Navigation RD&T

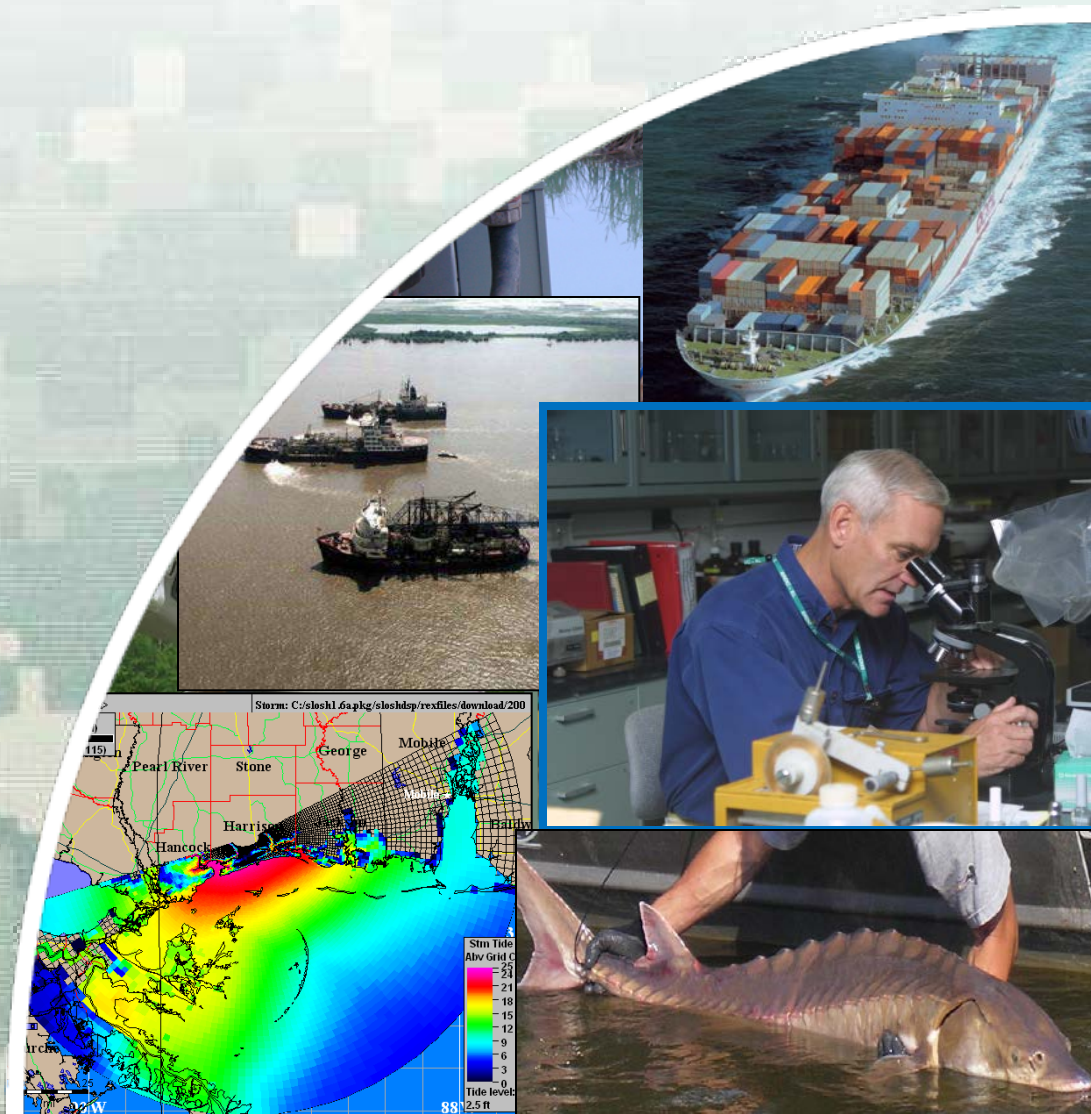
ERDC
Engineer Research and Development Center

Jeff Lillycrop
Technical Director

Advancing Science and Technology in Support of Sustainable Solutions to America's Water Resources Needs

20 Aug 2013
RSM Annual Meeting

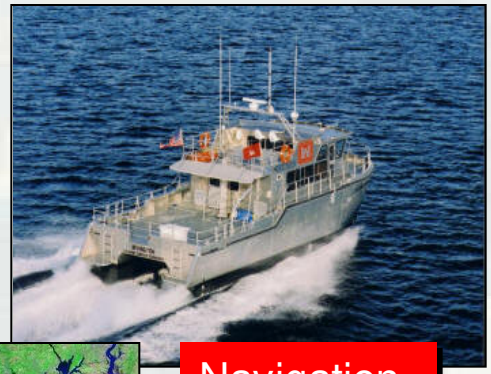
US Army Corps of Engineers
BUILDING STRONG®

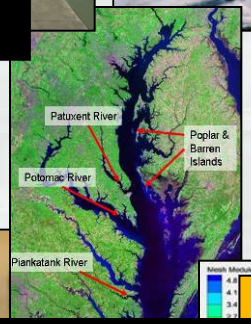


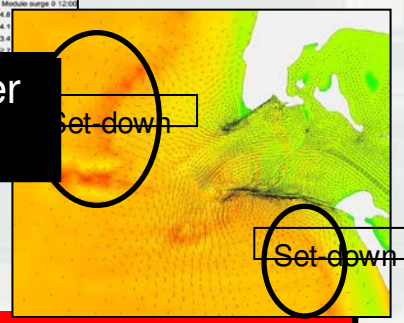
CW R&D at a Glance

- **USACE Business Areas**
  - Navigation and Hydropower
  - Flood and Coastal, Water Supply, Emergency Management
  - Environment - Restoration, Regulation, Stewardship

