



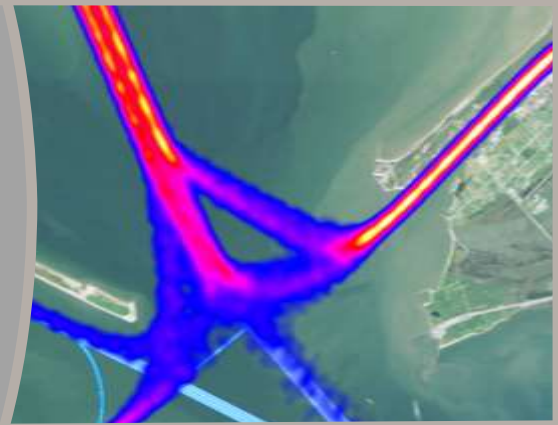
U.S. ARMY

RESEARCH & DEVELOPMENT UPDATE

Patricia DiJoseph, PhD

Harbors & Navigation Committee and QPI Meeting

18-19 April 2018



US Army Corps of Engineers



ERDC

Engineer Research and Development Center

USACE NAVIGATION MISSION

Corps is tasked with maintaining a vast, aging water resources infrastructure portfolio that is critical to national well-being.

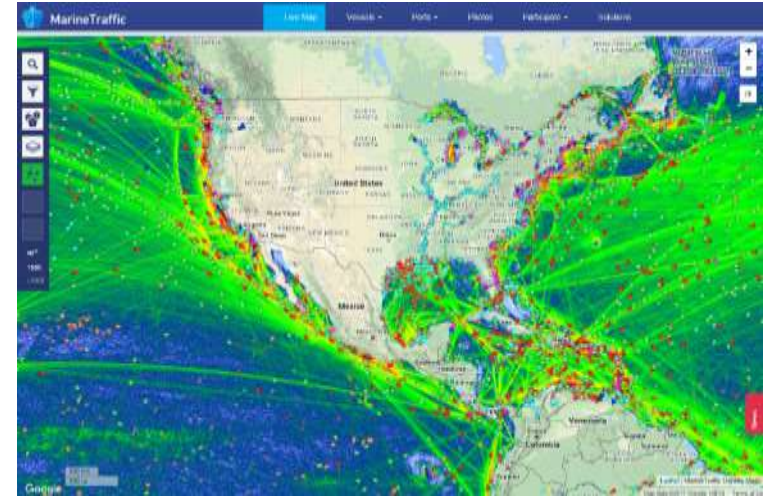
Navigation projects at coastal ports and along inland waterways facilitate marine transportation and help support complex, dynamic, global freight supply chains.

Challenge going forward is how to optimally support the national Marine Transportation System (MTS) using available resources.



AIS DATA PROCUREMENT

- Commercial providers offer archival data and real-time feeds, addressing many of the logistics needs of shippers and carriers.
- Coast Guard's NAIS is the authoritative government repository for archival AIS. Available to federal personnel via manual data requests through USCG NavCenter:
<http://www.navcen.uscg.gov/?pageName=NAISmain>
- USACE maintains an Interagency Security Agreement (ISA) with USCG to enable AIS data sharing and web services access to its Nationwide AIS.



LOCK OPERATIONS MANAGEMENT APPLICATION (LOMA)



Provides situational awareness and information dissemination for tactical navigation operations

Serves diverse navigation stakeholders:

- Aids lock operators with lockage planning, maintenance
- Provides vessel operators with dynamic navigation information
- Gives Corps management an operational view of waterways
- Included information interfaces with internal and external navigation systems

