EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
FY20 (YEAR 9) CONTINUING PROGRAM PROPOSAL SUMMARY PAGE

Proposals requesting FY19 funding are due to shiway.wang@alaska.gov and elise.hsieh@alaska.gov by August 23, 2019. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Program Number and Title

20120113 Data Management Program

Primary Investigator(s) and Affiliation(s)

Carol Janzen, Alaska Ocean Observing System

Date Proposal Submitted

23 August 2019 (revised 27 September 2019)

Program Abstract

The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) requires a data management program composed of tools covering the entire data lifecycle, from immediately after data collection, to long-term preservation, to discovery and reuse. During the 2012-2016 EVOSTC five-year funding cycle, the Alaska Ocean Observing System (AOOS) provided data management services for both the "Long-Term Monitoring of Marine Conditions and Injured Resources and Services" Program, referred to as Gulf Watch Alaska (GWA), and the "Herring Research and Monitoring" (HRM) Program. These two programs leveraged the existing data management capacity of AOOS, and have also helped inform and improve the overall AOOS data and metadata management, access, and visualization tools. The AOOS team and infrastructure continue to provide data services to the EVOSTC for the 2017-2021 funding cycle to maintain continuity and build upon the ongoing efforts and data management system development. New in 2020 (Year 9) is the addition of six Non-Program projects, which are being added to the Data Management workplan upon request from the EVOSTC. As before and with these new projects, AOOS will continue to provide access to the tools and services for which the principal investigators (PIs) of the GWA and HRM Programs depend. The Research Workspace will be maintained and supported to upload, organize, and document data, as well as to facilitate program administration. This platform is familiar to GWA and HRM PIs and allows data to be made promptly and securely available to team members and program administrators. The enhanced metadata editor accessed through the Research Workspace helps researchers more easily generate flexible yet robust, standards-compliant metadata. As in previous years, GWA and HRM Program data will be shared publicly (or 'published') through the AOOS Gulf of Alaska Data Portal, where it can be accompanied by any supplemental files or project documentation. The same publication pathway for the FY20 additional Non-Program project datasets is planned. Publishing through AOOS is beneficial to making the data available to a wide-ranging and established network of resource managers, scientists, and the general public to support decision-making. In addition, the GWA and HRM Program and new Non-Program datasets will ultimately be submitted to DataONE with a digital object identifier (DOI) for long-term preservation and broad access across multiple data repositories. Through the AOOS data management system, the significant expertise of the data management staff within its technical partner organization, Axiom Data Science, is leveraged. The Axiom staff have extensive experience with the GWA and HRM Programs and their associated data through the prior eight-years working with these programs. Building upon these established relationships and infrastructure, AOOS is well-poised to deliver continued success in its data management services to facilitate the access and

curation of data from Program and Non-Program projects to support decision-making related to Spill affected ecosystems.

The abstract should provide a brief overview of the overall goals and hypotheses of the project and provide sufficient information for a summary review as this is the text that will be used in the public work plan and may be relied upon by the PAC and other parties.

EVOSTC Funding Requested* ***(must include 9% GA)***

FY17	FY18	FY19	FY20	FY21	TOTAL
$218,000	$218,000	$218,000	$290,100	273,100	$1,217,300

Non-EVOSTC Funds to be used, please include source and amount per source: (see Section 6C for details)

FY17	FY18	FY19	FY20	FY21	TOTAL
$2,700	$2,800	$2,900	$3,000	$3,000	$14,400

If the amount requested here does not match the amount on the budget form, the request on the budget form will be considered to be correct.

1. PROGRAM EXECUTIVE SUMMARY

Provide a summary of the program including key hypotheses and overall goals, as submitted in your original proposal. Please include a summary and highlights from your FY19 work: preliminary results with figures and tables. If there are no preliminary results to present, please explain why (i.e., lab analysis is still in progress). List any publications that have been submitted and/or accepted since you submitted your last proposal and other products in Section 8. FY18 Annual Reports will be included with this proposal for review.

Following the 1989 *Exxon Valdez* oil spill ('Spill'), several decades of scientific research has occurred to monitor the impacts and recovery to the Gulf of Alaska region and its resources. Over time, ecosystem impacts directly related to the Spill have become more challenging to detect due to regime shifts, natural variability, climate change, and other anthropogenic changes. Data collected through long-term observations and focused research are fundamental to inform management decision-making by determining whether changes are related to natural or Spill-related factors, and by identifying what potential recovery actions may be needed. To address these challenges and facilitate the recovery of injured resources, scientific and resource management communities need access to the most current scientific information and environmental intelligence tools to help make sound decisions.

