**REVISED PROJECT NARRATIVE for FY15 (YEAR 5) ONLY**

**I. REGIONAL MANAGEMENT**

The Alaska Ocean Observing System (AOOS) is the regional association for Alaska as part of the national Integrated Ocean Observing System (IOOS). Within AOOS are three geographically, culturally and economically diverse regional coastal and ocean observing sub-systems (Gulf of Alaska, Bering Sea/Aleutian Islands and Arctic). AOOS began in July 2003 as a consortium of partners operating under a Memorandum of Agreement (adopted in 2005, and revised 2009, see www.aoos.org). It is the intent of AOOS to become formally certified as the Regional Association for Alaska.

* *Board:* AOOS is governed by a Board of Directors, currently made up of its membership of federal and state agencies, research entities, and private sector organizations (see www.aoos.org for members). Once the membership reaches 25 or more members, the Board may choose to elect a subset of members to serve as directors. An Executive Committee, made up of the AOOS officers and a representative of the fiscal agent, acts on behalf of the AOOS Board between meetings.
* *Committees and Advisory Groups:* AOOS uses two standing committees and numerous ad hoc committees for guidance (see Figure 1, Appendix C). The Data Management Advisory Committee is composed of technical experts, including both data users and data providers, from a variety of agencies and organizations. They provide technical advice to the AOOS Data Team and program staff. The AOOS board approved formation of a statewide stakeholder/user advisory committee in 2009, but for the purposes of developing this proposal, a larger community of users was tapped. Three workshops were convened, organized along the priority themes adapted from those identified by the National Federation of Regional Associations for Coastal and Ocean Observing (now known as the Integrated Ocean Observing System Association – IOOS) in 2009. These included Marine Operations, Coastal Hazards, and Ecosystems and Climate Trends. Representative stakeholder entities who participated in these thematic workshops continue to provide input into AOOS priorities. Thematic workshops were held again in winter-spring 2015 in anticipation of the next five-year IOOS proposal process.
* *Program staff: AOOS currently e*mploys two full-time staff (an Executive Director and a Program Coordinator), with a third – Director of Operations – starting June 29, 2015, half-time Program Manager for Partnerships and Outreach, and part-time interns as needed. Staff will manage all program components, implement the observing system to meet stakeholder needs, work with the data team to develop products for users, and collaborate with other regional, national and international ocean observing initiatives, including the national IOOS office and IOOS Association. Staff will focus much of its efforts on integration of Arctic observing activities and the statewide ecosystem and climate trends monitoring, and developing information products for stakeholders.
* *Fiscal sponsor:* The Alaska SeaLife Center, an incorporated nonprofit, acts under contract on behalf of AOOS as its fiscal sponsor, and performs all its legal, financialand administrative functions. The fiscal sponsor fee is based on the direct costs of those services.
* *Geographic approach:* The AOOS Board strongly believes that Alaska should have at least three, if not five, separate regional coastal and ocean observing systems (see Appendix D), based on the Large Marine Ecosystem concept (Sherman 1991). These include the Gulf of Alaska, Bering Sea and Aleutian Islands (BSAI), and Chukchi and Beaufort Seas (Arctic). The Board has placed a priority on expanding observation capacity in the Arctic and in the northern portion of the Gulf of Alaska (GOA). The GOA includes Prince William Sound and Cook Inlet, two regions with high vessel traffic and dynamic circulation systems that border the main population centers of Alaska.
* *The Arctic as a national priority:* One of the priority objectives in the recently adopted National Ocean Policy highlights changing conditions in the Arctic. It specifically calls upon the nation to: “Address environmental stewardship needs in the Arctic Ocean and adjacent coastal areas in the face of climate-induced and other environmental changes.” Additionally, NOAA has developed an Arctic Vision and Strategy, as well as an Implementation Plan. AOOS will look towards these initiatives in developing its Arctic monitoring program.
* *Planning challenges:* Developing an integrated ocean observing system at high latitudes creates unique challenges. In addition to the harsh environment, the marine system encompassed by AOOS is larger than the combined marine systems in the rest of the United States (nearly 44,000 miles of coastline). No other observing system in the United States has such climate extremes, significant geographic distances, and limited observing infrastructure. Although the population of Alaska is small (about 675,000), 80% of the residents live on the coast, including a large indigenous population.
* *Proposal approach and key objectives:* This proposal builds upon existing efforts, and takes into account the paucity of real-time observations in Alaska by relying extensively on collaborations. This includes leveraging with other programs, and providing coordination and synthesis services to better integrate existing activities. The proposal represents the priorities identified by the stakeholder workshops and adopted by the AOOS Board: 1) increase access to existing coastal and ocean data; 2) package information and data in useful ways to meet the needs of stakeholders; and 3) increase observing and forecasting capacity in all regions of the state, with a priority on the Arctic and the northern Gulf of Alaska. The proposed work plan is described under the following components: observations and products; data management; modeling and analysis; and communication, education and outreach.

