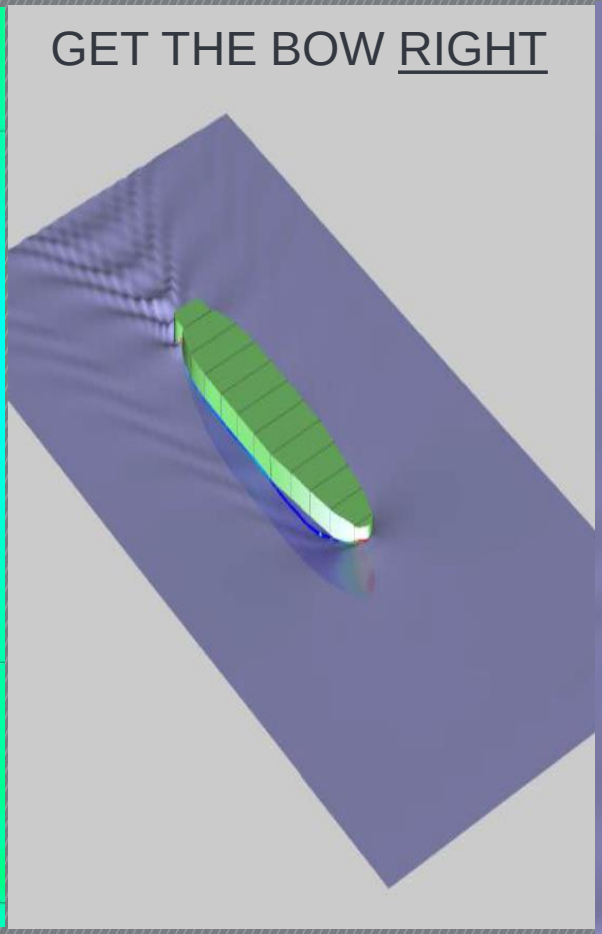
- The dredge that will carry our Hopper Division to the next generation; the next step in the transition from a fleet of nearly identical dredges to a fleet consisting of different dredges for different purposes – each the low cost producer in its target market

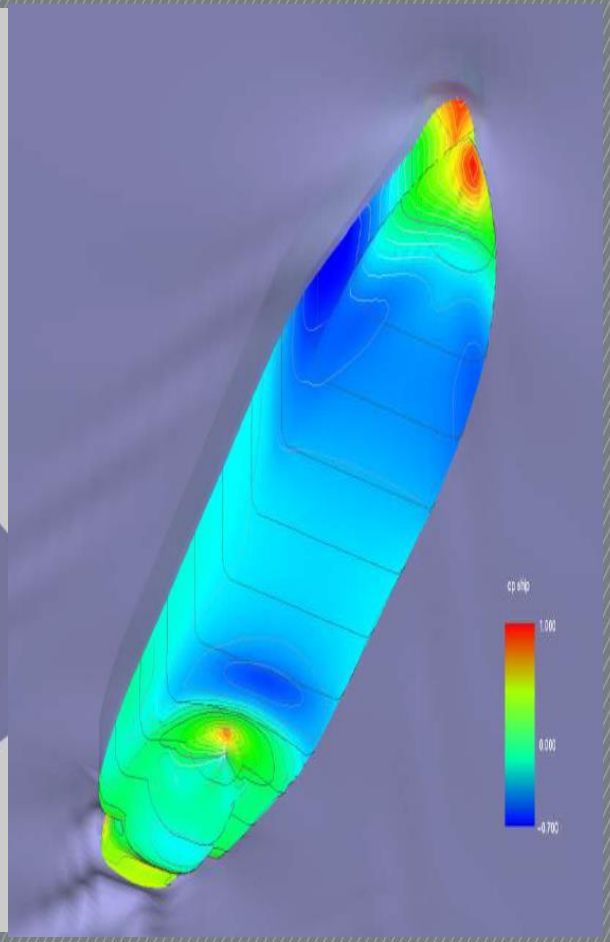
- Meet future market needs with increased O & M demand and funding due to HMTF, Coastal Protection, Gulf Coast Restoration, and the latest channel deepening (Capital Dredging) cycle

- Improve operating margins
- Compete in non-traditional hopper markets
- Make otherwise marginal projects possible due to reduced cost to owner
- Ship-like performance and reliability while retaining the advantages of the ATB

OVERCOMING THE CHALLENGES – HULL FORM OPTIMIZATION







Great Lakes hull design, optimized using
Computational Fluid Dynamics (CFD)

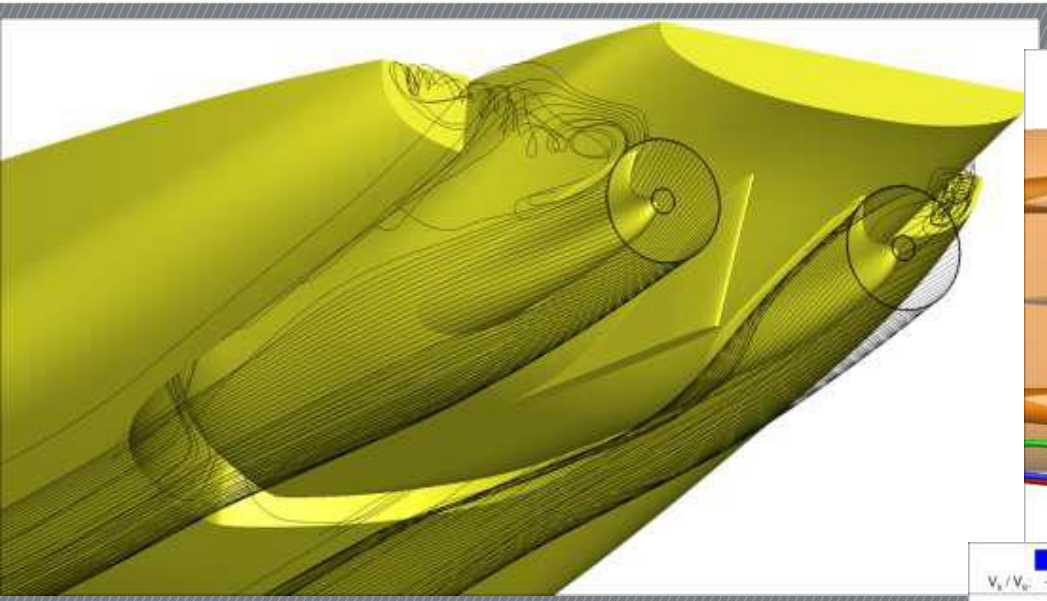
TANK TESTS OF LIBERTY VS ELLIS ISLAND

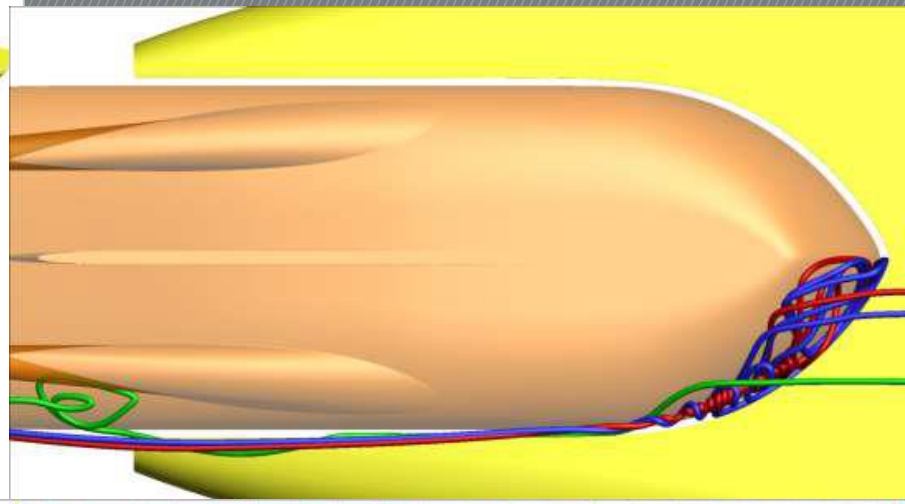
The Liberty with the bulb requires 5,600 kW (7,500 HP) to achieve 13.5 kts in deep water,