In 2012, EVOSTC awarded the Alaska Ocean Observing System (AOOS) a data management contract entitled "Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the *Exxon Valdez* Oil Spill". In that project, AOOS and its data partner Axiom Data Science (Axiom) successfully designed, developed and maintained an interactive web-based data management system to support the data management needs of the GWA and HRM Programs and the EVOSTC. AOOS and Axiom continue to provide the data management for both the GWA and HRM Programs during the second 5-year period (2017-2021), but is no longer an embedded project within the GWA Program. Instead, AOOS carries a subaward for the Data Management Program through the Prince William Sound Science Center (PWSSC), with Axiom as a contractor.

The goal of the Data Management Program is to provide critical data management to support the GWA and HRM project investigators and program leads, and starting in 2020, to provide the same level of data management support for six newly-funded EVOSTC Non-Program projects. The Data Management Program is designed to assist study teams in efficiently meeting their objectives and ensuring data collected or consolidated through the effort is organized, documented, and available for their use and for future use by the larger scientific community. AOOS and Axiom have demonstrated over the past three years continued success in meeting the goal of this program under a reduced budget. This is made possible by leveraging the extensive cyberinfrastructure and data management capacities of both Axiom and AOOS, while utilizing the existing, collaborative relationships with program PIs to ensure continuity in the data collected across efforts.

This workplan is for Year 4 of the 5-year program and responds to the EVOSTC's continued need for a cost-effective data management program that also maintains continuity and builds upon the efforts of the prior contract. In 2020, six new EVOSTC Non-Program projects are being added to this Data Management Program:

- Pigeon Guillemot restoration project (2012-2019 legacy data 5-years new data; FY2020-2024)
- Status and trends of Marbled Murrelet, Kittlitz's Murrelet, and Pigeon Guillemot in a changing northern Gulf of Alaska (FY2020-2024)
- Status and recovery of Kittlitz's Murrelet and Marbled Murrelet within the EVOS affected area (FY2020-2024)
- Nesting ecology of the Marbled Murrelet in the Kodiak Archipelago (FY2020-2023)
- Nearshore fish community assemblages associated with different river-estuary settings (FY2020-2022)
- Gulf Watch Ocean Acidification Monitoring (FY2020-2022)

Together, AOOS and Axiom are best situated to provide programmatic continuity for program and Non-Program projects by leveraging the data management system already instituted for the GWA and HRM Programs since 2012. In this workplan, this system will be maintained and augmented to enhance the accessibility of GWA, HRM and new the project datasets to ensure they are readily available to the general science and natural resource management communities, both now and into the future.

This program prioritizes data preservation and accessibility to the scientific and resource management communities. This is achieved through support for data submission and organization, metadata generation, and data transfer among study teams. Axiom data analysts and domain experts will continue to review metadata and data structure formats produced from all GWA, HRM and the new project's data collection activities and advise study team members in best practices for short-term and long-term data formats, as well as metadata authoring. Axiom software engineers will continue to enhance existing web-based tools to improve the discoverability of GWA and HRM project-level data. Under this next year of work, those tools will be expanded to include Non-Program project data being brought into the Data Management Program. These tools allow for EVOSTC-funded datasets to be searched and filtered by space, time, parameter and taxonomy, both privately within the project and externally after the data have been shared with the public. Further, the project data curation process has been designed to meet the requirements of the EVOSTC as specified in the Data Management Program Invitation, which includes the transfer of GWA and HRM Program data and, beginning in FY20, will also incorporate the newly added Non-Program project data to the EVOSTC storage resources at the completion of this fiscal year funding term (2021).

FY19 Highlights and Progress Summary

Below are milestone tasks for reporting period Year 3 FY19, February 1, 2019 – July 31, 2019

FY 19, 1st quarter (February 1, 2019 - April 31, 2019)