**II. OBSERVATIONS AND PRODUCTS**

**A. MARINE OPERATIONS**

**Goals**: Due to the geographic extent of Alaska, many areas frequently travelled by vessels do not have routine observations, accurate forecasts, or efficient ways for mariners to receive the forecasts. To improve safety, AOOS will focus on sustaining weather and surface current observations, improving weather and marine forecasts, and more effectively disseminating information to users.

**Background**: Alaska’s marine operations are diverse. The state is home to a $6 billion fishing industry, offshore oil exploration in Cook Inlet and the Arctic, a Marine Highway System serving local and visitor traffic, and cruise ships carrying a million cruise passengers per year. As Arctic sea ice retreats and the Northwest and Northern Route passages stay open for longer periods, more vessels pass through Alaska waters, taking shipments to international destinations or touring the Arctic for recreation. Weather and surface current conditions in Alaska change quickly, are locally specific, and aren’t always captured by Alaska’s limited coastal and marine weather stations. While Alaska’s geography will remain a challenge, AOOS has identified several key objectives for immediate improvements.

**Objectives and Approaches***:*

**1**. *Sustain and increase access to weather and surface current observations in key locations*. AOOS will continue its efforts to provide accurate and real-time observations to boaters in Prince William Sound and Cook Inlet. In partnership with the Oil Spill Recovery Institute, AOOS will provide funding to maintain the most critical (determined by a user survey) SnoTel stations in PWS and CI providing real-time web accessible data. The images from the webcams are juxtaposed on the AOOS website and accessed daily by pilots, boaters, lodge owners, fishermen, and recreationists, serving as one of the most popular pages on the AOOS website. We have assessed the value of each of these stations, and all are used by multiple agencies and stakeholder groups. AOOS also funded deployment in Year 4 of a webcam at the mouth of the Kenai River to provide real-time sea ice observations to the NWS Ice Desk. Cook Inlet Regional Citizens Advisory Council will maintain the webcam as part of their ice forecasting network.

 AOOS will also work towards improving observation and forecast dissemination. Presently most vessels receive weather data over VHF radio, which has limited coverage in Alaska and is not always efficient. AOOS will continue to partner with the Marine Exchange of Alaska to implement Automatic Identification System (AIS) transmitters to disseminate real-time weather data, buoy data, and weather forecasts to vessels. The Marine Exchange operates a network of over 100 AIS receiving stations, covering most of the state. By establishing joint WX/AIS stations at existing AIS locations, and installing new stations in remote areas, real-time information can be digitally displayed on a vessel’s AIS Minimum Keyboard Display or integrated into the vessel’s chart plotter for immediate use in navigation. This project was initiated in 2011 and over the last four years the technology, hardware and software have all been developed, procured and tested with AOOS funding. In Year 5 funds will be used to expand the number of locations where AIS transmitting stations are located as well as the number of weather sensors that feed into the AIS/WX network.

AOOS will continue to support operation and maintenance costs of four long-range High Frequency Radar (HFR) stations in the Chukchi and Beaufort Seas, leveraging funding from BOEM and Shell, and providing real-time access to surface current maps. If additional funding becomes available, we will work with partners in Cook Inlet and Prince William Sound, as well as other regions in western and Arctic Alaska, to develop operational High Frequency Radar (HFR) stations in those locations.

**2**. *Improve forecasts*. AOOS has been maintaining and enhancing wind and circulation models in Prince William Sound and Cook Inlet since 2005. In Year 5 AOOS will continue to assess the utility of its partnership with Yi Chao, now at Remote Sensing Solutions Inc., to maintain an operational ROMS forecasting model and data assimilation system in the Gulf of Alaska. The existing ROMS model supported the NOAA Coastal Survey Development Lab’s (CSDL) project to develop a real-time forecasting system for Cook Inlet based on ROMS. AOOS also provided funding in Years 2 and 3 to the Prince William Sound Science Center/Oil Spill Recovery Institute (PWSSC/OSRI) to help validate the existing hydrological model by incorporating glacial run-off and river gauge data. As part of the modeling strategy review initiated in Year 3 and continuing in Year 5 (see section IV), AOOS will continue to review future funding for the ROMS model, as well as funding for additional models.

**3**. *Tools and Products*. AOOS will also increase public access to real-time data through user-friendly tools, including integrated ocean portals, an updated version of the real-time sensor map, web cam maps, and iPhone and iPad compatible applications. An AOOS priority will be to develop methods to “push” relevant data to users on a routine basis, including automated alerts, as well as development of a “myAOOS” capacity, which would allow individual users to create their own specialized data portals.

**Audience and Benefits***:* Numerous weather-related marine casualties in Alaska have led to the loss of life, property and environmental harm. Many of these could have been avoided if the mariners had been able to access better real-time observations and forecasts. Some regions of the state, notably Prince William Sound and Cook Inlet, receive a diversity of vessel traffic from oil tankers and container ships, to ferries, commercial and charter fishing boats, and recreation vessels. Ninety-five percent of Alaska’s goods cross Cook Inlet, navigating through dynamic sea ice and extreme tidal and circulation variation, to arrive at the Port of Anchorage. The prospect of an accident in these waters has massive environmental, regulatory, and human consequences.