Uses AIS to track and communicate with vessels



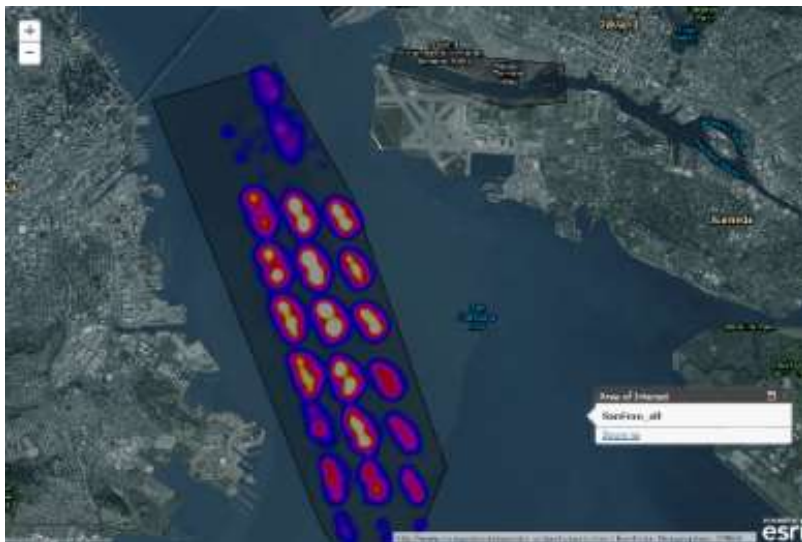
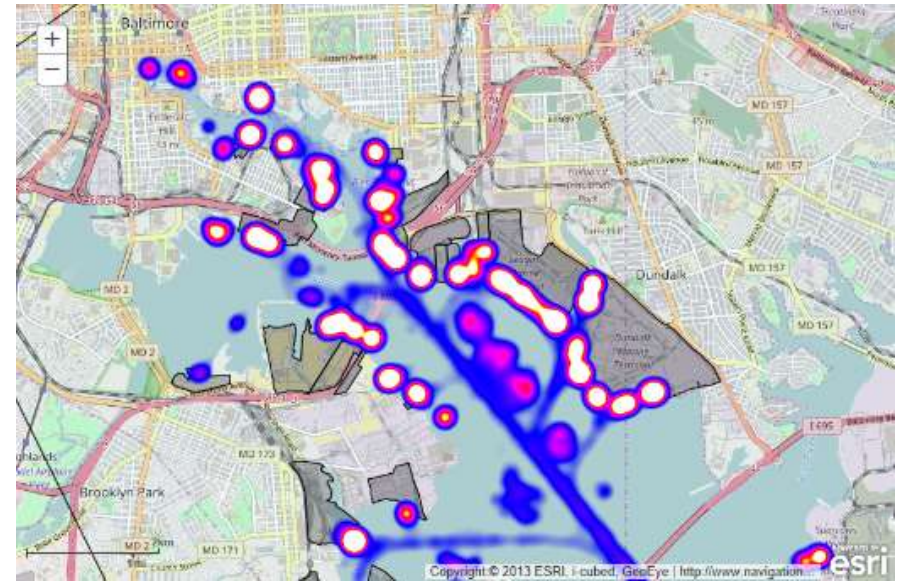
AISAP BUILT-IN CAPABILITIES

The screenshot displays the AISAP web application interface. On the left, the 'Projects' section shows a dropdown menu with 'CWG_demo1' selected and a green refresh button. Below this, the 'Project Details' section includes a 'Name' field with 'CWG_demo1', a 'Notes' field with 'Project Notes', and a 'Source' field with coordinates '50177, 50189, 50190'. There are several control buttons for map navigation and analysis. The 'Areas of Interest' section contains a table with one row: 'East and Gulf coasts'. The main map area shows a satellite view of a coastal region with numerous colorful lines representing vessel tracks. Labels on the map include 'Staten Island', 'Lower New York Bay', 'Coney Island Creek', 'Coney Island Park', and 'Coney Island Beach'. A scale bar at the bottom indicates 200m and 1mi. The Esri logo is visible in the bottom right corner of the map area.

Variety of built-in analysis and visualization capabilities:

