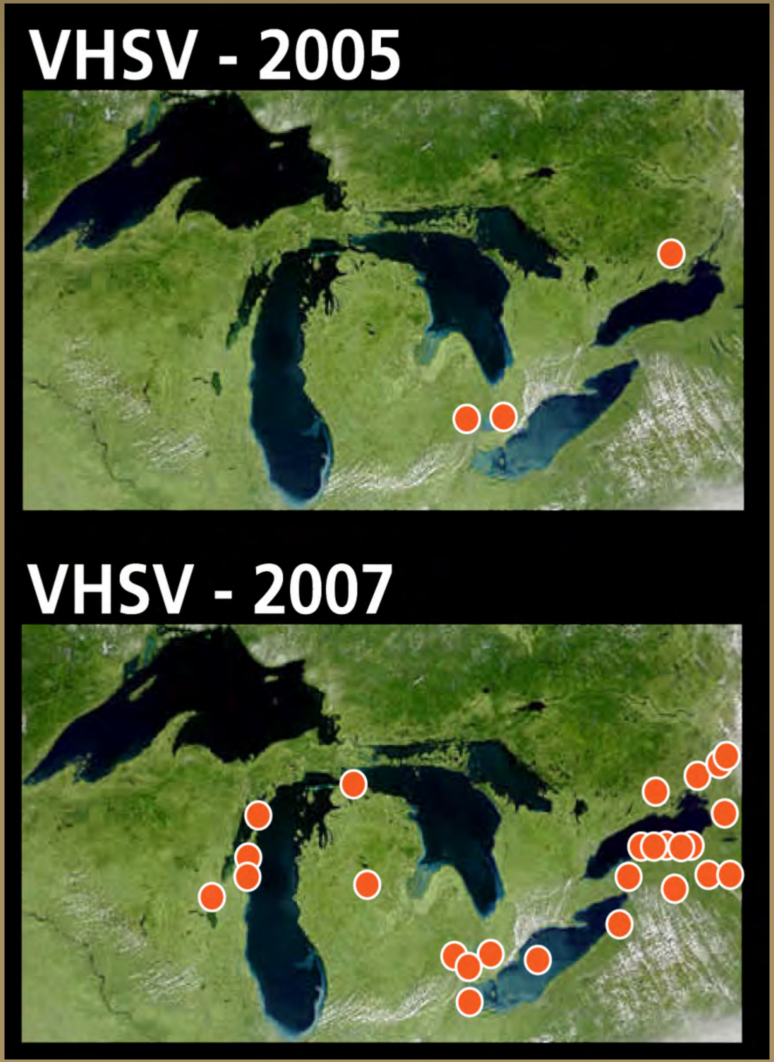
Ranger III Ballast Treatment Installation Update

August 3, 2012

A new Aquatic Invasive Species

The rapid spread through the Great Lakes of the fish pathogen viral hemorrhagic septicemia virus (VHSv).



