JALBTCX, GIS, NCDB, & Data Information Framework

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Chief, Spatial Data Branch

Operations Division

Mobile District

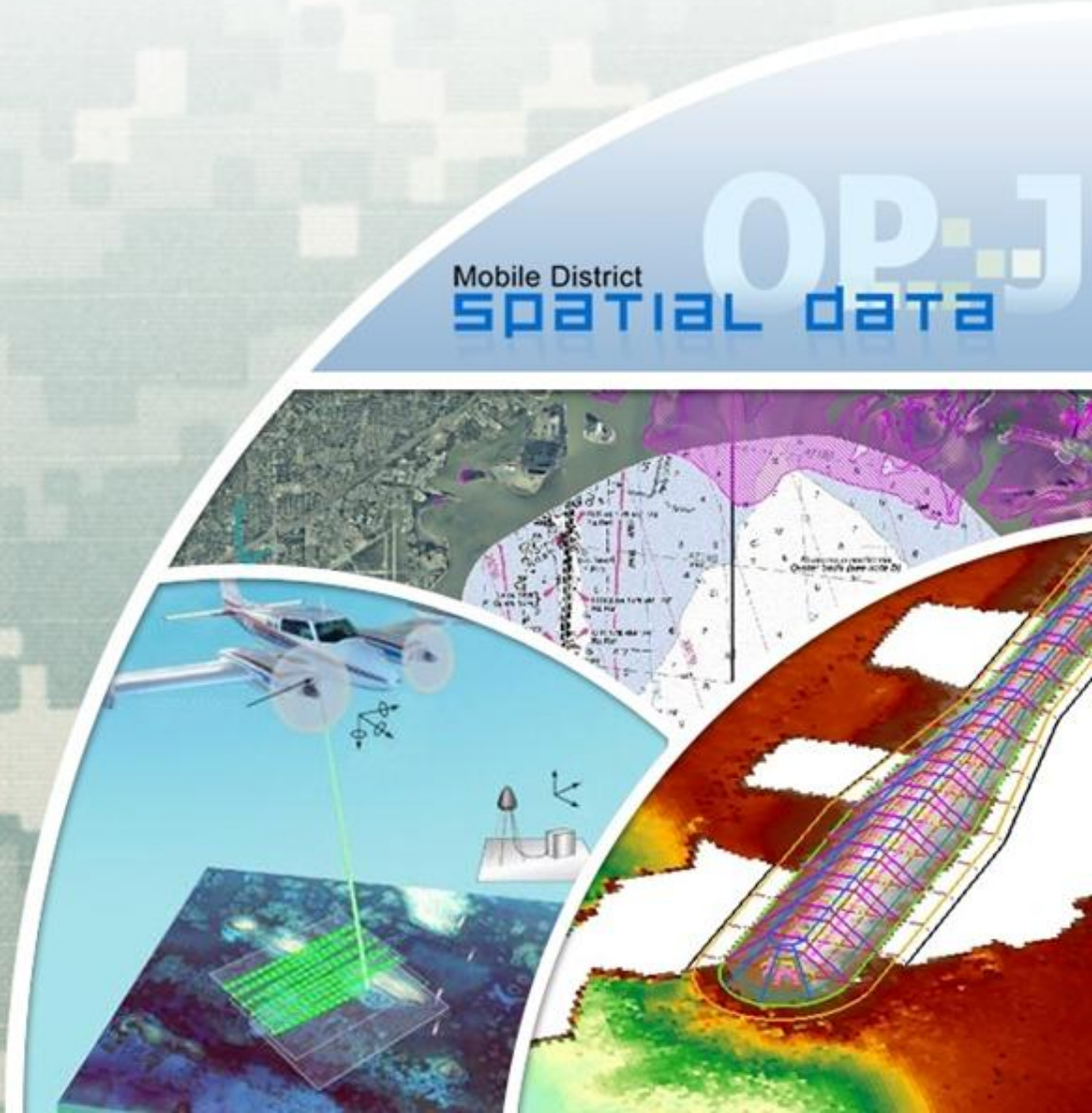
USACE Brief to AOOS & POA

Anchorage, AK

August 10, 2010

US Army Corps of Engineers

BUILDING STRONG®



Joint Airborne Lidar Bathymetry Technical Center of eXpertise

- JALBTCX
  - Operations
    - USACE
    - Navy
  - Technology Evolution
    - Coastal Measurements & Data Usage
    - Sensors & Systems
    - NOAA

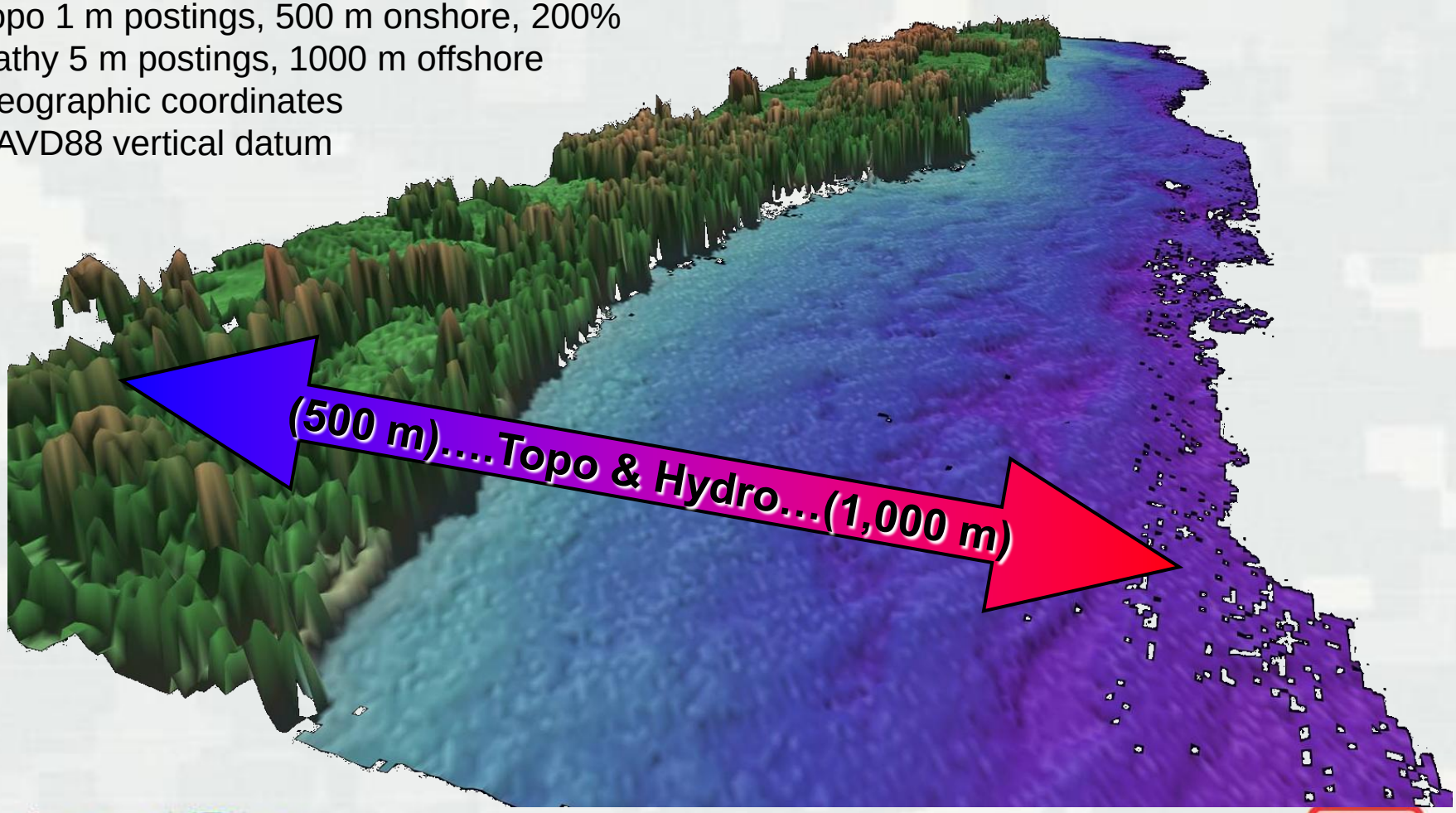
National Coastal Mapping Program

- Funded by HQ
- Initiated in FY2004
- Collect lidar elevation and imagery data to support regional sediment management
- Focus on sandy shorelines
- Annual planning meetings
- Districts
- PDT
- Other agencies
- In-house (CHARTS) and contract capability
- 5-year national cycle

