The Coastal and Hydraulics Laboratory Mission – The National Agenda

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Director

US Army Engineer R&D Center
Establishment of WES

- 1927 Flood
  - 300 deaths, $1B damages
- Flood Control Act (1928)
- U.S Waterways Experiment Station (1929)
  - Vicksburg, MS (close to Miss River Comm)
Hydraulic Research Beginnings

- Physical modeling of rivers first conducted in 1929 at WES
- Beach Erosion Board created in 1930 to address coastal issues
First Lab Building

- Main WES bldg (1930)
  - 165-ft flume
  - Small moveable bed models
  - Lab equipment
Waterways Experiment Station
Field offices (○) also maintained in Fairbanks, Alaska, and London.
U.S. Army Coastal and Hydraulics Laboratory
est. 1996

Vision:
The Nation's premier water resources laboratory

Mission:
To deliver solutions to our Nation’s most challenging water resources problems through research, development and application of cutting-edge science, engineering and technology for the Army, Department of Defense, civilian agencies and our Nation’s public good.
Coastal and Hydraulics Laboratory

- 240+ member team comprised of over 170 scientists & engineers with advanced degrees
- ~$75 million dollars for R&D
- Over 1M sq-ft of covered physical facilities
  - Field Research Facility (North Carolina)
- Approximately 500 research efforts from:
  - Multiple Corps of Engineers Districts
  - DOD sponsors
  - Department of Energy
  - U.S. Environmental Protection Agency
  - Federal Emergency Management Agency
  - Tennessee Valley Authority
  - State, Local and Foreign Governments
  - Private research sponsors
Facilities / Equipment

Current Capabilities
► Multiple basins/flumes for hydraulic models
► Long Shore Transport Facility
► Sediment Laboratory
► Field data collection systems
► Active wave and shore measurement
► Ship Simulator

Future Capabilities and Actions
► Consolidation and modernization
► Estuary/tidal data collection
► Dredge r&d
Modern Data Collection & Analysis

- **LiDAR**
  - National Coastal Mapping Program
  - Asset Management
    - Structural change detection

- **Unmanned systems**
  - Micro-robotic infrastructure assessment
  - Pier inspection remote operated vehicle
Complex Modeling
Free surface flows and fluid-structure interaction
Simulating Hydrologic States Using Multiphysics Approaches at Variable Resolutions

Providing hydrologic information that is globally aware and locally precise

Examples of the different levels of fidelity that can be achieved when simulating various hydrologic states.
Drivers

- Changing requirements
  - Modern warfare
  - Aging infrastructure
  - Global shipping
  - Limited funding/time: Smart planning

- Climate Variability
  - Event frequency/intensity
  - Water security
  - Resilience

- Changing Technology
  - Integrated water resources systems
  - Modular and unified computational modeling
  - Automated information flow
  - Innovative field measuring and monitoring
  - Efficient, modular lab capabilities

- Emerging Research Priorities
  - Infrastructure
  - Integration of technologies
Technical Focus

Deliver Impactful RD&T Products
- Numerical Technology Modernization
- Marine Transportation System Tools
- Structural Health Monitoring
- System Analyses and Management

Technical Competency & Multidisciplinary Innovative Teaming
- National nearshore processes research initiative
- Military research initiatives and growth in core competencies
- Forecast Informed Reservoir Operations

Technology for the Future
- Physical and Numerical Model Fusion – scour studies, cross scales, FSI
- Reduced Order Modeling – Coastal Hazards System
- Data Integration Frameworks – coastal processes, nav
- Observations, remote sensing, data for decisions, AIS Analysis Package
Significant Partnerships

Corps of Engineers
- Coastal Engineering Research Board – strategic coastal R&D priorities
- Hydrology, Hydraulics, and Coastal Community of Practice

Other Feds
- U.S. Bureau of Reclamation
- U.S. Committee on the Marine Transportation System
- National Oceanographic and Atmospheric Administration
- U.S. Geological Survey
- Bureau of Ocean Energy Management
- Marine Corps Intelligence Activity

Non-Fed
- American Shore and Beach Preservation Association
- Academia

International
- U.K. Meteorological Office & Environment Agency
- Coastal South Africa - CSIR
- Coastal Australia – CSIRO
- The World Association for Waterborne Transport Infrastructure (PIANC)
Nearshore Processes Research

92nd CERB meeting, Galveston, TX, *The Future of Nearshore Processes Research: Implementing a Research Plan by the Nearshore Processes Community*, Dr. Nicole Elko, ASBPA

**Strategic Need:** We have a much longer list of coastal processes R&D needs than the Corps or any agency or organization can address alone.

**CERB R&D Initiative:** Work with ASBPA to facilitate pulling Federal agencies together to create a collaborative implementation plan to the Future of Nearshore Processes Research Report.

**Operational Capability:** A collaborative, integrated national nearshore processes research plan.

Next steps, continue this initiative to address agency and societal needs, strengthen our academic programs, and produce knowledge and tools for the U.S coastal community.
CHL Coastal R&D Efforts for PR

- Model study of locations for a proposed breakwater in San Juan Harbor (1940)
- Model study of the proposed breakwater system for Roosevelt Roads Naval Base, Vieques (1944)
- National shoreline study (1973)
- San Juan National Historic Site, San Juan, Puerto Rico, design for prevention of wave-induced erosion (1979)
- Breakwater and revetment stability study, San Juan National Historic Site (1981)
- Ship navigation simulation study, San Juan Harbor (1993)
- San Juan Bay and estuary study: hydrodynamic field data collection (1998)
- Circulation Modeling for Proposed Port Facility at Ponce and Guayanilla (2002)
- Shoaling of Aguadilla Harbor (2007)