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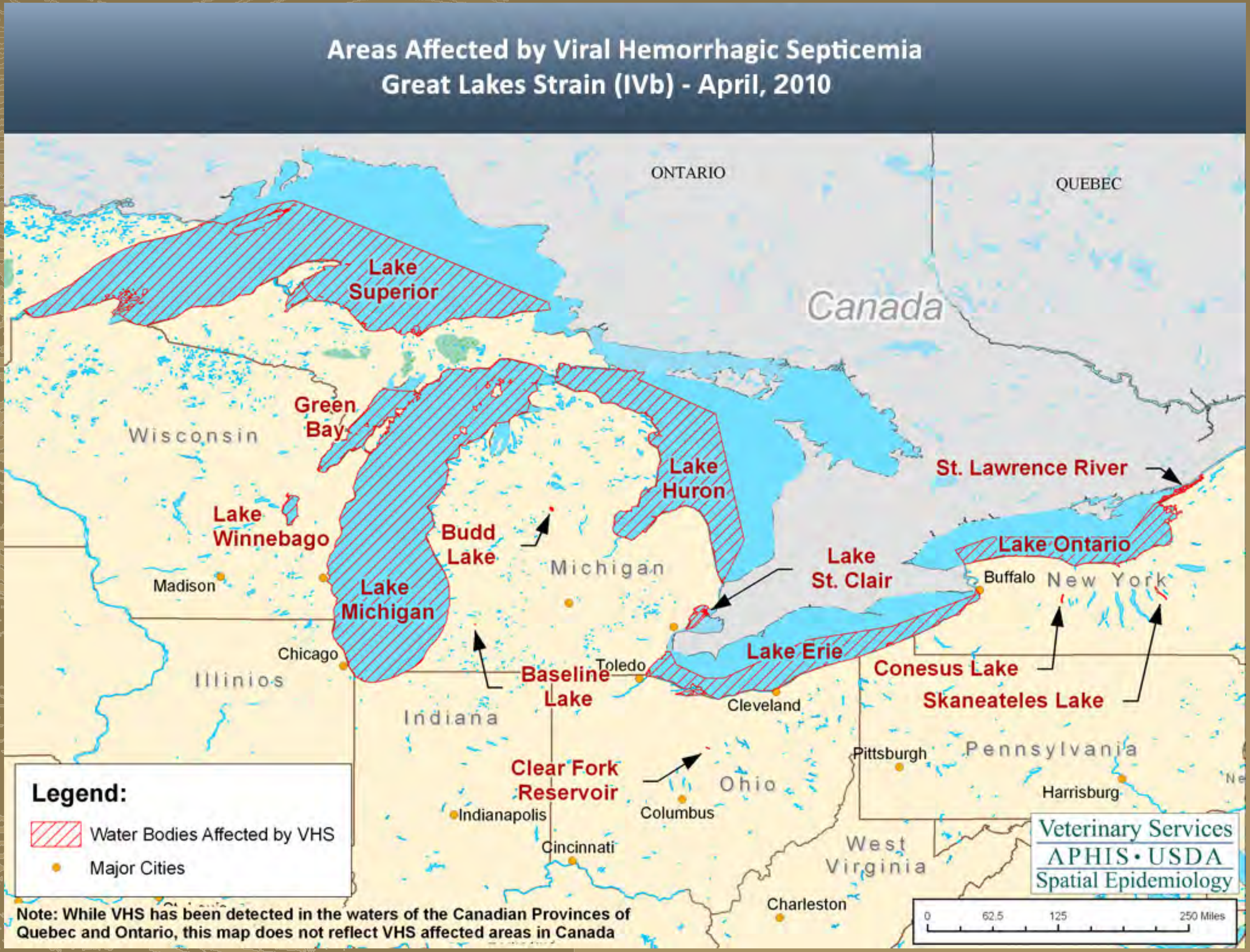

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Park Service Rapid Response

- Isle Royale installed a manually operated treatment system onboard the Ranger III.
- Developed in cooperation with Dr. David Hand at Michigan Technological University.

Trialing the System

The system used sodium hypochlorite as a biocide with ascorbic acid for neutralization prior to discharge.

Original dosing was via the vent tubes

Semi-automated: chlorine added via the pump during ballast intake.

Manual Dosing of Ballast

Chlorinated water soak time is short: time it takes to go to Isle Royale

Upon arrival at Isle Royale, chlorinated water is always neutralized for safe discharge.

Chlorine analysis by Chief Engineer Edward Hickey

Assuring discharge standards are met.

Manual system at less then IMO standards

- Cost Effective
  - Costs of Manual Operation
    - Install: $500
    - Chemicals: $8 in chlorine and $71 in neutralizer;
    - Operating manually:$2400
- At 5mg/l Biologically Effective for VHS and veligers
  - NPS HPC counts
    - 90-94% reduction