February 21, 2019:	Present data submission reminders to Principal Investigators (PIs) during winter PI teleconference (Obj 3)
February 27, 2019:	Submitted Semi-Annual Report to PWSSC for this program FY18 subaward period August 31, 2018 – January 31, 2019 (for NOAA reporting)
February 27, 2019:	Provided Mandy Lindeberg (GWA Project Lead) and Scott Pegau (HRM Project Lead) updated Data Submission Inventory for status update as of Dec. 31, 2018 preceding the 2018 EVOSTC Annual report due in April 2019 (Obj 6)
April 1, 2019:	Provided Mandy Lindeberg (GWA Project Lead) and Scott Pegau (HRM Project Lead) updated Data Submission Inventory Table updated through Jan. 31, 2019 to be included in the FY18 EVOSTC Annual Report due in April 2019 (Obj 6)
April 5, 2019:	Submitted 2019 annual report to EVOSTC and posted on Research Workspace (EVOSTC revised deadline to April 15, 2019 due to government shutdown) (reporting)
Ongoing:	Publish data and data products through the AOOS Gulf of Alaska data portal (Obj 5) Provide ongoing data and metadata support to PIs (Obj 3) Provide continued access to program data through the Research Workspace and portal (Obj 4)

FY 19, 2nd quarter (May 1, 2019-July 31, 2019)

May 22, 2019:	Present data submission reminders to PIs at spring PI teleconference (Obj 3)
July 8, 2019:	Provided Mandy Lindeberg (GWA Project Lead) and Scott Pegau (HRM Project Lead) updated Data Submission Inventory Table as of Jun. 30, 2019 preceding the 2019 Semi-annual subaward report to PWSSC (July 31, 2019) and the FY20 EVOSTC Workplan deadlines (August 23, 2019) (Obj 3 and 6)
July 23, 2019:	Present data submission reminders to PIs at summer PI teleconference (Obj 3)
July 26, 2019:	Submit semi-annual subaward Report to Prince William Sound Science Center (PWSSC) for FY19 reporting period February 1-July 31, 2019 (for NOAA reporting)
Ongoing:	Provide maintenance on data management system (Obj 4) Provide ongoing data and metadata support to project PIs, as needed (Obj 3 and 6) Provide continued access to program data through the Research Workspace and portal (Obj 4)

Project investigators continue to provide core data management oversight and services for the Gulf Watch Alaska (GWA) and Herring Research and Monitoring (HRM) programs and all milestones as listed in section 2.A. have been met for this reporting period. Below we provide more details to the Data Management Program Objectives met during the past two quarters.

<u>Objectives 1 and 3:</u> The data management (DM) team maintained communications with PIs following the one-on-one data scoping meetings held with individual PIs from both the GWA and the HRM programs at the November 2018 annual meeting in Anchorage. The DM team participated in the quarterly GWA Program PI conference calls to provide regular data management updates and data submission reminders on February 21, May 22, and July 23, 2019.

Objective 3: To help PIs efficiently author robust metadata to describe their respective datasets, metadata templates created in 2017 were used to ensure standardized information for fields that must contain program-wide metadata were included (e.g. access constraints, use constraints, and programmatic contact information). These templates make metadata creation less cumbersome for PIs by using a real-time process that occurs in concert with data collection and analysis. Templates can be found within the Research Workspace.

Objective 4: Software engineers at Axiom continue to provide support for the Research Workspace, resolve bugs and implement new functionality in response to user feedback. Scheduled and as-necessary maintenance to the data management system infrastructure, including the Research Workspace and the Gulf of Alaska Data Portal, was made during this reporting period to ensure continuous operation and reliability for the GWA and HRM Program PIs. A performance-related update was released that improves the responsiveness of the Research Workspace. A number of DataONE bugs affecting the Research Workspace Member Node were identified, researched, and steps towards resolution were completed to facilitate archive of GWA and HRM project data. An improved DataONE citation preview feature for PIs was created to help more easily structure metadata for optimal citations. A Java framework update was implemented that affects most of the underlying code in the Research Workspace, which will improve Axiom's ability to maintain the system and be responsive in delivering future updates.

The Research Workspace continues to be the internal file sharing and storage tool used by the DM Program. All data files (including the contextual information, raw data, data not currently public, etc.) are housed in the Workspace, and contain individual PI user and group profiles in which data are submitted and shared among project collaborators. In most cases, projects are meeting or exceeding expectations for data sharing using this tool.

Objective 5: Throughout the performance period, the AOOS web catalog service was maintained to provide continuous public data and metadata access. A re-architecture of the Gulf of Alaska data catalog search occurred to provide data result groupings by data types and cascading project tags, as requested in user feedback. Refactoring also occurred to improve search term results, indicate applied filters, and provide a framework for better catalog asset integration and maintenance in the future. The GWA and HRM project pages were improved to prominently display and link to the dataset archives (via the DataONE DOI) and to make the download of data and metadata more intuitive (Figure 1).