- **FY13 Business Lines**



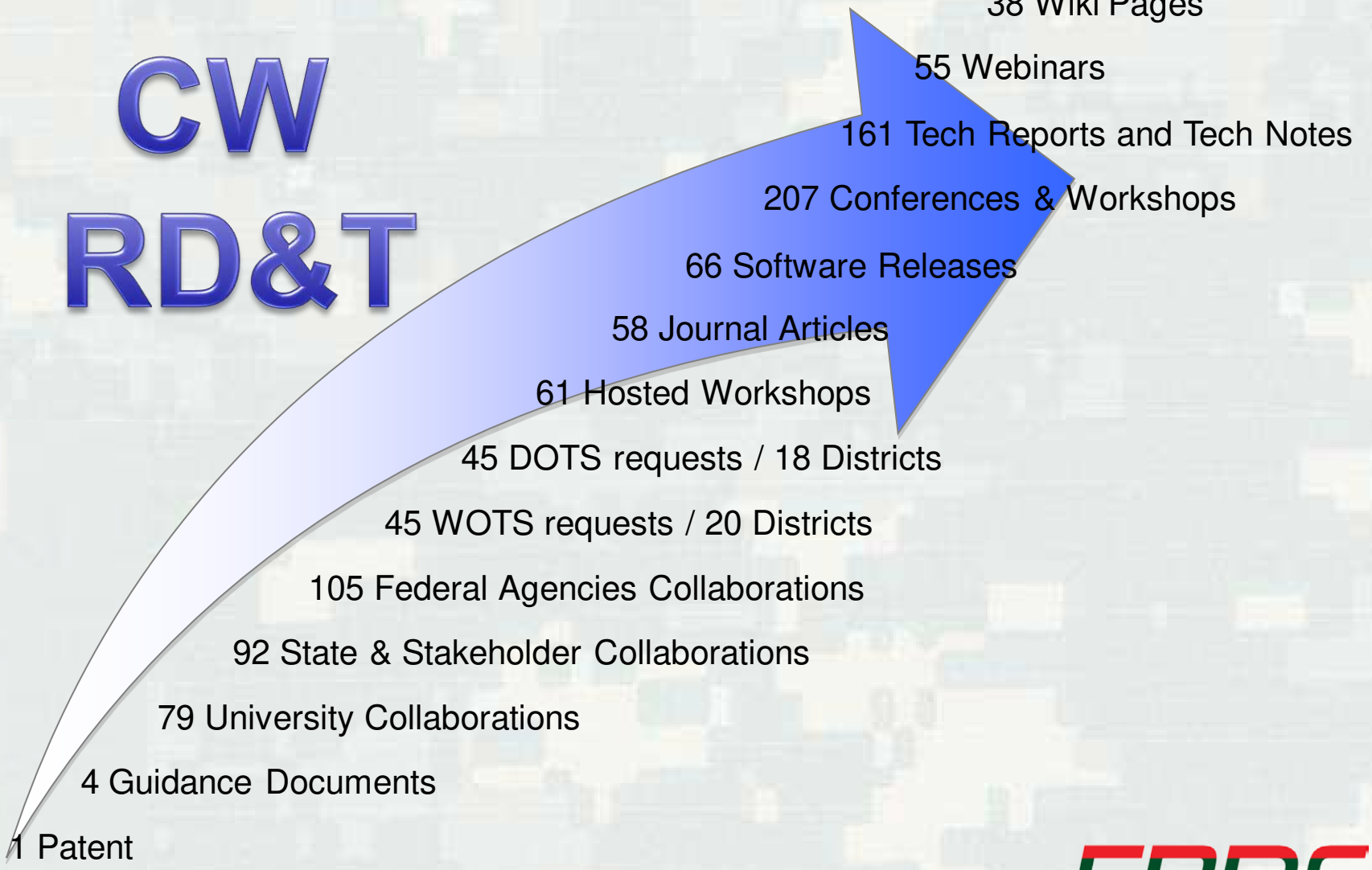




ERDC

CW RD&T Technology Transfer

Summary of FY12 Products



Corps Navigation Mission

Provide safe, reliable, efficient, effective and environmentally sustainable waterborne transportation systems for movement of commerce, national security needs, and recreation.

USACE Navigation Assets

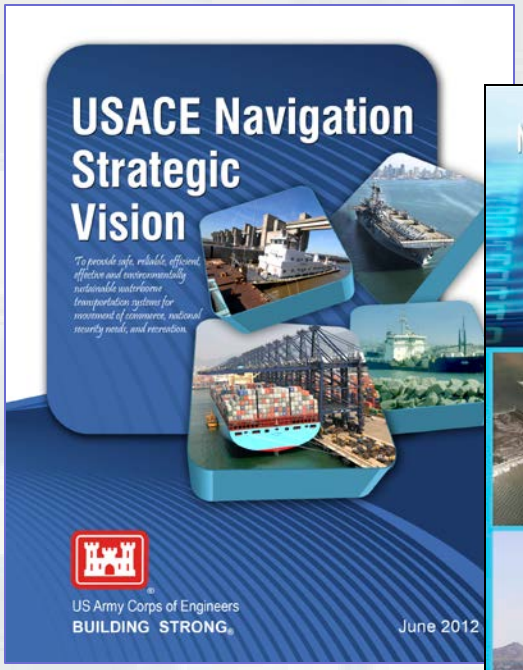
COASTAL NAVIGATION

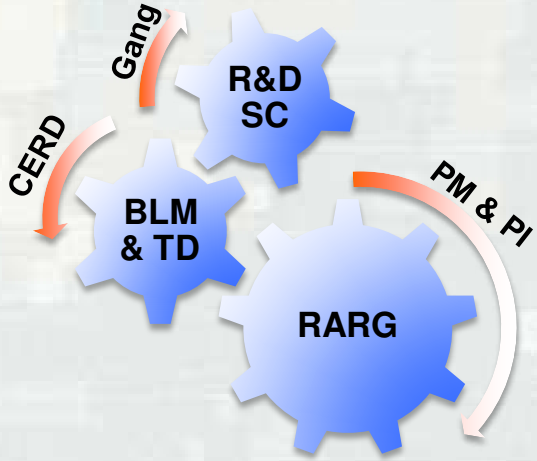
1067 Navigation Projects
19 lock chambers
13,000 miles of channels
929 navigation structures
844 bridges

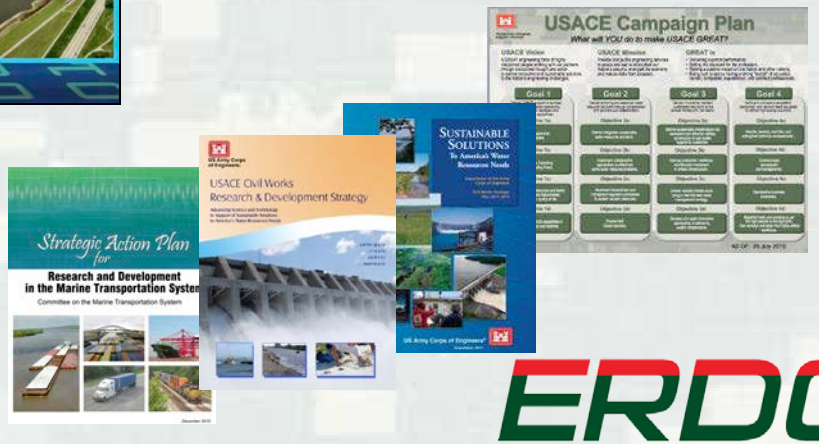
INLAND NAVIGATION

27 Inland River Systems
207 lock chambers @ 171 lock sites
12,000 miles of inland river channels

Navigation RD&T Guiding Documents







Navigation RD&T Strategic Needs & Priorities

FY13

- Extend the useful life of existing navigation infrastructure
- Operate and manage national waterborne transportation assets as an integrated system
- Optimize and prioritize channel availability for commercial freight movement
- Engineering with nature to enhance ecosystem and project processes, benefits and services
- Implement eNavigation throughout the National MTS
- Deliver sound engineering and scientific solutions to align with the Planning Modernization initiative

Navigation RD&T Portfolio

Dredging Operations and Environmental Research
Dr. Todd Bridges

Coastal Inlets Research Program
Dr. Julie Rosati

Navigation Structures

Navigation Systems
Mr. Eddie Wiggins

Regional Sediment Management
Ms. Linda Lillycrop

Monitoring Completed Navigation Projects
Dr. Lyn Hales

Dredging Operations Technical Support
Ms. Cynthia Banks

Inland Electronic Navigation Charts
Dr. Bob Mann / Ms. Denise LaDue

National Coastal Mapping Program
Ms. Jennifer Wozencraft

ERDC
Engineer Research and Development Center

Dredging Operations Environmental Research (DOER)

Dr. Todd S. Bridges, ST
Senior Research Scientist,
Environmental Science

US Army Corps of Engineers®

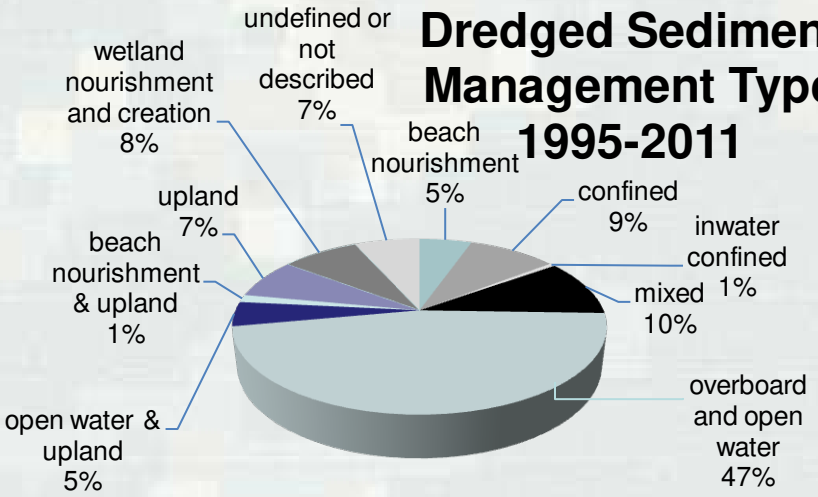
Beneficial Use of Dredged Material

John Childs

- Problem
  - Corps generates/ manages ~250E6+ cy of DM each yr
  - BU is necessary for sustainability of Nav. program
  - IWR tracks DM management, but not beneficial use
  - Funding is limited and incentives are needed for BU

Objective

- Increase BU
- Track DM Management and BU
- Technology transfer across Districts
- Identify feasible and cost effective management controls and engineering controls to allow for BU
- Identify BU incentives



