Trust Fund 2009 Work Program

Date of Report: 4 April 2011
Date of Next Progress Report: 30 June 2011
Date of Work Program Approval: 1 June 2010
Project Completion Date: 30 June 2011

I. PROJECT TITLE: Emergency Delivery System Development for Disinfecting Ballast Water

Project Manager: Scott Smith
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Location:
Project work, both previously completed efforts and the current effort, has taken place on board the ship, *M/V Indiana Harbor*, as it has transited through the Great Lakes.

Total Trust Fund Project Budget:	**Trust Fund Appropriation**	**$ 125,000**
	Minus Amount Spent:	**$ 107,503**
	Equal Balance:	**$ 17,497**

Legal Citation: M.L. 2009, Chap. 143, Sec. 2, Subd. 6b

Appropriation Language: (b) Emergency Delivery System Development for Disinfecting Ballast Water. $125,000 is from the trust fund to the commissioner of the Pollution Control Agency for an agreement with the United States Geological Survey to test the viability of treating ballast water through access ports or air vents as a means to prevent the spread of invasive species.

II. PROJECT SUMMARY AND RESULTS:

This project is **Phase III** of an overall effort to produce an Emergency Response Guide to Handling Ballast Water to Control Non-Indigenous Species. Phase I ($25,000) was funded by NOAA and resulted in a study plan entitled “Mixing Biocides into Ships’ Ballast Water: Efficiency of Novel Methods.” Phase II ($185,000) was funded by the Great Lakes Fisheries Trust and studied in-line injection, bulk dye dosing, perforated hose dosing and passive mixing methods, such as ship’s motion.

Similar to Phase II, this effort (**Phase III)** prepared ballast tank mixing and sampling equipment, field work on a working ship to trial promising ballast mixing methods, and

analysis/report. The active methods being studied in Phase III are venturi eductors and air lifts. The outcome will be the incorporation of these methods (if determined to be effective and practical) into a best practices guide for treating the ballast water of ships either:

- Arriving in port with high risk ballast water,
- Leaving a port that contains ballast known to be high risk for the destination port, or
- Grounded and laden with high risk, untreated ballast water.

III. PROGRESS SUMMARY

Progress as of 6/1/10 - Result 1 and Result 2 activities have been completed. The logistics, planning and equipment preparation were completed by May 15, 2010. The field deployment and onboard testing activities, including breakdown, were completed on May 23, 2010. The remaining work for this project, Result 3 Data Analysis and Report, is currently underway.

Progress as of 3/1/11 - Result 1 and Result 2 activities have been completed. The logistics, planning and equipment preparation were completed by May 15, 2010. The field deployment and onboard testing activities, including breakdown, were completed on May 23, 2010. The remaining work for this project, Result 3 Data Analysis and Report, is currently underway. A draft of the final report and a draft update of the Emergency Response Field Guide have been created and are under further review through the USGS peer-review process.

IV. OUTLINE OF PROJECT RESULTS*:*

Result 1: Logistics and Equipment Preparation

Description: Shipboard field trials require significant preparations because: (a) There is no opportunity to "go to back to the shop" to get broken or forgotten supplies. (b) Ship's commercial rates typically ranging between $40,000 and $80,000 per day. This requires equipment to be ready to go and integrated with operations such that it does not delay the ship. Equipment preparation specifically includes:

- Logistics Preparation:
    - Team Coordination: Sampling Team, Dosing Team, Ship Personnel, Ship Office Personnel
    - Finalize Test Protocol
    - Develop, Print, Bind Field Logs
    - Obtain Ballast Water Discharge Permit(s).
    - Team Travel and Accommodation Arrangements
    - Purchasing and administrative preparations
- Equipment Preparation:
    - Sampling and Measurement
        - Dye Sampling Equipment Rental and Set-up
        - Pressure Transducer Suite Set-up

        - Ship Dynamics Measurement Suite Set-up
    - Mixing Equipment
        - Dye Stock and Dosing Equipment Set-up
        - Air Lift Equipment Set-up
        - Eductor Equipment Set-up
    - Consumables Procurement
    - Shipment and Handling of Equipment to Ship Location

Summary Budget Information for Result 1: **Trust Fund Budget: $ 39,829**
Amount Spent: $ 39,829
Balance: $ 0

Deliverable	Completion Date	Budget
1. Summary-Personnel	15 May 2010	$4,770
2. Summary- Contracts	15 May 2010	$17,475
3. Summary-USGS-Leetown Science Center	15 May 2010	$2,065
4. Summary-Supplies	15 May 2010	$15,519

Result Completion Date: 15 *May 2010.*

Result Status as of 1 June 2010: The three groups: educator team, air lift team, and sampling team, responsible for Set-up and execution of the on ship testing completed preparations for the on ship trials in a timely fashion. Planning took place during weekly teleconferences where each of the three teams gave status updates. Communication with the ship's owner was ongoing during the planning process and their comments/concerns were answered and communicated to the teams. The majority of the required equipment was purchased or rented in advance and was loaded onto the ship approximately 1 week before the testing teams arrived in Duluth, MN.