Further offshore, mariners in Alaska routinely encounter 30-foot seas, long-term darkness and far distances to the nearest vessel. As ice and sea state conditions fluctuate due to changes in climate, observing and forecasting needs become even more relevant.

Representative stakeholders include commercial fishermen and recreational boaters, the U.S. Coast Guard, Marine Exchange of Alaska, the Alaska Energy Authority, the U.S. BOEM, the Prince William Sound and Cook Inlet Citizens Advisory Councils, the National Weather Service (NWS), Alaska Ports and Harbors, the Oil Spill Recovery Institute (OSRI), the Northwest Arctic and North Slope Boroughs, and offshore oil and gas companies such as Shell and Conoco Phillips. AOOS has also received staunch support and information requests from charter boat associations, remote lodge owners, and small aviation companies.

**B. COASTAL HAZARDS**

**Goals**: The goal of AOOS’s coastal hazards component is to improve the ability to forecast and plan for changing storm and sea ice conditions, and their impacts on coastal communities. AOOS will focus on water level and wave observations, and sea ice data products.

**Background**: The impacts of climate change have become readily apparent in Alaska. As our nation’s only Arctic state, Alaska is experiencing dramatic reductions in sea ice cover, increased storm surge, thawing coastal permafrost, and consequent coastal erosion. These conditions are endangering coastal communities, most of which are home to Alaska Natives. In a statewide assessment, flooding and erosion affects 184 out of 213 Native villages (GAO 2003). While some villages may need to be permanently moved, relocation is usually prohibitively expensive. Meanwhile, better forecasting for storm surge and inundation is needed to help local people prepare for dangerous storm events.

Sea ice plays an active role in both the coastal processes described above, and impacts to the safety of subsistence hunters and commercial operations offshore. Ice extent and thickness is on a stochastic trend downward, and ice dynamics are complex and difficult to predict. Although progress has been made in past years, current efforts of monitoring real-time ice conditions and analyzing past ice conditions are insufficient to meet user needs.

**Objectives and Approaches:**

**1**. *Increase water level observations in Western Alaska*. Portions of the Alaska Harbor Observation Network pilot projects in Seward and Kodiak, funded with other grants, are being transferred to the Marine Exchange of Alaska. AOOS will assist with ongoing coastal hazard evaluation and coastal vulnerability mapping, adaptation and resiliency by working with the National Weather Service to fund in Year 5 additional water level observations and data products in western Alaska communities that are vulnerable to sea level rise, storm surge and coastal erosion.

**2**. *Increase wave observations*. AOOS will maintain the WaveRider buoy installed in Cook Inlet in 2011 as part of implementing the IOOS National Operational Waves Observation Plan in Alaska. The buoy(s) will measure wave height, period, and direction. Real-time data from the buoy(s) will be telemetered to AOOS and streamed through the AOOS web portal, as well as pushed to the NWS for ocean forecasting. The data will also be archived by AOOS, and accessible for historical research. In addition, in Year 5 AOOS will analyze wave and current data from the Beaufort Sea moorings to validate NOAA’s Wavewatch forecast, especially for late fall months prior to freezing of sea ice. Funds were provided for this activity in Year 3, but delayed a year.

 **3**. *Develop sea ice data products.* In Year 5 AOOS will provide funds to update twice a year the electronic sea ice atlas developed during Years 1 and 2 in partnership with the Alaska Center for Climate Assessment and Policy (ACCAP). This atlas consists of digitally stored sea ice concentration data on a grid covering all Alaska coastal waters to a distance of approximately 300 n mi (500 km) from shore. The spatial resolution is 5-10 km, and the time-resolution is weekly, spanning the period from the early 1950s through the current year, with the intent to be updated twice a year annually. The accompanying statistical software will enable probabilistic depictions of ice coverage of various concentrations on specific calendar dates at user-specified locations. Mapping software will be included with the digital database. The software will include the capability for computation of area totals of ice coverage, opening and closing dates for various shipping corridors, seasonal severity indices, and other measures to be determined through discussions with potential users.

**Audience and Benefits:** Changes in sea ice affect activities ranging from subsistence hunting and coastal travel to community safety and the use of ice as a platform by industry. Multiple entities are looking for information on sea ice conditions at spatial-temporal resolutions higher than standard products from the NWS Ice Desk, and the topic of sea ice forecasting was raised at every AOOS scoping workshop. Stakeholders include coastal subsistence communities from Dillingham to Nuiqsut, as well as Shell, Conoco and other oil and gas companies active in offshore drilling and exploration, coastal managers, the U.S. Army Corps, the U.S. Navy, and researchers in the Earth/Arctic system science field.