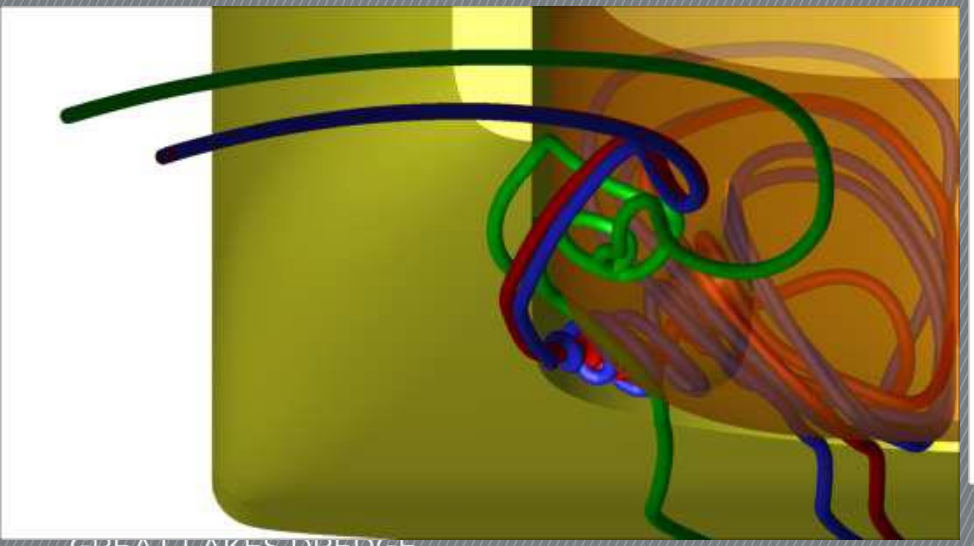
The ATB with bulb requires 8,200 kW (11,000 HP) to achieve 13.5 kts in shallow water

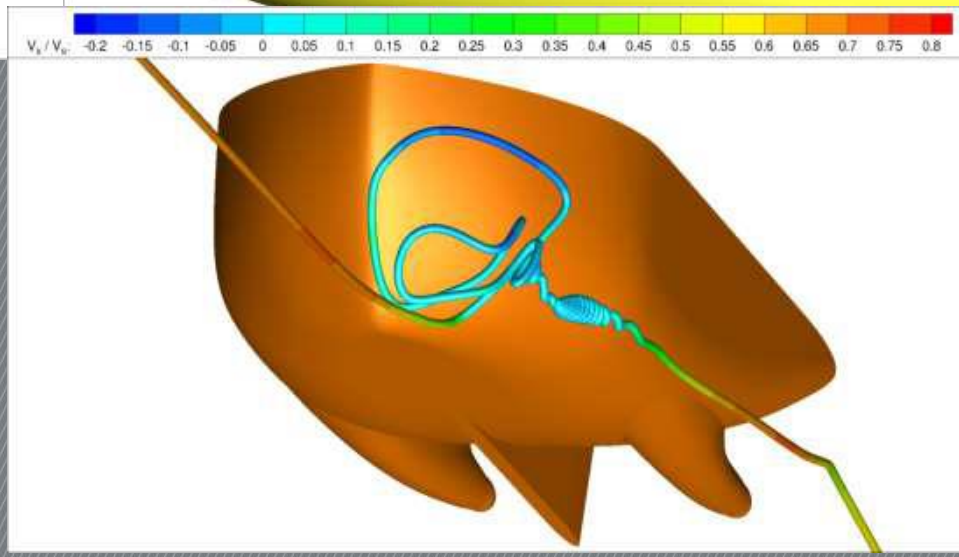
More than 2x the capacity of the Liberty Island, same speed, 1.5x power, less wake