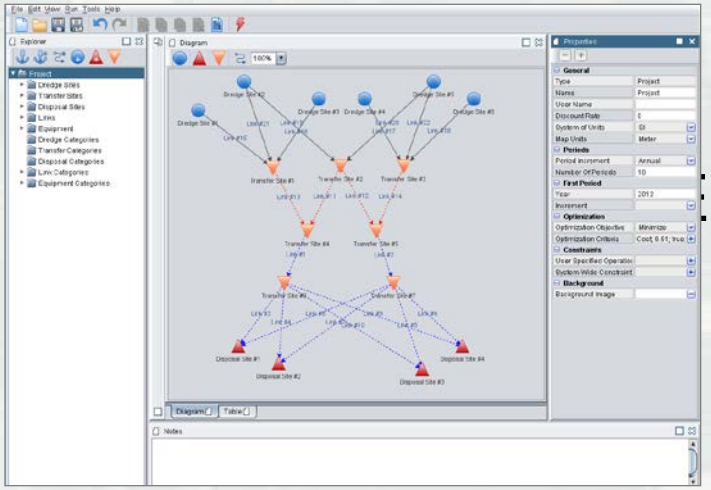
Approach

- Bring together previous and current research into Guidelines
- Quantify environmental (and social) benefits
- Occupy RSM and EWN
- BU is a primary goal of the National Dredging Team

Dredged Material Disposal Management

Linkov & Bates

- Problem
  - Multi-objective dredging planning & sediment management is complex
  - Existing optimization software was archaic, limited, and hard to use



Objective

- Improved user interface
- Improved multi-objective optimization functions
- GIS & decision support
- Open source software that is easy to maintain

Approach

- Three modules (GIS, Optimization, Decisions)
- Visual, customizable, interactive user interface
- Java code built on open source optimization tools

Engineering With Nature

Thomas J. Fredette

Problem

- USACE faces multiple challenges that affect delivery of safe and reliable navigation projects. These include:
  - Time and costs required to implement and operate projects increasing due to inter-agency coordination and consultation, regulatory compliance issues, market pressures, etc.
  - USACE infrastructure and operations are viewed by many stakeholders as being in conflict with environmental and social interests.
  - Environmental expectations and regulatory requirements for projects continue to steadily increase.
  - The effective budget for the USACE has been decreasing.

Objective

- Document, demonstrate, and monitor EWN sites.
- Highlight how these infrastructure development efforts provide economic, environmental, and social benefits – in a sustainable way – producing a "triple win".
- Enable greater support by and collaboration with our partners and stakeholders by illustrating case studies that use natural processes to achieve a broad range of project objectives.
- Support and advance the USACE Environmental Operating Principles and Civil Works Strategic Plan.

Approach

- Conduct technical data/literature search to identify existing projects.
- Survey USACE Districts to identify and document existing projects and their benefits.
- Develop an Interactive Geographic Site Database.
- Evaluate identified projects and develop technical approaches for improving implementation and performance.

Coastal Inlets Research Program

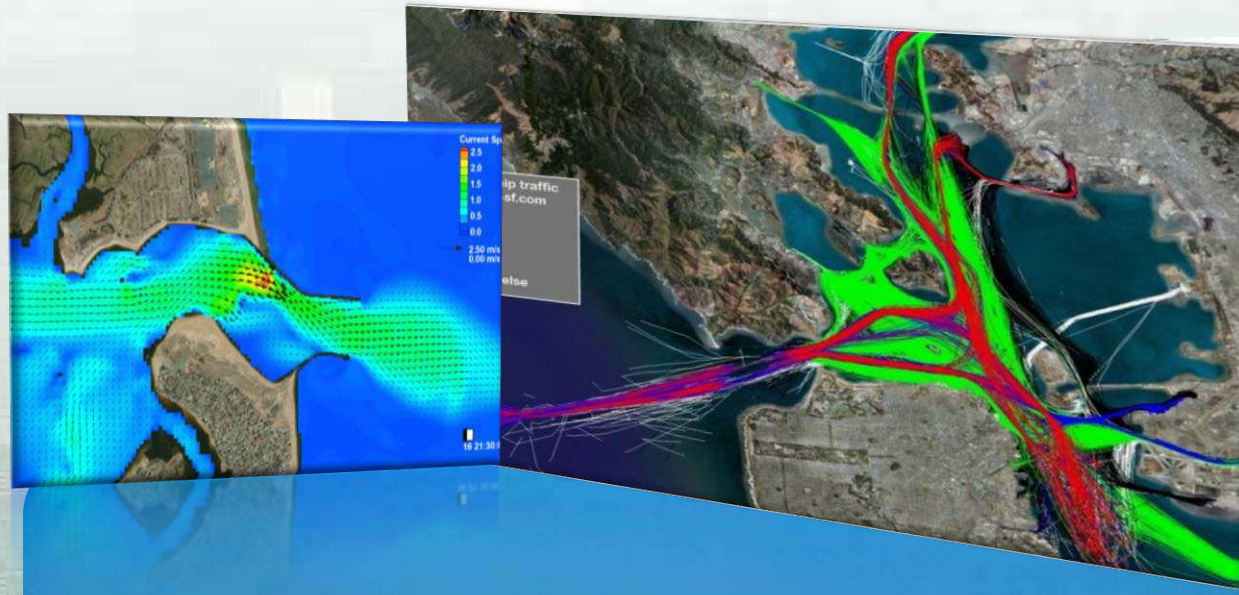
ERDC
Engineer Research & Development Center