The need for wave buoys and water levels sensors has also been loudly voiced. Alaska’s existing wave buoys cover only a small fraction of Alaska’s 44,000 mile coastline, creating major challenges in forecasting storms, reporting conditions, and effectively responding to spills. NOAA’s National Data Buoy Center (NDBC) has struggled to maintain its existing buoys in Alaska, and several key buoys are not operational. Representative stakeholders for wave buoys include National Weather Service forecasters, the U.S. Army Corps of Engineers, coastal communities, shippers, fishermen, the U.S. Coast Guard, and USGS wave hindcast modelers.

**C. ECOSYSTEMS/FISHERIES AND CLIMATE TRENDS**

**Goal:** The goal of this component is tobuild upon and leverage existing activities to develop an integrated network of physical, chemical and biological observations off Alaska to meet short- and long-term needs. AOOS will focus statewide on enhancing a Distributed Biophysical Observatory (DBO) and expanding ocean acidification observations. In the northern Gulf of Alaska (GOA), the focus will be on advancing sentinel monitoring.

**Background:** Alaska has a need to understand marine climate variability and ecosystem change in the long term, as well as how conditions affect ocean circulation and productivity in the short term. Additionally, ocean acidification (OA) has emerged as a new and potentially high impact issue in Alaska, with the relatively shallow shelf seas in the northern Gulf of Alaska, the Bering Sea, and the Chukchi Sea already experiencing seasonal manifestations of OA. Because of Alaska’s remoteness and the high cost of ship time, consortia are forming to maintain support of long-term time series of physical, biological and chemical oceanographic conditions to understand climate variability and ecosystem change, including funding for equipment replacement. Sentinel monitoring in the GOA enhances past AOOS-funded activities in the most-heavily used ocean region of Alaska.

**Objectives and Approaches:**

 **1.** *Time series datasets.* AOOS will partner with others to maintain long time series in the Gulf of Alaska, Bering Sea, and Chukchi/Beaufort Seas.

(a). AOOS’s goal is to ensure that data from the sampling efforts are accessible to all researchers and the public, as well as marine spatial planning efforts. AOOS staff has already developed a web-based mapping application, which provides access to metadata for sensor platforms and known cruise and sample efforts in the Beaufort and Chukchi Seas. The current version of this system is publically available at: <http://data.aoos.org/maps/arctic_assets.html> and is being expanded statewide. AOOS will collaborate with the other Pacific Ocean RAs to develop integrated products from our complementary initiatives.

(b). AOOS will contribute to a consortium led by UAF SFOS to support sampling along the Seward Line, the longest multidisciplinary time series in Alaska. The line provides a critical long-term data series on oceanographic conditions in the GOA and how the region may be changing with climate impacts. It has been sampled continuously since October 1997, with some measurements going back to late 1970’s. Funding supports the cost of two cruises a year (May and August/September), sample/data processing and analysis.

 (c). Prior AOOS funding support for a glider has been used to help initiate a consortium led by UAF SFOS to establish a high-latitude observation node using moorings and glider transects in the central Chukchi Sea to complement the Distributed Biological Observatory (DBO). This is a critical section for observing the through-flow of water between the northern Bering Sea and the interior Arctic, and is a location of large primary productivity in an Arctic shelf sea.Funding in Year 5 will be used to purchase additional instruments for the mooring originally funded in Year 3 that will be used to anchor this node and enhance time series data collection efforts. Funding will also be provided in Year 5 to further develop an Arctic-specific library of marine mammal calls (walrus, seals, belugas, and whales) that is incorporated into a hydrophone system to monitor marine mammals in near real-time. This activity was tested in a pilot project on an AUV glider in the Chukchi Sea during the summer field season of 2013 and will be tested more extensively in Year 5.

 (d). AOOS will work with other west coast ocean observing systems to support efforts to document and understand unusual ocean and weather anomalies.

 **2**. *Ocean acidification monitoring.* AOOS will partner with the UAF Ocean Acidification Center, the Alliance of Coastal Technology (ACT) and NOAA to support the statewide OA research and monitoring program, and make data available through AOOS.

(a). AOOS will maintain OA sampling of an existing, ongoing oceanographic time series transect (Seward Line) in the northern Gulf of Alaska two times per year to quantify the physical and biogeochemical controls on OA. The goal is to obtain 10 years of monitoring on the Seward Line, establishing the time series necessary to capture definitive changes in ocean carbonate chemistry. Samples of dissolved inorganic carbon, total alkalinity, partial pressure of CO2, pH, carbonate mineral saturation states, particulate organic carbon, dissolved organic carbon, and oxygen isotopes will be collected and analyzed. OA data can then be combined with observations of specific pelagic and benthic calcifying organisms to monitor how keystone species in the food web are responding to increased intrusion of atmospheric CO2.