Figure 1. Example GWA project page in the GOA data portal. The project display provides a narrative and links to the associated DataONE archive using the DOI(s). Users may also download project data and metadata from the catalog page. This example can be seen in the GOA data portal: https://l.axds.co/2ZgqPmQ

Objective 6: The DM team maintains a data submission inventory of data expected to be generated by EVOSTC GWA and HRM sampling efforts. The inventory describes the datasets, indicates the investigator responsible for the data, and notes the status of data and metadata for each project. This not only allows the DM Team to track projects, it provides information Program Leads need to remediate any data submission delays that arise. It is also a convenient way to report out to the EVOSTC the status of all data from their funded programs and projects. Data Management lead (Janzen) has started sending quarterly updates of the data submission inventory to GWA and HRM Program Leads for this purpose. The quarterly updates are simply to inform the program leads how PIs are performing with data submissions and are not punitive. During this reporting period, data submission updates were provided to the Program Leads on February 27, 2019, April 1, 2019 and July 8, 2019. The DM Lead will continue to email the data submission inventory to the Program Leads in Q3 and mid-way through Q4 to ensure sharing of this critical information ahead of the annual data submission deadline -- December 1. The DM Program Lead will also schedule a data submission status call in the 3rd Quarter (mid-August) and again in early November. This will happen each year to review the data submission status for each program PI ahead of the December 1 data submission deadline. The Data Inventory Table for the period ending July 31, 2019 is provided in Section 8.

Providing and maintaining a system to serve the GWA and HRM data management needs is a core component of the DM Program. To ensure the efficacy of such a system, regular and structured feedback is required from data management system users, i.e., the Program Leads and PIs. The data management team gathers feedback from PIs through group discussion, one-on-one meetings and email

correspondence and will continue to do so throughout the course of this program. This feedback is tracked and synthesized to identify what data management methods are working well and what procedural modifications or new technologies could be implemented to improve the performance of the data management system. This feedback solicitation is ongoing. Some examples of feedback from the PIS include:

1. Improving the copy feature in the Research Workspace to make it more intuitive for PIs to copy and edit metadata records among years.
2. Refactoring the portal catalog search to be more responsive to keyword, title, and author names search terms.
3. Linking archived project datasets and DOIs from Research Workspace projects to the DataONE Search Catalog.

2. PROGRAM STATUS OF SCHEDULED ACCOMPLISHMENTS

***Milestones** are annual steps to meet overall project objectives.*

***Tasks** are annual steps to meet milestones (for example, sample collection, data analysis, manuscript submittal, etc.)*

For each milestone and task listed, specify by each quarter of each year their status (completed, planned), as submitted in your FY19 proposal.

Reviewers will use this information in conjunction with annual program reports to assess whether the program is meeting its objectives and is suitable for continued funding.

A. Program Milestones and Tasks

Table 1. Program milestones and task progress by fiscal year and quarter, beginning February 1, 2017. C = completed, X = not completed or planned. Fiscal year quarters: 1 = Feb 1 – April 30; 2 = May 1 – July 31; 3 = Aug. 1 – Oct. 31; 4 = Nov. 1 – Jan. 31.

	FY17				FY18				FY19				FY20				FY21			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OBJ 1 - OBJ 1- ***Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities: Status*** **- completed**																				
Convene data management meeting with GWA and HRM Program leads (and Non-Program project leads as needed).	C				C		C				X	X	X	X						
Convene data scoping meetings with individual PIs to develop GWA, HRM and Non-Program project data management plans (DMPs)	C	C	C								X	X	X	X						

Develop up-to-date inventory of expected and submitted data for 5 years				C	C		C		C	C	X	X	X	X			X	X	X	X
Complete/disseminate data management plans (DMPs) for GWA and HRM and DMPs for Non-Program project (to Program PI)		C			C						X	X	X	X						
Institutionalize metadata authoring among program and Non-Program teams		C												X						
Develop/disseminate metadata templates		C									X	X		X				X		
OBJ 2 - *Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration – completed and ongoing as necessary*																				
Set-up new GWA & HRM Workspace groups, & in Year 4, FY19, set-up new Workspace for Non-Program projects.	C	C									X	X	X	X						
Connect data and metadata to any previous data instances		C						C												
Support continued access to GWA and HRM data collected in the prior five-year effort in the former Workspace group, and, as needed, make this data also available in the new Workspace group(s)	C	C																		
OBJ 3 - Data submissions and metadata generation: Status - on target *Milestone: Support and provide training for data transfer and metadata production using the Workspace*																				
Provide Workspace and metadata training to PIs (as needed)	C			C				C	C			X				X	X			
Milestone: Track regular data and metadata submissions																				