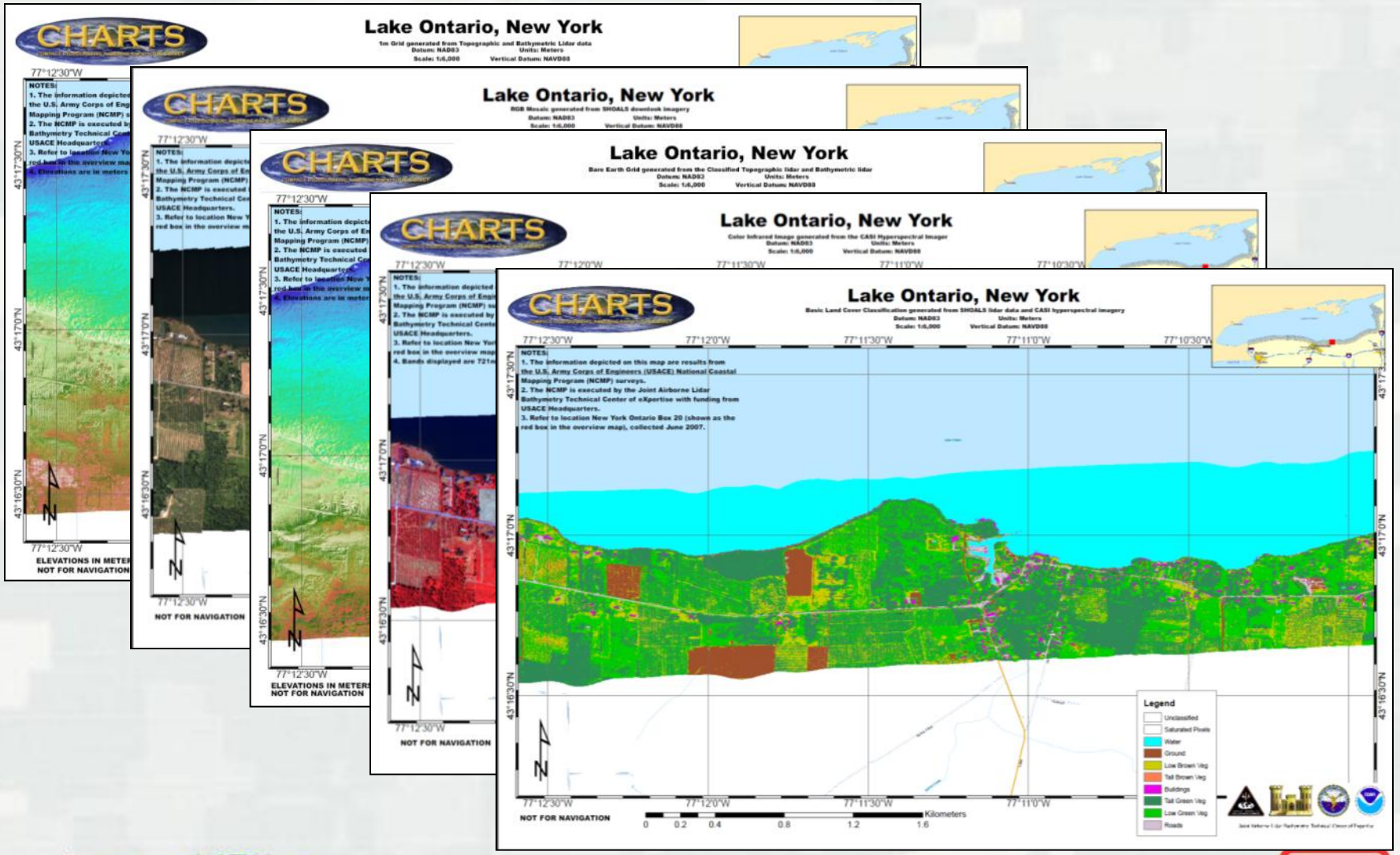
In addition to NCMP, JALBTCX supports USACE post-hurricane response through emergency supplemental funding.

NCMP – Collection Scheme

Bathymetric and Topographic lidar
Topo 1 m postings, 500 m onshore, 200%
Bathy 5 m postings, 1000 m offshore
Geographic coordinates
NAVD88 vertical datum



USACE NCMP Products



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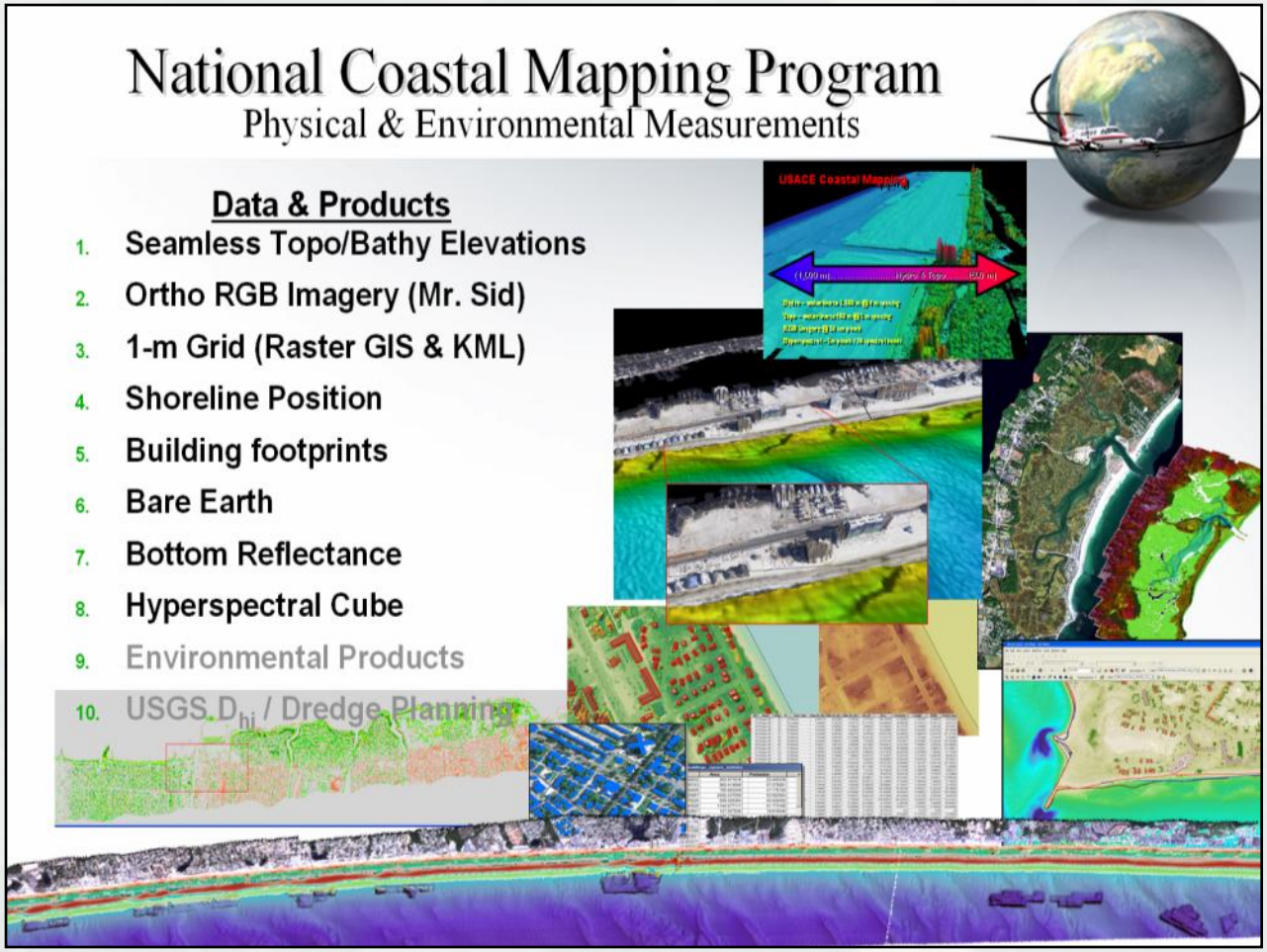
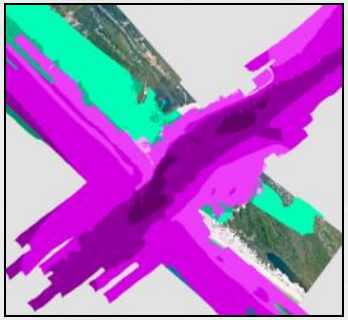
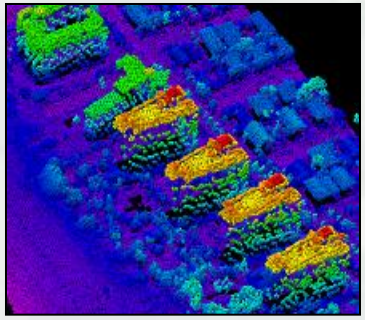
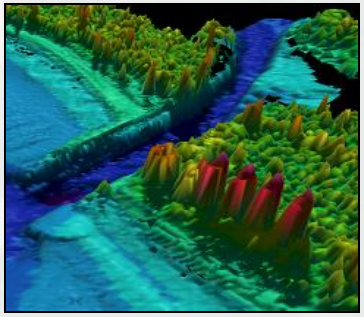
NCMP Physical & Environmental Measurements