(b). Previous AOOS funds were used to add additional OA sensors to a mooring in the Beaufort Sea, funded through NSF. This mooring is no longer operational. AOOS will contribute again in Year 5 to a consortium developed to support operations and maintenance of OA sensors on two moorings in the Bering Sea and the Gulf of Alaska. AOOS also plans to develop new OA data products in Year 5 with the Seward Line and mooring data.

(c). In Year 3 AOOS funded development of a numerical model of the high latitude Gulf of Alaska to determine the duration, intensity and extent of OA events. Forecasts from this model will allow regional stakeholders to better prepare for the challenges of future OA events. In Year 5 AOOS will continue to monitor results of that initiative and assess the value of further development.

(d). In Year 3 AOOS supported the Marine Sensor Innovation program in support of NOAA’s OA Program by testing an OA sensor at a shellfish hatchery in Seward. In Year 5 we will continue to monitor the results of that project and provide access to the data it develops. We will also continue our collaboration with the other Pacific Regional Associations to develop and test new OA sensors and increase education and outreach about OA to the public.

**3**. *Sentinel monitoring in northern GOA*. AOOS seeks to meet short-term and long-term fisheries and ecosystem-based management needs by partnering with the Prince William Sound Science Center (PWSSC), the Oil Spill Recovery Institute (OSRI), NOAA/UAF’s Kasitsna Bay Laboratory, Cook Inlet and PWS Regional Citizens Advisory Councils, and the Kachemak Bay NERR to maintain intensive sentinel monitoring in Prince William Sound and Cook Inlet.

(a). AOOS had proposed in Year 2 to contract with PWSSC to purchase, test, and deploy a profiling mooring at the central Prince William Sound (PWS) site that has been used as a CTD station for most research programs conducted in PWS, as well as a thermosalinograph on the PWSSC research vessel *New Wave* to collect measurements of surface water properties. The profiling mooring activities are now being accomplished using other sources of funding. In Year 5 AOOS will provide partial support to maintain the thermosalinograph surveys.

(b). Many of the tide stations in PWS provide long-term records of water temperature and meteorological variables. AOOS supported a partnership with the Oil Spill Recovery Institute (OSRI) and NOAA in Years 2 and 3 to test the use of conductivity sensors at the Cordova tide station. This work has been combined with monitoring efforts of the Cordova school students to test the accuracy of the sensors over time. In Year 5 AOOS will continue to monitor the results of this project.

(c). AOOS will also fund mooring turnovers for biological monitoring. The Ocean Tracking Network (OTN) and Pacific Ocean Shelf Tracking network (POST) installed acoustic monitoring equipment at the entrances to PWS in 2012. The monitoring equipment will be used to identify tags on salmon, sharks, whales, and other organisms that pass through Prince William Sound. AOOS will fund annual data retrieval and ingestion, a small investment to maintain a biological monitoring network in Alaska.

(d). The need for additional oceanographic (temperature/salinity) observations in Cook Inlet has been identified as a high priority by the AOOS-sponsored Cook Inlet modeling working group, the 2005 Cook Inlet Physical Oceanography Workshop, and other stakeholder meetings. In this project, we propose to collect oceanographic data along repeated transects in Kachemak Bay and lower Cook Inlet, through deployment of CTDs. This sampling would support development and validation of the NOAA operational circulation forecast model, as well as the understanding of variability in estuarine and coastal ocean acidification. We propose to conduct repeated small boat CTD surveys in Kachemak Bay and lower Cook Inlet. CTD data will be provided to NOAA’s CSDL to support an operational NOAA circulation model and to the AOOS data management team. The project will leverage an existing CTD provided by the Kasitsna Bay Lab, as well as other funding from the Gulf Watch Alaska project funded by the *Exxon Valdez* Oil Spill Trustee Council.

**Audience and Benefits***:* Alaska’scoastal waters support a rich and diverse ecosystem, home to one of the world’s largest fisheries, as well as abundant populations of seabirds and protected marine mammals. The region has already demonstrated its susceptibility to climate-driven change when the relative dominance of the commercially important fish species changed in the mid-1970s. Unexpectedly, crab and shrimp declined while salmon and groundfish populations increased. These changes coincided with the beginning of decadal-scale adjustments in the atmosphere and ocean in the North Pacific. Ultimately, commercial fishers had to invest heavily in infrastructural adjustments to remain economically viable.

Ecosystem change in Alaska has direct social and economic implications that are likely to be more profound with the advances of climate change. As research questions abound, great benefits can be gained by enhancing research and monitoring initiatives and integrating the data they produce. Synthesis products developed from existing and new data will be used to identify seasonal and interannual cycles in carbonate, physical ocean parameters, planktonic productivity, and other processes, well as for indices to be included in the new Alaska Coasts and Oceans Report. Representative stakeholders include the fishing industry, federal and state management entities, and subsistence-based communities, and academic and agency researchers.

