# Environment and Natural Resources Trust Fund
# 2012-2013 Request for Proposals (RFP)

**Project Title:** Analytical Method for Water Quality Assessment

**ENRTF ID:** 104-E2

**Topic Area:** E2. NR Info Collection/Analysis

**Total Project Budget: $** 57,720

**Proposed Project Time Period for the Funding Requested:** 2 yrs, July 2013 - June 2015

**Other Non-State Funds: $** 0

**Summary:**

This research will develop analytical method for quantitative risk assessment to improve the corresponding method required by New Hampshire code of administrative rules in terms of accuracy, sensitivity, and reproducibility.

**Name:** Seraphin Chally Abou

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**Location**

**Region:** Central

**County Name:** Statewide

**City / Township:** Duluth

| | | | |
|---|---|---|---|
| _____ Funding Priorities | _____ Multiple Benefits | _____ Outcomes | _____ Knowledge Base |
| _____ Extent of Impact | _____ Innovation | _____ Scientific/Tech Basis | _____ Urgency |
| _____ Capacity Readiness | _____ Leverage | _____ Employment | _____ TOTAL _____% |

**PROJECT TITLE:** Integrated Risk-Based Assessment of Accidental Pollution of Drinking Water and Related Public Health Issues

## I. PROJECT STATEMENT

The Great Lakes and watershed networks nationwide and across the state are inherently vulnerable to accidental risk of contamination from chemical and oil spills because of their distributed geography. This research objective is to implement water quality metrics with multiple objectives aggregation methods that can be reproducible graphically and interpretable for capturing safety attributes, public risk preferences for law enforcement, and emergency decision-making and for prioritizing issues of greatest concern for Great Lakes contamination and related public health and safety.

Overall, due to the increase of marine transportation because of the global economy, the goal is to evaluate probable accidental risk contamination from chemical and oil spills in the Great Lakes and create models for capacity planning, impact analysis, on-demand forecasting, and plans for mitigating and reacting to emergency situations. This will involve a series of in-depth examinations of threats, vulnerabilities, consequences, and conditions that marine transportation affects, including the marine habitat and the health of the populations served by the Great Lakes.

The existing *Emergency Operation and Response Plan* failed to comply with the Maritime Transportation Security Act (MTSA) of 2002: Section 70113 of the MTSA of 2002 directs the Secretary of the Department of Homeland Security (DHS). There is no elaborated strategy to implement a system to collect, integrate, and analyze information concerning vessels operating on or bound for waters subject to the jurisdiction of the United States, including information related to cargo and intermodal shipments. This indicated the need for a continuous and layered analysis of the risks and vulnerability of the Great Lakes resources and seaway systems. This research will fuel the state's knowledge-based critical resources protection and emergency act, resulting in informed decision-making related to the cost of cleanup, marine environment contamination level, and other civil liabilities.

The expected outcome of the project is an overarching *Emergency Operation and Response Plan* that reflects safety requirements and a recovery plan for facilities, the nationwide economy, and public health. More importantly, the outcome will describe, in detail, the necessary logistics support activities for each EOP element and assign responsibility for those activities.

Note that although the proposed project shares the fundamental risk analysis principles and aligns with the National Response Plan (NRP), *it will not attempt to replace the marine areas risk and vulnerability assessment procedures prepared as part of the federally mandated Facility Security Plan (FSP).*

## II. DESCRIPTION OF THE PROJECT ACTIVITIES

### Task 1: Assessment—functional analysis of the Great Lakes marine transportation systems

Evaluate the vulnerability and capability of the Great Lakes marine transportation systems to initiate and respond to a given emergency, whether outside assistance is needed and its availability, establish key links and align the project objectives to address priority monitoring needs, and allow for an effective merger of information management among existing disparate safety programs.

**Duration:** 4 months.

**Deliverables:**

- Risk survey report in accordance with generally accepted government auditing standards
- Hazard mapping; Preliminary Hazard List (PHL)

**Budget:** $680.00

### Task 2: Analysis—characterization of safety factors

Identify critical hazards, collect evidence, and evaluate all foreseeable types of risk management. This will involve the coordination of response operations, the analysis of transportation uncertainties, and the management of hazardous material. This step will evaluate the state's emergency response capability.

**Duration:** 5 months.

**Deliverables:**

- Effective response procedures that will account for the organizational coordination of both state and local stakeholder interests
- Produce a report outlining the different resources available at the city, state, and federal level

**Budget:** $2,705.00

**Task 3**: **Best response concept**

This task is to develop multi-objective metrics as a tool for hazard evaluation and prompt responses to unexpected events.

**Duration:** 5 months

**Deliverable**: Elaborate incident command structure

**Budget:** $855.00

**Task 4: Plan—integrated emergency operation plan**

Outline the *Integrated Emergency Operation Management Plan* applicable to all stages of the local response network and evaluate the cleanup cost.