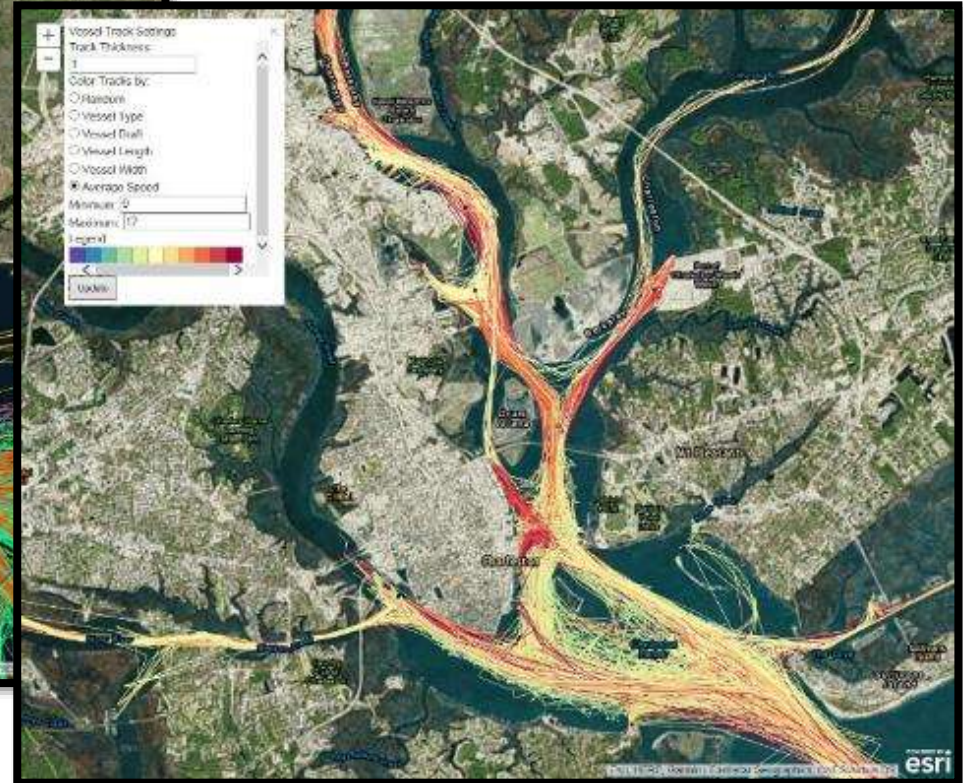
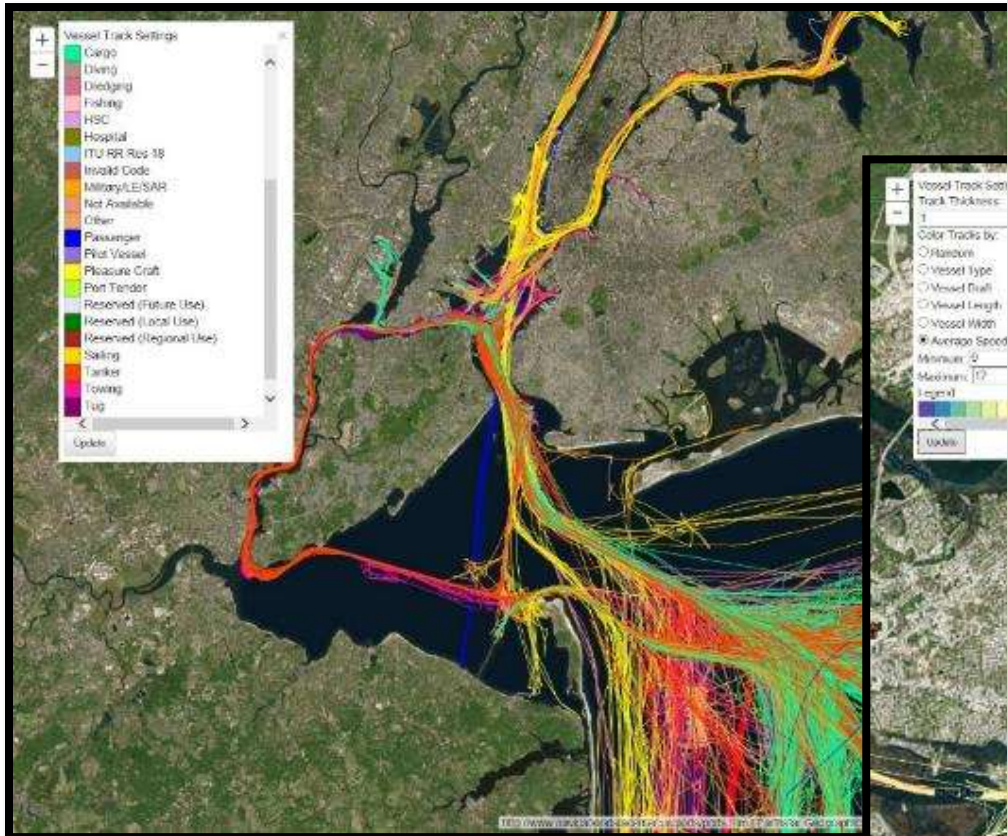
- Heat/cluster maps
- Vessel track line overlays
- Traffic statistics (vessel types, counts, sizes, etc.)
- Travel/dwell time analysis
- Time history plots of vessel speeds and trip counts