**D. COASTAL & MARINE SPATIAL PLANNING**

In response to the new National Ocean Policy recommendation for Coastal and Marine Spatial Planning (CMSP), AOOS will focus a significant portion of its data management efforts to provide the capacity to integrate data. This involves working with diverse partners to create spatial visualization tools specific to Alaska. The tools will provide a common platform for stakeholders, including industry, regulatory agencies and the public to access relevant information about the oceanography, ecology, and human activities. The tools will be multidimensional, and include the elements of depth and seasonality. Formation of the tools will involve in-depth stakeholder input, streamlined and integrated data from multiple sources, and an open source, non-proprietary data management system. AOOS will work closely with state and federal agencies, private industry, and any Alaska regional partnership that might develop.

Cook Inlet and the Arctic are the two areas most likely to see some form of CMSP due to their multiple – and sometimes conflicting - uses. The AOOS data team has already developed a prototype tool focusing on Cook Inlet. The prototype provides access to a wide array of multidisciplinary data including bathymetry, hydrography, wildlife surveys, real-time river gauge data and ocean conditions, and contaminant sampling programs. The data was acquired from government agencies, non-governmental organizations, and tribal communities. The data access system relies upon a four-dimensional (three space dimensions, plus time) standards-based data management framework and can be accessed at http://portal.aoos.org/cirt.php, AOOS is also leveraging funding received in 2012-13 from NOAA’s Regional Ocean Partnership program to develop data integration and visualization tools for the Arctic in anticipation of potential commercial fishery development. That portal can be accessed at http://portal.aoos.org/?v=rand&portal\_id=3.

**III. DATA MANAGEMENT & PRODUCTS**

**Goal:** The goal of AOOS Data Management is to serve as a regional data hub for Alaska coastal and ocean information to meet the needs of a variety of stakeholders.

**Background:** Following an open competition to provide AOOS data management services, the AOOS Board awarded a five-year contract to Axiom Consulting and Design of Anchorage in August 2010, led by chief information architect Rob Bochenek. Axiom will work with the program staff and other partners to support the AOOS data system and products developed for users, consistent with IOOS standards and protocols. The overarching strategy for this effort involves implementing an end-to-end technological solution, which allows data and information to be channeled and distilled into usable and functional products. Simultaneously, the underlying data will be assimilated and used by the IOOS data assembly system through interoperability protocols (see Figure 2 in Appendix C for details).

**Objectives and Approaches:**

**1**. *Provide support for AOOS website and data portal*. Funds will continue to be provided to develop and maintain the AOOS integrated website, data portal and user interface. Usage is being monitored and documented, and user feedback and emerging technologies are being integrated into future system iterations.

**2**. *Ingest prioritized datasets, warehouse, archive and provide access through query and mapping tools.* The AOOS Data Team will work closely with program staff, the Data Management Advisory Committee, project PIs and regional data providers to ensure that prioritized datasets are ingested into the system and made available for access. This includes descriptive metadata, and appropriate and easily accessible archives. In order for the data management framework to be effective, users must be able to visualize spatial components of datasets and collection parameters filtered by space and time on a web based mapping system. The system will ultimately need to provide synthesis by allowing data types to be discovered, homogenized and integrated across individual data sources. Approaching the task in a phased, periodic software development cycle will ensure that the system will evolve rapidly with periodic redirection informed by review and feedback from the stakeholder community.

**3**. *Maintain and provide access to a variety of products* *described in this proposal*. Emerging products from AOOS include the AOOS Ocean Data Explorer, Real-time Sensor Map, Arctic Assets Map, Model and Remote Sensing Explorer, Sea Ice Atlas, Downscaled Climate Model Projections, and CMSP visualization tools such as the Arctic Portal and the Cook Inlet Response Tool. Future products will be launched through a rapid-development process based on user needs. Focusing development efforts on using interoperability systems (WMS, WCS, WFS and SOS) will ensure that information stored in the AOOS data system will be available for both the user community and data assimilation systems such as IOOS and the World Meteorological Organization World Telecommunication System. Existing AOOS data serving applications can be accessed off the AOOS website at <http://data.aoos.org/>.

 **4**. *Develop multi-regional products with other regional associations (RAs)*. AOOS will actively collaborate with the other IOOS RAs along the Pacific Ocean coastlines (PacIOOS, NANOOS, CENCOOS, and SCCOOS) over the course of the funding cycle to advance stakeholder access to cross-regional data services as defined by commonalities in specified user requirements.  Initially and at a minimum, AOOS and the other Pacific RAs propose to improve access to existing data services (products, map-based visualizations, and information) through collaborative effort to establish common website linkages.  Future effort will focus on the development and coordination of shared visualization and data-serving systems (common Application Programming Interface (APIs) and interoperability systems (WMS, WFS, WCS and SOS)) that focus on data and products common to all regions (i.e., glider data, model nowcasts and forecasts, key climate variables). In Year 4 we used other funds to develop a collaborative website for ocean acidification data collected by shellfish hatcheries. In Year 5 AOOS will use funding from the national IOOS DMAC office to provide continued support for the scalability map, maintain and enhance i52N services, improve tools for managing biological data and support data management for High Frequency Radars.