Maintain updated submission data inventory (Obj. 1, M. 3) to track data and metadata submissions to the Workspace for GWA, HRM and Non-Program projects				C		C		C	C	C		X		X		X		X		X
Non-compliance notification to PM, following no PI action as needed. {Starting FY18-Q4, PM receive quarterly updated data submission inventory table }			C				C		C	C	X				X				X	
Non-compliance report to EVOSTC, following no PI Action (as needed)				C				C				X				X				X
Milestone: Hold annual data progress meetings with individual PIs																				
Hold one-on-one meetings with PIs on data progress		C				C				C				X				X		
Revise DMPs to respond to project-level changes						C				C		X		X				X		
Conduct semi-annual review of data submissions		C		C		C		C		C		X		X		X		X		X
Notification of PIS re: metadata & data submission deadline		C		C		C		C	C	C	X	X		X		X		X		X
Milestone: Provide supplemental data and metadata quality control																				
Complete QC of data formats and completed metadata				C				C				X				X			X	X
OBJ 4 - Continued access to program data through Workspace and portal: Status – on target *Milestone: Create Workspaces to immediately serve the needs of GWA and HRM Programs (*																				
Serve existing infrastructure to newly funded GWA&HRM Programs	C	C																		

Milestone: Develop semi-automated submission pathways to data archives																				
Deploy automated pathways from Workspace to archives			C																	
Milestone: Provide scheduled and unscheduled maintenance to the system infrastructure																				
Provide maintenance on data management system	C	C	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X
OBJ 5 - Final data and documentation available publicly to various audiences – on target																				
Milestone: Prepare data and metadata into preservation-ready file formats																				
Verify the conversion of file formats as preservation-ready		C	C	C			C	C			X	X			X	X			X	X
Review data to be published with PIs for consent		C	C	C			C	C			X	X			X	X			X	X
Audit the readiness of datasets for archive		C	C	C			C	C			X	X			X	X			X	X
Milestone: Publish data and relevant program documents through the Gulf of Alaska Portal																				
Publish data and data products through the GOA portal		C		C	C			C	C			X	X			X	X			X
Final data collections submitted to DataOne		C		C			C		C				X				X	X	X	X
Milestone: Submit all final data and metadata (Not applicable until Year 5)																				
OBJ 6 - Program on track and responsive to end user and PI feedback and requests. *Milestone: Interface with program PIs on data management progress and procedures*																				
Present data management procedures & progress at annual meetings	C			C	C			C	C			X	X			X	X			X
Provide ongoing data and metadata support to Pis, as needed	C	C	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X

Maintain regular contact with PIs about data management throughout the year	C	C	C	C	C	C	C	C	C	C	X	X								
Milestone: Continually evaluate progress and new technologies and management methods to keep pace with program needs																				
Conduct user surveys with project PIs about data management methods, application and progress				C	C				X			X	X			X	X			
Milestone: Report progress annually to the EVOSTC																				
OBJ 7 - Verify data and metadata completeness and final transfer at the term completion – N/A, YEAR 5																				
Milestone: Ensure the existence and completeness of all data in the data inventory																				
Verify data and metadata completeness for GWA & HRM Programs																		X	X	X
Discuss final transfer & storage of data to EVOSTC																	X			
Implement transfer agreement																				X
Reporting																				
Progress or Subaward Reports		C		C		C		C		C		X		X		X		X		X
Annual reports					C				C				X				X			X
Annual PI Meeting				C				C				X				X				x
FY work plan (DPD)		C	C			C	C			C	X			X	X					

B. **Explanation for not completing any planned milestones and tasks**

For each milestone and task listed in the table that has not been completed as scheduled, please provide an explanation and when you expect to complete it. If all milestones and tasks have been completed, write a complete sentence stating that.

Reviewers will use this information in conjunction with annual program reports to assess whether the program is meeting its objectives and is suitable for continued funding.

Objective 1. *Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities.*

1. *Milestone 1. Convene data management meeting with GWA and HRM Program leads, and Non-Program PIs starting in FY19*
2. *Milestone 2. Convene data scoping meetings with individual PIs to develop GWA and HRM data management plans (DMPs), and Non-Program DMPs starting in FY19*
3. *Milestone 3. Develop and maintain up-to-date inventory of expected and submitted data (ongoing)*
4. *Milestone 4. Complete/disseminate data management plans (DMPs) for GWA, HRM in FY17 and for Non-Program projects starting FY19*
5. *Milestone 5. Institutionalize metadata authoring among program teams and Non-Program project PIs*
6. *Milestone 6. Develop/disseminate metadata templates to GWA, HRM and Non-Program PIs*

Status: All Tasks for this objective have been completed, and will be revisited as needed.