Julie Dean Rosati
Program Manager

Jeff McKee
HQ Navigation
Business Line Manager

Jeff Lillycrop
Technical Director

Eddie Wiggins
Associate Technical Director



Mission Support · Technology Transfer · CIRP · Research & Development

US Army Corps of Engineers
BUILDING STRONG®

Coastal Modeling System

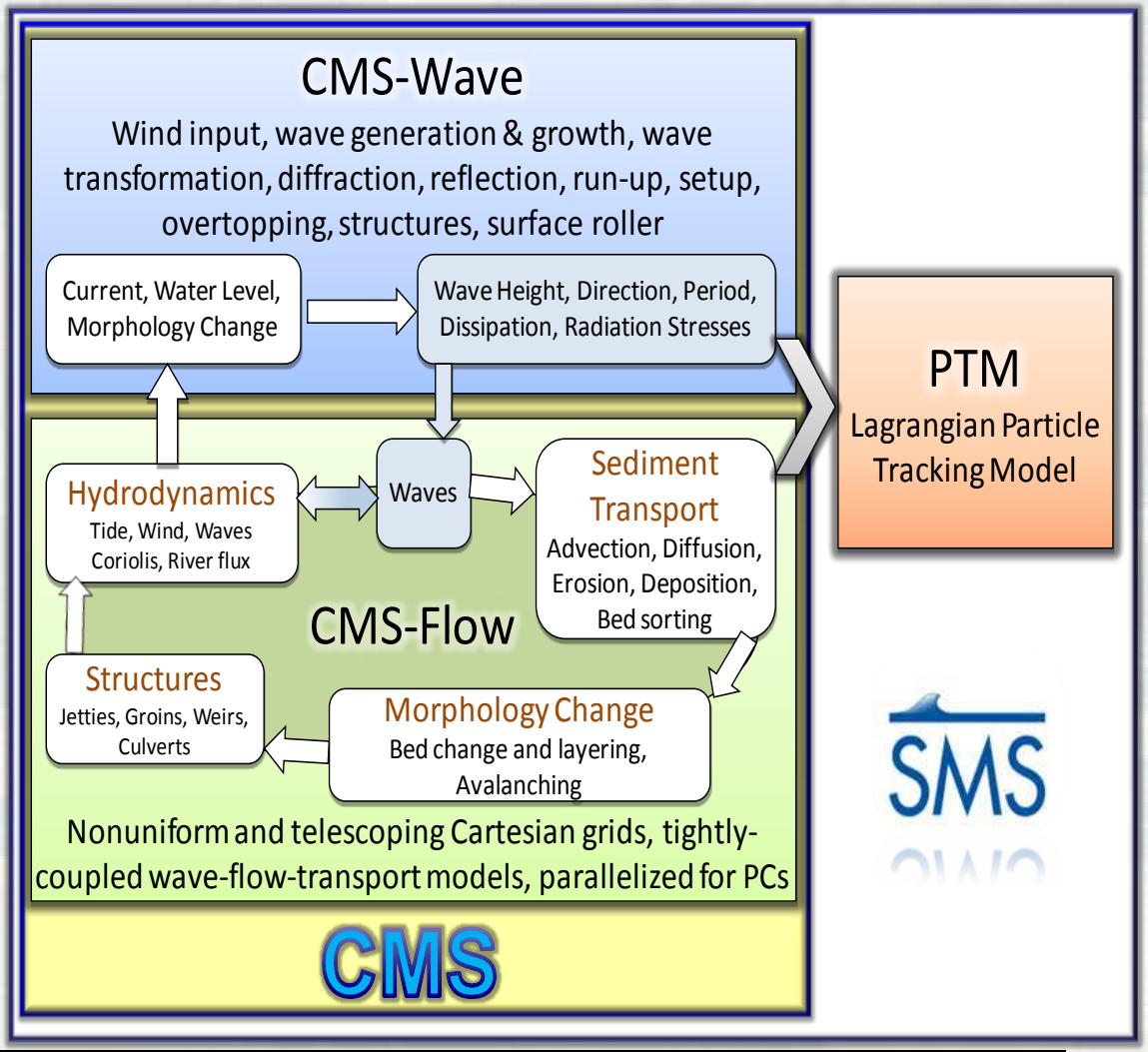
CHL Coastal and Hydraulics Laboratory

What is the CMS?

Integrated wave, current, and sediment transport model in the SMS

Includes:

- Application specific solvers
  - Implicit: Δt~10 min
  - Explicit Δt~1 sec for
- Multiple-sized sed. transport
- Grid options
  - Non-uniform and
  - Telescoping Cart. grids
  - Flexibility and efficiency
- Parallelization on PC's
- FVM - Conservative

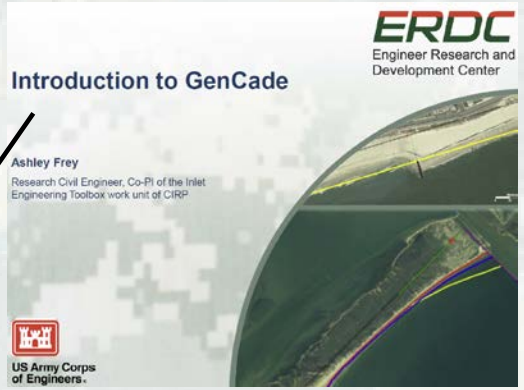


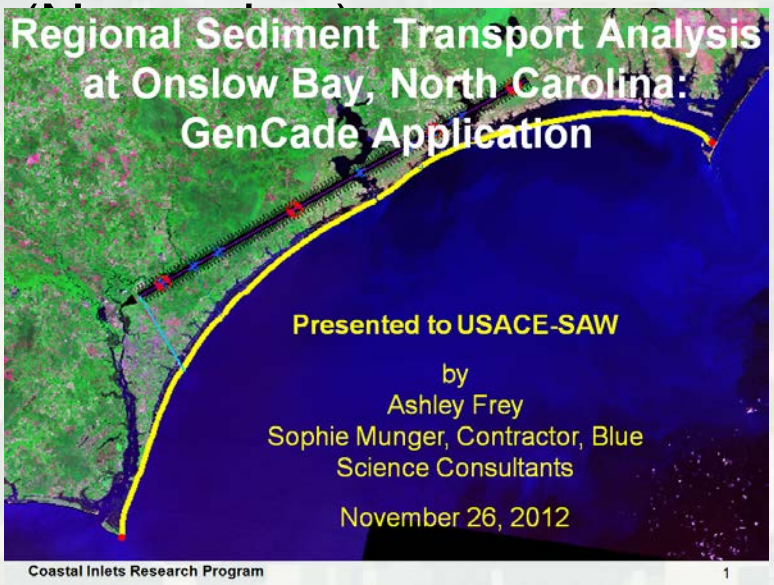
GenCade – Tech-Transfer & District Interaction

Webinars

Introduction to GenCade Webinar (October, 6 hours)

Onslow Bay Webinar to SAW





GenCade

Webinar occured 16-18 June 2012

Agenda

16 October 2012 - Day 1

- Welcome
- Introduction to GenCade
- Introduction to GenCade in the SMS
- Helpful Hints
- GenCade Applications
- Completed Project Demo
- Simple Case Demo

17 October 2012 - Day 2

- Simple Case Demo (continued)
- Inlets and Beach Fills Case
- Complex Case (start)

18 October 2012 - Day 3

- Complex Case (continued)
- Future Capabilities
- Wave Conversion Tool

Files

Click underlined links on the agenda to access presentation material, CMS User's Guide, and data files.

- GenCade Executable
- SMS 11.1 Beta (Full Installation)
  - 32-bit Installer
  - 64-bit Installer
- Day 1 material
- Day 2 material
- Day 3 material

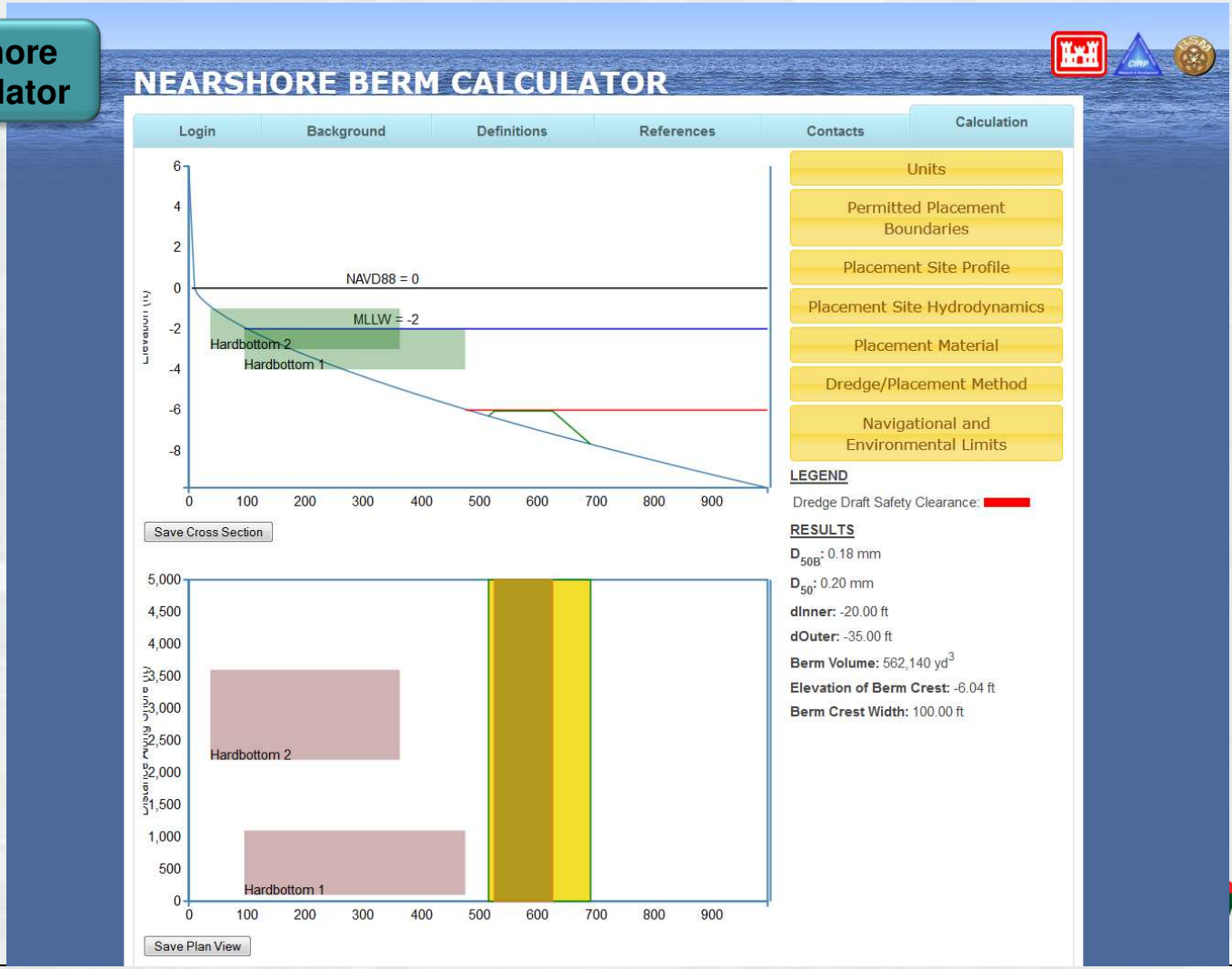
Webinar Audio/Video Files

- Day 1 (~100 MB)
- Day 2 (~113 MB)
- Day 3 (~ 75 MB)