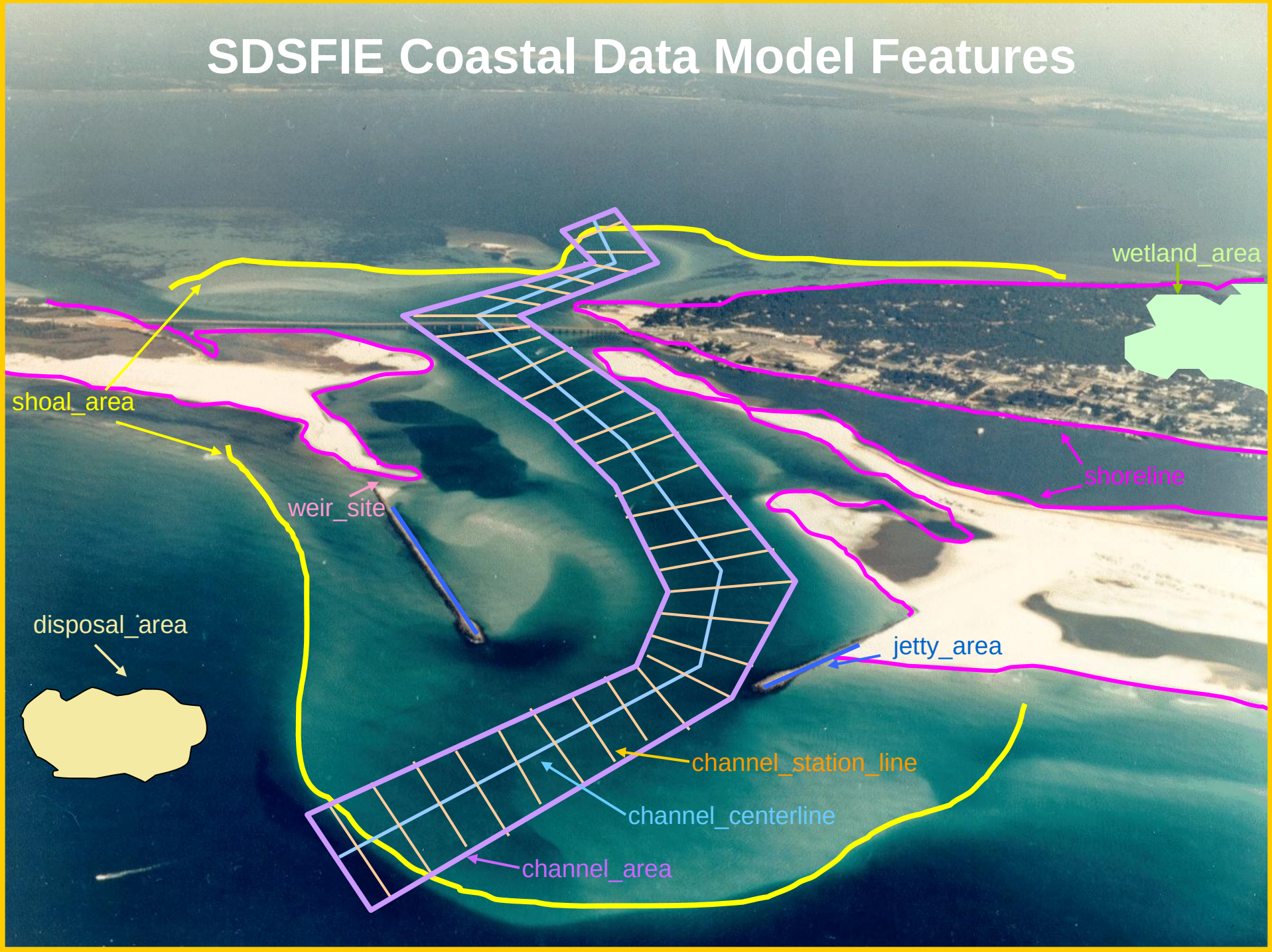


eCoastal Program: enterprise GIS for coastal engineers

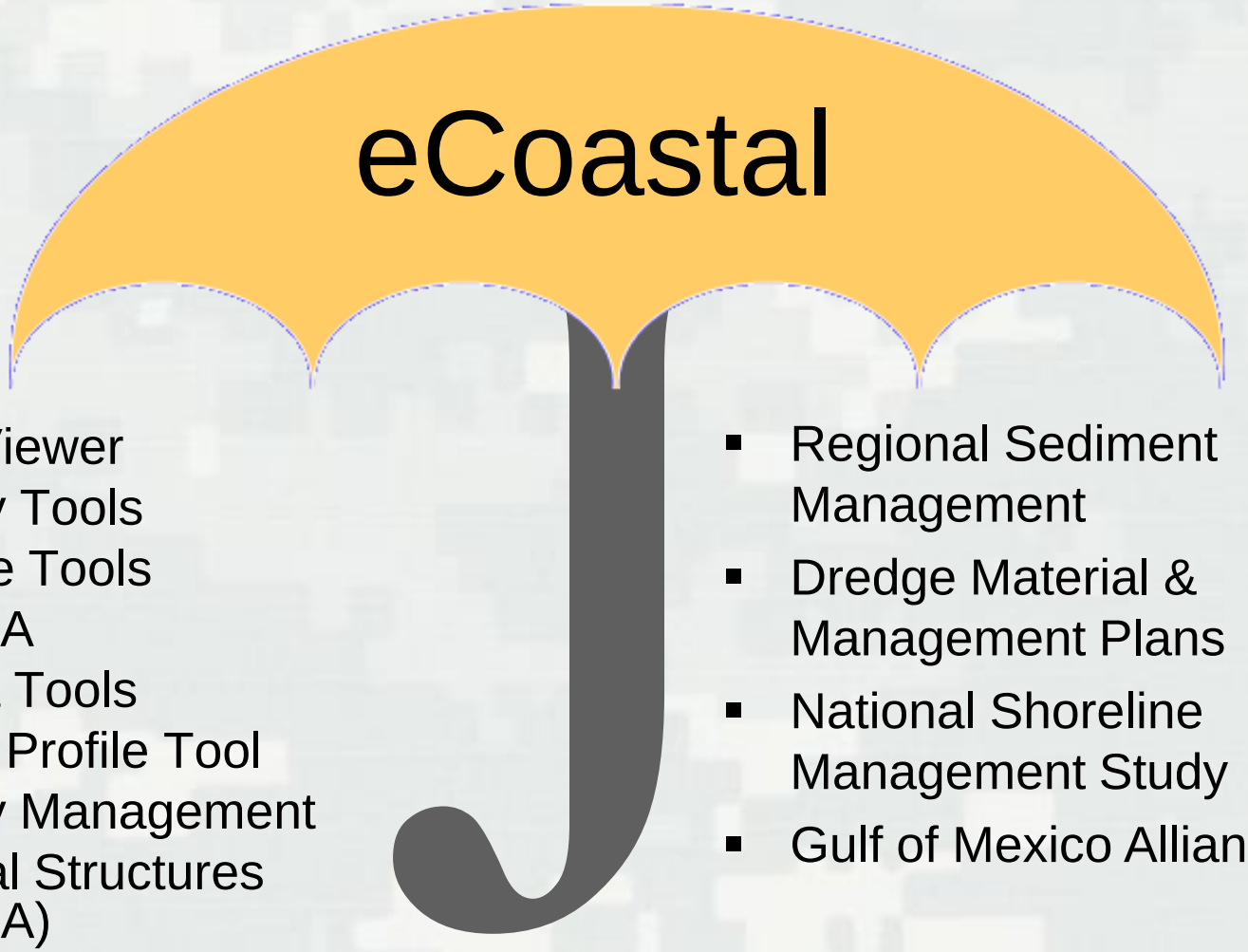




eCoastal is an **architecture** developed by the U.S. Army Corps of Engineers that addresses spatial data standards (SDS), geodatabase development, and desktop and web applications. It was designed as data management solution to provide baseline information for effective planning and prediction of regional and local coastal processes.

SDSFIE Coastal Data Model Features



eCoastal

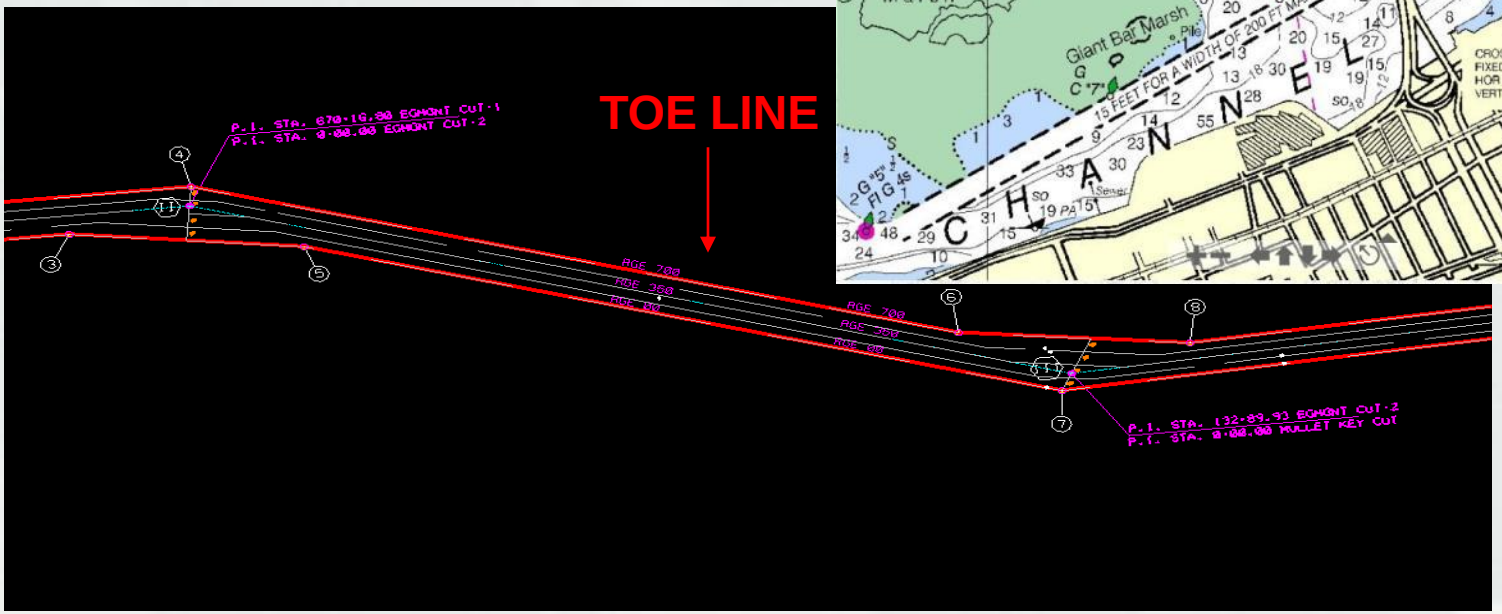


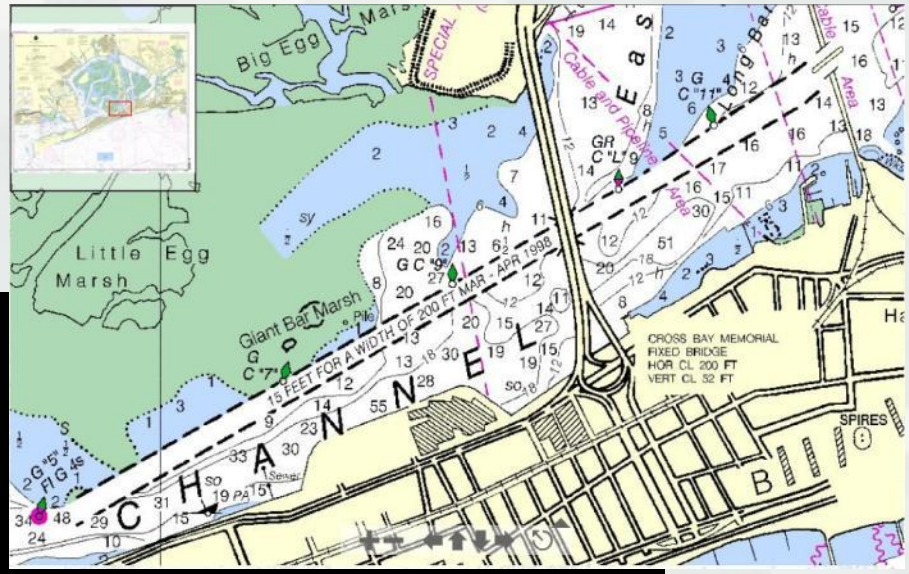
- Data Viewer
- Survey Tools
- Dredge Tools
- SBAS-A
- Report Tools
- Beach Profile Tool
- Survey Management
- Coastal Structures (CoSCA)
- SUDS

- Regional Sediment Management
- Dredge Material & Management Plans
- National Shoreline Management Study
- Gulf of Mexico Alliance