GETTING THE PROPELLER FLOW RIGHT

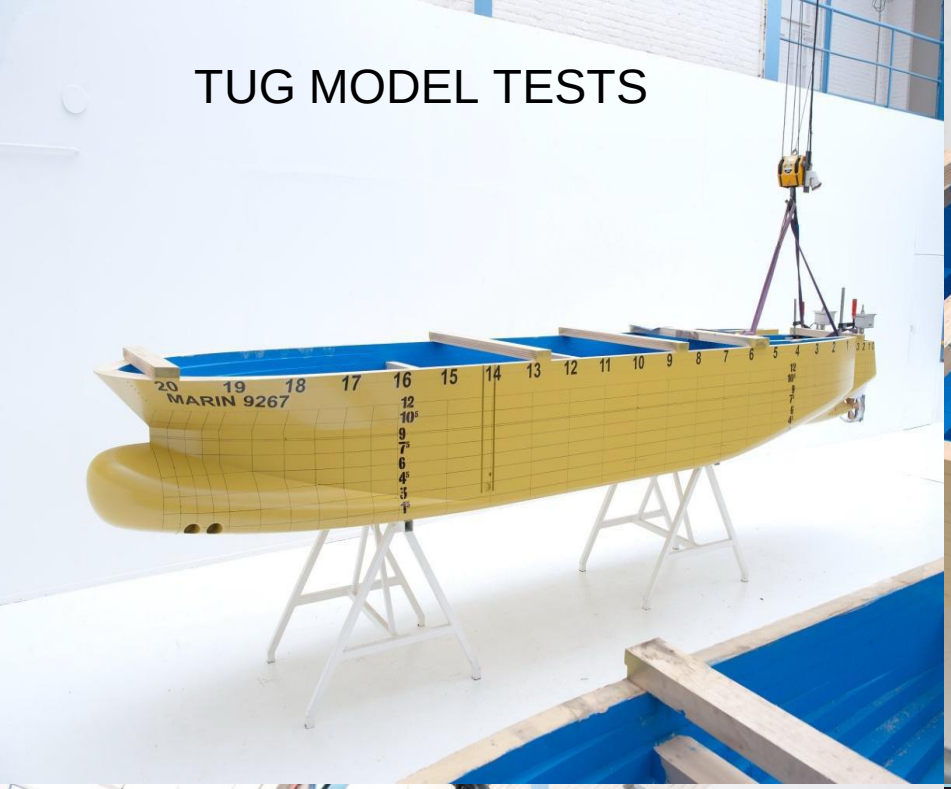


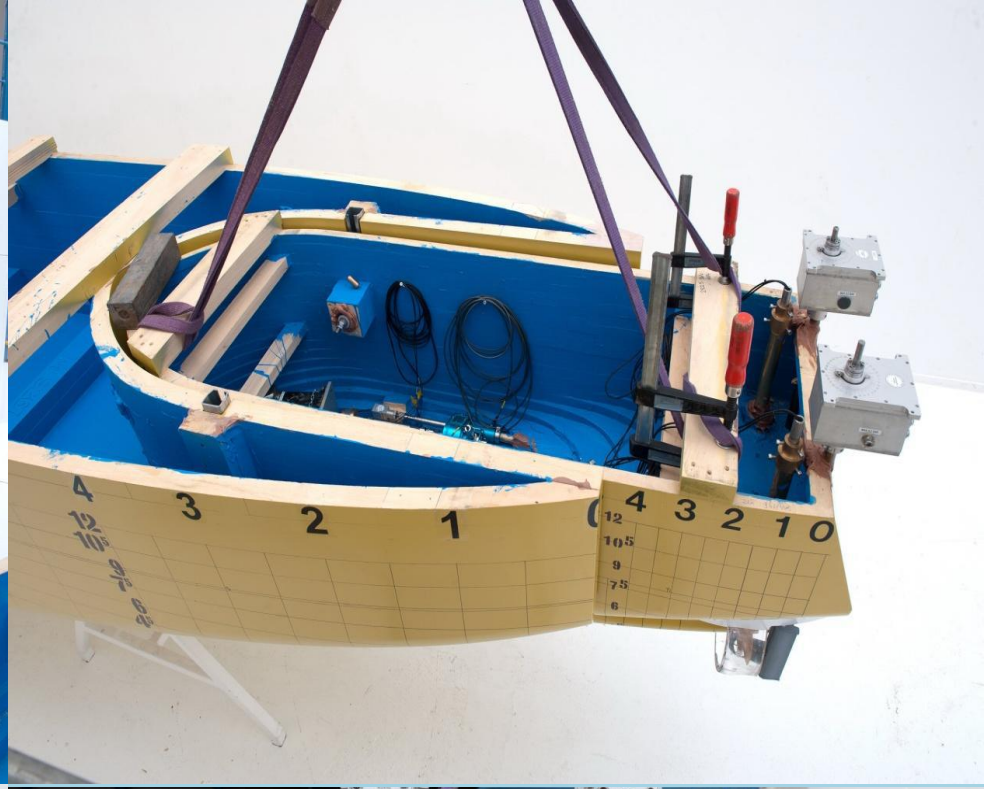


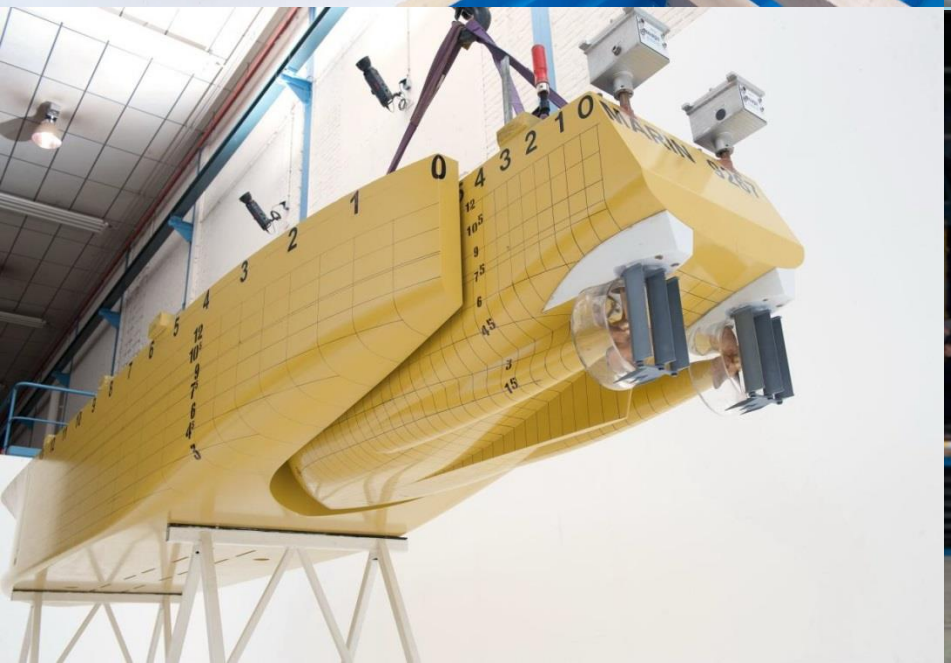




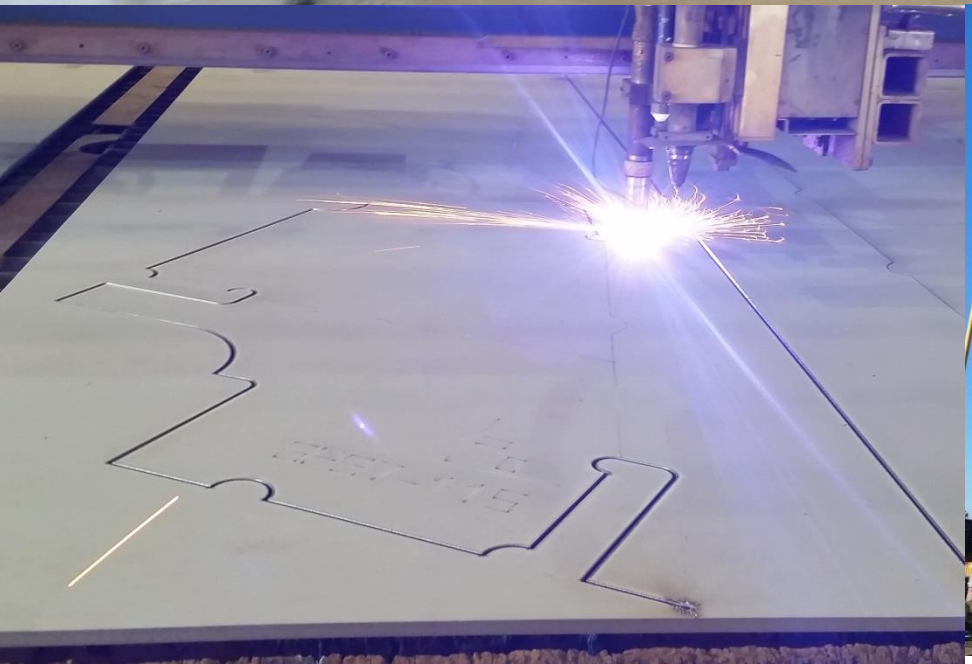
TUG MODEL TESTS



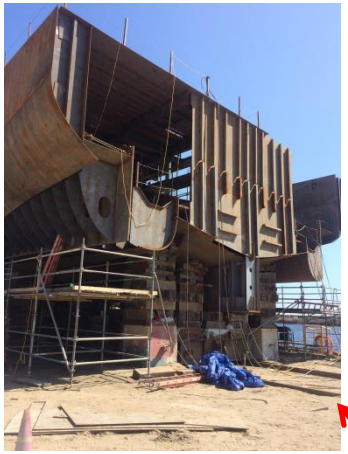


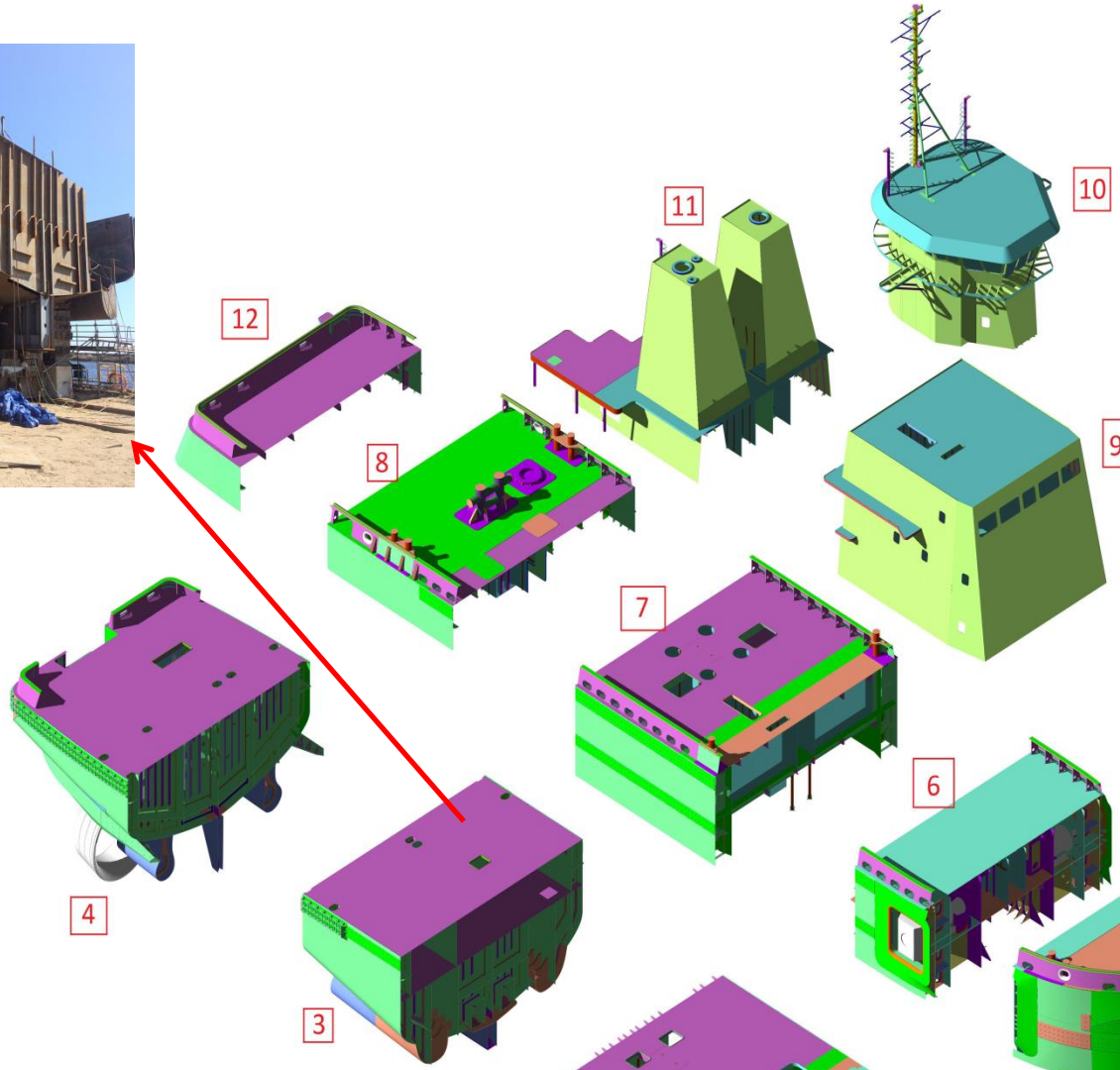


Steel Cutting 14 September 2014

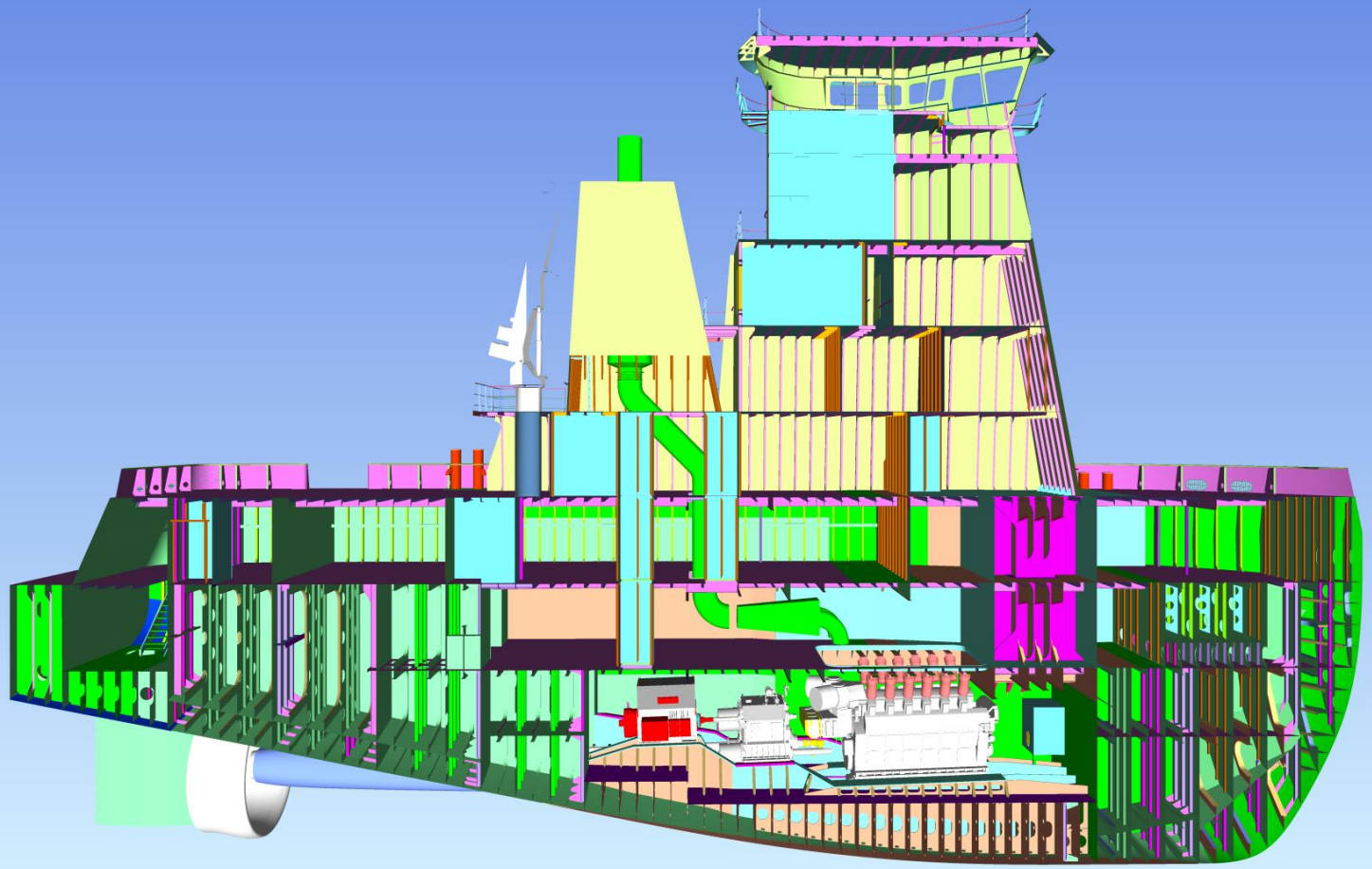


