PLANNING FOR AN IOOS® THREE-REGIONAL, INTERAGENCY WATER QUALITY DEMONSTRATION PROJECT

October 22, 2010

I. Introduction

This white paper provides an overview for a proposed Integrated Ocean Observing System (IOOS®) three-region, interagency water quality demonstration project that is specifically focused on the development of a beach water quality forecasting/advisory tool. It is hoped that increasing awareness and knowledge about this project will lead to greater support in the IOOS® Regions.

The project, first proposed at the IOOS® Regional, Interagency Workshop, will help inform beach or shellfish harvesting closure decisions. The expected outcome is an integrated assessment tool that can be utilized by beach water quality managers or public health officials that would combine precipitation data, beach water quality observations, and offshore observations and meteorological and ocean forecasts to better inform their decisions. It is anticipated that increasing awareness and knowledge, through channels like this paper, will lead to greater support for this project in the IOOS® Regions will lead to greater support for this project.

II. Background

In January 2010, three IOOS® Regional Associations, the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA) organized an IOOS® three-region, interagency water quality workshop with the purpose of exploring integrated science-based solutions to major water quality issues in the Northeastern Regional Association Coastal Ocean Observing System (NERACOOS), the Mid-Atlantic Coastal Ocean Observing System Regional Association (MACOORA), and the Southeast Coastal Ocean Observing Regional Association (SECOORA) IOOS® Regions. The workshop discussion scanned the needs, gaps and challenges of monitoring, modeling, research and management decision making and identified actions to resolve some of these many issues. One of the workshop objectives was to reach consensus on a demonstration project that could be implemented by all three IOOS® Regions.

The candidate major water quality issues agreed to for the workshop were nutrient enrichment, hypoxia, beach water quality and harmful algal blooms and the workshop was framed so that each of the IOOS® Regions would offer examples of successful assessment tools that address one or more of these focus topics. The IOOS® Regions identified specific management outcomes or how the tool they presented was utilized by coastal managers or public health officials. The successful applications, products or processes highlighted by the community of coastal resource managers and public health officials, research scientists and policy-makers exemplified use of an integrative approach. Here are a few of the products summarized from the workshop:

- Researchers from NERACOOS, the University of New Hampshire and the New Hampshire Department of Environmental Services demonstrated how uses of multiples lines of information have been used to develop eelgrass-based nutrient criteria for the Great Bay, in New Hampshire.

- In MACOORA, the U.S. Geological Survey (USGS) and the Delaware River Basin Commission (DRBC) have demonstrated the combined use of discrete, probabilistic, and continuous monitoring data from various Federal, State, and Interstate agencies to characterize the spatial and temporal distributions of dissolved oxygen and nutrients in the Delaware River Basin from the watersheds, estuaries, to coastal areas. The DRBC, in conjunction with the USGS, has developed and demonstrated a Real Time Water Quality E-mail Notification System that can be scaled to a National Level. The Rutgers University's Institute of Marine and Coastal Sciences in collaboration with the New Jersey Department of Environmental Protection Division of Water Monitoring and Standards have partnered to establish daily chlorophyll assessments for New Jersey's coastal waters using aircraft remote sensing for improved monitoring of HABs.

- In SECOORA, an implementation of a preemptive advisory beach water quality tool has been demonstrated for a section of South Carolina coast that addresses the need for more timely advisories for beach shellfish bed closures due to elevated bacterial levels (Fletcher et al., 2009[1]; Kelsey et al., 2010[2]). Enhancement of utilities within existing monitoring programs were made that resulted in resulted in improved accuracy and timeliness of closure forecasts, with reduced false positives and lower indirect community costs by eliminating unwarranted advisories. Coastal resource managers and public health officials can easily access water quality prediction from an online portal.

In breakout sessions dedicated to each of the major water quality issues an action plan to address each of these areas was surmised by small teams. The teams identified specific issues pertaining to each area, a list of gaps and needs emerged, which included (1) more effective integration and discovery of probabilistic, discrete, continuous, remotely-sensed data for assessing water quality status and trends (2) improved spatial and temporal resolution of observations and (3) more effective communication/information exchange between research scientist and coastal resource managers and public health officials and actions surfaced that could resolve some of the issues identified.

Outcomes from the breakout sessions were reviewed at the end of the workshop and in keeping with the workshop objective to reach consensus on a water quality demonstration project, a proposal was made to develop a beach water quality focused-application to pursue across the three IOOS® Regions. The proposal was based on the beach water quality forecast model based in the SECOORA Region that was presented. The workshop participants agreed this was an application worth pursuing.

III. IOOS® Three-Region, Interagency Water Quality Demonstration Project Proposal

The IOOS® three region, water quality demonstration project proposed at the IOOS® Regional, Interagency Water Quality Workshop is based on an application developed in SECOORA by teams' at the University of South Carolina, South Carolina Department of Health and Environmental Control, University of Maryland and Raytheon.

A straw man project proposal for the demonstration project was outlined and the proposal envisions a demonstration tool that in six to twelve months integrates various sources of precipitation data, beach water quality and ocean observations, and meteorological and ocean forecasts to help inform beach closure decisions in multiple regions.

The problem with current beach water quality advisories is that they are based on the previous day's water quality sample, specifically the bacterial count. However, numerous studies have shown that the previous day's rainfall is a better predictor of whether waters are safe for swimming or harvesting shellfish. The capability to estimate rainfall amounts is available using data provided by the Next Generation Radar (NEXRAD) system and when integrated with other available data can be used in forecasting water conditions. This integration is a focal point of the project in order for the available models to be able to use the data. This will give the beach water quality managers and public health officials the key information they need to make their decisions to issue beach advisories.

IV. Project Status

In May 2010, the straw man proposal was presented at a National IOOS® Product Development Workshop, in Ann Arbor, Michigan, and well received. Building on the momentum that was generated, individuals from the IOOS® Regions, USGS and NOAA formed a small work team in the summer of 2010 that began to discuss how to support, develop and implement this project. One of the emergent needs is to generate greater support through the IOOS® Regional Associations. Increasing support at the regional level is recognized as a means to advance the project. One way of accomplishing this is to develop regional constituents or stakeholder teams that can "champion" the project. The current strategy, as it has been discussed, for developing this project relies heavily on

---

[1] Fletcher, M., J. Pournelle, D. Ramage, D. Porter, V Shervette, and R. Kelsey. 2009. A southeast regional testbed for integrating complex coastal and ocean information systems. Oceans09.

[2] Kelsey, R, G. Scott, D. Porter, T. Siewicki and D. Edwards. 2010. Improvements to shellfish harvest area closure decision making using GIS, remote sensing and predictive models, Estuaries and Coasts (2010) 33: 712-722, DOI 10.1007/s12237-010-9264-7.

leveraging existing activities. The work team also recognizes finding additional resources will help to advance the development of this project from a concept to a demonstration. The individuals involved with this project continue to be engaged on many levels that pertain specifically to the project, but also to broader issues that span monitoring, data management and decisions support tool development. In conclusion, it is hoped that this paper will lead to greater support for the project.