Channel Framework

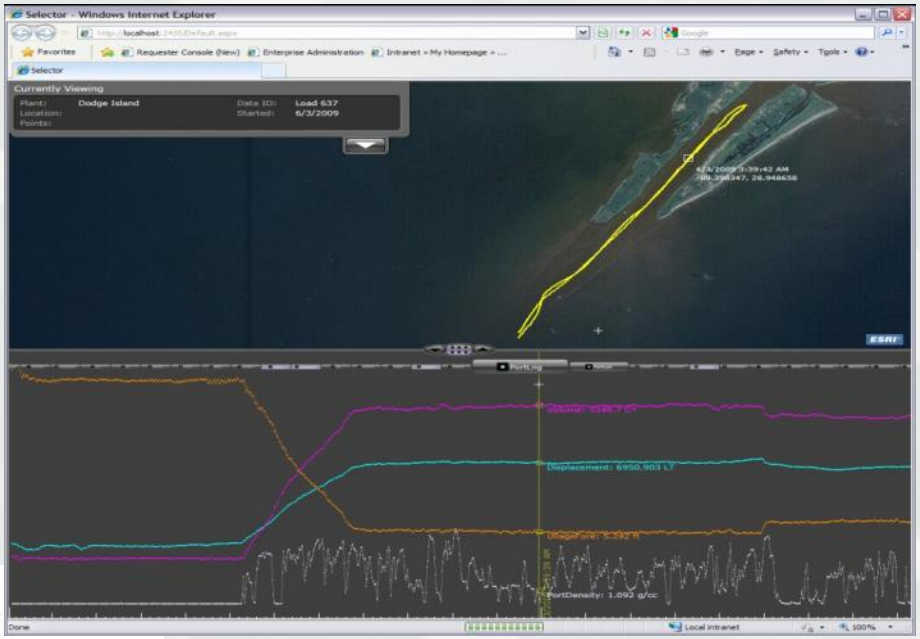
- Basis for USACE data to update NOAA ENC
- Baseline feature for spatially updating the IWR waterway network
- Tracks channel history through authorized, maintained, and any changes in channel dimensions



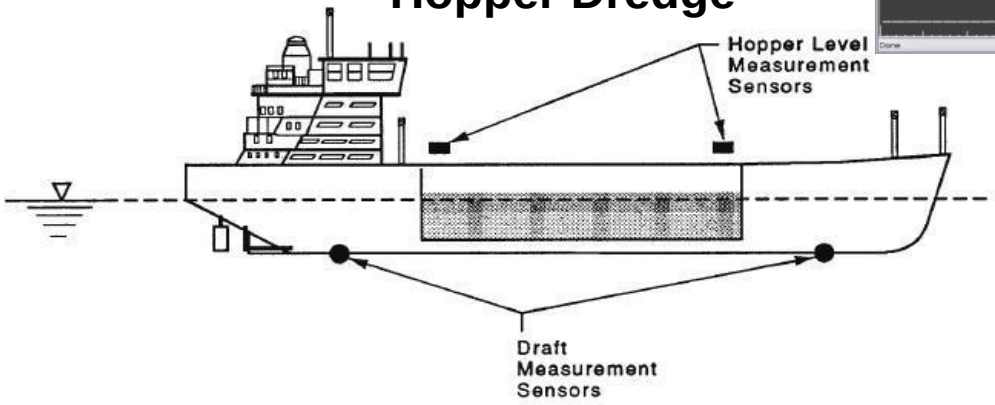


Dredge Quality Assurance (DQM) Program “Silent Inspector”

The DQM System is an automated dredge contract monitoring system comprised of both hardware and software developed by the US Army Corps of Engineers . The Corps developed the SI as a low-cost, repeatable, impartial system for automated dredge monitoring



Hopper Dredge



Scow

Future

Mechanical

Pipeline

ARRA

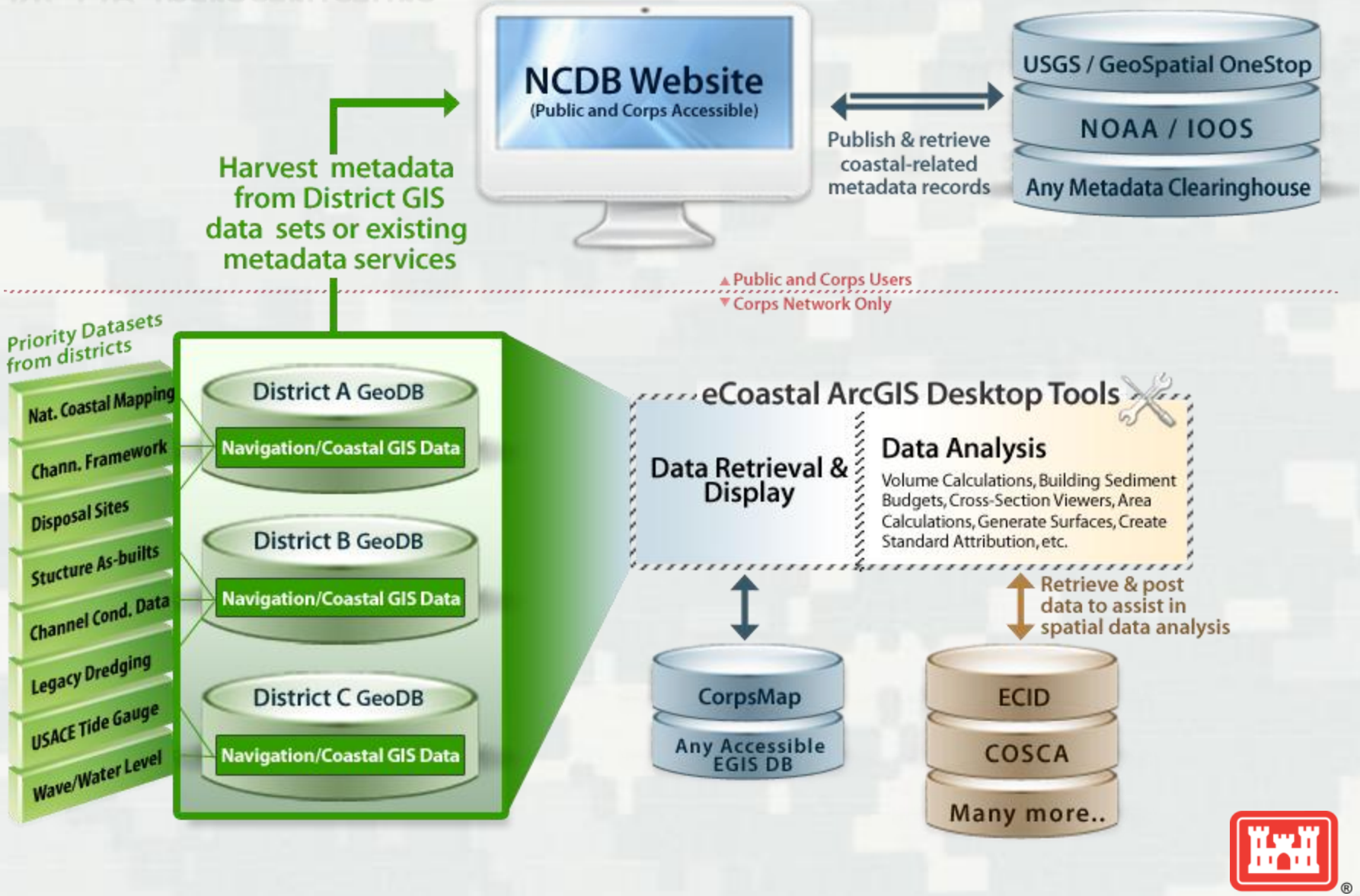
- **National Coastal Mapping Program**

  (Joint Airborne Lidar Bathymetry Technical Center of Expertise—JALBTCX)

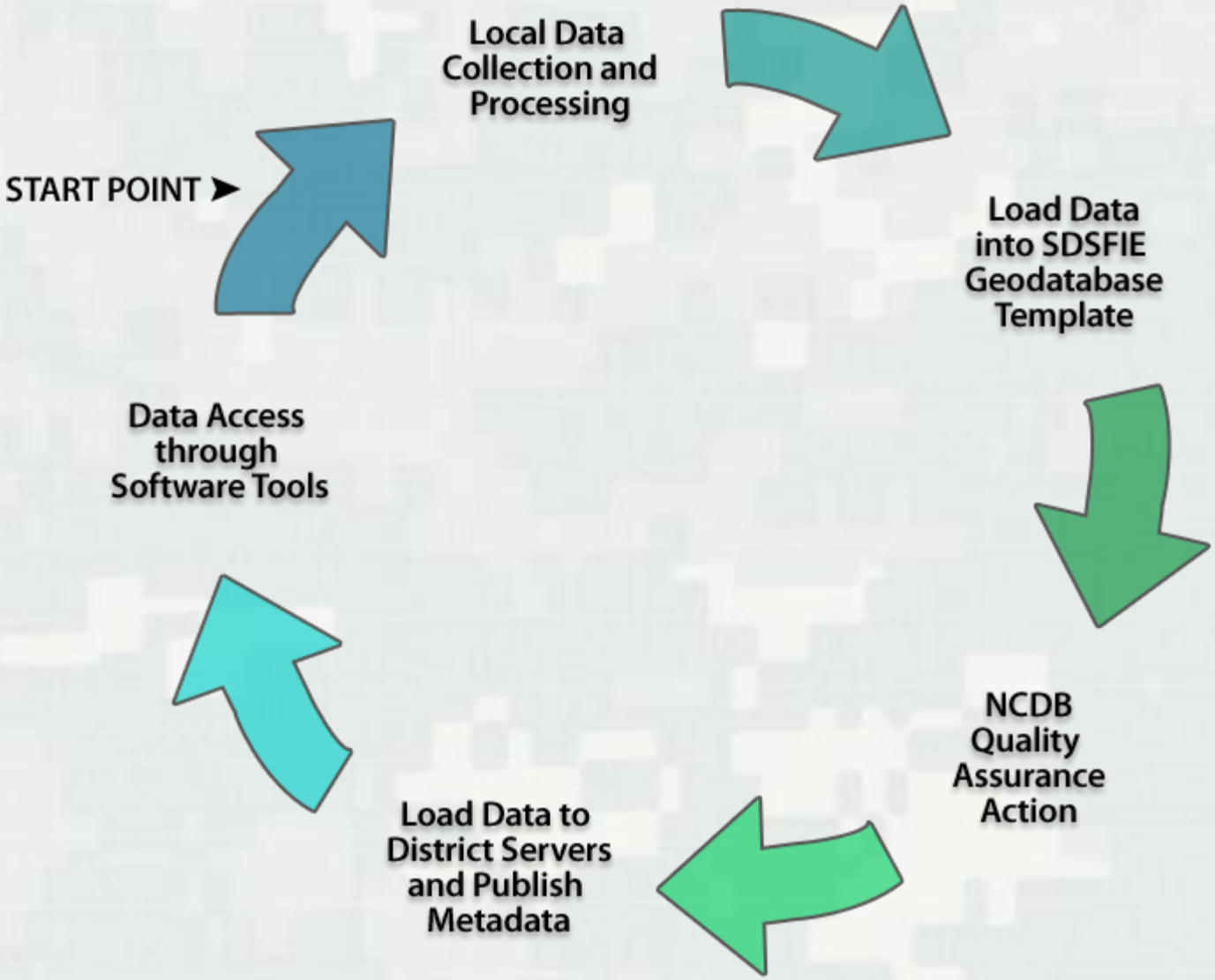
  - RECOVERY – National Coastal Mapping Program
  - RECOVERY – Coastal Zone Mapping Imaging Lidar (CZMIL)
  - RECOVERY – Navigation & Coastal Data Bank