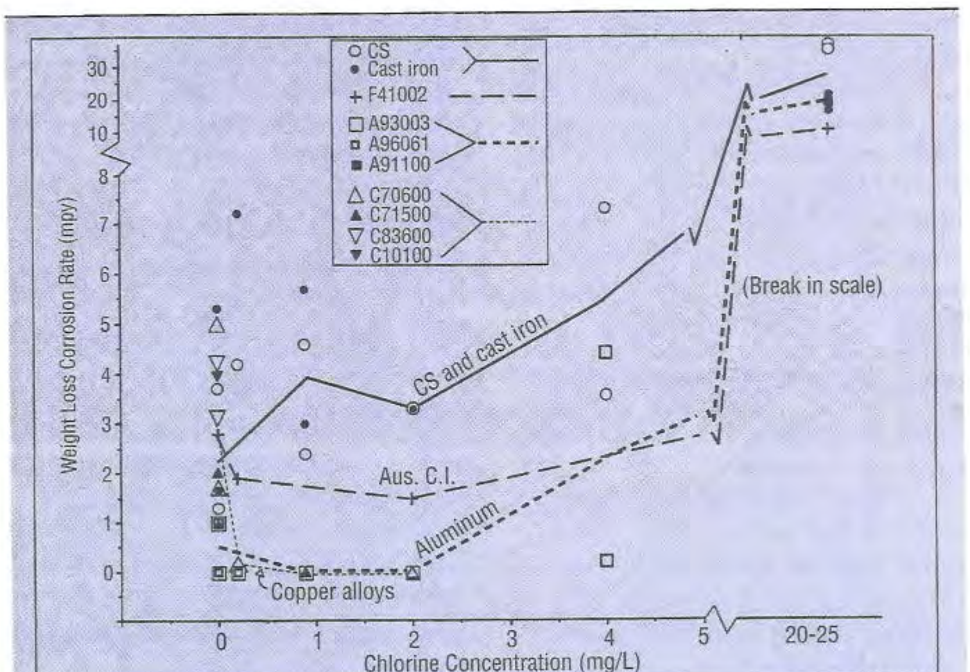
Chlorine based Automated System

- Cost Effective
  - Costs of Automatic System
    - Install: $92,000
    - Operating costs:$1200
    - Testing to IMO standards $500,000

- Biologically Effective
  - NPS HPC counts
    - 90-94% reduction
  - GSI bench scale results:

Size Class of Organisms	IMO Standard	Trial 1	Trial 2	Trial 3	Trial 4	Test Avg. (n = 4)
≥ 50 μm (n = 2)	< 10 /m^3	1,338 ± 687 /m^3	132 ± 30 /m^3	768 ± 13 /m^3	333 ± 32 /m^3	642 ± 534 /m^3
≥ 10 and < 50 μm (n = 1)	< 10 /mL	6 /mL	1 /mL	4 /mL	4 /mL	4 ± 2 /mL
< 10 μm – Heterotrophic bacteria (n = 3)	N/A	373 ± 17 MPN/mL	219 ± 53 MPN/mL	130 ± 36 MPN/mL	564 ± 48 MPN/mL	321 ± 95 MPN/mL
< 10 μm – *Escherichia Coli* (n = 3)	< 250 CFU/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL
< 10 μm – Total Coliforms (n = 3)	N/A	13 ± 4 MPN/100 mL	7 ± 2 MPN/100 mL	2 ± 1 MPN/100 mL	4 ± 2 MPN/100 mL	6 ± 2 MPN/mL
< 10 μm – *Enterococci* (n = 3)	< 100 CFU/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL	<1 MPN/100 mL

Freshwater Chlorine Corrosion



Chlorine levels (mg/L)	0	0.2	0.8-1.0	2	3-5	20-25
Days exposed	365 92	114	366 92	366	250 250	32 31
Test number	1 2	3	4 5	6	7 8	9 10

FIGURE 2

Corrosion Behavior of Various Alloys in Raw and Chlorine-Treated Fresh Water.
The four 0 ppm to 2 ppm residual chlorine tests were made at Rochester, New York, but the chlorine content was not reported in the original work. The plant is reporting 23 ppm chlorides currently. The fifth test was made at a Midwest treatment plant at which site the original data included 790 ppm chlorides.

