Navigation System Performance R&D

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Engineer Research and Development Center

Civil Works R&D Steering Committee
September 26, 2014
CMTS Future of Navigation

- **Purpose:** “develop and carry out a work plan for the implementation of the e-Nav Strategic Action Plan.”
- **Membership:**
  - Open to all CMTS agencies
  - **Co-chairs:**
    - USCG, USACE, NOAA
- **Focus areas:**
  - Integrating Systems
  - Seamless Data Exchange
  - Decision-Focused Information
  - Human-Focused Interface
  - Improved Connectivity
  - Interagency Coordination
Marine Safety Information (MSI)

“Notices to Skippers”

NOAA

USCG

NGA

USACE

IMSIB

1. _____

2. _____

3. _____

4. _____

Brian Tetreault

BUILDING STRONG®
eHydro Application and Reporting Process

Condition Plots
HQ Channel Indices
NOAA Reports

Web Site
Web Services

District

Planning Quantities

eHydro GIS Application

Survey

Enterprise Navigation Channel Framework
CPT can generate depth-utilization profiles showing the distribution of cargo across the range of maintained depths for any system of navigation channels.

CPT then compares these tonnage-draft profiles to the segment controlling depths resulting from present shoaling conditions.
Operate Integrated Systems

**AM Nav Channel Work Flow**

- Risk Informed Decision
- CPT
  - Shoaling Analysis & Condition (CSAT)
  - eHydro Survey
  - 3D Channel Framework
  - Continuous Update - Channel Surveys
  - Baseline Maintenance Cost
  - Internal Management Costs
  - Dredging & Placement Costs
Lock Operations Management Application (LOMA)

Purpose:
• Provide end users information needed for decision support

Goals:
• Increase lock operator situational awareness
• Provide vessel operators better information
• Provide better information to Corps management
• Exchange information with external users

AIS is the central LOMA technology
LOMA Current capabilities

- Lock operator situational display
- AIS vessel information
- Zone management
- Playback capability
Performance Monitoring via AIS

- Analysis provides performance baselines
- Conditions can be monitored going forward
- Analyses are scalable across time and space, so single channels can be monitored for a few hours, or entire coasts can be monitored for years.
## Selected Preliminary Findings: Ohio River Travel Times, 2013

<table>
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<th>travel time (hrs)</th>
<th>Destination / To (Ohio River Mile)</th>
<th>Upstream Direction</th>
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<td>low 25th percentile</td>
<td>Cairo, IL (981)</td>
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<tr>
<td>median 50th percentile</td>
<td>Paducah, KY (934)</td>
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<td>high 75th percentile</td>
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<td>Louisville, OH (602)</td>
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<td>Cincinnati, OH (470)</td>
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<th>Origin / From (Ohio River Mile)</th>
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<th>Paducah, KY (934)</th>
<th>Evansville, IN (781)</th>
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</tbody>
</table>

Downstream Direction
Lock approach analysis

- Analyze vessel approach:
  - Historical vessel tracks (from AIS)
  - Water levels, gate settings, etc.
  - Assess correlation
- Examine problem areas, accidents
- Develop real-time assessment & warning system
Structural Health Monitoring

Validation Data

Sensors at Lock

Surrogate Model

High-Fidelity FEM

Decision Support
- Warning Lights
- Data Archival/Retrieval
- Email/Text Alerting

Reachback Capability

BUILDING STRONG®
MTS Performance Measures

- Economic Benefits to the Nation
- Capacity & Reliability
- Safety & Security
- Environmental Stewardship
- Resilience
Navigation Data Integration Framework

Navigation DIF Components
• Source Databases
• Hub Catalog
• Tools
• Web Services
• Portals

Navigation Sub-categories
• Dredging
• River Information Services
• Surveying & Mapping
• Infrastructure & Asset Management
• Engineering With Nature & Regional Sediment Management
• Marine Transportation System
Data & Application Access

- Organizes access to USACE Navigation data and applications (users & developers)

- Links USACE data and application assets

- Provides other agency & public access to approved data and tools
Questions?