The remainder of the equipment and consumables were delivered to the ship with the crew. The ships grocery supplier was utilized to help with transferring equipment to the ship during cargo loading at Two Harbors, MN. The teams arrived and boarded the vessel with all equipment on time 15 May 2010.

Result Status as of 1 December 2010: All shipboard research and data collection has been completed. **RESULT 1 COMPLETED.**

Result Status as of 1 June 2011:

Final Report Summary:

Logistics and equipment preparations performed and complete, ready for ship trials.

The three groups: eductor team, air lift team, and sampling team, responsible for set-up and execution of the on ship testing completed preparations for the on ship trials in a

timely fashion. Planning took place during weekly teleconferences where each of the three teams gave status updates. Communication with the ship's owner was ongoing during the planning process and their comments/concerns were answered and communicated to the teams. The majority of the required equipment was purchased or rented in advance and was loaded onto the ship approximately 1 week before the testing teams arrived in Duluth, MN.

The remainder of the equipment and consumables were delivered to the ship with the crew. The ships grocery supplier was utilized to help with transferring equipment to the ship during cargo loading at Two Harbors, MN. The teams arrived and boarded the vessel with all equipment on time 15 May 2010.

Result 2: Field Deployment

Description: Field deployment is the effort required to execute the actual work on board the ship. There are significant set-up and break-down efforts on board the ship such that the testing methods are ready for execution when the ship actually takes on the ballast water.

		Budget	Revised Budget
Summary Budget Information for Result 2:	Trust Fund Budget:	$57,960	$64,519
	Amount Spent:	$64,519	$64,519
	Balance:	$ 0	$0

Deliverable	Completion Date	Revised Budget
1. Summary-Personnel	23 May 2010	$10,075
2. Summary- Contracts	23 May 2010	$35,018
3. Summary-USGS-Leetown Science Center	23 May 2010	$15,800
4. Summary-Travel	23 May 2010	$3,626

Result Completion Date: 23 May 2010

Work Program Amendment Request – March 21, 2011: We request that the budget for Result 2 be retroactively approved to increase the amount from $57,960 to $64,517 for an increase of $6,557 and that Result 3 be reduced by the same amount.

The reason more funds for Result 2 were needed is that more work was required to complete Result 2 than originally anticipated. This research has not been conducted prior to this effort and is therefore hard to precisely budget.

The Budget for Result 3 is reduced by the same amount of $6,557 to stay within the allotted LCCMR budget. Additional funds were provided by USGS to make up for

budget shortfalls. USGS has provided over $50,000 in additional funds to support this research.

An extension of the final deliverable due date is requested from June 30, 2011 until July 30, 2011. Funding was recently provided through the Great Lakes Restoration Fund to conduct Phase IV of this project. This phase will build upon the LCCMR research by building a ballast treatment system and testing it on a Laker. This additional research is scheduled for our research team in June, 2011. The extension will allow time for our researchers to complete both projects.

Work Program Amendment Request Approved by LCCMR staff on xxx, 2011

Result Status as of 1 June 2010: The teams boarded the ship 15 May 2010 and disembarked 23 May 2010. Equipment was installed in the ballast tanks, the conveyor tunnel and on deck between 15 May and 17 May with all setups tested before closing of manhole accesses. The ship took on ballast in Gary Harbor Indiana the night of 17 May and testing commenced the morning of 18 May as the ship left port. Testing continued almost nonstop until the ship arrived in Superior, Wisconsin on 20 May. Discharge monitoring and harbor dilution studies were conducted while the ship was loading cargo the night of 20 May. Ship made an additional stop in Superior, WI to offload equipment requiring a crane to lift after cargo operations were completed. The test teams entered the empty ballast tanks after the ship exited Duluth Harbor the morning of 21 May to remove all equipment. Equipment was all removed, cleaned, and stowed on deck by the afternoon of 23 May. All remaining testing personnel disembarked ship at the Sault St. Marie Locks the afternoon of 23 May. The remaining equipment on board the ship will be offloaded the next time they make a Superior, WI port call.