Nearshore Berms
RSM Leveraged

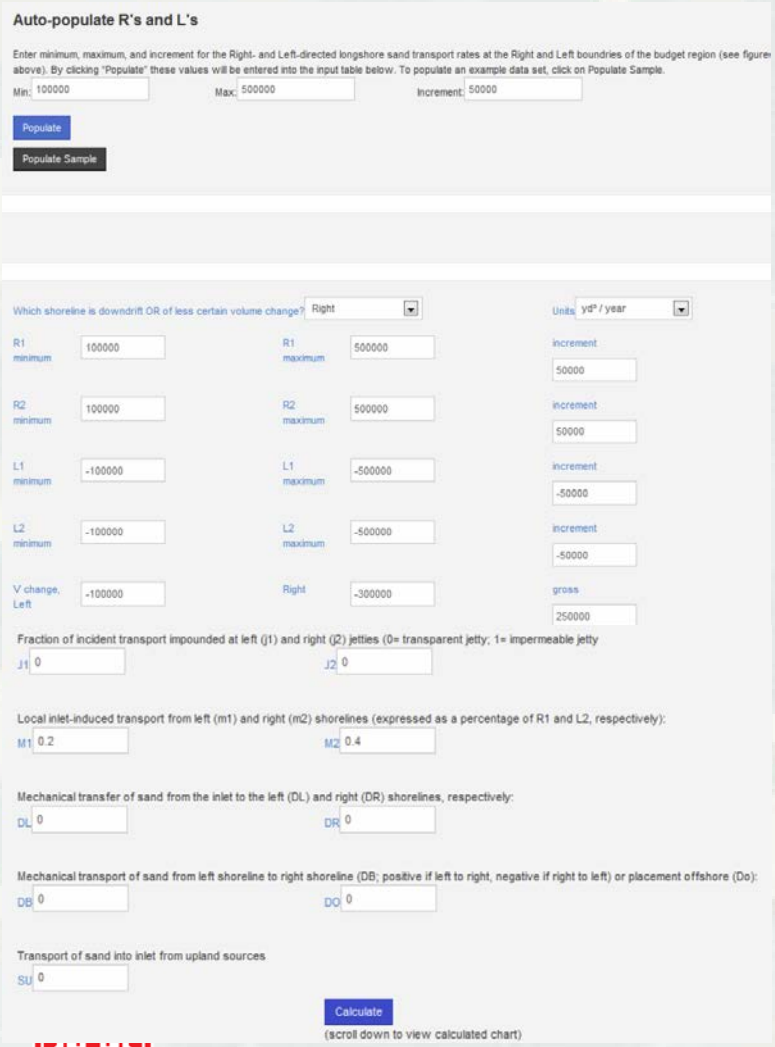
CHL Coastal and Hydraulics Laboratory

The Nearshore Berm Calculator



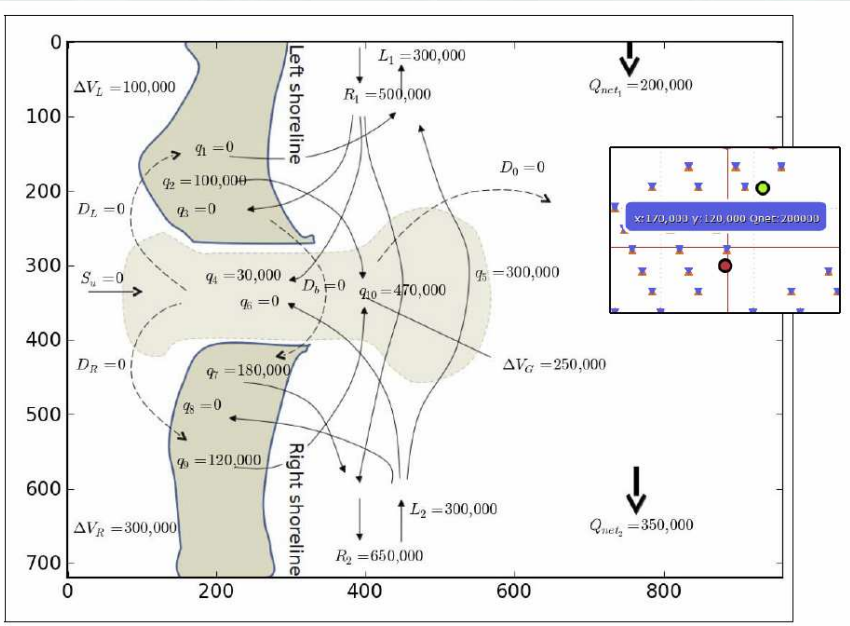
Sediment Budget Calculator

CHL Coastal and Hydraulics Laboratory



An online web-tool that applies the Bodge Method of formulating an inlet and adjacent beach sediment budget through developing a Family of Solutions that satisfy user-defined constraints

Webinar in July with 11 attendees from Districts



Innovative solutions for a safer, better world

National Coastal Mapping Program

Jennifer M. Wozencraft
Director, Joint Airborne Lidar Bathymetry Technical Center of Expertise

US Army Corps of Engineers
BUILDING STRONG®

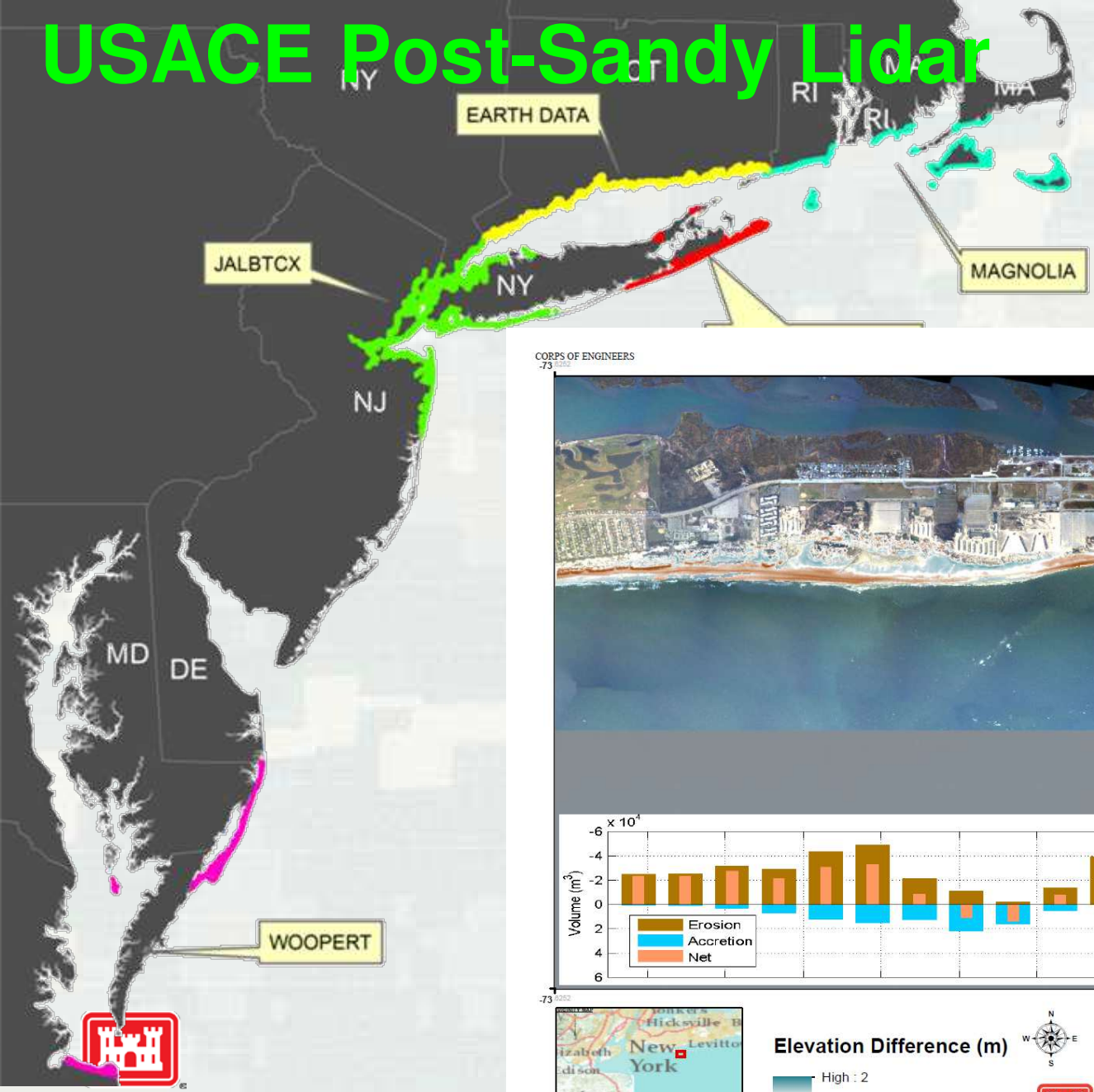
Joint Airborne Lidar Bathymetry
Technical Center of Expertise