Objective 2. *Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration.*

1. *Milestone 1. Set-up new GWA and HRM Workspace groups (FY 17) and Non-Program project Workspace accounts (FY 19)*
2. *Milestone 2. Connect data and metadata to any previous data instances*
3. *Milestone 3. Support continued access to GWA and HRM data collected in the prior five-year effort in the former Workspace group, and, as needed, make this data also available in the new Workspace group(s)*

Status: All Tasks for this objective have been completed and will be revisited as needed.

Objective 3. *Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Workspace. All tasks for this objective are on track, but some updates are provided.*

1. *Milestone 1. Support and provide training for data transfer and metadata production using the Workspace*
2. *Milestone 2. Track regular data and metadata submissions* -The data submission inventory is used to track data and metadata submissions to the Workspace against data that was expected to be generated through the GWA and HRM program terms (see Section 8). In FY19, Non-Program project data listings will be added to this inventory for overall management. This inventory will be used to keep the Program Leads informed of data submission compliance, and is not punitive, rather used to preempt any data

submission issues. Since FY17, there has been no need to submit a non-compliance report to either GWA or HRM PM, largely due to the competent tracking of data submissions.

3. *Milestone 3. Hold annual data progress meetings with individual PIs -* Axiom continues to meet annually with each individual PI to discuss progress. In FY19-20, data management plans (DMPs) for the add-on Non-Program projects will be developed sometime in the next 4 quarters, depending on funding startup.

4. *Milestone 4. Provide supplemental data and metadata quality control -* According to the data sharing policies (see below), the PIs are to conduct quality assurance on data collection procedures and quality control the data they generate. Quality control by the data managers is focused on data file formatting and metadata documentation to ensure authoring adheres to known best practices and accurately reflects data captured within individual data files. This process includes an automated completeness check for required metadata fields; a secondary quality control check by Axiom data management staff for accuracy and consistency of metadata resulting in a list of any issues in the metadata that will be delivered to the PI; and a final check for ISO-format validation after metadata quality issues have been addressed and before submitting the dataset to national archives.

   Data sharing policies adopted by the GWA and HRM teams are as follows (unless prohibited by partner agency):

   - All data are posted on the GWA Program Workspace as they become available following collection in order to promote internal integration and sharing within the project.
   - These data are replaced with QA/QC'd data when available.
   - Comprehensive metadata using FGDC (or ISO) standards accompany each dataset.
   - Monitoring data are made available to the public as soon as they have been QA/QC'd or within 1 year following collection, whichever is sooner.
   - Anyone making public use of another team's data contacts the data collector and provides appropriate attribution and credit.
   - The Science Coordinating Committee must agree to any deviations from these policies in advance.
   - Additionally, all PIs and project managers are expected to adhere to EVOSTC policies regarding retention of all documents, correspondence (electronic and paper), samples, and data per the terms of the EVOSTC court settlement.

Non-Program projects added to this FY20 workplan will follow the same data policies.

Status: All Tasks are on track for FY19 and will be ongoing through FY20 (and FY21).

Objective 4. *Provide, maintain, and modify technical infrastructure to ensure access to information produced or processed by the GWA and HRM Programs*.

1. *Milestone 1. Create Research Workspaces to immediately serve the needs of GWA and HRM Programs* -
2. *Milestone 2. Develop semi-automated submission pathways to data archives* - Axiom continues to develop tools that augment the Research Workspace in order to automatically send data to a DataONE (a nationally recognized long-term archive for scientific data) member repository for long-term preservation.
3. *Milestone 3. Provide scheduled and unscheduled maintenance to the system infrastructure*

Status: All Tasks are on track for FY19 and will be ongoing through FY20.

Objective 5. *Publish and promote data collected by the HRM and GWA Programs, making it available for research, management, and general audiences*.

During the research phase of this funding cycle, data are securely available for internal use through the Workspace. When data are ready to be published, they will be made available through the existing, public-facing data portal (Gulf of Alaska Portal: https://portal.aoos.org/gulf-of-alaska) for exploration and discovery. By the end of the proposed five-year term, all final data and metadata will be archived through DataONE, where it will be preserved over the long-term. National repositories also reach wider audiences, thus expanding the access, discoverability, and active management of data collections generated through these programs.