Tug Units





Tug *Douglas B. Mackie* 3D Model

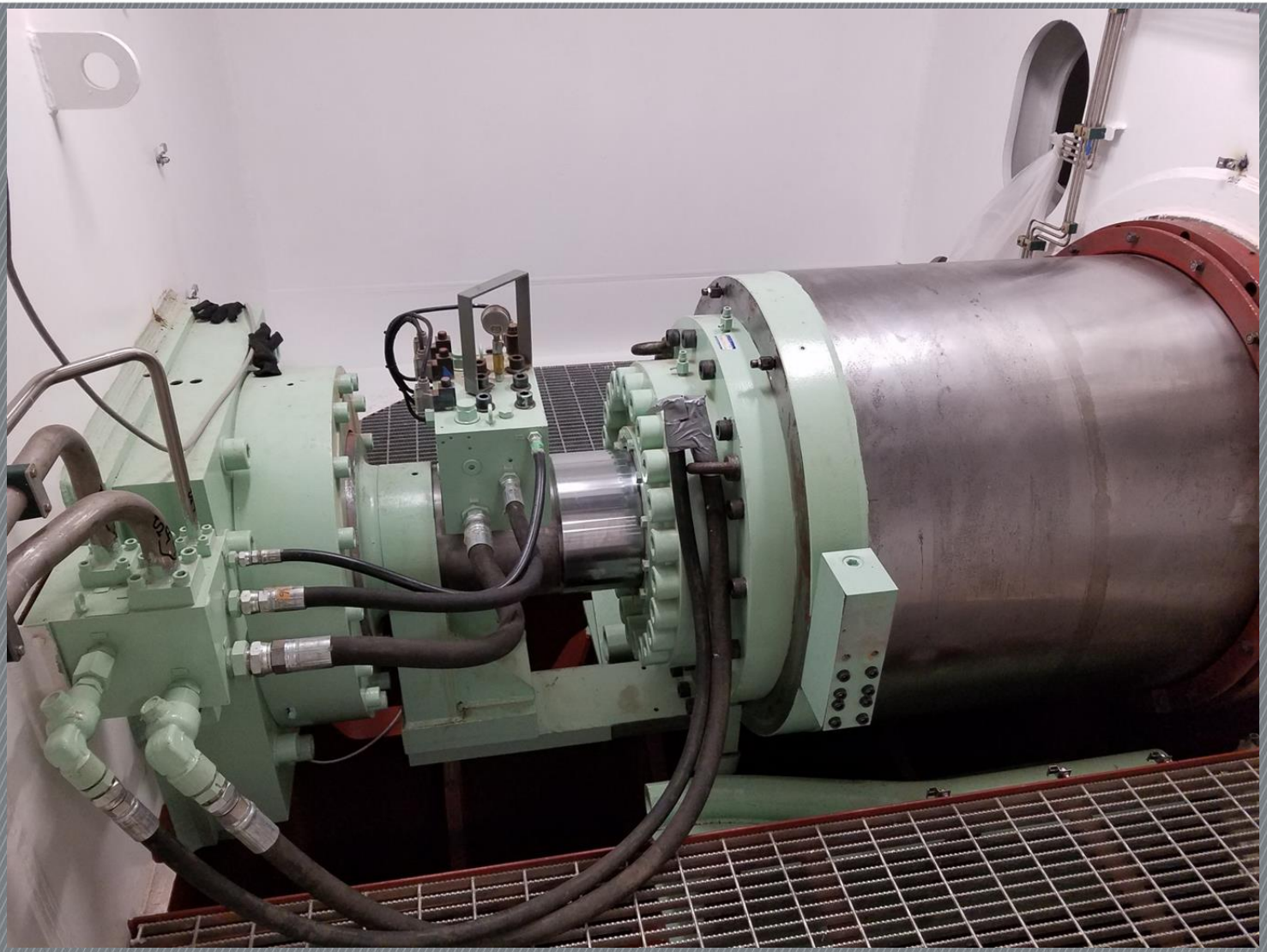


Final Deck Unit Installation

Main Engine Installation

Kort Nozzles

TUG TAISAI PIN CONNECTION



ARTICOUPLE CONNECTION

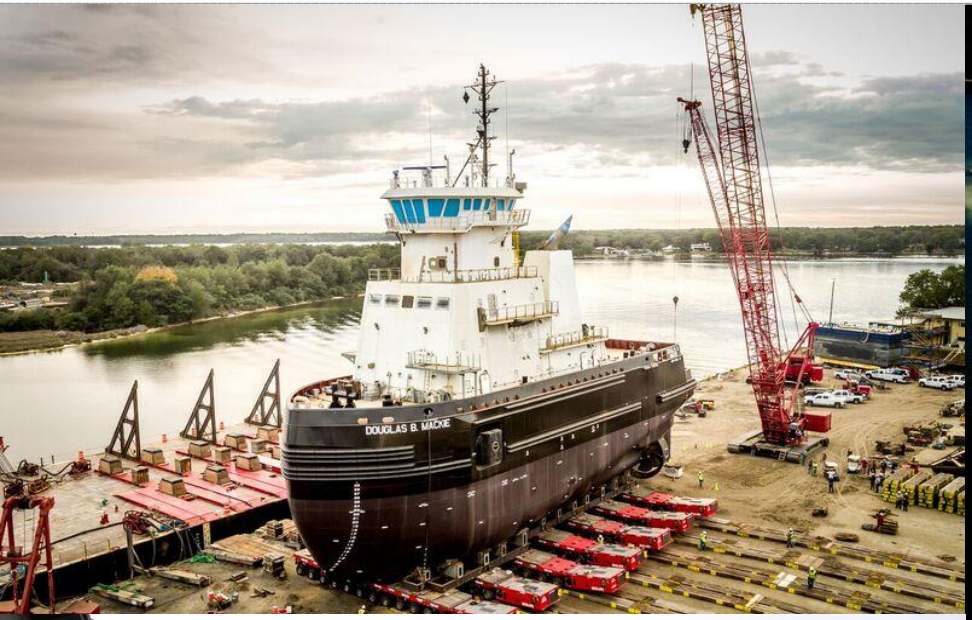
MAK 7,500 Hp Tug Main Engine

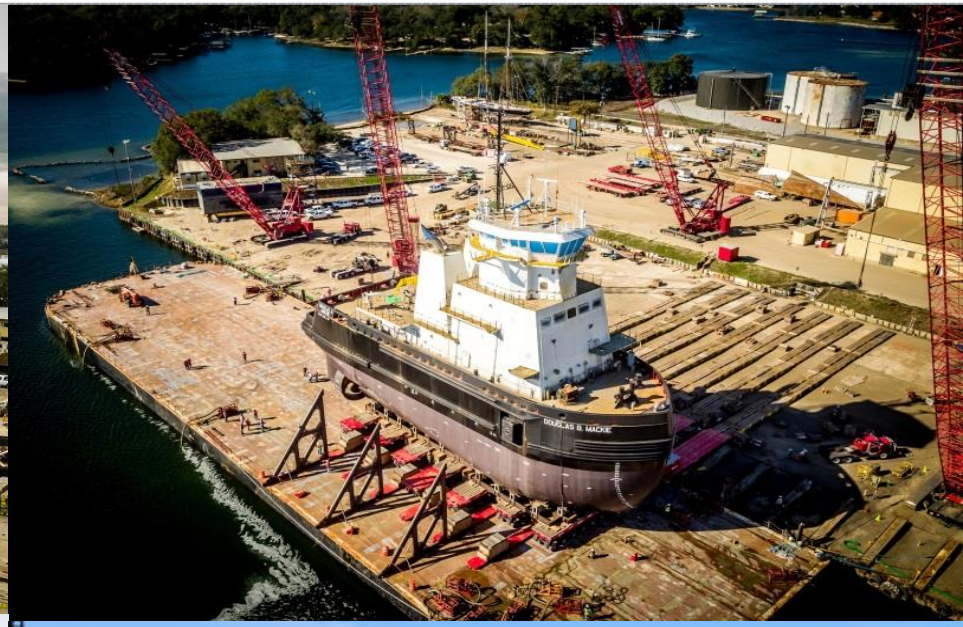
Tug Shaft Generator