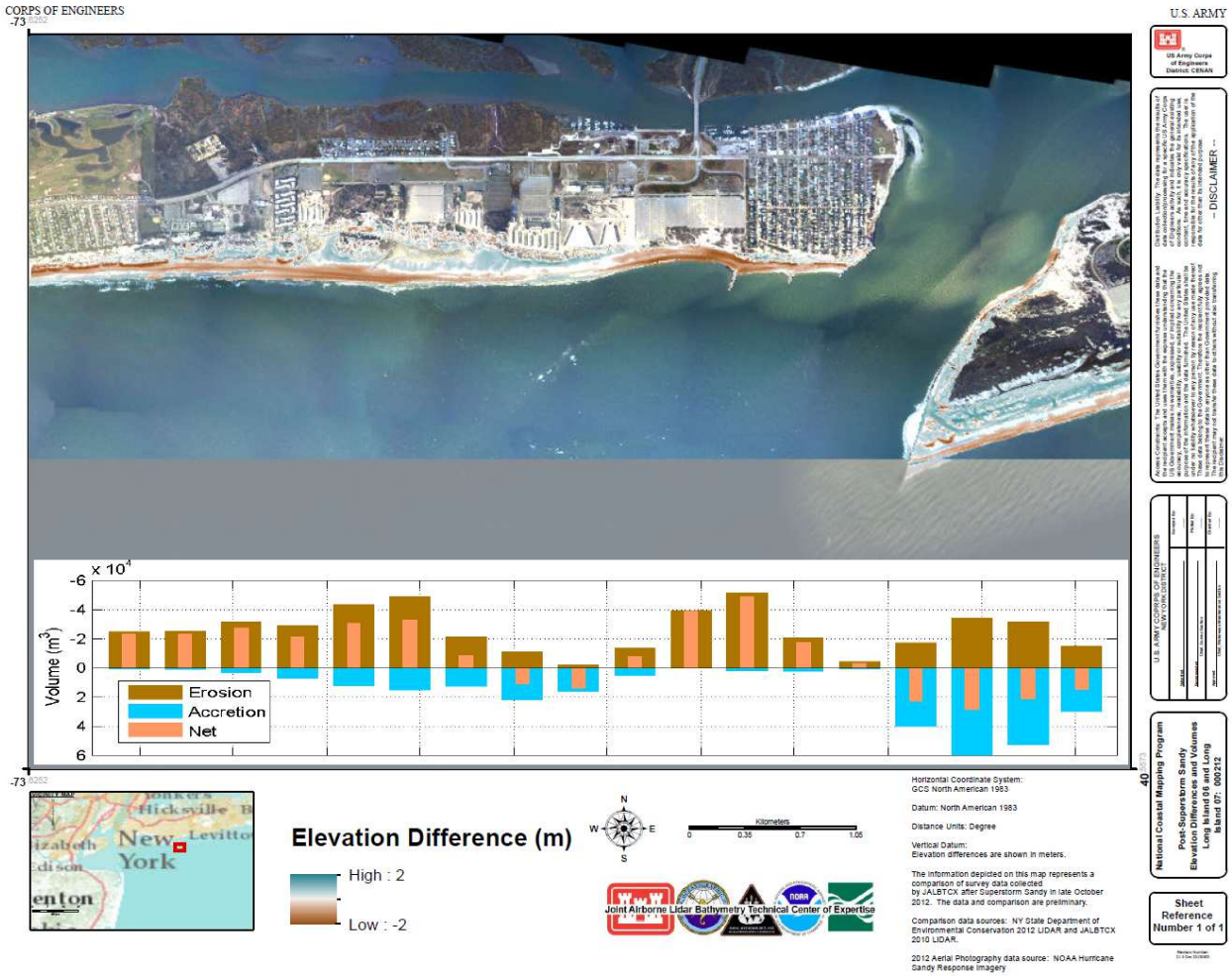
National Coastal Mapping Program

Seabrook, NH, 2011 federal navigation project and backbay marsh

USACE Post-Sandy Lidar

JALBTCX was also tasked by North Atlantic Division with comparing the pre-event datasets from the USACE National Coastal Mapping Program with the post-event lidar data.