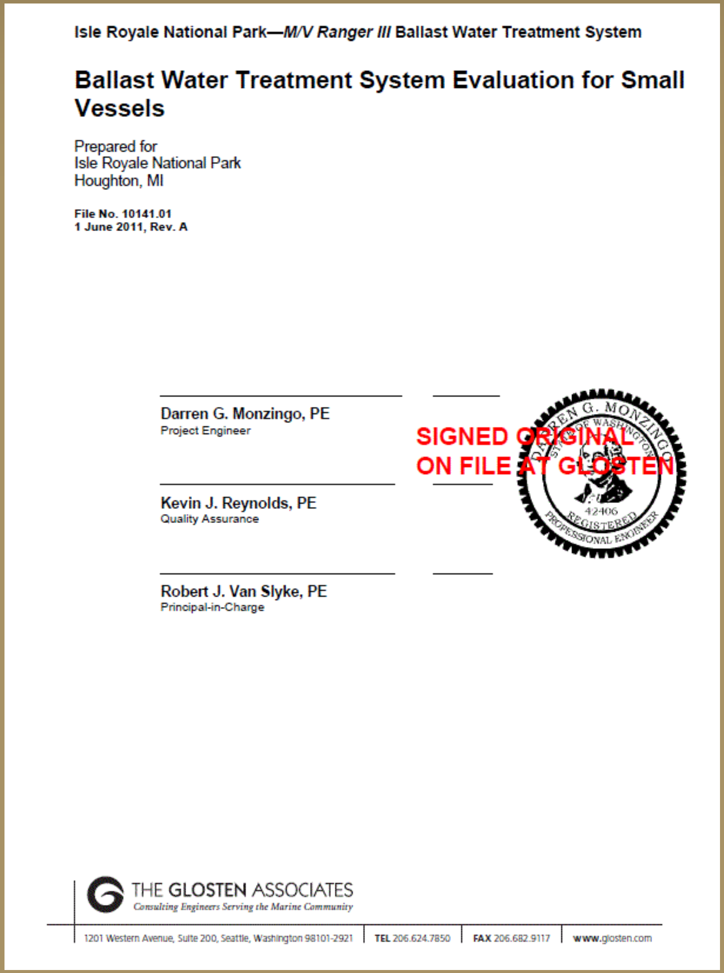
Arthur H. Tuthill, R.A. Avery, S. Lamb and G Kobrin, "Effect of Chlorine on Common Materials in Fresh Water", *Materials Performance*, November 1998, NACE, Houston, TX.

Better Treatment

- The Great Lakes Restoration Initiative provided funding for an upgrade from the initial emergency treatment system.

Treatment Assessment

- A naval architecture firm, The Glosten Associates, produced a report on the available treatment systems for ships of the size and type of the Ranger III.
- Available on the Isle Royale website


Isle Royale National Park—*M/V Ranger III* Ballast Water Treatment System

Ballast Water Treatment System Evaluation for Small Vessels

Prepared for
Isle Royale National Park
Houghton, MI

File No. 10141.01
1 June 2011, Rev. A

Darren G. Monzingo, PE
Project Engineer

SIGNED ORIGINAL
ON FILE AT GLOSTEN

Kevin J. Reynolds, PE
Quality Assurance

Robert J. Van Slyke, PE
Principal-in-Charge

THE GLOSTEN ASSOCIATES
Consulting Engineers Serving the Marine Community

1201 Western Avenue, Suite 200, Seattle, Washington 98101-2921 | TEL 206.624.7850 | FAX 206.682.9117 | www.glosten.com

Factors Influencing Selection

- Vessel Service Characteristics
  - Ship type and capacity
  - Ballast water characteristics (salinity)
  - Voyage and ballasting profiles (duration and turn-around times)