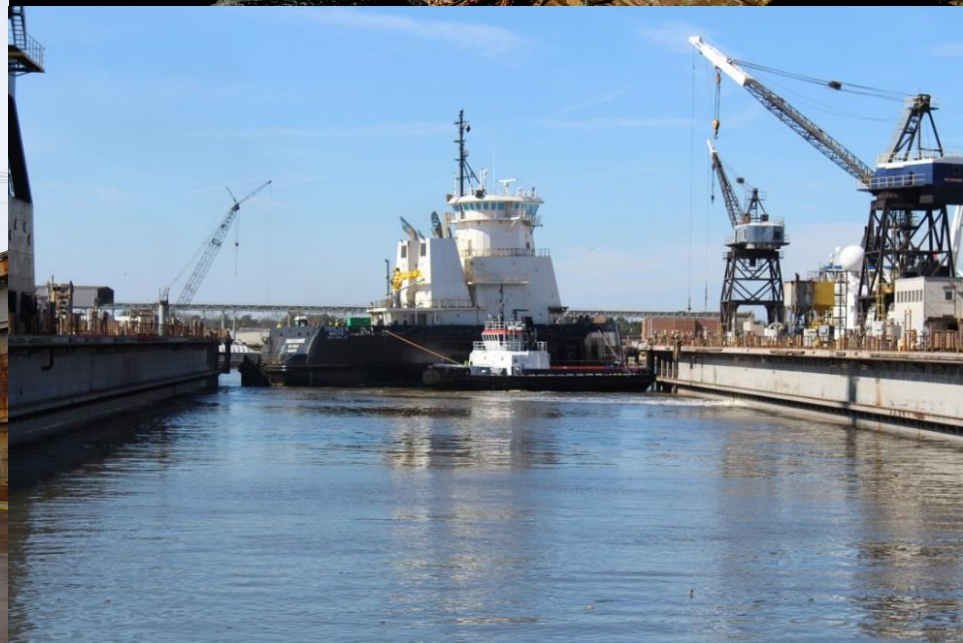
TUG ARTICOUPLE PAD INSTALLATION

BERARD HEAVYLIFT TRANSLATION ONTO BARGE

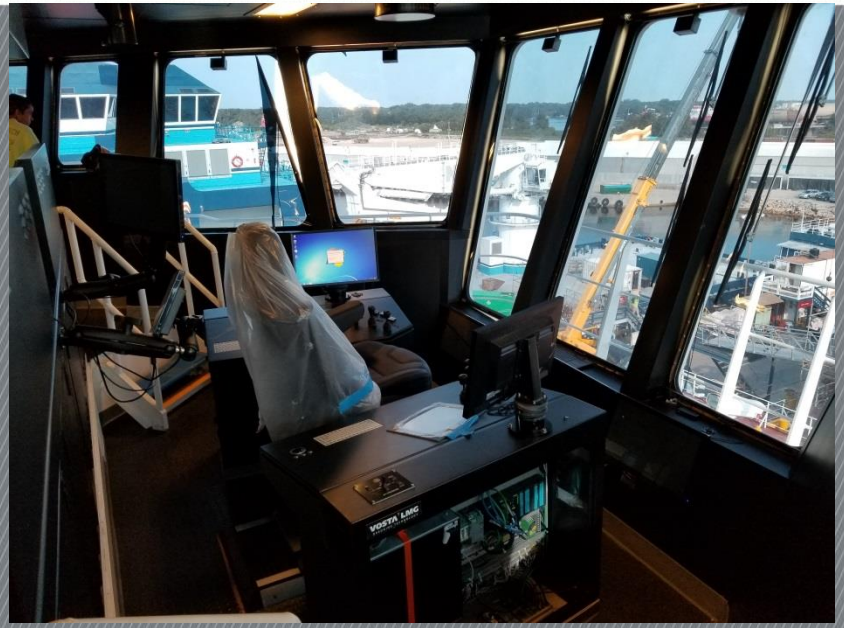
TUG MACKIE TRANSLATION AND LAUNCING







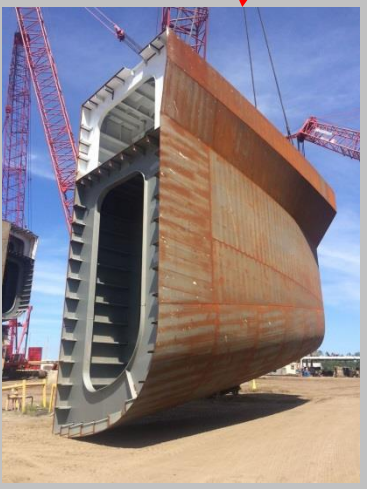
TUG NAVIGATION BRIDGE

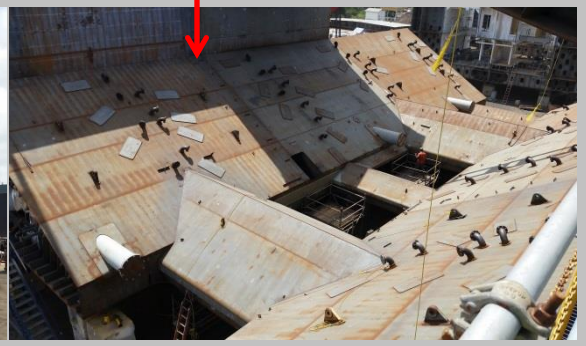


ENGINEERING DECK

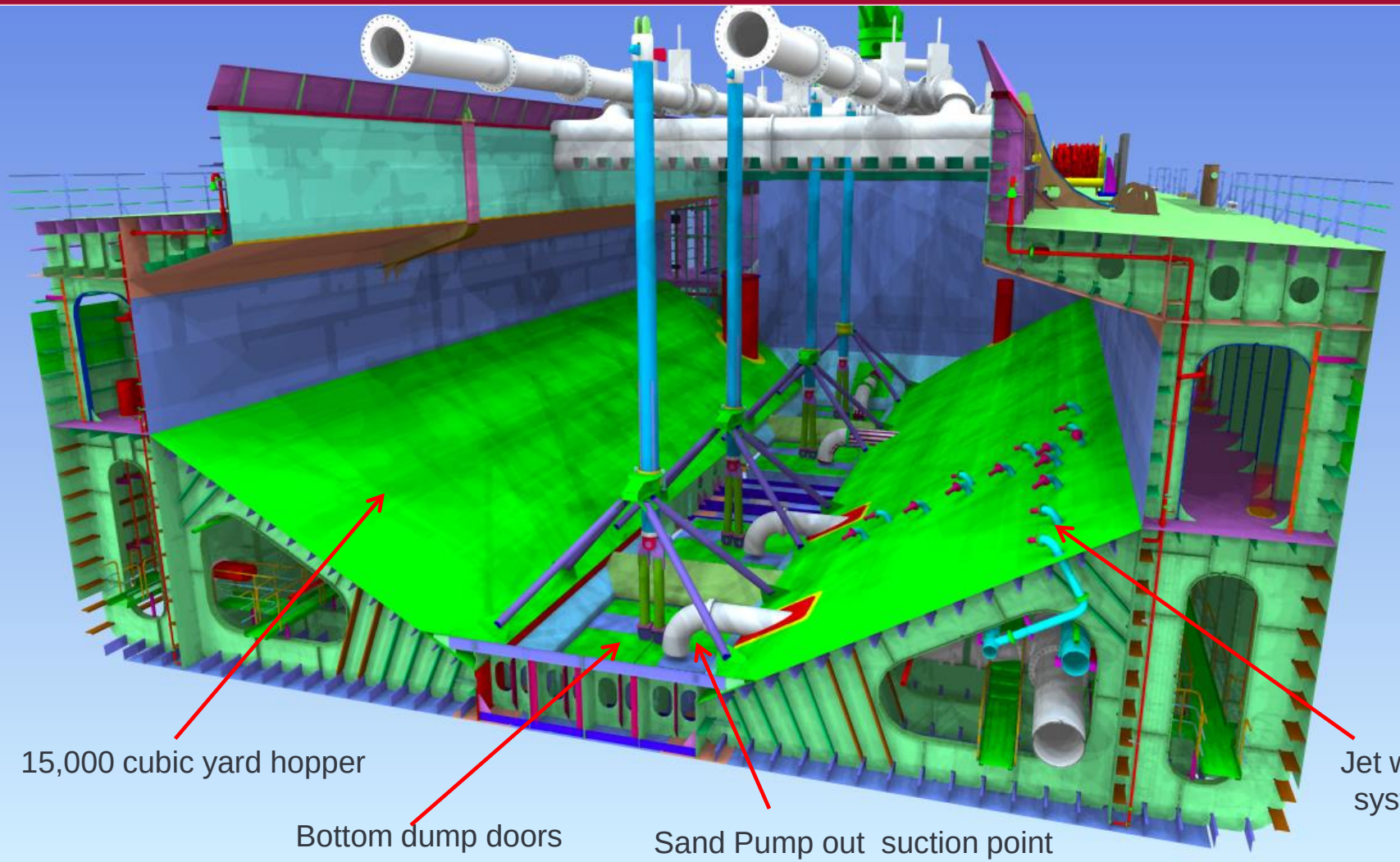
TUG SEA TRAILS 5 OCTOBER 2017