NCDB District Locations

NCDB Infrastructure

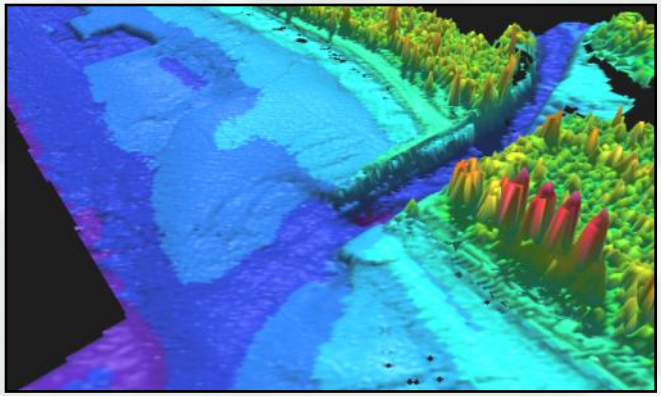


NCDB Business Process



NDCD Data Gathering

- Creating or populating each district's enterprise GIS
  - Data sets include
    - Disposal sites
    - Structures as built drawings
    - Channel condition surveys
    - Channel framework
    - Legacy dredging data
    - National coastal mapping products
    - Tide gage data
    - Wave/water level data



  - SDSFIE-compliant geodatabase templates will be provided to each District's NCDB team for their mapping efforts
    - All data will be built, loaded into the geodatabase template
    - NCDB will have a quality assurance process
    - Data will be loaded into the district eGIS for access and updates

Data Integration Framework

Lead – W. Jeff Lillycrop
ERDC CHL Technical Director, Naviagtion

Coastal Working Group Survey

26 Data Use Questions

Office Symbol	Division	District	1. What types of coastal projects do you have? (i.e. shoreline protection, beach nourishment, shallow draft harbors, deep draft harbors, recreation, environmental restoration. etc.)
LRC, LRB	Great Lakes and Ohio River Division	Buffalo, Chicago	shoreline protection, beach nourishment, shallow draft harbors, deep draft harbors, recreation, environmental restoration, confined disposal facilities, navigation channels dredging projects
LRE		Detroit	Shore protection, Re-hab of Navigation Structures (Shallow and Deep Draft, Sediment Transport Studies, Dredged Sediment Placement Studies, Inner Harbor Wave Analyses, FEMA Flood Elevation Determination, Lawsuit Defense Studies
NAE	North Atlantic Division	New England	Shoreline protection and inundation prevention, coastal structure repair, beach nourishment, shallow draft harbors, deep draft harbors, recreation, environmental restoration, confined disposal facilities, navigation channels dredging projects
NAN		New York	shoreline protection (storm damage reduction), beach nourishment, shallow draft harbors, deep draft harbors, ecosystem restoration, intrscoastal waterways, breakwaters, coastal inlets
NAP		Philadelphia	Hurricane and Storm Damage Reduction projects (including 10 beach nourishment projects), coastal structures (seawalls, jetties, revetments), shallow draft navigation, submerged breakwaters, environmental restoration
NAB		Baltimore	Shoreline Protection; Beach Nourishment; Shallow draft navigation, environmental restoration, Sand bypassing
NAO		Norfolk	Storm damage reduction, ecosystem restoration, beach renourishment, shallow and deep draft navigation projects
SAW	South Atlantic Division	Wilmington	Shoreline protection, beach nourishment, deep draft harbors, shallow draft channels, and environmental restoration.
SAW		Charleston	Shoreline protection, beach nourishment, deep draft harbors, shallow draft channels, and environmental restoration.
SAS		Savannah	Deep Draft Navigation Harbors, Beach Renourishment, Environmental Mitigation/Restoration, Dredged Material Disposal Areas, Shallow Draft Waterways, Flood Damage Reduction
SAJ-EN		Jacksonville	All of the above.
SAJ-PD		Jacksonville	all of the above; mainly shore protection with beach nourishment. hard structures used to a lesser extent. current construction of hard structures is to maintain beach fill in place. Navigation projects include both deep and shallow draft navigation and Intra Coastal Waterway. Navigation: deep draft harbors at 5 major cities and various shallow draft projects as well as the Gulf and Atlantic Intra Coastal Waterways
SAM		Mobile	Shoreline protection, beach nourishment, deep draft navigation harbor, restoration.
MVN	Mississippi Valley Division	New Orleans	Beneficial Use, Marsh restoration and protection, shoreline protection, Freshwater and sediment diversions, deep draft navigation channels, locks, gates, barrier island restoration, hydrologic restoration, sediment trapping, sand mining, sand management
SWG	Southwestern Division	Galveston	Coastal projects in SWG include coastal storm damage reduction, ecosystem restoration, deep-draft and shallow-draft navigation, and flood risk management. The coastal storm damage reduction project also takes into consideration a recreation aspect.
SPL	South Pacific Division	Los Angeles	All of the above including shoreline protection, storm damage reduction, navigation, recreation, ecosystem restoration.
SPN		San Francisco	Shore Protection, Flood Control, Shallow Draft Harbor, Deep Draft Harbors, Environmental Restoration
NWP	Northwestern Division	Portland	Deep draft and shallow draft navigation channels, rubblemound jetty navigation entrances, small boat harbors, riverine and estuary pile dike systems, shoreline erosion and protection, open water dredged material disposal sites, environmental restoration, shoreline/coastal flooding
NWS		Seattle	Shallow draft harbors, deep draft harbors, environmental restoration, beach nourishment
POA	Pacific Ocean Division	Alaska	shore protection, deep draft navigation, shallow draft harbor, flood damage reduction
POH		Hawaii	shoreline protection, beach nourishment, shallow draft harbors, deep draft harbors

2 Summary Spreadsheets Compiling Input from 21 Coastal Districts

Office Symbol	Division	District	Beach Profiles: Sources of Data	Beach Profiles: Problems Encountered	Beach Profiles: Related Data Needs
LRC, LRB	Great Lakes and Ohio River Division	Buffalo, Chicago	SHOALS in-house surveys contract	SHOALS - inconsistent coverage due to turbidity and breaking waves	
LRE		Detroit	Contractors. D&M	Inconsistent datum	Denser coverage around harbor
NAE	North Atlantic Division	New England	SHOALS/CHARTS in-house surveys contract	SHOALS/Charts - inconsistent coverage due to turbidity and breaking waves	
NAN		New York	In house (survey Branch) Contract Engineering Staff Local University	timeliness of data collection increasing costs difficulty in getting immediate post-storm profiles (for model calibration)	LIDAR vs. short profiles
NAP		Philadelphia	Contractor, in-house non-Federal sponsor (DE) University (Stockton)	environmental windows (not completing profiles) accuracy in surf zone	technologies that develop accuracy surveying the surf zone
NAB		Baltimore	A-E	Control issues on occasion	
NAO		Norfolk	Local sponsor, Local Universities		
SAW	South Atlantic Division	Wilmington	Annual monitoring 2 projects.		
SAW		Charleston	University State of South Carolina contractor	incorrect equipment setup	
SAS		Savannah	Construction Contractor Surveys In-House Survey Crews	Reliability due to potential conflict of interest Due to the large tidal range, it is difficult to get both hydrographic and topographic surveys during a reasonable time frame.	
SAJ-EN		Jacksonville	AE's, In-house	none	
SAJ-PD		Jacksonville			
SAM		Mobile	Lidar, In-house Bathymetric Survey, State databases	Inconsistent vertical datums. Issues with post processing.	
MVN	Mississippi Valley Division	New Orleans			
SWG	Southwestern Division	Galveston			
SPL	South Pacific Division	Los Angeles	hydrographic and nearshore surveys Old Corps and BEB records Old County records BEACON/SANDAG Organization of Local Gov't	datum conversions, accuracy not geo-referenced ambiguous alignment and zero location inconsistent datums (vertical) and local datums	Data to Produce Accurate Beach Profiles, long-term records that are geo-referenced need frequent enough capture seasonal and long-term trend Comparing historic beach profiles with current profiles and LIDAR
SPN		San Francisco	Survey Contractors NOAA Coast & Geodetic Survey USGS Surveys In-house staff	Datums Variability in survey techniques or assumptions Poor understanding of the true accuracy of various survey techniques	Datums; transect reference point Risk and Uncertainty Lidar capable software and computer power
NWP	Northwestern Division	Portland	in-house crew, contractor State governments, local agencies photogrammetric methods, lidar	some datum and control issues ground control setup expensive	more regional coverage needed after storms
NWS		Seattle	District WA Dept. Ecology	Data is unavailable without requesting	Post-storm monitoring surveys of erosional hotspots
POA	Pacific Ocean Division	Alaska	Contract surveyor	survey control. vertical datum changed relative to survey due glacial rebound/and or sea level rise	new monuments and tide gaging to update old monuments
POH		Hawaii	A/E Contracts	Cost is extremely high in remote locations. Datum issues.	In-house resources and tools would be beneficial.