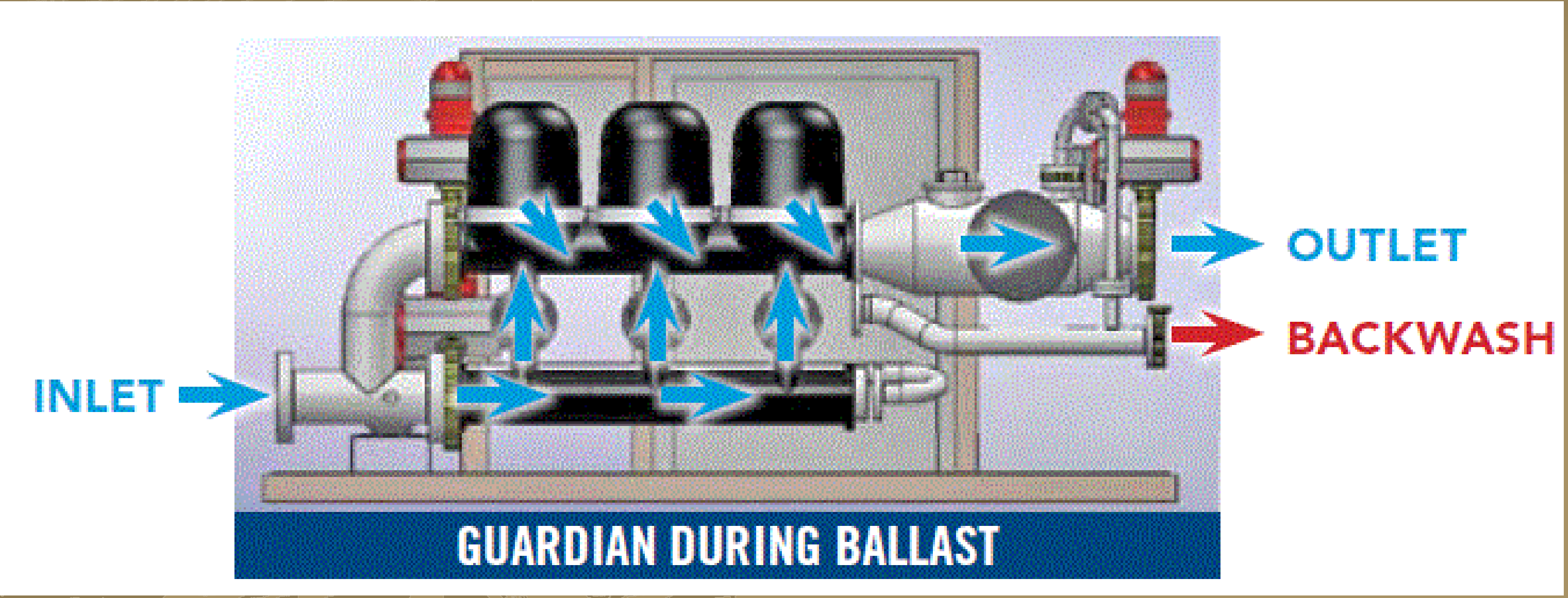
- **Treatment System Characteristics**
  - Efficacy and Toxicity
  - Treatment Method
  - Equipment size and weight
  - Electrical power demand
  - Handling of hazardous substances
  - Impacts on corrosion

- **General Considerations**
  - Costs to install and maintain
  - Availability of service and spare parts