Barge Units



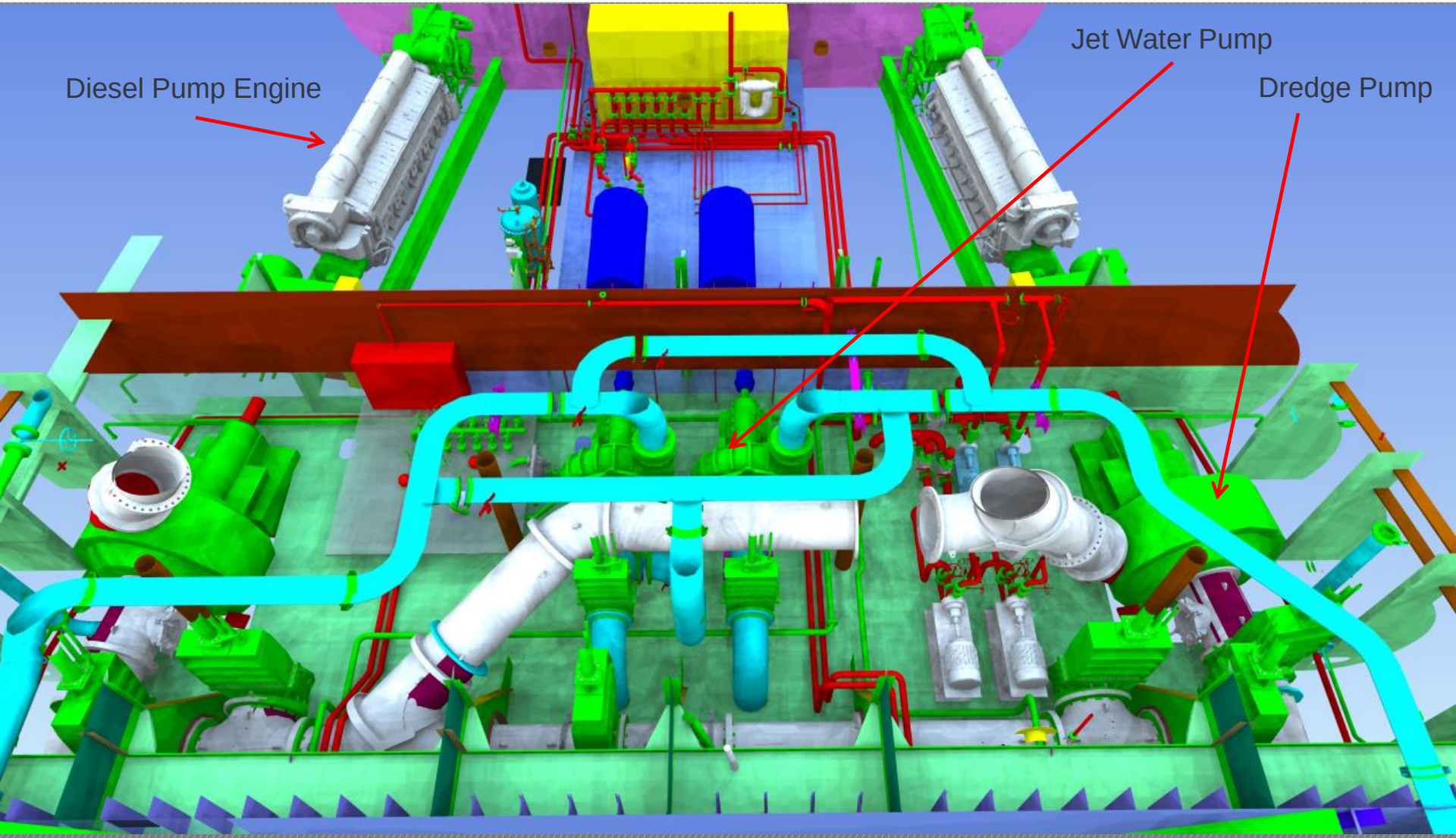


ATB Barge *Ellis Island* 3D Model of Hopper



Partially Constructed Hopper

3D Model of Pump Room

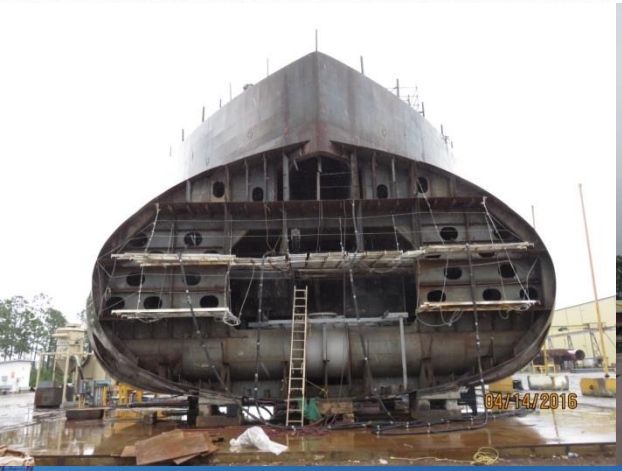


Pump Engines

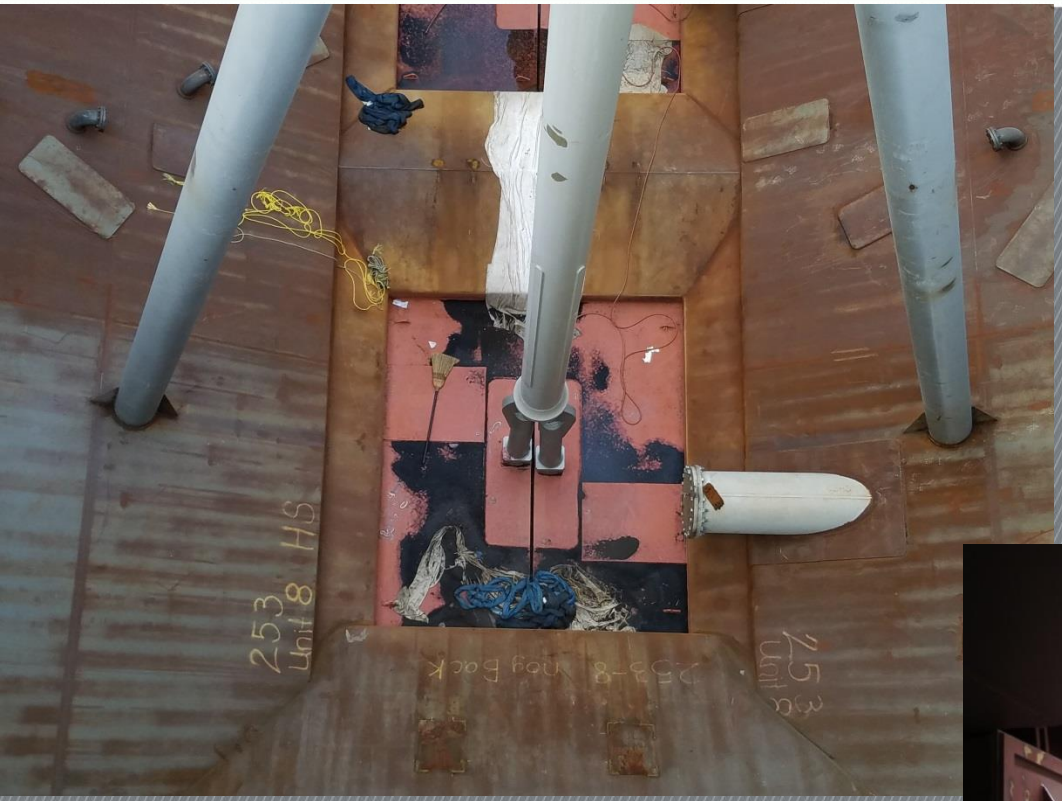
ELLIS JET PUMPS AND 36” GIW DREDGE PUMP

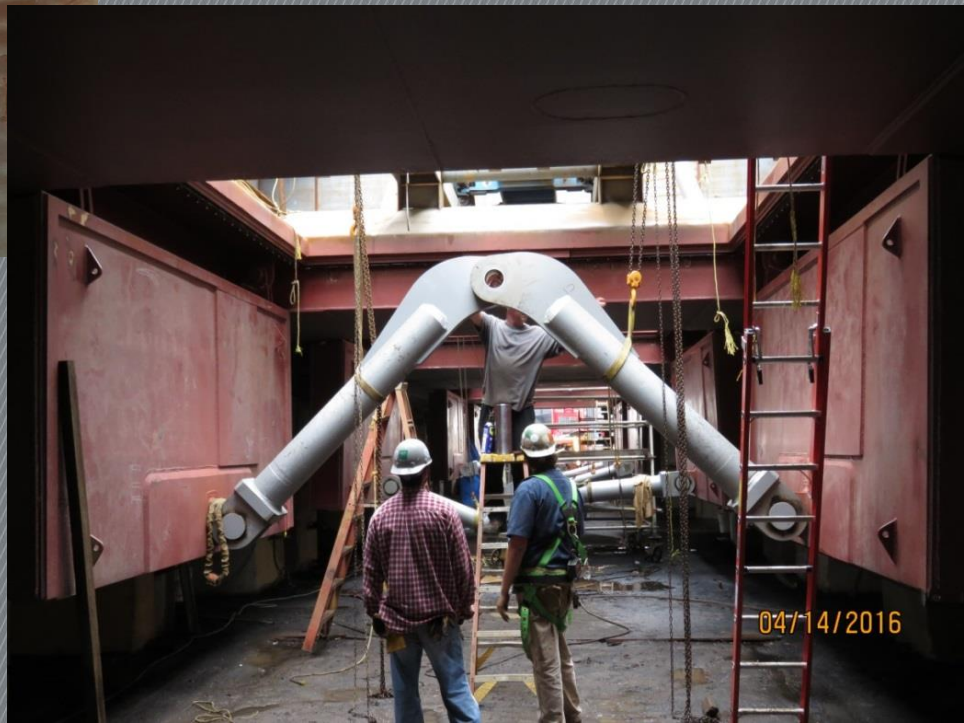

FIRE EXTINGUISHER