Synopsis of District Needs

CERB 2009

- Data is required to execute our missions

- We have requirements for a wide range of data types – temporal, spatial, financial, real-time, legacy, biological, chemical, physical, environmental, economic…

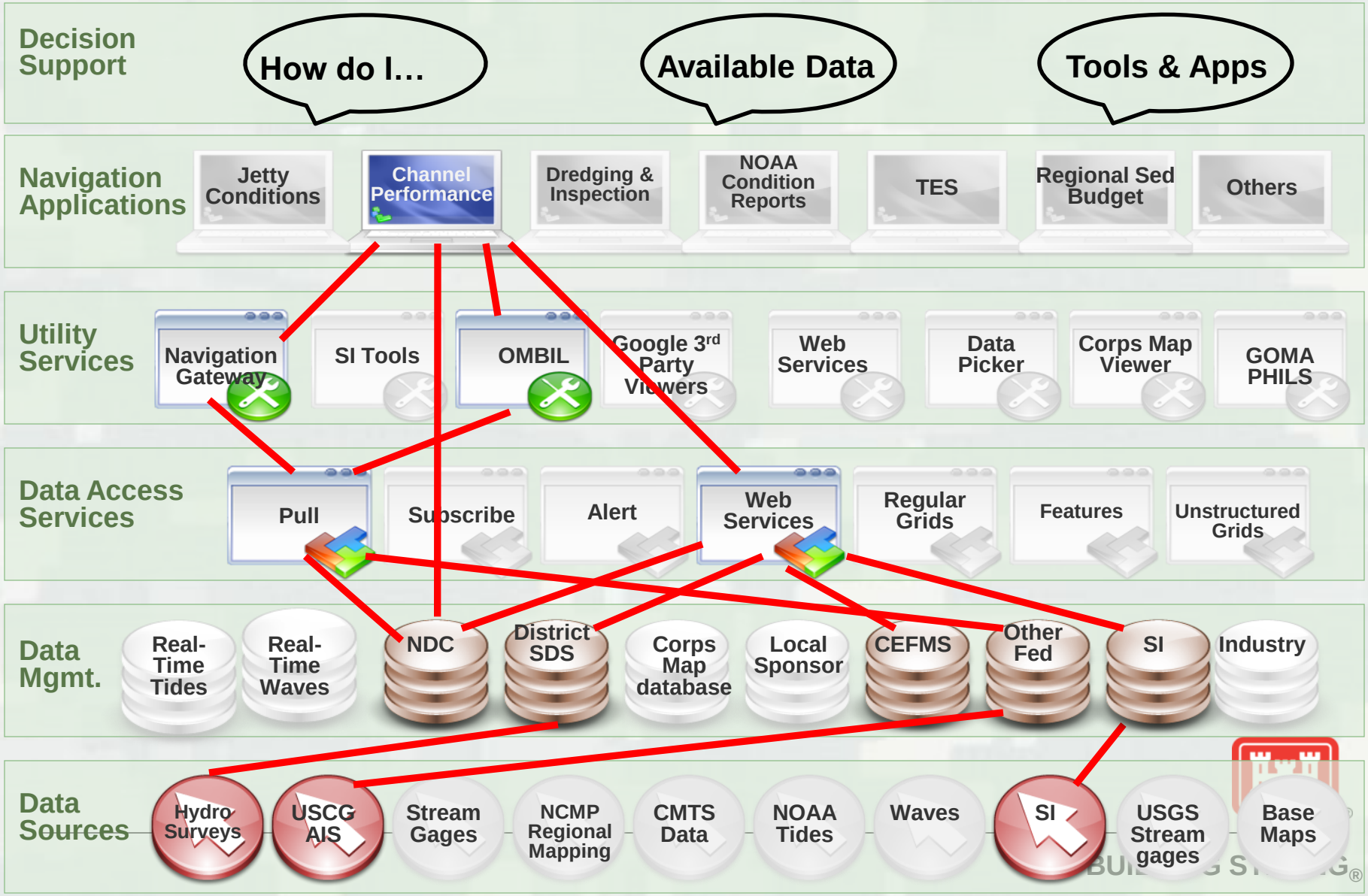
- Corps collects / produces a lot of data that is indispensable to us, our stakeholders, and the public

- Corps relies on other agencies for much data: other Fed (USGS, NOAA, others), coastal States (TX, LA, MS, AL, FL, CA, OR, WA, all), NGO's, and Universities

- There are national & regional issues that require data partnerships to adequately address

- Need a sustainable framework to discover, access, and use data

Navigation: Channel Performance



IOOS DIF Development Approach

Start Small

Be Specific

Don’t duplicate data

Maximize value / impact

Data Integration Framework (DIF)

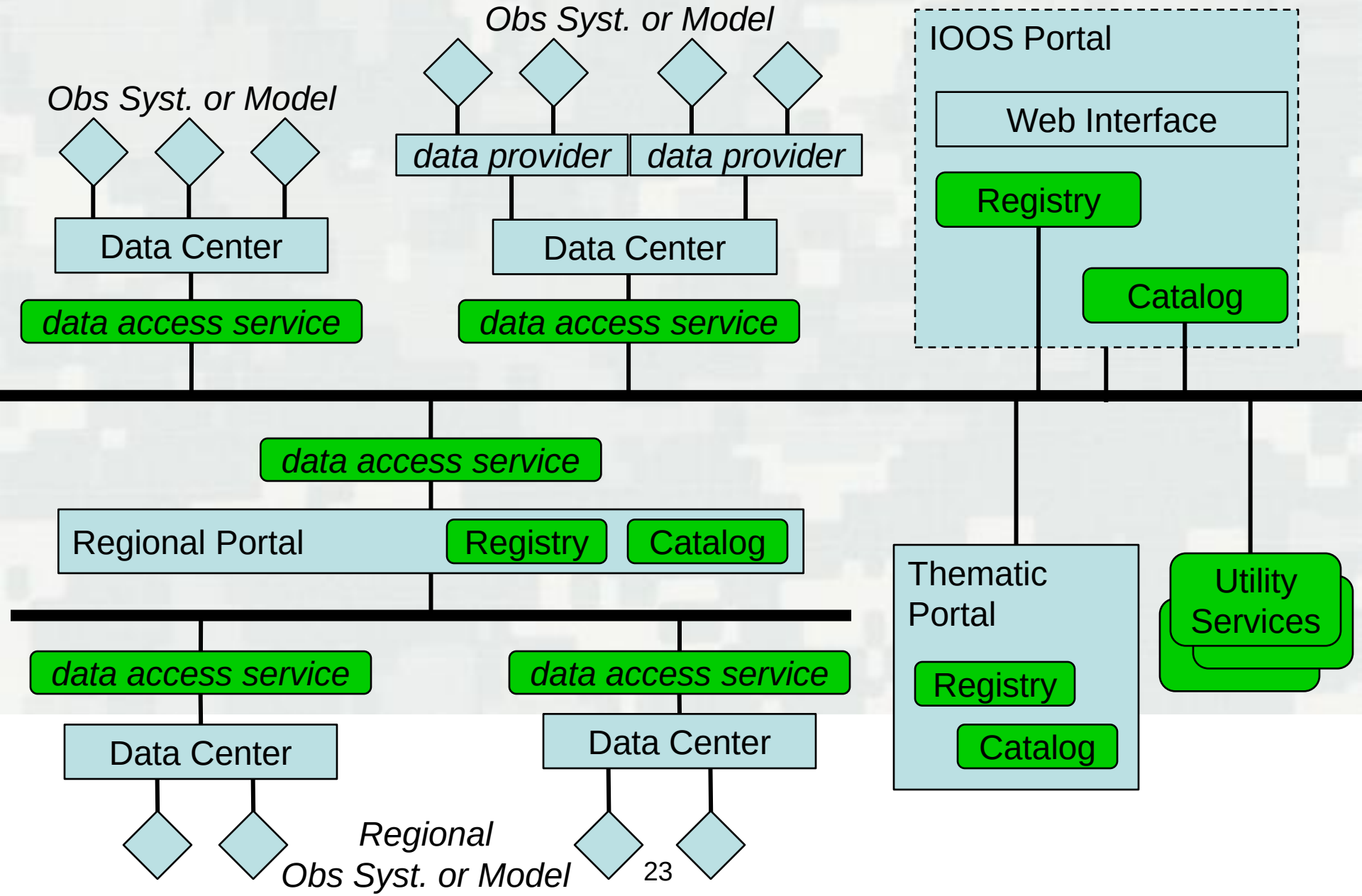
- First spiral of IOOS development
- Standardize on small number of services & encodings
- Implement at selected provider & customer sites
- Start with several core variables
  - Currents
  - Temperature
  - Salinity
  - Water Level
  - Winds
  - Waves
  - Ocean Color (chlorophyll)
- Evaluate in FY 2010

(Graphic by i3 Aerospace Technologies Pty Ltd – used with permission)