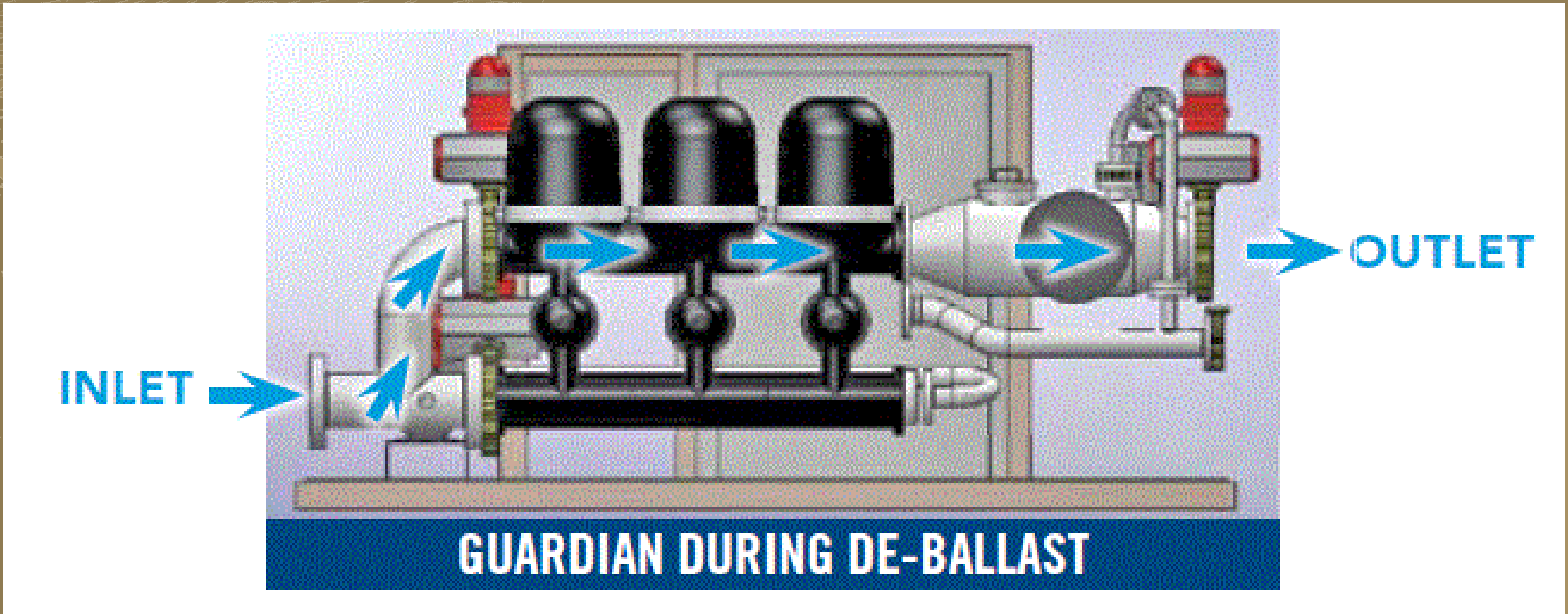
Selection Process

System	Salinity	Residence Time	Redundancy	Under Development	Final Selection
PureBallast					
Electro-Cleen	X				
OceanSaver		X			
VOS		X			
Hyde Guardian					
NK-O3	X				
OptiMarin			(same as Hyde)		
ClearBallast					
Glo-En Patrol			(same as Hyde)		
Unitor					
				Siemens	
				NaOH	
				NaOCl	