AISAP HEAT MAPS



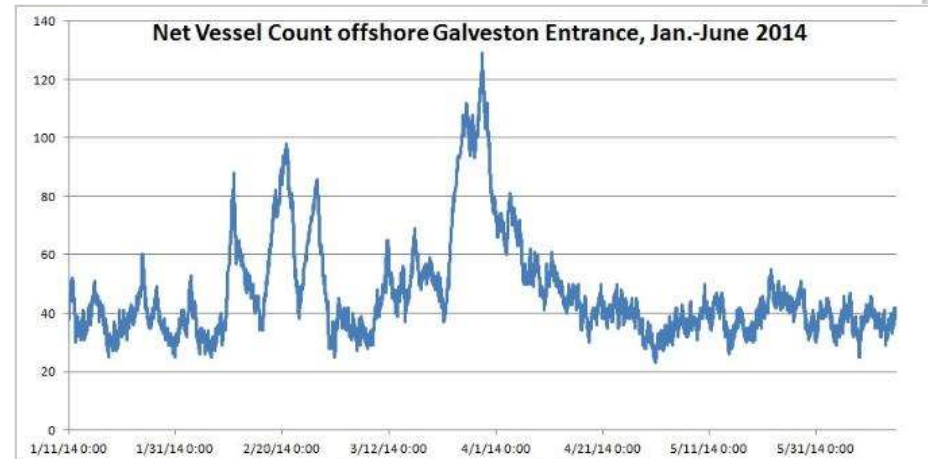
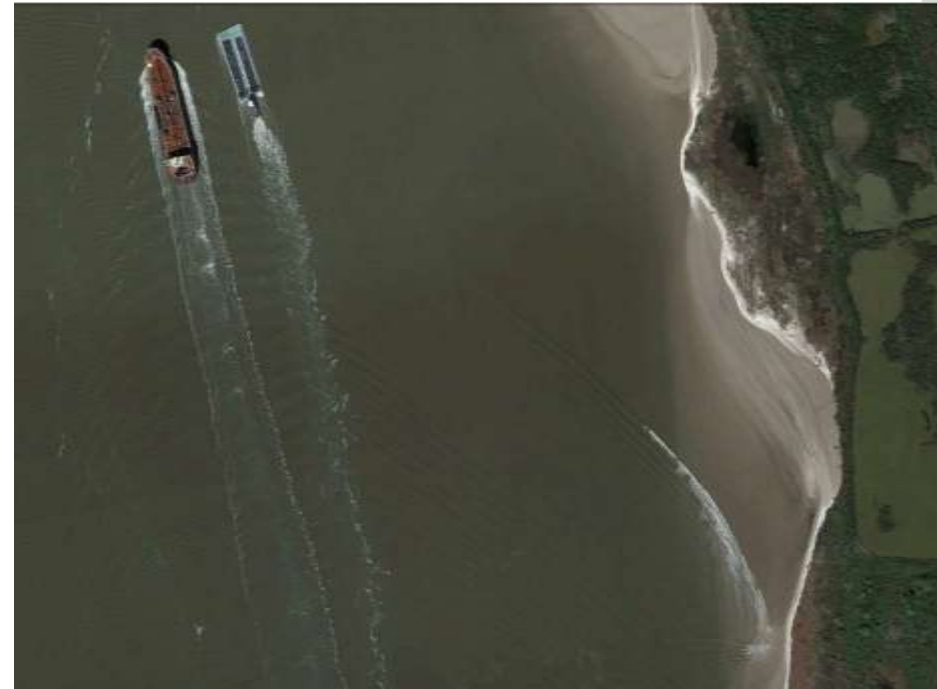
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AISAP TRACK LINE OVERLAYS