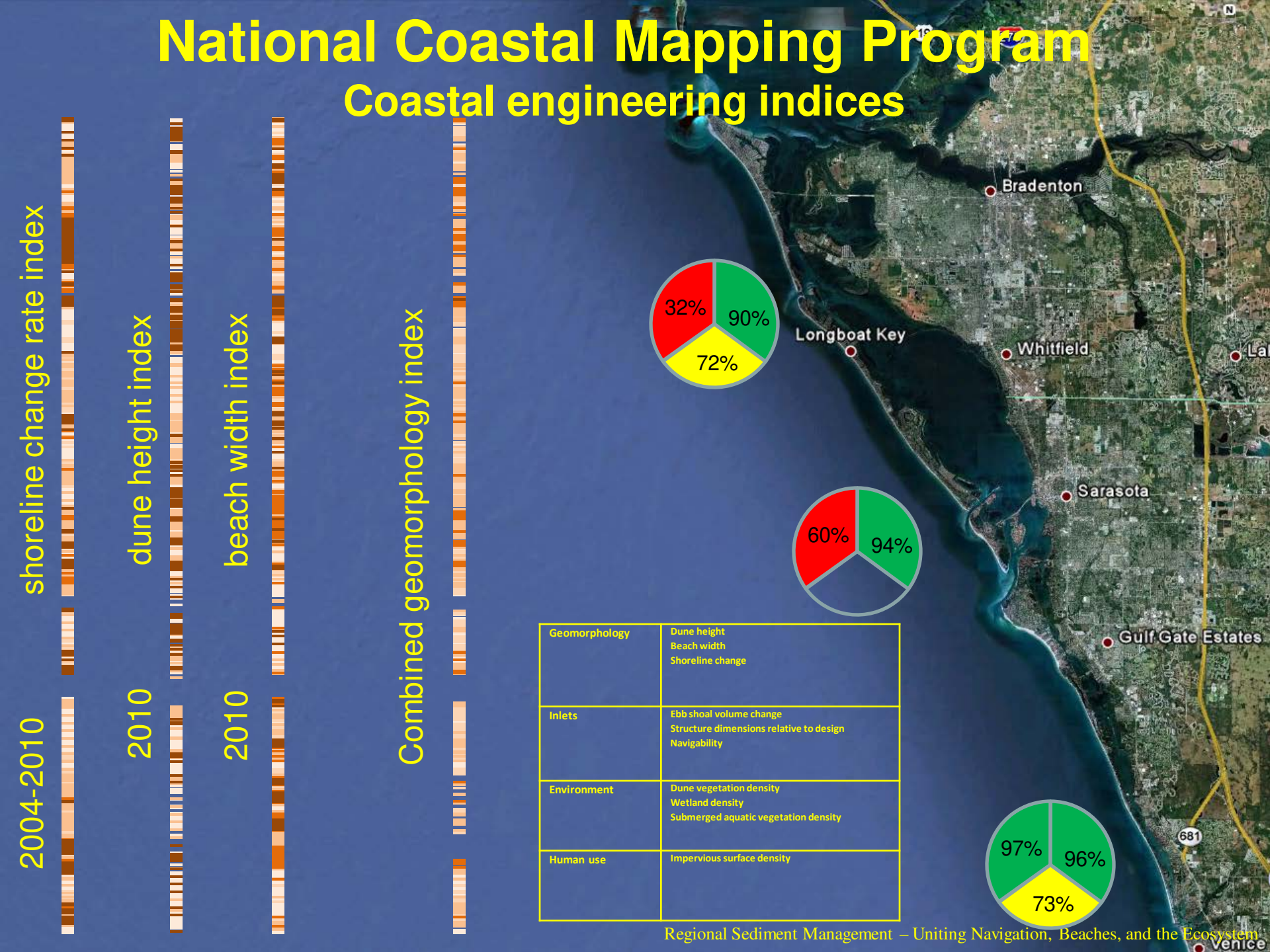




BUILDING STRONG®

National Coastal Mapping Program

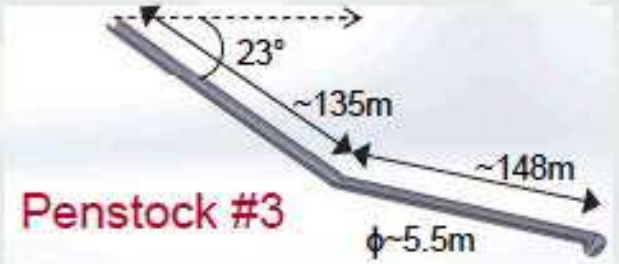
Coastal engineering indices



Geomorphology	Dune height Beach width Shoreline change
Inlets	Ebb shoal volume change Structure dimensions relative to design Navigability
Environment	Dune vegetation density Wetland density Submerged aquatic vegetation density
Human use	Impervious surface density

FY13 Product Development

- 11/8/2012 Site Visit, Carter's Lake, Penstock #3
- Challenges
  - Little / no light
  - Water / slippery surface in center
  - No surface features
  - Curved & inclined floor
  - Fe_2O_3 dust



ERDC

Innovative solutions for a safer, better world

USACE Regional Sediment Management Program (RSM)

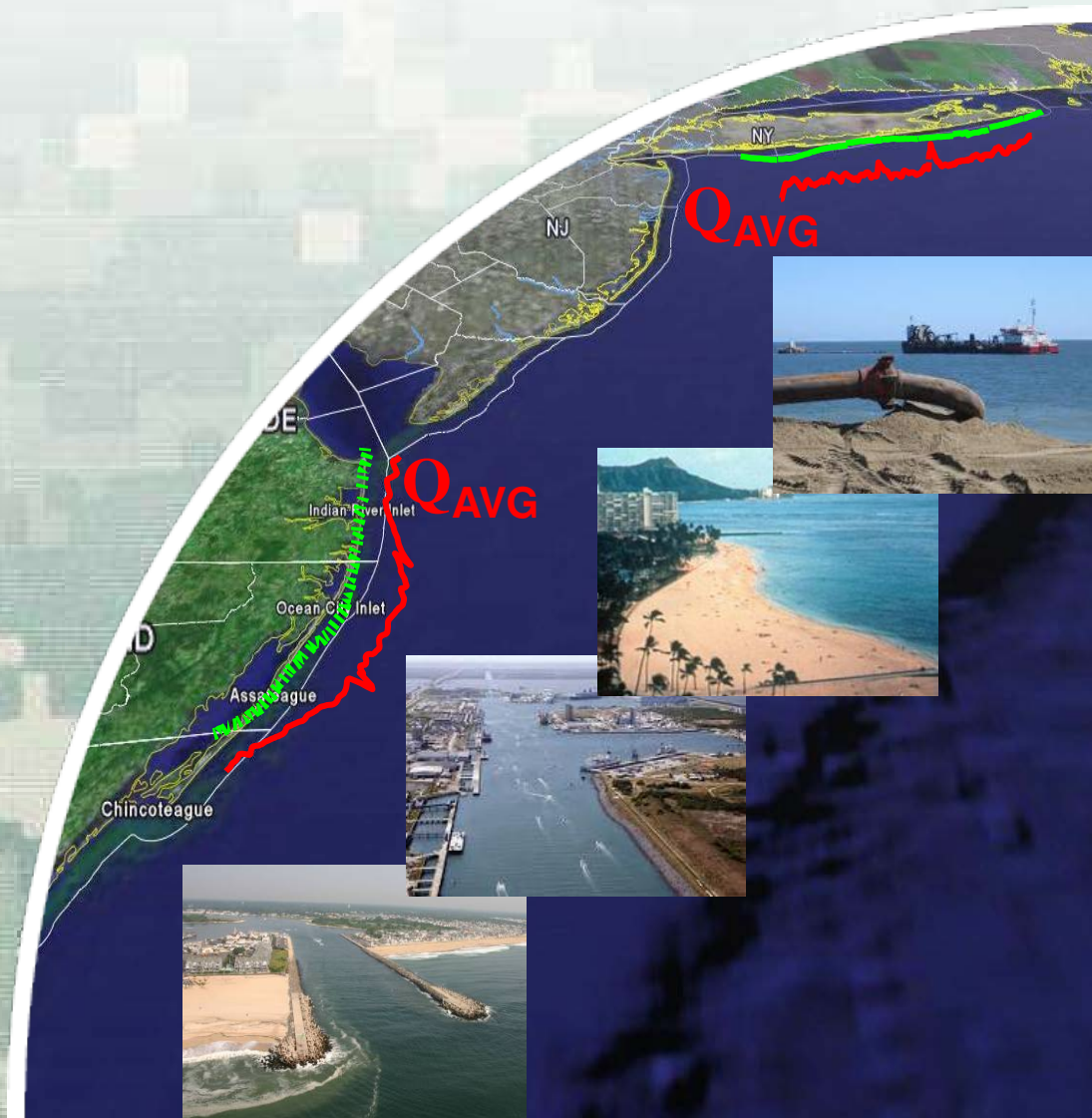
Linda Lillycrop
Program Manager

Jim Walker
HQ, Proponent
Navigation Business Line Manager

Jeff Lillycrop
Technical Director, Navigation

Eddie Wiggins
Associate Technical Director, Navigation

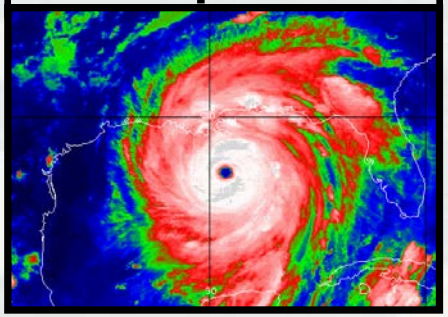
Navigation RARG Meeting
Vicksburg, MS
3-5 April 2012