UV/Filtration System by Hyde Marine



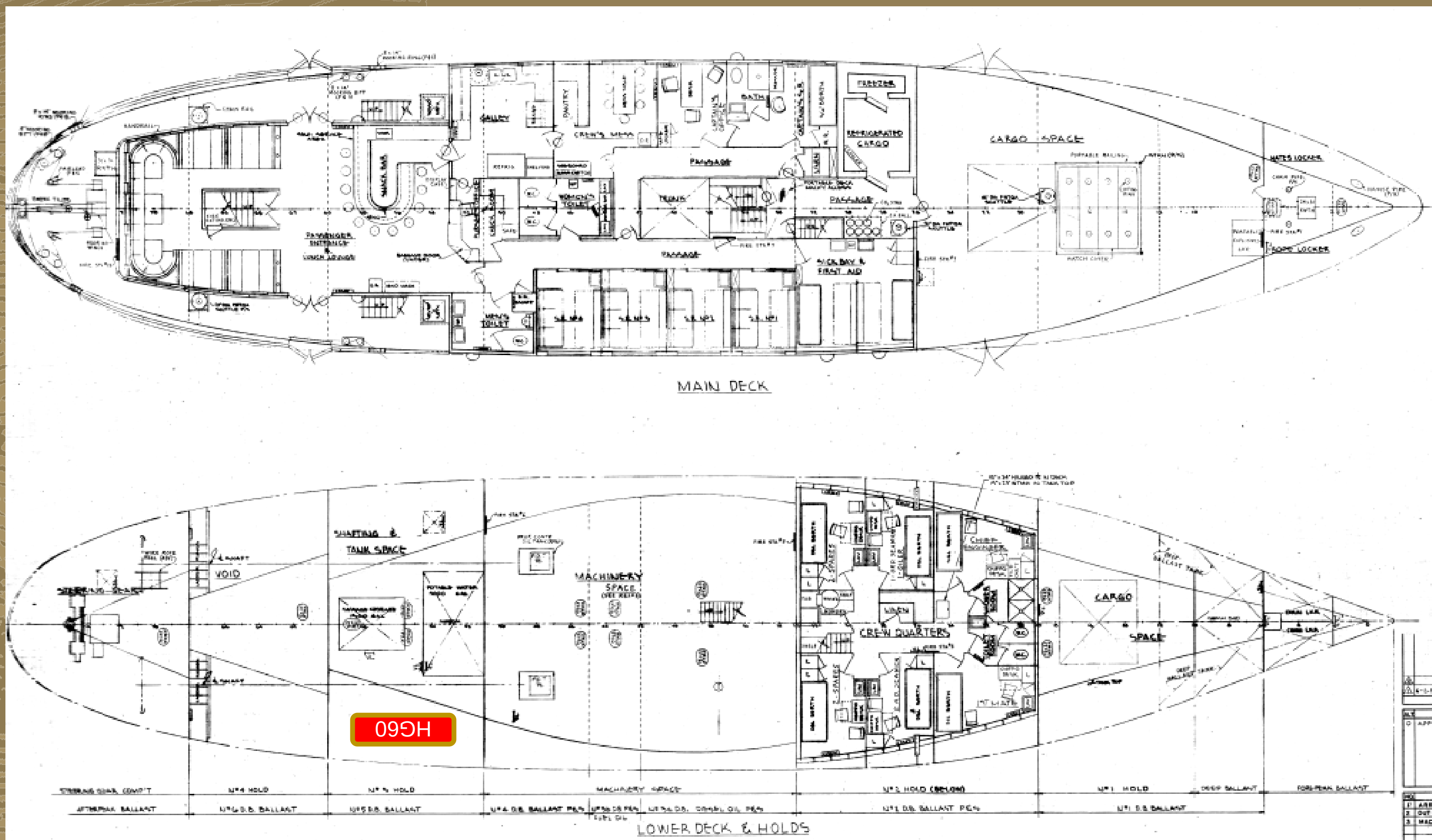
UV/Filtration System by Hyde Marine



Bypasses the filter, but goes through the UV chamber.

HONEST SOLUTIONS. HONEST EQUIPMENT.

Location



Location

Platform

Installation

With the UV Chamber

Installation Done at the Houghton, MI Dock

FRASER
SHIPYARDS, INC.

Cargo Hold as Pipe Shop


MOTT
HOBART

Power Panel and 208/440 Transformer

Hole for Power Panel

[redacted]

Installation of Overboard

[redacted]

Installation of Remote Operator

Completion

Hyde GUARDIAN
Ballast Water Treatment System
www.hydemarine.com
FILTER INLET
06/07/2012

[redacted]


Hyde GUARDIAN
Ballast Water Treatment System
www.hydemarine.com
INSTALLED BY SCHWARTZ BOILER SHOP,INC.
CHEBOYGAN,MICHIGAN
COMMISSIONING DATE MAY 25,2012
FILTER INLET
OUT
06/07/2012

Flow Meter and Sampling Port

Installation Costs

- Project management over 2 years: $35k
-
- $140k approx. for selection process- including NEPA and Industry outreach (this is a cost industry would not incur).
- Hyde provided a $170k system
- $155k approx. for installation
  - Note that costs may have been lowered, but the install was split to accommodate passenger voyages.
  - Also required extra expenses related to contracting that was peculiar to this project.
- Efficacy testing: GSI will be testing.

Ongoing and Future Efficacy Testing

- NPS bacterial counts
- Wayne State bacterial counts
- Great Ships Initiative
  - ETV style testing this year

Milestones

- 2008 MWRO and NOAA support for technical feasibility study plan
- 2009-10 American Steamship Company becomes a partner
- 2008 Clorox becomes a partner for Ranger III and expands support in 2010
- 2009 Great Lakes Ballast water collaborative formed.
- 2008/9 Great Lakes fisheries trust grant
- 200 9 published the Emergency treatment guide as a web based resources for spill and grounding responders.
- 2010 LCCMR grant
- 2010 Dow support with FIFRA compliance
- 2011 MARAD and GSI support – emergency prototype

NPS Ballast Program Goals

- **Goal 1) Prevent Aquatic Invasive Species transfers to, or from, Isle Royale National Park via commercial vessels and the NPS vessel Ranger III.**

  Results: Purchase of system this month install planned for winter layup. NPS local rule making. Technology transfer to small ships on-going.