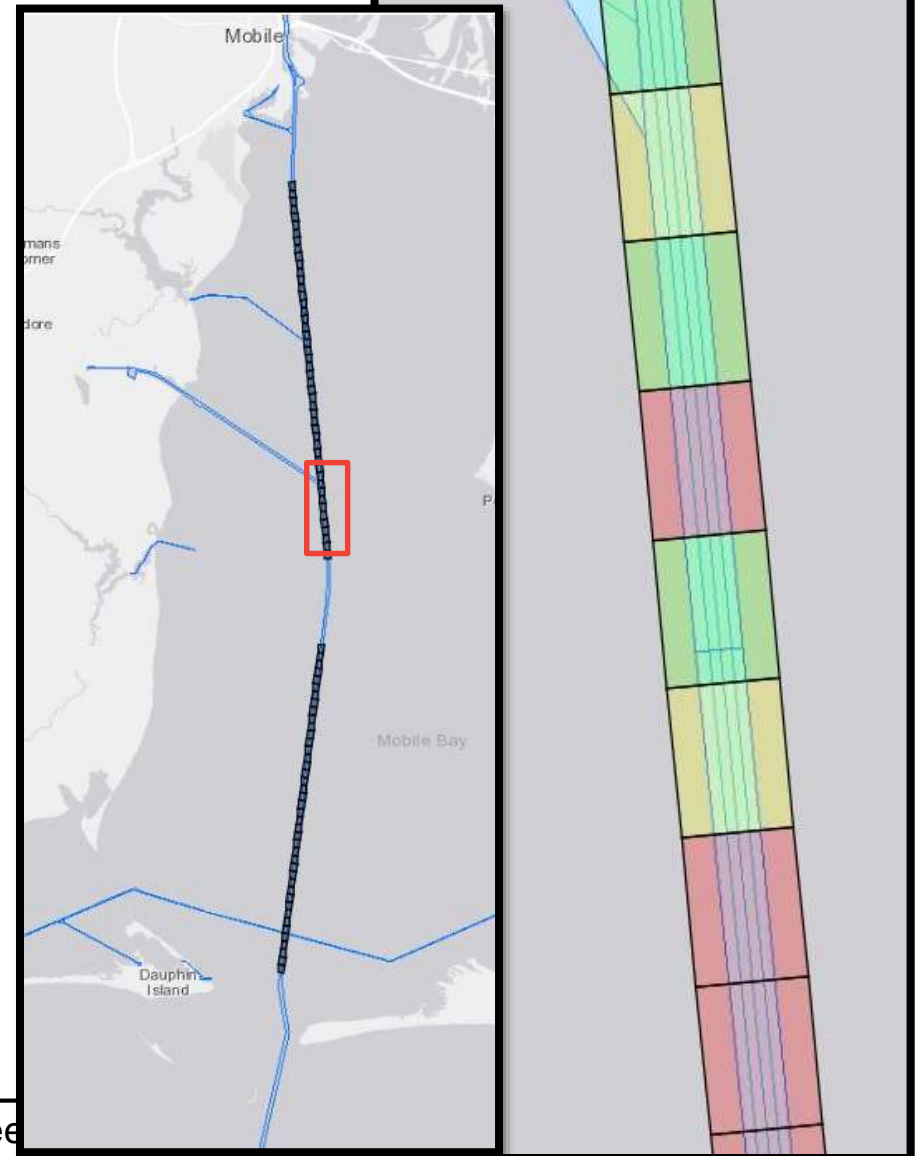
POTENTIAL APPLICATIONS

- Wake-induced wave energy/shoreline erosion (couple to numerical wave models as well as field measurements).
- Provide monthly indicators for port throughput based on calibration with Corps' Waterborne Commerce Statistics
- Functional performance evaluation of jetties and breakwaters (for wave and adverse current suppression)