150-LB

Bow Erection Sequence



BOTTOM DUMP DOORS





GREAT LAKES DREDGE
& DOCK CORPORATION

PREP FOR SIDE LAUNCH

LAUNCH 30 SEPTEMBER 2016

ELLIS FORE DECK

Commissioning Starboard Drag Arm

6.6kv SYSTEM COMMISSIONING

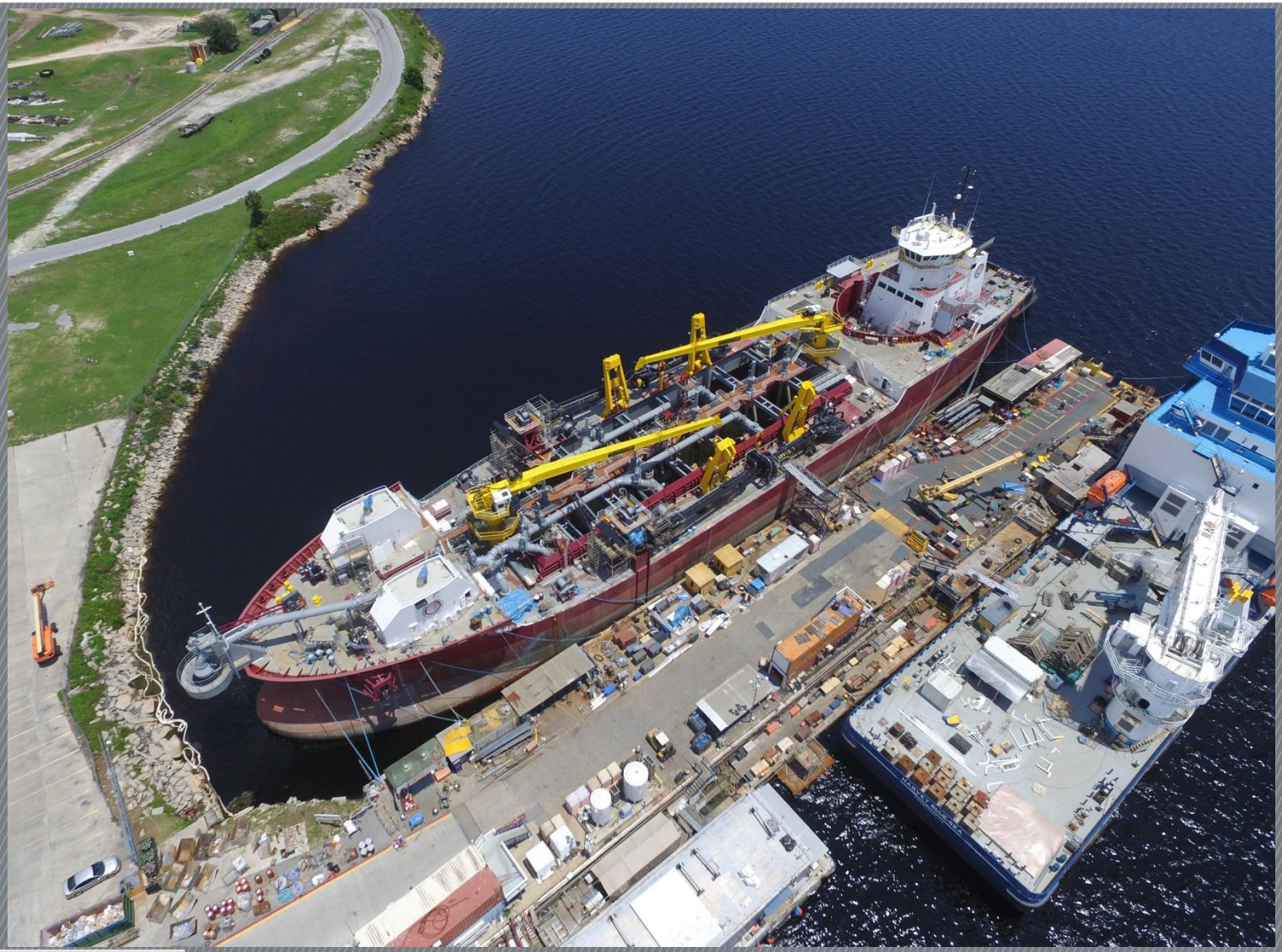
ELLIS HOPPER DECK

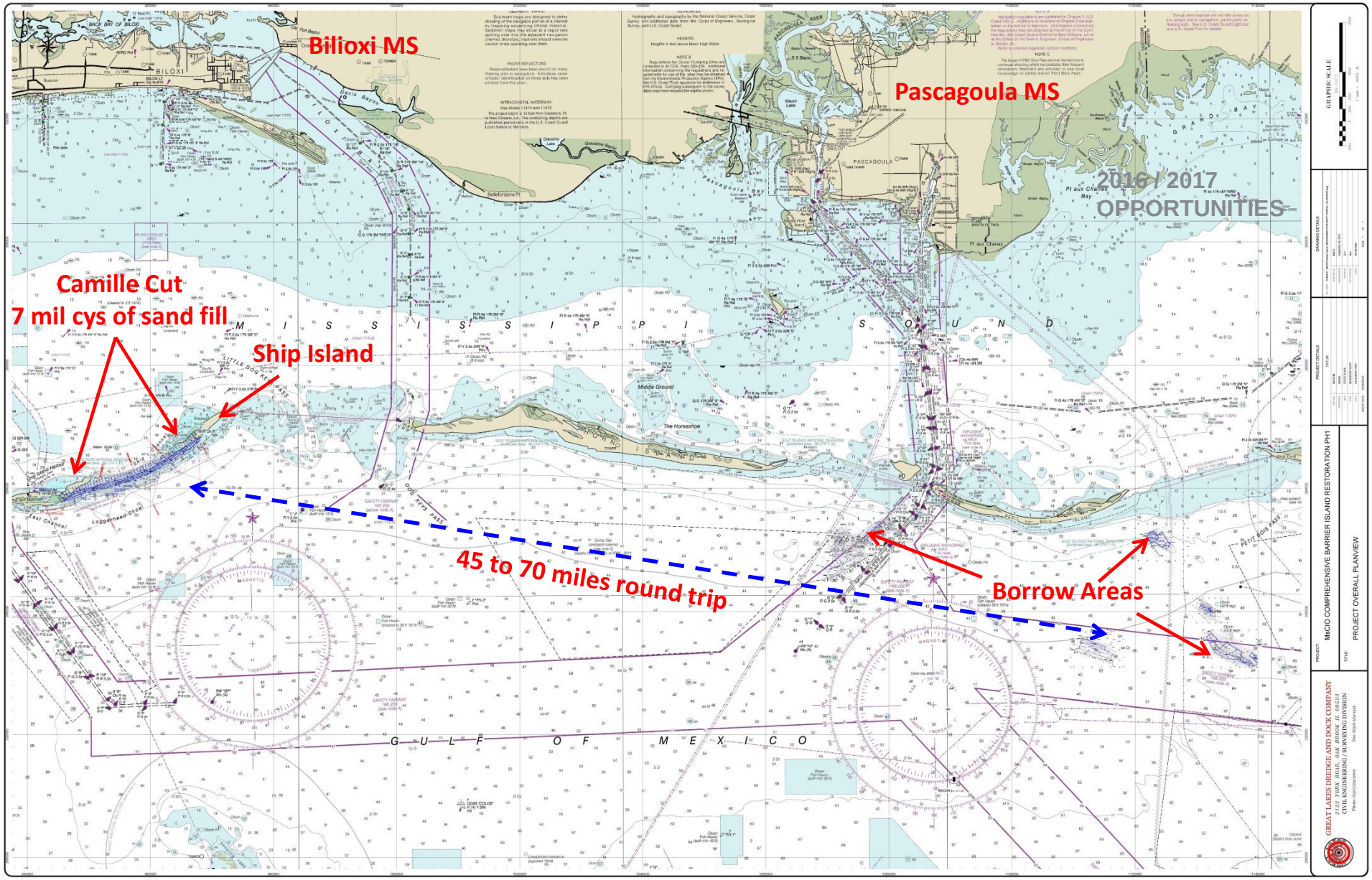
ELLIS ISLAND TESTING VOSTA DREDGE CONTROL AUTOMATION