Digital Coast

- Distributed architecture
- Many contributors
- Access to the Public

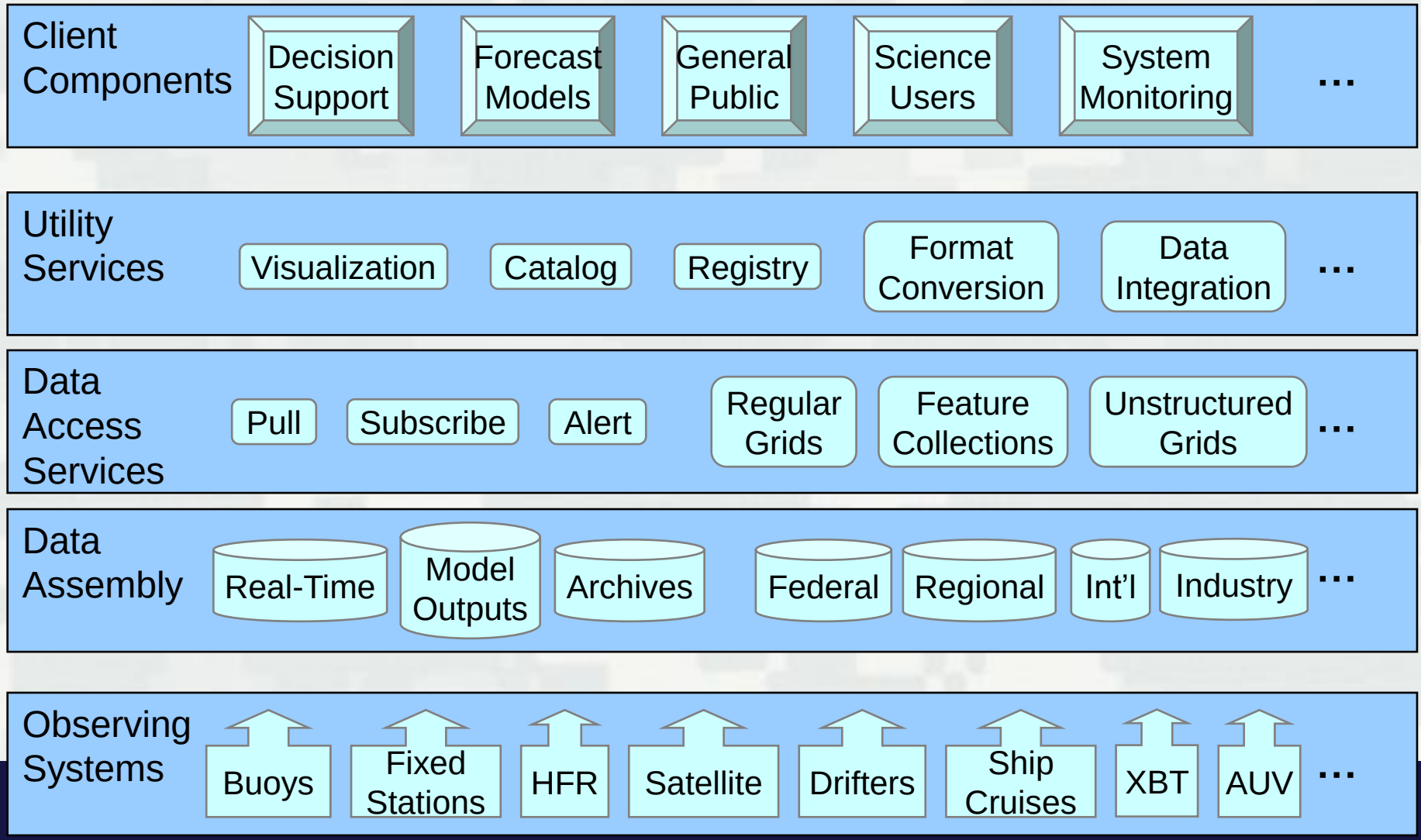
Service-Oriented Architecture



IOOS Web Services and Data Standards

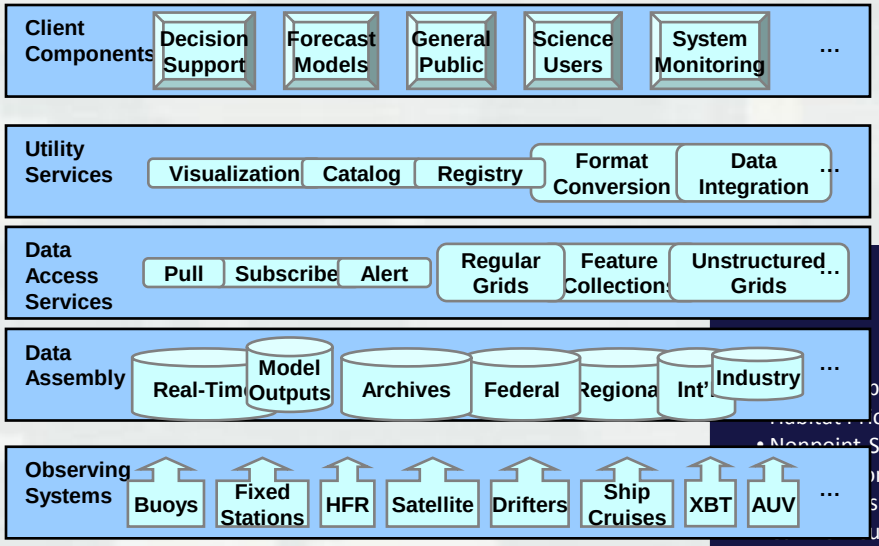
Data Type	Web Service	Standard
In-situ data (buoys, piers, towed sensors)	Sensor Observation Service (SOS)	XML based on OGC Observations and Measurements (O&M)
Gridded data (model outputs, satellite)	OpenDAP and/or Web Coverage Service (WCS)	NetCDF using Climate and Forecast (CF) conventions
Images of data	Web Map Service (WMS)	TIFF, PNG etc. -possibly with standardized styles

IOOS Data Management and Communication



Approach

USACE Develop a comprehensive design



DIGITAL COAST

pport
ority Planner
Source Pollution and
mparison Tool
s Surface Analysis Tool
ual Simulation Tool
• Multipurpose Marine Cadastre

Informational
• Storm Mapping Tutorial
• Storm Data Resource Guide

Data Access and Visualization
• Hurricane Evacuation Zones Mapping Tool
• Legislative Atlas
• Historical Hurricane Tracks IMS
• Hazard Assessment Tool

Data Handling Tools
• Lidar Data Handler
• Chart Reprojector
• Electronic Navigational Chart Handler
• Nautical Chart Viewer

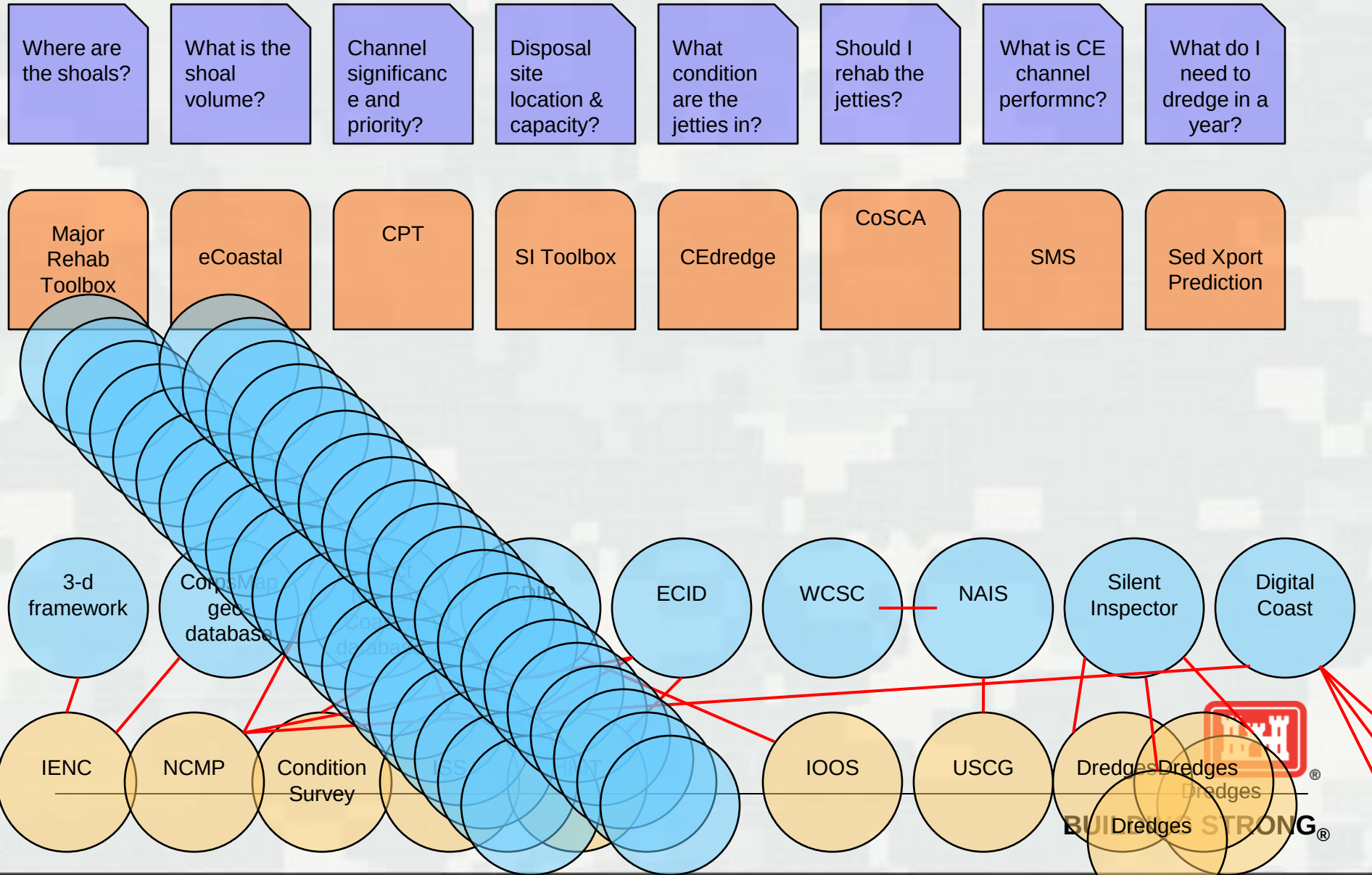
Data – Tools - Training

Mission Critical Decisions

- When to Dredge?
- Where to Dredge?
- Where to Place Material?
- Are there Alternatives to Dredging?
- What is the Dredge Availability?