POTENTIAL APPLICATIONS

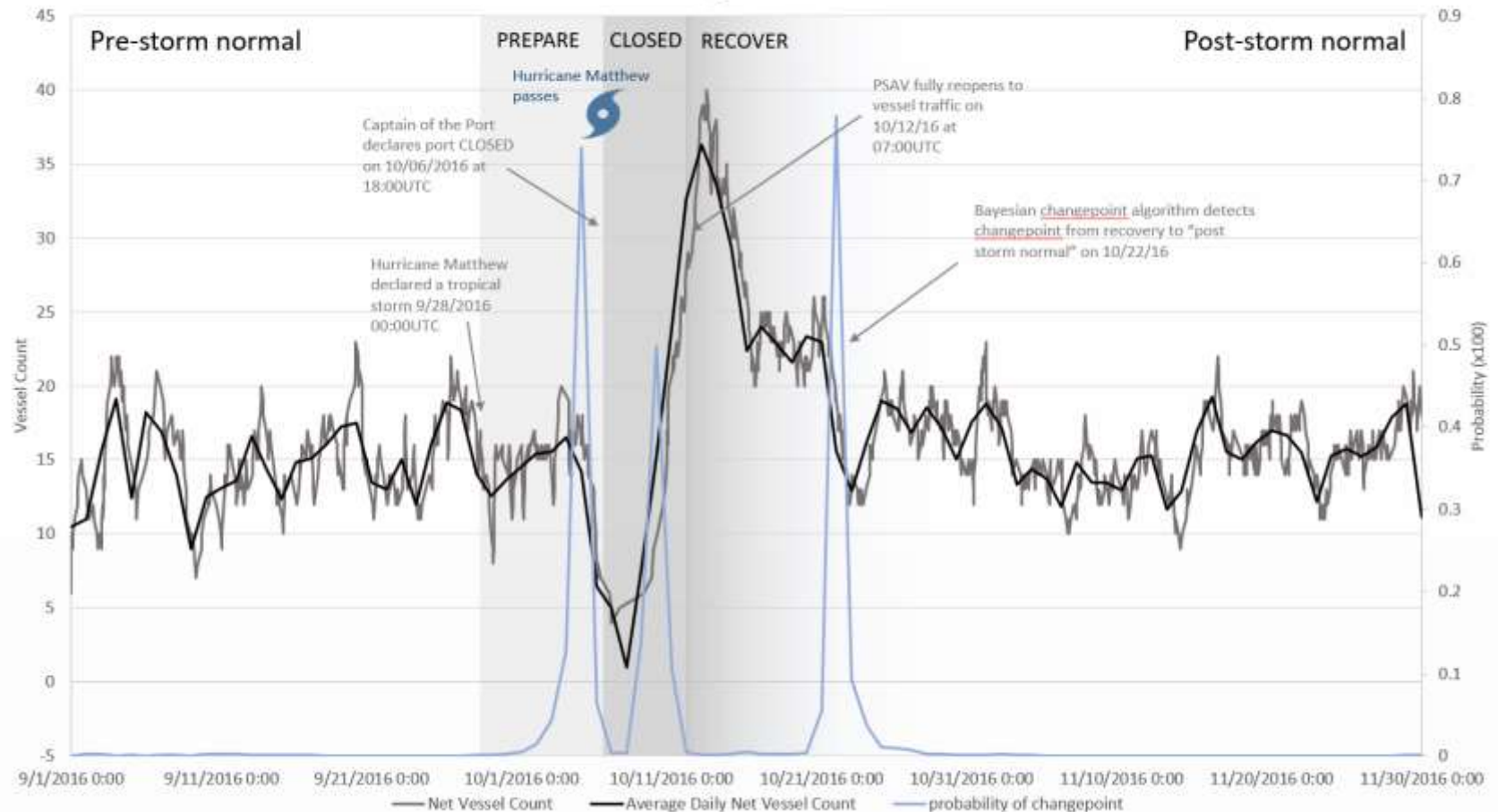
- Vessel traffic patterns within a channel
 - Two-way passing
 - Overtaking
- Vessel traffic effects on transit times
- Operating conditions effects on transit times