US Army Corps of Engineers
BUILDING STRONG®

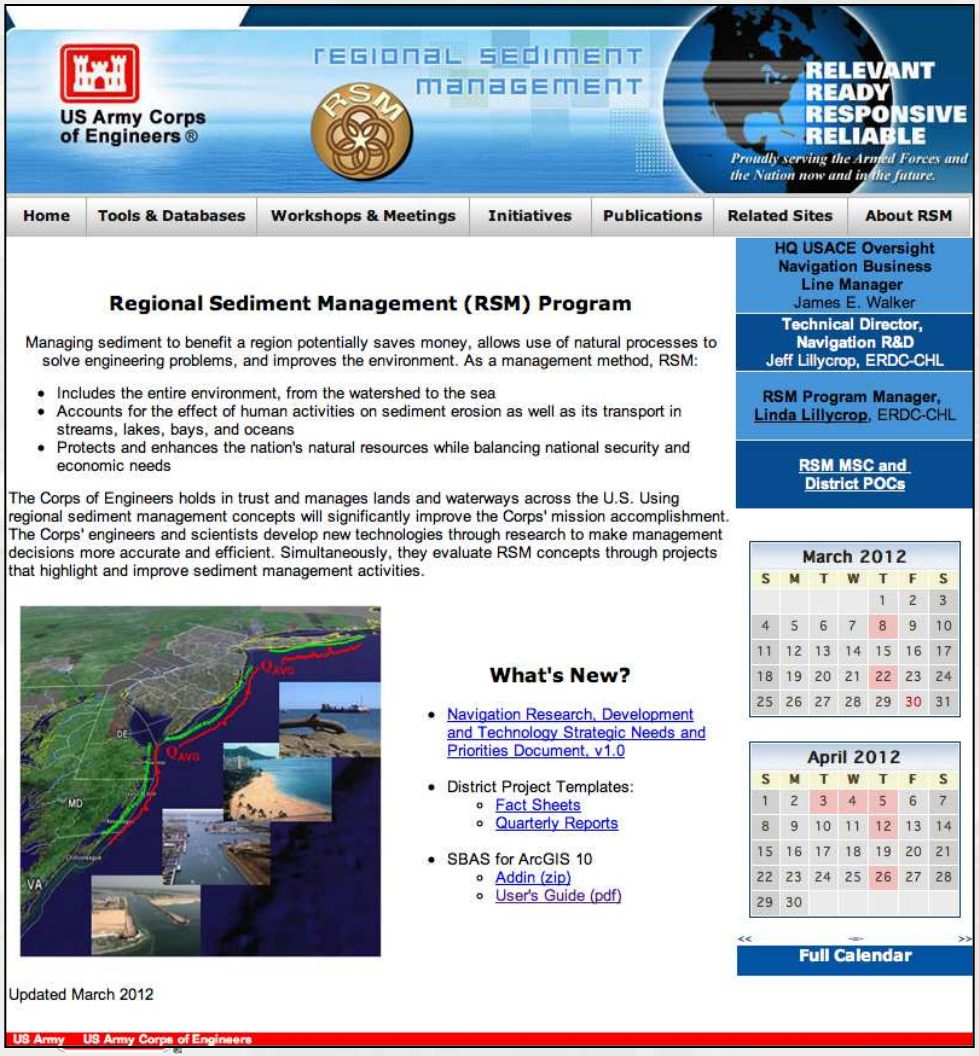
Regional Sediment Management

Districts

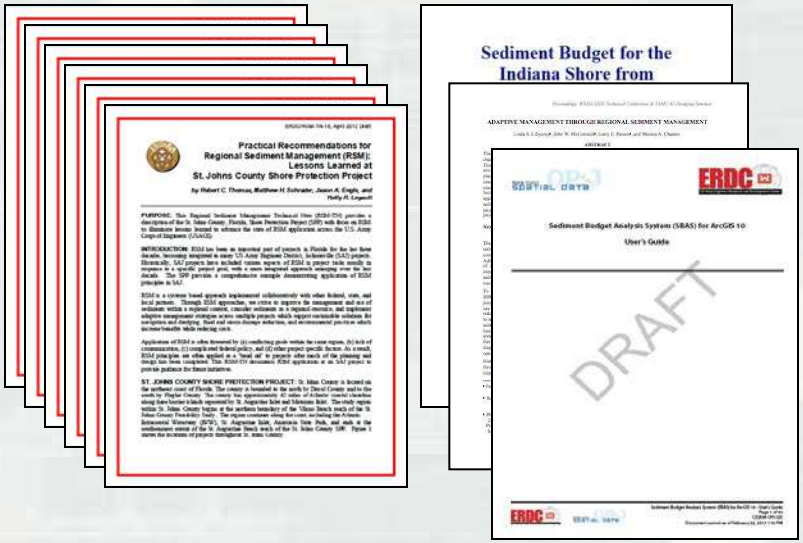
Navigation/Dredging	Flood Risk Management	Environmental Restoration	Emergency Response
			

RSM Products FY12 & FY13 - FY17

RSM.USACE.ARMY.MIL

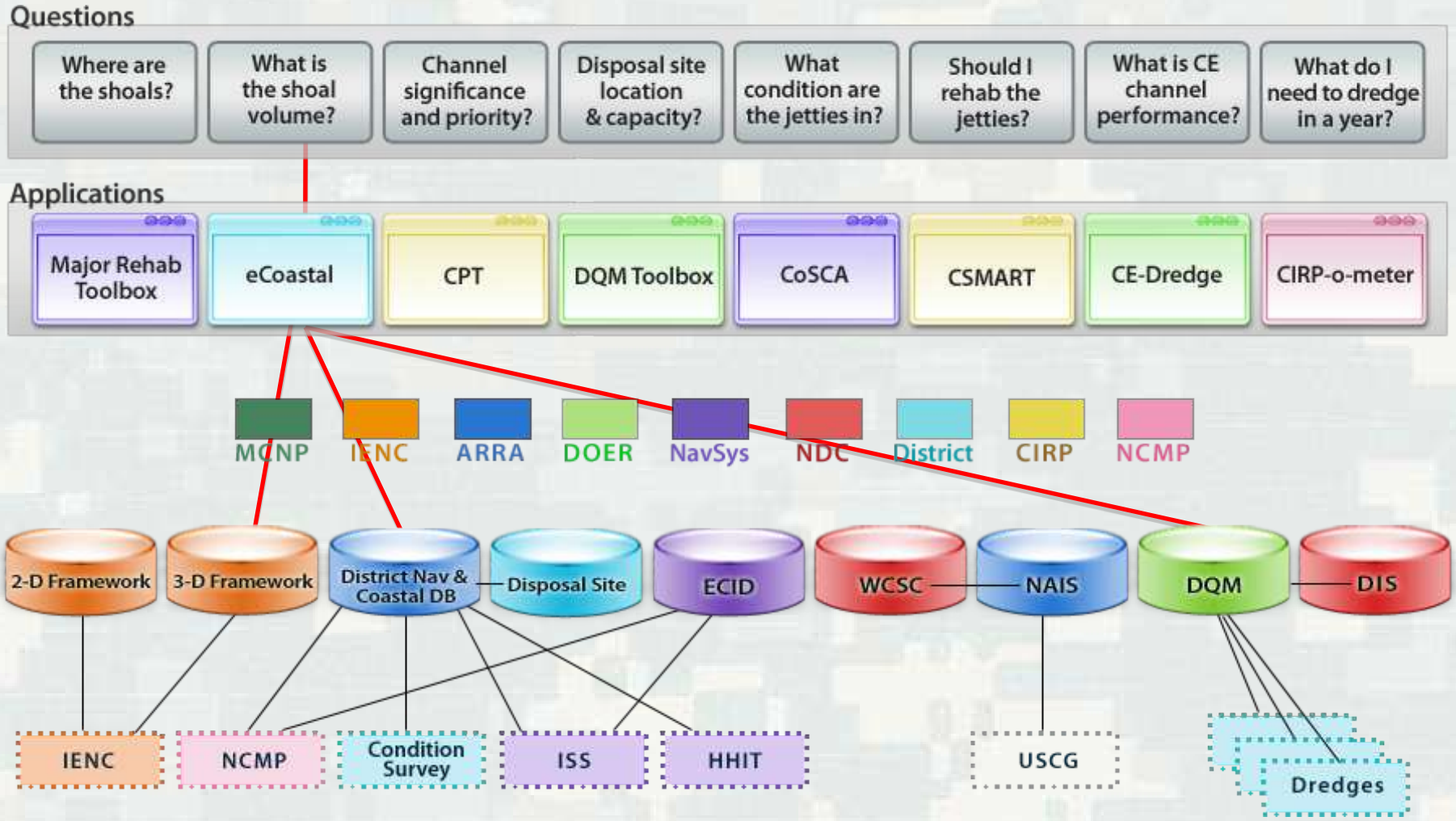


RSM Technical Notes, Reports, Manuals, Conference Papers



Bi-Monthly RSM Conference Calls Webinars

Navigation Data Integration Framework



Questions?