Result Status as of 1 December 2010: RESULT 2 COMPLETED.

Result Status as of 1 June 2011:

Final Report Summary:

Field deployment, including demobilization efforts, performed and complete.

The teams boarded the ship 15 May 2010 and disembarked 23 May 2010. Equipment was installed in the ballast tanks, the conveyor tunnel and on deck between 15 May and 17 May with all setups tested before closing of manhole accesses. The ship took on ballast in Gary Harbor Indiana the night of 17 May and testing commenced the morning of 18 May as the ship left port. Testing continued almost nonstop until the ship arrived in Superior, Wisconsin on 20 May. Discharge monitoring and harbor dilution studies were conducted while the ship was loading cargo the night of 20 May. The ship made an additional stop in Superior, WI to offload equipment requiring a crane to lift after cargo operations were completed. The test teams entered the empty ballast tanks after the ship exited Duluth Harbor the morning of 21 May to remove all equipment. Equipment was all removed, cleaned, and stowed on deck by the afternoon of 23 May. All remaining testing personnel disembarked ship at the Sault St. Marie Locks the

afternoon of 23 May. The remaining equipment on board the ship will be offloaded the next time they make a Superior, WI port call.

Deliverable	Completion Date	Budget
1. Summary-Personnel	15 Sept 2010	$3,154
2. Data Analysis by Contractor	15 Sept 2010	$3,880
3. Project Report by Contractor	15 Sept 2010	$5,480
4. Field Guide Update by Contractor	15 Sept 2010	$7,885
5. Data Analysis by USGS	July 2011	$9,969

Result 3: Data Analysis/Report

- **Description:** Following completion of shipboard efforts, the team will analyze the data to determine the relative efficiency of the various mixing methods. Additionally, the Emergency Response Field Guide will be updated with any of the methods in this Phase III work which are promising. These specific activities include: Data Analysis, Report Development and Field Guide Update

Summary Budget Information for Result 3:		Budget	Revised Budget
	Trust Fund Budget:	$27,212	$20,651
	Amount Spent:	$0	$3,154
	Balance:	$0	$17,497

Result Completion Date: 30 July 2011.

Result Status as of 1 June 2010: Analysis efforts are currently underway.

Result Status as of 1 December 2010: All shipboard data has been collected and a draft Project Report and Field Guide Update has been submitted to USGS by the Contractor. The draft Report and Field guide are under review by our USGS research team. The contractor will be provided with a list of amendments that must be completed to satisfy the terms of our agreement. The final amended products from the Contractor will then be submitted to the USGS peer review process for additional review and refinement. Final publishable documents are expected to be ready in June of 2011

Result Status as of 17 March 2011: A draft report has been completed and is undergoing peer-review.

Result Status as of 30 July 2011:

Final Report Summary:

V. TOTAL TRUST FUND PROJECT BUDGET: $125,000

Personnel: $ 17,999
Contracts: $ 69,990
USGS-Leetown Science Center: $17,865
Equipment/Tools/Supplies: $ 15,519
Travel: $ 3,626

TOTAL TRUST FUND PROJECT BUDGET: $125,000

Explanation of Capital Expenditures Greater Than $3,500: NONE

VI. PROJECT STRATEGY:

A. Project Partners:

1. USGS Western Fisheries Research Center (WFRC). As the primary contract for the grant, the Center will receive no indirect costs for implementing this research. The WFRC has agree to cost-share the indirect costs of this project by paying for these expenses out of other bugdgets. The indirect costs absorbed by the WFRC amount to $42,000.
2. USGS Leetown Science Center. The center will receive $17,865 to cover efforts to develop the air lift methods, staff time, and travel to the ship for field trials.
3. A marine engineering firm. The marine engineering firm selected by the WFRC through a compeditive process will perform as a contractor and receive $69,990. This will cover overall logistical coordination of the testing efforts, including dye dosing and sampling preparation, execution, and reporting upon completion of the effort.
4. National Park Service, Isle Royal. NPS will not receive any funding. However, NPS will be obtaining critical discharge permits, as well as supply needed on-site support efforts in the Great Lakes. Additionally, NPS will serve as the "customer" by both providing feedback real time as field efforts are progressing, and be a receipient of the results of the study.