RESILIENCY STUDIES

HURRICANE MATTHEW 2016 – NET VESSEL COUNT

Port of Savannah - Cargo and Tanker Net Vessel Count



HURRICANE HARVEY 2017 VESSEL LOCATIONS

Hurricane Harvey Cargo and Tanker Vessel Signal Density Plots

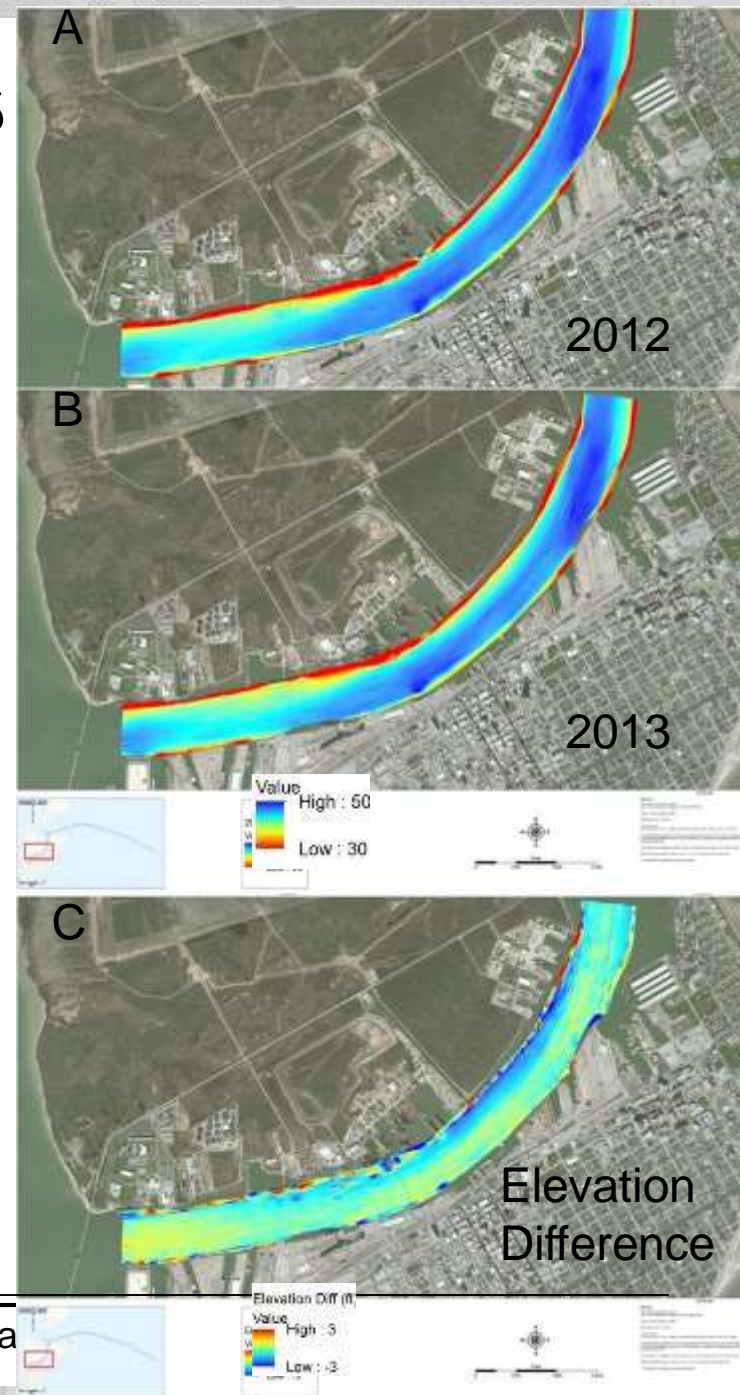
Created with ERDC Automatic Identification System Analysis Package (AISAP)



ERDC Navigation Data Performance Team: Katherine Touzinsky, Kenneth N. Mitchell, Patricia DiJoseph, Marin Kress

Corps Shoaling Analysis Tool (CSAT)

- *What will the channels look like in the future?*
- Use historical survey data from eHydro and generate difference grid sets between dredging events
- Predict average shoaling rates and dredging requirements per channel reach
- Report volumes at different depth/time intervals and shoaling rates
- *Efficiently process large spatial datasets*



Engineering With Nature®

...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

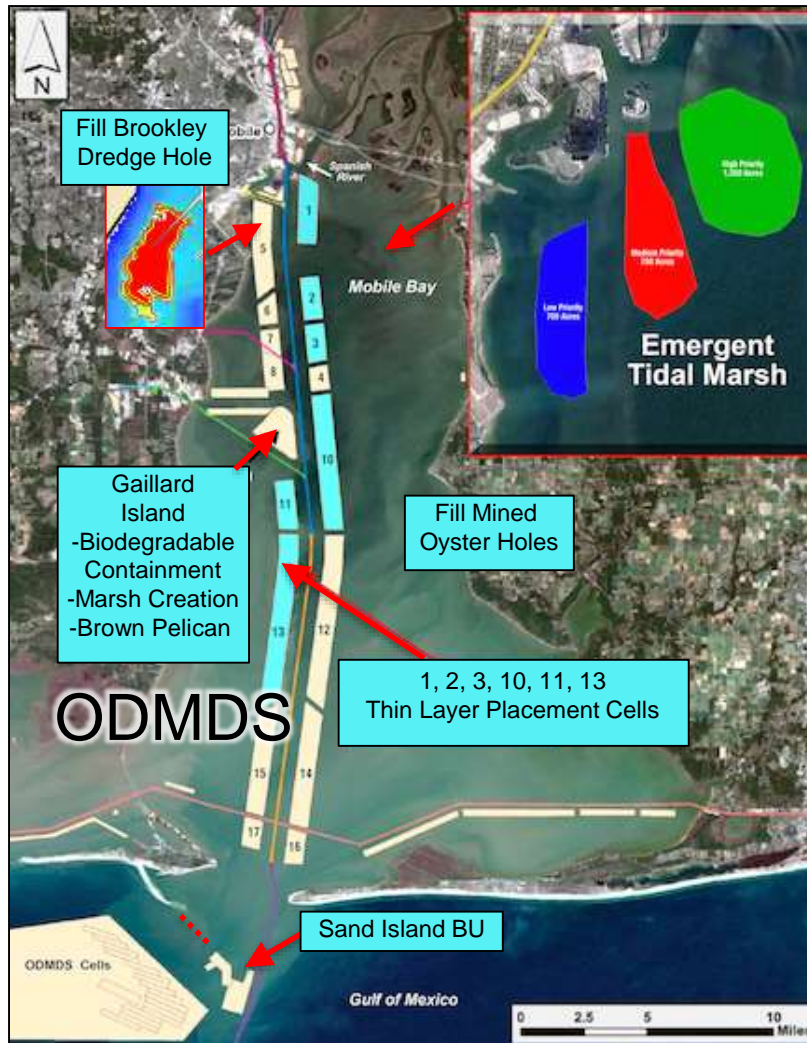
Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



www.engineeringwithnature.org

MOBILE BAY, AL



WRDA86:

- Place all dredged sediments in ODMDS
- 4.0 Mcy/yr, Hopper Dredge, 20-Miles
- Tripled maintenance costs

2014 Decision reversed

- ERDC Tools and Technologies
- RSM Interagency Work Group

\$12M annual value

- Thin Layer Placement in Mobile Bay
- Sand Island Beneficial Use Area (SIBUA)
 - Downdrift benefits to Dauphin Island
 - Protect lighthouse

Fill dredge holes

- Brookley Hole, Oyster Holes

Gaillard Island

- Biodegradable Containment
- Marsh Creation
- Brown Pelican

Future in-Bay placement:

- Thin Layer Placement
- 1000 acre emergent marsh

HORSESHOE BEND ISLAND EWN PROJECT

ATCHAFALAYA RIVER, LA

Producing Efficiencies



Material placement created new channel, reduced frequency of maintenance dredging; shortened transit distance for ships.

Using Natural Processes



Used rivers natural flow and conveyance to engineer/construct island.

Broadening Benefits



New placement option for material; economic benefits for navigation; diverse habitat created; site used for recreational purposes.

Promoting Collaboration



MVN and ERDC partnered with USFWS, Port of Morgan City to achieve results.



Received 2015, 2017 WEDA Awards, 2017 Dredging and Port Construction Working, Building, or Engineering With Nature Award in London, England.

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THANK YOU

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