3000 HP HOPPER JETTING SYSTSM TESTS

VIEW FROM TUG BRIDGE

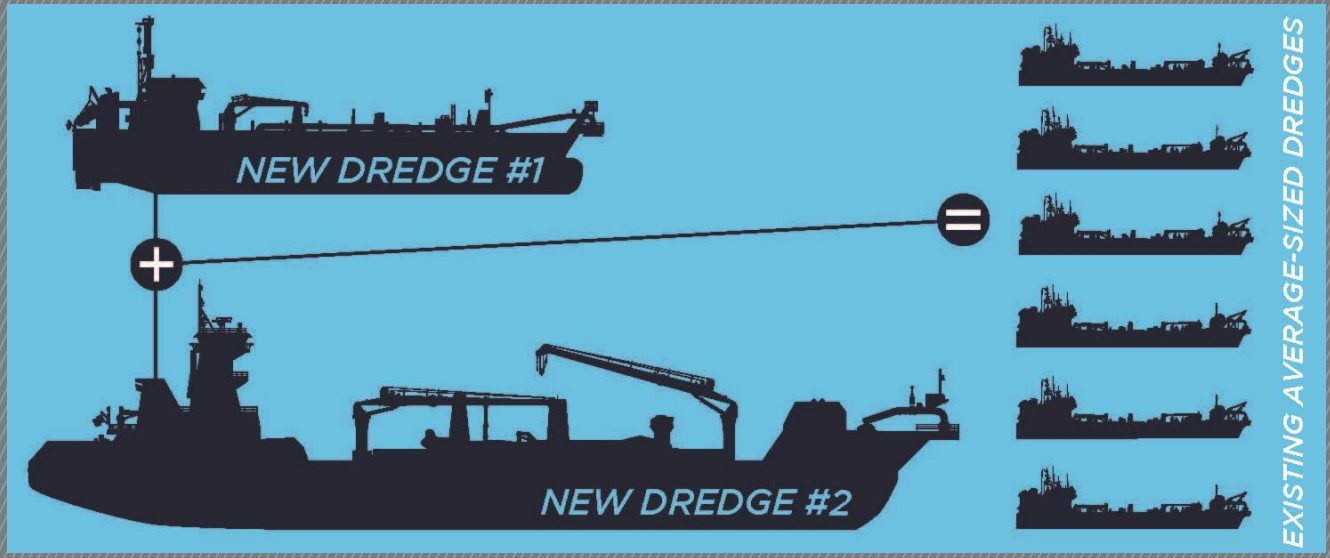
TUG MACKIE AND ELLIS ISLAND AT OUTFITTING PIER





Coastal Protection – Hurricane Camille Cut Ship Island MS
MSCIP Phase 1

Change in Industry Capacity



Historical Industry Capacity (1997-2015) – 66,340 cy

lndustry Capacity with Weeks and GLD&D Newbuilds – 90,040 cy