1. *Milestone 1. Prepare data and metadata into preservation-ready file formats* - Examples of preferred formats for different types of data include: ASCII formats (TXT, CSV, XML), NetCDF, and PDF. Ultimately, it is the responsibility of the data providers to generate and document preservation-ready data formats. However, Axiom data analysts continue helping PIs convert data from agreed-upon formats (used by the PIs) into preservation-ready file formats when necessary. Any custom scripts that are developed to convert between formats and visualize the data will be saved to streamline conversion of similar data types in the future. To ease file use and analysis by PIs that prefer proprietary or product-specific formats, the original files will be retained.

2. *Milestone 2. Publish data and relevant program documents through the Gulf of Alaska Portal -* The Workspace is used as a gateway to publish data and associated metadata to the GOA portal, once metadata complies with content and quality requirements. The GOA portal is publicly available for discovery by researchers, managers and general audiences, and is the first public accessible data portal for GWA and HRM data. PIs have ultimate control for managing their data and determining when to make it publicly available to GOA and DataONE. Final data collections are offset by one-year. For this period, DataONE submissions for FY17 were completed in Q1. FY18 data are currently being processed and prepared for publication next spring 2020.

3. *Milestone 3. Submit all final data and metadata documents to a national archive -* By the end of the proposed five-year term, all final data and metadata will be submitted to DataONE, a nationally recognized long-term archive for scientific data. Workspace integration with DataONE provides services for automatically transferring data and metadata, controlling access to data products as they are populated in the system, and services for replication and preservation of data. Workspace project metadata will be updated to include any identifiers associated with the data once it has been ingested into DataONE (e.g., DOI, archival accession numbers). This pathway will simplify preservation and publication for PIs while providing transparency to the data managers, program leads, and funders.

   As a federally funded program, AOOS is required to submit or make available all data it generates or serves on their website to a national archive center. AOOS works closely with the National Centers for Environmental Information (NCEI) to assist with the preservation of appropriate data types. Since 2017, Axiom has been working with NCEI to develop a formal relationship to submit curated datasets from the Research Workspace to the national archive. NCEI is actively processing the Research Workspace archive submission request and, once finalized, may offer an additional archive option for EVOS-funded project datasets.

Status: All Tasks are on track for FY19 and will be ongoing through FY20.

Objective 6. *Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.*

1. *Milestone 1. Interface with program PIs on data management progress and procedures*
2. *Milestone 2. Continually evaluate progress and new technologies to keep pace with program needs -* Implementing a system to serve the GWA and HRM data management needs is a core component of this proposed work. To ensure progress of the data management team in meeting these needs, regular and structured feedback is required from data management system users. While no formal feedback surveys were conducted during this performance period, the data management team encourage continued feedback through data management progress updates and presentations during PI meetings, teleconferences, and one-on-one interactions.
3. *Milestone 3. Report progress annually to the EVOSTC -* The EVOSTC Annual Report deadline was submitted near the end of the first quarter (April 15, 2019) of this reporting period due to the U.S. Government shutdown in December 2018 through January 2019. AOOS submitted the FY18 annual report to EVOSTC and posted on Research Workspace on April 5, 2019 ahead of the deadline. The Data Management Team Lead provides an in-person summary update at the annual EVOSTC meetings, usually held in the fall. Axiom Data Management Team members also participate in EVOS Science Panel calls during workplan review and approval times during fall.

Status: All Tasks are on track for FY19 and will be ongoing through FY20.

C. **Justification for new milestones/tasks**

Please provide justification for any new milestones or tasks that are being proposed. If none are proposed, write a complete sentence stating that.

Reviewers will use this information in conjunction with annual program reports to assess whether the program is meeting its objectives and is suitable for continued funding.

During a July 9, 2019 communication with AOOS Program Lead Janzen, the EVOSTC expressed interest in adding six new Non-Program EVOSTC-funded projects to the suite of data resources managed under the Data Management Program. A sixth project was added in September for consideration. The six projects are shown below in Table 2.

Table 2. FY20 EVOSTC Non-Program projects to be added to the current Data Management Program.