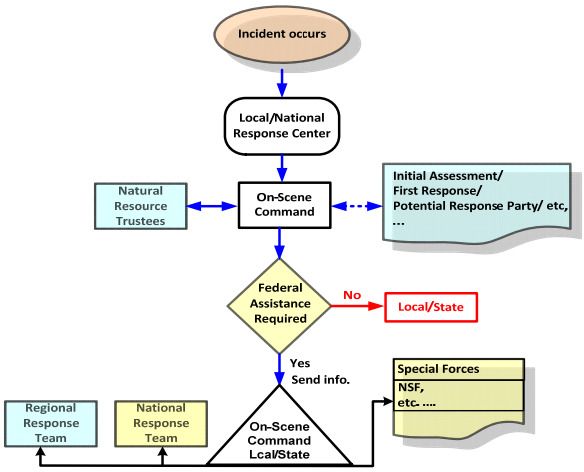

Fig. 1 Incident command system structure

**Duration:** 6 months.

**Deliverables:**

- Estimate of cleanup and recovery cost based on selected hazardous material.
- Environmental impact risk matrix

**Budget:** $2000.00

**Task 5: Final report**

**Duration:** 4 months

## III. PROJECT STRATEGY

### A. Project Team/Partners

**Principal Investigator:**

Name: Seraphin Chally Abou

**B. Timeline Requirements:** 24 months

### C. Long-Term Strategy and Future Funding Needs

A future research project will refine sets of critical infrastructures risk management assets to tailor findings from this project so that the Duluth EORP can serve as a model for other facilities and Great Lakes ports as a *Network-Centric* Emergency System format**.** The project has a clear plan for leveraging significant extramural support and sustaining the work with other funds from NIH, EPA, and NSF.

# 2012-2013 Detailed Project Budget

## IV. TOTAL ENRTF REQUEST BUDGET *[Insert # of years for project]* **years**

| BUDGET ITEM | AMOUNT |
|---|---|
| **Personnel:** Faculty 100% summer time; (Salary:$7300; Benefit:$3385) | $ 11,785 |
| **Personnel:** One student 25% academic year; 60% summer time (salary: $27000; Benefit:$15100 ) | $ 42,100 |
| **Equipment/Tools/Supplies:** Software for data analysis | $ 1,435 |
| **Acquisition (Fee Title or Permanent Easements):** | $ - |
| **Travel:** Internal travel for data collection and survey | $ 2,400 |
| **Additional Budget Items:** | $ - |
| **TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =** | $ 57,720 |

## V. OTHER FUNDS

| SOURCE OF FUNDS | AMOUNT | Status |
|---|---|---|
| **Other Non-State $ Being Applied to Project During Project Period:** | $ - | *Indicate: Secured or Pending* |
| **Other State $ Being Applied to Project During Project Period:** | $ - | *Indicate: Secured or Pending* |
| **In-kind Services During Project Period:** | $ - | |
| **Remaining $ from Current ENRTF Appropriation (if applicable):** | $ - | *Indicate: Unspent? Not Legally Obligated? Other?* |
| **Funding History:** | $ - | |

**SERAPHIN CHALLY ABOU, Ph.D., P.Eng**

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## Profile

- Mechanical engineer with over 8 years of research and teaching experience; considerable expertise in critical infrastructure, systems safety, risk and physical hazard control and mathematics modelling.
- Highly developed ability to understand overall systems design philosophy and safety requirement, as well as the relationship between mission functionality, system architecture, plus criticality and safety aspects.
- Resourceful and innovative instructor who strives to help students improve grades, supporting colleagues and the administration and facilitating each student's social and intellectual growth by creating an environment of mutual respect and open communication.

## Areas of Expertise

| | | |
|---|---|---|
| □ Systems Safety Engineering | □ Critical Infrastructure Systems | □ System Analysis |
| □ Failure Analysis and Detection | □ Identification of Risk Factors | □ Risk Management |
| □ Mathematics Modelling | □ Environmental, Health and Safety | □ Process Safety |

## RESEARCH/TEACHING

- Maintained sound professional performance as a practicing engineer using the knowledge of theories and principles and their applications in the science of System Safety, Mechatronics, and Hydraulics as well as in the related fields of Systems Health Monitoring, Manufacturing Engineering, Knowledge Acquisition and Critical Decision Support.
- Enhanced research activities for understanding potential failure modes/mechanisms, failure detection and response, methods of fault annunciation, environmental and related health and safety.

## ENGINEERING

- Contributed to projects involving physical and numerical modelling simulation and process control. Verified instrumentation to address Systems Safety Engineering issues such as hazard mitigation for safety critical systems; performed analysis and testing.

## ACADEMIC EXPERIENCE

### Research Summary

Dr. Abou's research addresses the topics of (i) system safety and prognostic; (ii) critical infrastructure safety design and control; (iii) risk management of extreme events applied to a variety of engineering systems and (iv) multiobjective decision making applied to mechatronic systems health monitoring and system safety.

**University of Minnesota Duluth, MN** **September 2006 – present**

***Assistant Professor, (ME and MEHS program)***

Supervise graduate students; liaise with universities, industries and government agencies to initiate collaborative research projects. Lead dynamic MEHS (*Master of Environment Health and Safety*) students group for supporting and enforcing safety science practices in industries.

**Courses taught:**

- System Safety and Loss control (Safe 6011),
- Noise Control and Industrial Ventilation (Safe 6111)
- Fire Prevention and Emergency Preparedness (Safe 6201)
- Risk Management and Workers Compensation (Safe 6012)
- Fluid Mechanics (ME 3111)