 *5. Assess the Alaska Department of Fish and Game (ADF&G) prototype and explore* *expansion to other agencies*. AOOS has partnered over the past three years with the ADF&G Division of Commercial Fisheries (ADF&G) to establish a data-serving node feeding into the AOOS system. Data and information will be marshaled between AOOS and ADF&G through interoperability systems and protocols in order to improve research and resource management decisions by leveraging the power of distributed data exchange. This project is largely complete. In year 5 AOOS will continue to partner with ADF&G on a coordinated Yukon River Chinook salmon run timing initiative. In addition, we will assess the results of the entire project and determine if additional efforts would be beneficial and if this prototype and methodology could be expanded to serve data existing in other regional resource management agencies.

**6**. *Collaborate with other state, regional, national and international data management programs.* The AOOS Data Team staff will work closely with the AOOS Data Management Committee and participate in the Federal-State Alaska Data Integration Working Group. They will also develop partnerships with other existing data management systems in Alaska and the Arctic, including those for the Arctic Observing Network (AON) and the Sustained Arctic Observing Network (SAON). Additionally, the Data Team will actively participate in IOOS Association and national IOOS data management committees and teams.

**Audience and Benefits:** Specifics have been described for individual products. Overall, stakeholders have consistently asked for a central location for ocean observations in Alaska.AOOS is refocusing its efforts to ensure that the data system is serving up products specifically designed for stakeholders and users.

**IV. MODELING & ANALYSIS**

**Goal:** The goal of this component is to develop an AOOS modeling strategy, which may include a statewide forecast modeling framework.

**Background** To date, ocean circulation models have been developed by AOOS within PWS and CI. Other ocean circulation models have been developed by UAF, NOAA, University of Washington, and the University of Maine, focusing on different geographic areas of Alaska and in various stages of development. These are not harmonized at this time and there is no coherent statewide strategy to do so. Other models, including those for winds, waves, sea ice, ecosystems, harmful algal blooms, and storm surge, are also in various stages of development. One option is to develop a statewide modeling framework to build upon the modeling test bed initiative funded by the national IOOS office and develop an Alaskan platform to exchange existing model output and test new models as they become available. There may be other options, especially in consideration of the small amount of funding AOOS has available for modeling efforts (approximately $200k a year) and the limited funding available from other partners.

**Objectives and Approaches:**

**1**. *AOOS Model Strategy.* In Year 5 AOOS will continue to inventory the status of existing models in Alaska and develop a process for assessing their status and identifying priorities for either maintenance support or further development. The outcome is being used to develop an AOOS Modeling Strategy for the next 5-10 years. A modeling workshop was held at the 2014 Alaska Marine Science Symposium as part of this effort.

**2**. *Model and Remote Sensing Explorer.*TheAOOS data staff are exploring methods for serving four dimensional and higher datasets via THREDDS, ncWMS and other NetCDF data management and interoperability systems. This application, known as the AOOS Model Explorer, also provides access to terrestrial climate models for Alaska and assimilates a wide array of atmospheric and oceanographic remote sensing data being served off of NASA Earth Observation (NEO) system. This system will be extended in Year 5 to serve additional models and remote sensing datasets in addition to developing tools for users to analyze gridded data resources. The current version of this system is openly available at <http://data.aoos.org/>.

**Audience and Benefits:**

Many times, modelers work in isolation from each other due to the technical nature of their work, and lack of time to coordinate. The AOOS plan focuses on helping modelers improve their models, as well as facilitate a collaborative statewide modeling effort using joint resources. Fortified ocean circulation models covering the state will benefit oil spill response, search and rescue operations, boater safety, and understanding of ecosystem processes. Additionally, AOOS understands the importance of making these models publically accessible, reducing multiplicative research efforts, and promoting the applicability of ocean science to many disciplines.

**V. COMMUNICATION, EDUCATION & OUTREACH (CEO)**

**Goal:** Our goal is to promote greater awareness of the value of ocean observing in meeting stakeholder needs and to increase ocean observing capacity in Alaska.

**Background:** AOOS has a strong reputation in Alaska as one of the few multi-agency, multi-disciplinary organizations designed to facilitate and coordinate marine-related efforts. The AOOS Board has made facilitation, coordination, and partnership building one of the cornerstones of the AOOS program, and the Executive Director and the Program Manager for Partnerships and Outreach devote significant time to these efforts.

**Objectives and Approaches:**

**1**. *COSEE Alaska Partnership.* AOOS is a founding partner in COSEE Alaska: People, Oceans and Climate Change ([www.coseealaska.net](http://www.coseealaska.net)). AOOS provides access to real-time data, as well as helping its scientific partners connect to broader audiences. AOOS partners in a number of COSEE Alaska activities, including the Communicating Ocean Sciences Workshop at the annual Alaska Marine Science Symposium, an event that attracts up to 800 Alaska scientists, managers and stakeholders each year. It also partners with SEANET, a website and blog featuring ocean-based climate change news. In Year 3 AOOS collaborated with COSEE Alaska, as well as the Alaska Sea Grant Program, in hosting a workshop on Community Based Monitoring. In Year 5 AOOS will continue to follow up on recommendations from that workshop.