- **Goal 2) Prevent new AIS arrivals from salt water vessels releasing near or grounding within a NPS boundaries or live AIS releases within the great lakes to float into NPS boundaries via the development of the emergency ballast treatment**

  Results: have a skid mounted treatment ready for testing spring of 2012 shore station testing of biocide this fall. (Need a partner who de-ballasts saltwater in US Port)

- **Goal 3) Prevent inter-basin transfers of AIS via the freshwater fleet by developing and demonstrating treatment technology to meet their needs.**

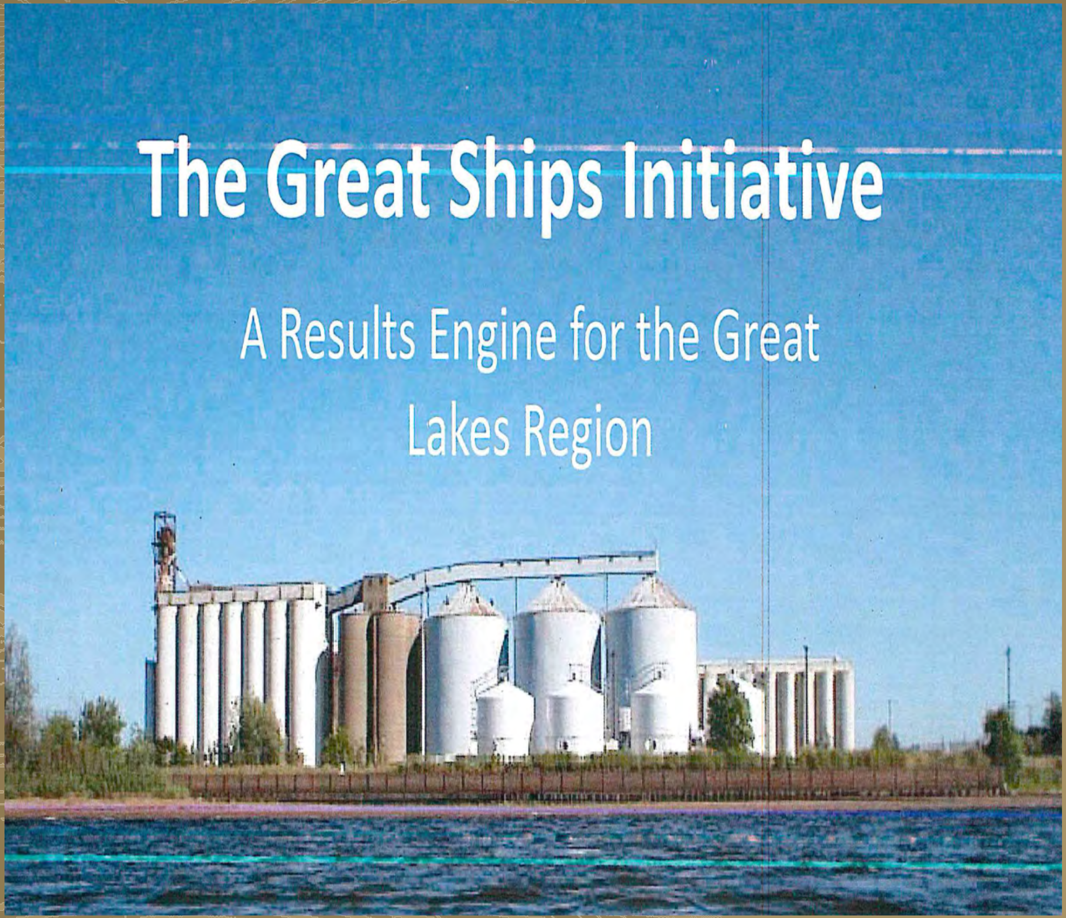
  Results: demonstrated to industry potential to mix: with USGS know-how mixed the largest and problematic ballast tank areas when they are full. Paving the way to be able to neutralize full tanks or implement emergency treatment that can include both the biocide application and the neutralization process.

- **Goal 4) Develop a path through the regulatory maze by initiating projects that support treatment approvals for fresh and salt water applications for large and small ships.**


GOLDEN BEAR


04/24/2012

National Park Service
U.S. Department of the Interior



EXPERIENCE YOUR AMERICA

Successful Install

- Work planned during winter lay-up unexpected delays resulted in a two-stage install.
- Work accomplished at end of lay-up and within our operating season
- System installed at the dock
- No further delays during install and operations once a plan was in place

THANK YOU TO ALL INVOVED

MSO Duluth USCG, ABS, Fraser Shipyard, Hyde Marine, Schwartz, NMA, Glosten and GLRI

Thanks!

Hyde Marine
HONEST SOLUTIONS. HONEST EQUIPMENT.

Schwartz

NMR

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SHIPYARDS, INC.

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