Project	PI(s)	Data Type	Dataset	Years
19110853 Pigeon Guillemot Restoration project ($285k)	Kuletz, Kaler, Irons	legacy	● annual PIGU surveys on Naked Island group and control group, ● mink surveys (bait stations, camera traps, track surveys), ● mink trapped on the Naked Island Group (3 islands)	2012-2019
		expected	● annual PIGU surveys on Naked Island group and control group, ● mink surveys, ● BLKW productivity	2020-2024 5 years
Status and trends of marbled murrelet, Kittlitz's murrelet, and pigeon guillemot in a changing northern Gulf of Alaska ($836K)	Hollmen, Maniscalco	expected	● Seasonal abundance and distribution for 3 species; ● audio visual surveys to identify nests; ● remote sensing - radar, acoustics, and thermal imaging to monitor breeding birds ● characterize nesting habitat and phenology ● Video monitoring of one PIGU colony for chick provisioning and nesting success	2020-2024 5 years
Status and recovery of Kittlitz's murrelet and marbled murrelet within the EVOS affected area ($686k)	Labunski, Kaler, Kuletz, Frost	expected & legacy	● Update population estimates for two species in K Bay using vessel-based surveys and historical data ● Describe population trends and marine habitats	2020-2024 5 years

Nesting ecology of the marbled murrelet in the Kodiak Archipelago ($1.1mil)	Corcoran	expected	● VHF radio and solar-powered satellite transmitters each spring for three breeding seasons to investigate nesting habitat. ● Aerial and ground-based telemetry to locate nest sites. ● Audio-visual surveys to pinpoint exact nest location. ● Digital cameras to monitor chick provisioning and nest outcome. ● Habitat characteristics associated with nest sites.	2020-2023 4 years
Nearshore fish community assemblages associated with different river-estuary settings ($191K)	Walker	expected	● Physical data: temperature, salinity, turbidity, dissolved oxygen ● Physical habitat characterization; ● Fish data: species, abundance, size frequency, diet composition	2020-2022 3 years
Gulf Watch Ocean Acidification Monitoring ($63k)	Hettrick, Campbell, Baird, Evans	expected	• Physical data parameters: temperature, salinity, dissolved oxygen • Inorganic carbon chemistry data from LCI and PWS sampling transects	2020-2022 3 years

These projects are being considered by the EVOSTC and are added to the Data Management workplan for FY20 for review. The new projects will require additional funding, hence a revised budget for FY20-21 is provided. Some of these projects extend beyond the current 5-year Data Management Program accepted by the EVOSTC, therefore we provide annual estimates to manage these data through their lifecycle in this workplan (see Table 3), but only add the costs for these projects to the formal budget through 2021 (see ABSTRACT Annual costs table). These new projects will be managed in much the same way as the GWA and HRM Program projects, and are being woven into the Data Management Program as standalone Non-Programmatic projects (e.g., not under the GWA or HRM Programs management). The general scope, approach and cost estimate for these additional data management services is therefore provided as an add-on to the GWA and HRM Data Management Program budget (Tables 3-4).

The data management approach for Non-Program projects will be similarly structured to that used for the GWA and HRM programs (as written in the EVOSTC FY17-FY21 Data Management program proposal). The approach is focused around the following same objectives (fully detailed in Section 2. A.):

OBJECTIVE 1. *Initiate data management services and oversight for EVOS Non-Program project data-related activities.*

OBJECTIVE 2. *Standardize, consolidate and document legacy project datasets (i.e. prior to 2019), as appropriate, for continuity and integration with newly-collected project data.*

OBJECTIVE 3. *Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Research Workspace.*

OBJECTIVE 4. *Provide, maintain, and modify technical infrastructure for user groups to access information produced or processed by the Non-Program projects.*

OBJECTIVE 5. *Publish and promote data collected by the Non-Program projects, making it available for research, management, and general audiences.*

OBJECTIVE 6. *Execute management, user feedback, and internal and external communications related to Non-Program projects data and data products.*

OBJECTIVE 7. *Verify data and metadata completeness and final transfer at the term completion.*

In this proposed work, the existing AOOS data system used to support the GWA and HRM Programs will be leveraged and enhanced to achieve the data management goals of the add-on Non-Program projects. The data system includes the:

- The AOOS Data System for data storage and centralization
- The Research Workspace and associated metadata editor
- The Gulf of Alaska Data Portal.

Table 3. Yearly activities and cost estimates by year to incorporate data management services for 5 Non-Program projects, assuming all EVOSTC Non-Program projects are fully funded throughout lifecycle of project. Cost estimates in this table do not include 9% GA; however, the submitted revised budget request does.

Year	Activities	Cost Estimate
Year 1	● Consolidate legacy data into RW and begin documentation ● Create new RW projects & onboard PIs ● Complete project data management plans with PIs ● Establish metadata templates ● Organize projects for data storage in Year 1	$63,000
Year 2	● Archive legacy PIGU data ● Submission of Year 1 data & metadata ● Technical support for using RW ● Data standards & metadata QC ● