



# Acquisition Directorate

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## Research & Development Center

# USCG R&D Center Ballast Water Research Program: Parsing the Problem



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# Partners

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- **USCG-5224**
- **Naval Research Laboratory**
- **EPA/ Environmental Technology Verification Program**
- **MARAD (Maritime Administration)**
- **Numerous public and private technical advisors, stakeholders, and interested parties**



# Why Are We Doing This?

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**Technical support to Coast Guard, which has responsibility for developing and enforcing regulations governing ballast water.**





# How Are We Doing This?

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- **Ballast Water issue split into exchange and treatment components**
- **Reliance on multiple loci of expertise**



# Ballast Water Exchange

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- **BWE Regulations exist**
- **Major Question - How do you verify BWE?**





# Tracers

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- **In the beginning. . . . . There was salinity**
- **Sought tracer and tool**
  - Tool – SBIR to Fargo, ND
  - Tracer – Workshop/Trials/Cruises
    - Atlantic, West Coast, Hawaii-West Coast, New Zealand/Australia, Pacific Rim





# Current Status

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- **Tool independently tested**
- **Final Stage = field testing**
- **Release to field units**





# Ballast Water Treatment

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- **Needs assessed**
  - Regs -> Standards -> Enforcement-> Approval + Validation
- **Regs are Coast Guard-5224 responsibility**
- **Enforcement is Coast Guard responsibility**
- **R&D Center focused on approval and validation**
- **Approval = Shore + Ship**
- **Validation = Tools and Protocol**







	<b>2000</b> ballast water issue addressed to EPA/ETV RDC audits -> help needed
	<b>2001</b> CG/EPA MOA, Stakeholder mtgs, tech panels BAA for test facility
-2 stds workshops, Test filtration/UV	<b>2002</b> NRL-NRL Test facility startup- test filters
ETV stakeholder, tech panel mtgs Project – surrogate cultures	<b>2003</b> <b>Tech panel Basic Protocol</b>
-Workshop- size cutoff for stds Inject and sample live organisms	<b>2004</b> -Assessment Primer for developer treatment tests ETV Tech Panel- Biology Protocols & Statistics
Commercial Sources for Surrogates Start HAB cultures	<b>2005</b> Start Surrogate Cookoff Artemia Tests Augmentation Tests(Humics, Sediments)
Statistics Review #1 Start Automation Effort Protocol Beta Test	<b>2006</b> Low Counts & Detection Limits Live/Dead Stains
CFD Analysis & Sample Port Design	<b>2007</b> More AutoAnalysis
Phytoplankton Workshop (New Test Facilities begin)	<b>2008</b> ETV Tech Panel mtg- Final STO Selection Empirical test of Port Models
More Automation (zoop~ complete; protist started)	<b>2009</b> Automation Continues STO Discussions
Beta Test of Revised Protocol Begin Test Facility Evaluation	<b>2010</b> Continue Test Facility Evals
Automation for Protists	<b>2011</b>





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- **Initial Conditions**

- Previous shipping studies
- No protocol
- No test facility
- No ballast water treatment systems

- **In 2000,**

- Introduced ballast water issue to EPA's ETV Program
- Conducted audits of existing BWT developers: determined need for clearly defined protocols

- **In 2001,**

- Coast Guard and EPA Signed Ballast Water MOU
- RDC issues BAA for test facilities





- **In 2002,**
  - NRL Test Facility began modifying existing capabilities to address ballast water
  - RDC funded tests of variety of filter types
  - ETV Stakeholders and Tech Panel meetings
- **In 2003,**
  - Determined size cutoff for standards
  - Completed basic test protocol
  - Injection and Sampling of live organisms into turbulent flow pipes
- **In 2004,**
  - Assessment Primer for Technology Developers
  - ETV Technical Panel – Biology Protocols and Statistics
  - Commercial Sources of Surrogates
  - Begin HAB culturing





- **In 2005,**
  - Start surrogate cookoff
  - Artemia tests
  - Augmentation tests for humics and sediments
  - Statistics review #1
  - Start automation effort for zooplankton
  - Beta Test of Protocol by NRL
- **In 2006,**
  - Low counts and Detection Limits (microbeads)
  - Live/Dead Stains
  - CFD Analysis and Sample Port Designs
- **In 2007,**
  - More AutoAnalysis
  - Phytoplankton Analysis Methodology Workshop
  - Facilities begin developing testing capacity, using draft protocol





- **In 2008,**
  - Automation efforts continue
  - Zooplankton nearly completed; start on protists
  - ETV Technical Panel- Final Surrogate (STO) Selection
  - Empirical tests of Sample Port Models
- **In 2009,**
  - Automation efforts continue
  - STO discussions
  - Begin evaluations of Test Facilities
  - Beta test of Revised Protocol
- **In 2010,**
  - Continue evaluation of Test Facilities with single BWT system
  - Continue automation of protist analysis



# Future Work

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- **Continued evaluation of additional facilities**
- **Develop shipboard Test protocols**
- **Develop shipboard verification protocols**





**Numerous people volunteered time and talent to develop the protocol under ETV guidance. Many review cycles took place, many problems were uncovered, many individual projects resulted- some of which are discussed in the following presentations.**