**2**. *Regional information initiatives.* AOOS will support regional theme pages on the AOOS website, as well work with any appropriate regional working groups in PWS, Cook Inlet, and the Arctic.

**3**. *AOOS website, publications and other outreach tools.* AOOS uses its website to feature ocean observing news and highlight new user products. The site archives all meeting documents and reports, and connects users with the data pages and products developed by the AOOS data team. In Year 5 AOOS will continue to develop pages that highlight data collected from AOOS-sponsored observations. In addition, we have transitioned to producing bi-monthly e-newsletters and distributing to our listserve of over 500 recipients.

**4**. *Alaska Oceans & Coast Report*. Multiple stakeholders have expressed interest in a “State of the Alaska Oceans” report with summaries, trends, graphics, and an overall picture of Alaska’s oceans updated at least once per year. AOOS will continue to work with potential partners to scope out a potential report and seek short and long-term funding.  AOOS is also working on having a presence on a radio program, and in brochures and on web pages of partners and entities.

**5**. *Alaska regional partnerships, and collaborations*. Numerous collaborative initiatives have begun in Alaska designed to inform or guide science or resource management issues, particularly in the face of climate change. These include the North Slope Science Initiative (NSSI), the Alaska Climate Change Executive Roundtable (ACCER), the Alaska Center for Climate Assessment and Policy Steering Team (ACCAP is the NOAA RISA for Alaska), Alaska Sea Grant Program and its advisory group, the new Department of Interior Climate Science Center and Landscape Conservation Cooperatives, and NOAA’s regional collaboration team. In addition, a new research initiative is being developed by the Northwest Arctic Borough, and in Year 5 AOOS will continue to participate in the initial Steering Committee. AOOS has been, and will continue to be, an active participant in these initiatives.

**6**. *Stakeholder interaction*. AOOS has, and will continue, to seek opportunities to meet directly with stakeholders and users to ensure we are aware of their needs, and that we are designing products to meet them. Numerous opportunities abound for these efforts including the Alaska Forum on the Environment, which often attracts 1,500 participants, many from Alaska Native villages. Additionally, AOOS is reaching out to stakeholders to serve on “focus groups” to beta test new web interfaces and applications and ensure their effectiveness before going public.

**Audience and Benefits:** Major stakeholder groups in Alaska include commercial fishermen, harbormasters and pilots, recreational boaters, subsistence users, industry, and coastal managers, as well as collaborative initiatives such as NSSI, ACCAP, and the Alaska Climate Change Executive Roundtable. AOOS also connects with users in public forums such as the Alaska Marine Science Symposium, and the Alaska Forum on the Environment. Additionally, AOOS will continue to collaborate on a national level with the IOOS Association’s Education and Outreach Committee to build synergy with the other regions, share information and products, and develop creative outreach efforts.

**VI. COST PROPOSAL**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Total** |
|  |  |  |  |  |  |  |
| **Totals thru grant:** | **1,848,000** | **1,989,766** | **2,085,037** | **2,306,889** | **2,558,636** | **10,788,328** |
|  |  |  |  |  |  |  |
| **Holdbacks:** | **25,000** | **25,000** | **125,000** | **25,000** | **25,000** | **225,000** |
| NOAA/PMEL (Mathis) |  |  | 100,000 |  |  | **100,000** |
| NOAA/Kasitsna Bay Lab (Holderied) | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | **125,000** |
|  |  |  |  |  |  |  |
| **Totals received:** | **1,873,000** | **2,014,766** | **2,210,037** | **2,331,889** | **2,583,636** | **11,013,328** |
|  |  |  |  |  |  |  |

*Detailed budget information.* Included in Appendix A are an overall descoped project budget and budget narrative for a total of $2,558,636 for Year 5 with detailed budgets for each of the subawards and the Axiom service contract. This amount does not include a holdback of $25,000 requested for NOAA Kasitsna Bay Laboratory (Holderied) to perform activities described above. AOOS wishes for NOAA to retain these funds and have them used by the specified NOAA office.

*Lease versus buy:* **No equipment described in this proposal is available for lease. All items require a direct purchase.**

*Base capacity and enhancements.* AOOS originally submitted a budget request for $4 million a year for five years, which reflects the true need for ocean observing activities in Alaska. Appendix A includes a descoped budget of $2,583,636, which reflects Budget Priorities and minimal base capacity for Year 5. Under this funding scenario, program staff and the data management team would stay roughly the same (with an additional FTE in year 5) since these are AOOS Board priorities. Staff would provide some level of Arctic observation coordination and integration in-house. Major reductions would occur in nearly all proposed observations, modeling and equipment purchases.

**VII. MILESTONES & DELIVERABLES** *Note: see Appendix B for more detail.*