Integrated Coastal Navigation

Channels & Structures

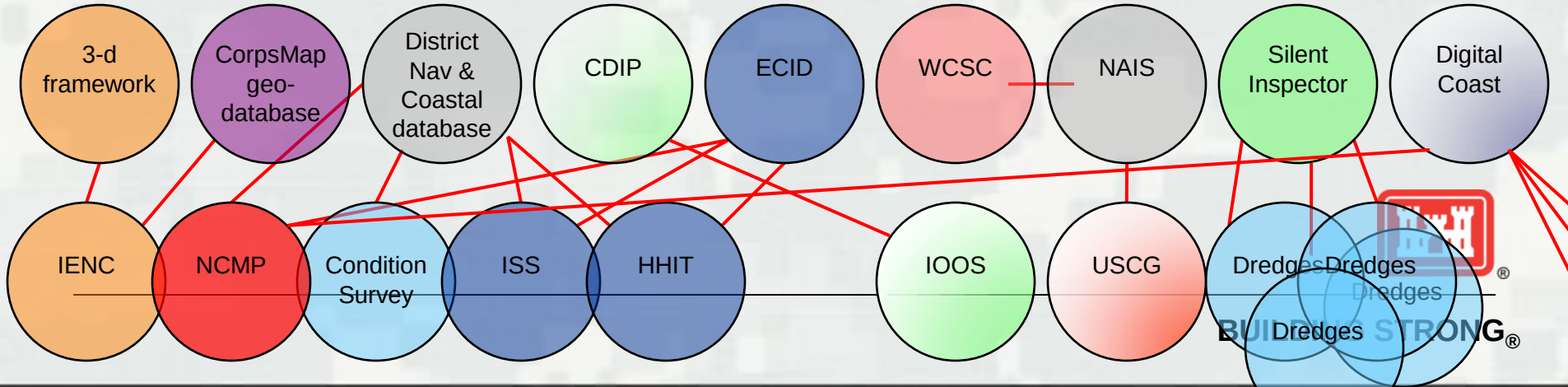


Integrated Coastal Navigation

Program Interaction

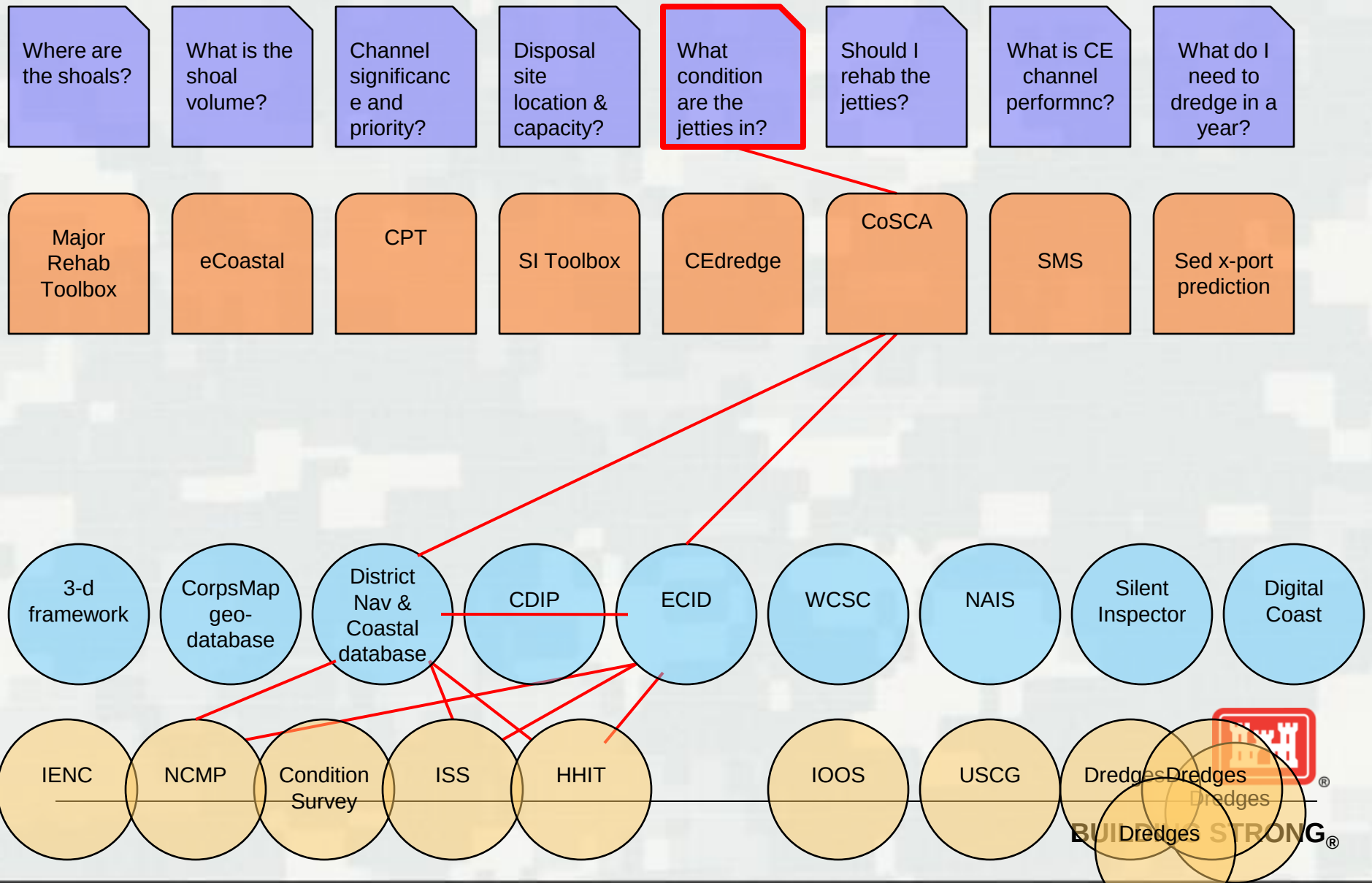
Where are the shoals?	What is the shoal volume?	Channel significance and priority?	Disposal site location & capacity?	What condition are the jetties in?	Should I rehab the jetties?	What is CE channel performnc?	What do I need to dredge in a year?
Major Rehab Toolbox	eCoastal	CPT	SI Toolbox	CEdredge	CoSCA	SMS	Sed X-port prediction

MCNP **IENC** **CIRP** **DOER** **NavSys** **HQ** **NDC** **District** **ARRA** **NCMP** **Scripps** **USCG** **NOAA**



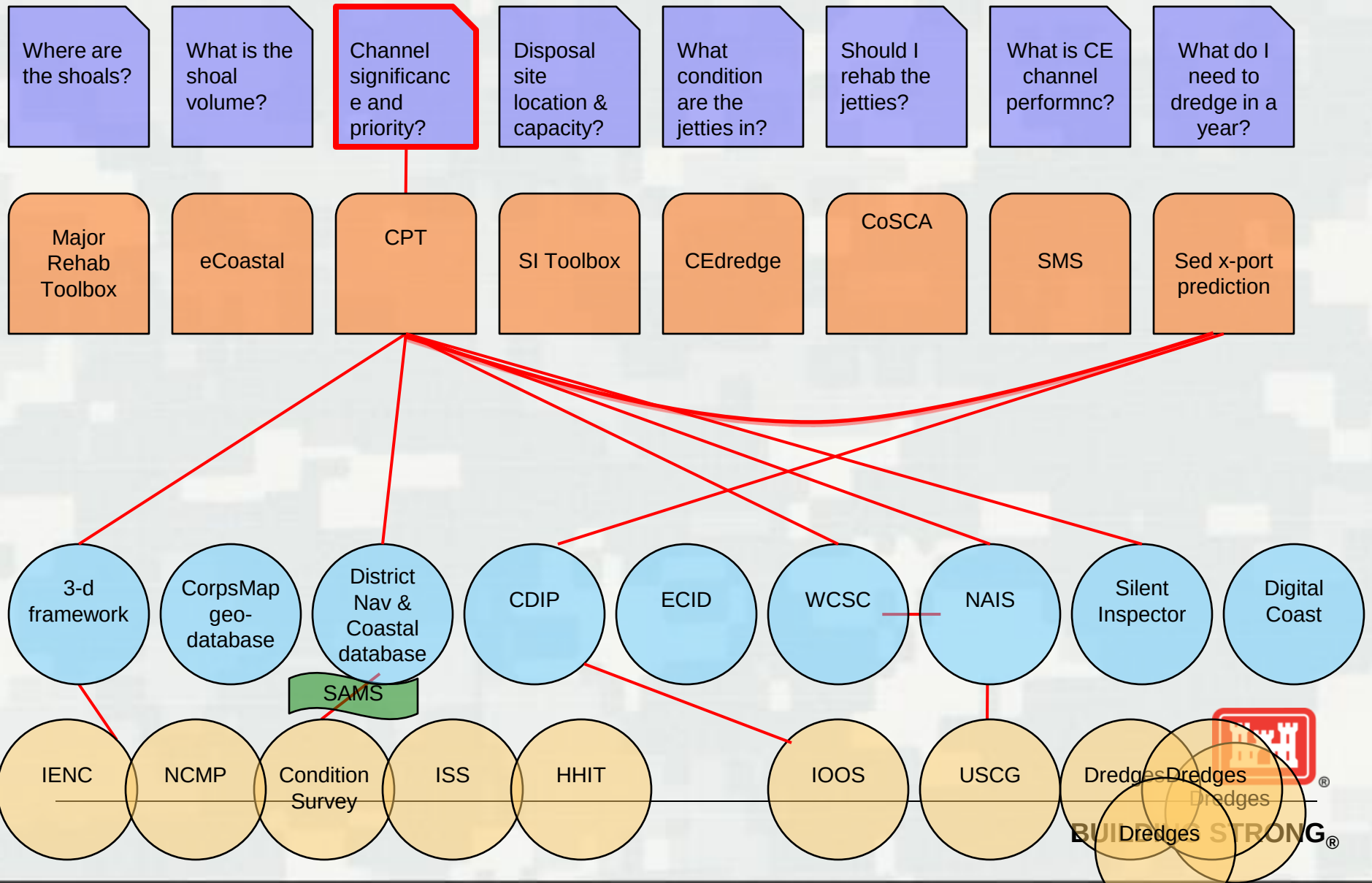
Integrated Coastal Navigation

Jetty Condition



Integrated Coastal Navigation

Channel Priority



Proposal

Detailed DIF Design
Include a pilot project
Complete in 2 years

2-year program

1. Define requirements
2. Define interactions
3. ID existing parts & resources
4. Develop detailed design
5. Prototype (alpha) **Year 1**
6. Assess Prototype
7. Final Design
8. Implement prototype
9. Products: Detailed Design and Prototype **Year 2**

Approach

Team

Develop and Design an operational prototype Data Integration Framework

Program Manager: Dr. Rob Wallace, ERDC / Information Technology Lab

IOOS (Fed)
IWG-OCM (Fed)
Digital Coast (NOAA)
USGS

ACE-IT
CECI

Karl Brown, SWG
Heather Schlosser, SPL
Tom Smith, POH
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, LRE
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Carl Dyess, SAM

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Molly Reif, ERDC
Ned Mitchell, ERDC
Mark Graves, ERDC
CorpsMap, ERDC
Jennifer Wozencraft, JALBTCX

Nancy Blyler, HQ
Jeff McKee, HQ

Summary

Proposal:

- Develop a detailed data integration framework design
- Includes a pilot project
- Two-years
- Creates a Corps-wide Team

Proposal does:

- Leverages on-going efforts
- Produces a design to tie them together
- Uses lessons from IOOS

Proposal does NOT:

- Duplicate on-going efforts
- Create new applications or tools
- Create new databases

Question/Comments?

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