B. Project Impact and Long-term Strategy:

Ballast water is the primary pathway for aquatic invasive species (AIS) introduction and spread to the Great Lakes and Lake Superior. At least one new invasive species is found in the Great Lakes each year. Many ballast water treatment technologies are currently undergoing research, development and various regulatory approvals. International, national and state laws are being established to mandate the use of ballast treatment; however it will be many years before effective ballast treatment devices are available or required for all vessels. Lake Superior will remain at risk for new AIS for many years unless simple cost effective emergency treatment is developed, especially for high risk vessels. High risk vessels include those that frequent Great Lakes ports with known infestations or active outbreaks of AIS. For example, viral

hemorrhagic septicemia (VHS) has not been found in Lake Superior, but ships that take up ballast water in areas where there is an outbreak of VHS and then discharge untreated ballast water into Lake Superior may pose a high risk. Development of methods to treat ballast water in high risk vessels would substantially reduce the risk of spreading VHS and other AIS to Lake Superior.

This study would build on existing efforts to reduce risks of introducing and spreading AIS through ballast water. An ongoing investigation at the Great Ships Initiative is bench testing the efficacy of active substances such as chlorine to treat ballast water. At the same time, other researchers are developing methods to identify high risk ports in the Great Lakes. This study will field test several emergency treatment methods in the absence of installed metering systems, including powered mixing devices and administering a biocide directly through the access ports. The methods must include protocols to ensure an environmentally sound discharge. The methods should also be practical for deployment on any vessel, economical, and cause minimal delays in the vessels' schedule.

C. Other Funds Proposed to be spent during the Project Period:

This project is Phase III of a planned IV to achieve final project results. At the end of each successive phase, we are advancing the best practices for emergency ballast water treatment. As such, each phase is valuable in isolation – and each phase builds upon the results of the last.

Efforts which have been completed or are in progress to complement this $125,000 grant for Phase III:

- Phase I – Study Planning. Funding Agency NOAA - $25,000. Completed.
- Phase II – Passive Mixing Field Trials. Funding Agency Great Lakes Fisheries Trust - $185,000. In progress, 80% complete.
- Phase III – This proposal.
- Phase IV – Developing and Testing Novell Methods. Funding Agency USGS – GLRI. Proposal accepted and scheduled for June 2011 test.
- Significant in-kind financial contributions have been made by the NPS, and the USGS-WFRC through proposal preparation efforts and during phases I, II and III.

D. Spending History: See "C" above.

VII. DISSEMINATION:

The focus of the effort is to provide practical guidance for handling high risk ballast water to emergency responders. The outcome will be the incorporation of these methods (if determined to be effective and practical) into a best practices guide for treating the ballast water of ships either:

- Arriving in port with high risk ballast water,

- Leaving a port that contains ballast known to be high risk for the destination port, or
- Grounded and laden with high risk, untreated ballast water.

Progress as of 6-1-10 – Preliminary information from Result 1 and Result 2 activities were shared at the May 18, 2010 Great Lakes Ballast Water Collaborative meeting in Montreal, QC and at the June 1, 2010 Lake Superior Binational Program - Invasive Species Workshop in Duluth, MN.

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted beginning not later than 1 June 2010. A final work program report and associated products will be submitted no later than 30 July 2011.

IX. RESEARCH PROJECTS: N/A

Attachment A: Budget Detail for 2010 Projects - Summary and a Budget page for each partner (if applicable)

Project Title: *Emergency Delivery System Development for Disinfecting Ballast Water*

Project Manager Name: *Scott Smith.*

Trust Fund Appropriation: $125,000

REVISED 3-21-2011

Trust Fund Appropriation: $125,000

2009 Trust Fund Budget	Result 1 Budget	Result1 budget revised	Amount Spent	Balance	Result 2 Budget	Result2 budget revised	Amount Spent	Balance	Result 3 Budget	Result3 budget revised	Amount Spent	Balance	TOTAL BUDGET	TOTAL SPENT	TOTAL BALANCE
SUMMARY -PERSONNEL	9,575	4,770	4,770	0	13,706	10,075	10,075	0	9,969	3,154	*3,154*	0	17,999	17,999	0
SUMMARY -CONTRACTS	22,955	17,475	17,475	0	29,803	35,018	35,018	0	17,242	17,497	0	17,497	69,990	52,493	17,497
SUMMARY - USGS LEE TOWN SCEINCE CENTER		2,065	2,065	0		15,800	15,800	0		0	0	0	17,865	17,865	0
SUMMARY -SUPPLIES	7,299	15,519	15,519	0	9,031	0	0	0	0	0	0	0	15,519	15,519	0
SUMMARY- TRAVEL		-	-	0	5,420	3,626	3,626	0	0	0	0	0	3,626	3,626	0
COLUMN TOTAL	39,829	39,829	39,829	0	57,960	64,519	64,519	0	27,211	20,651	3,154	17,497	125,000	107,502	17,497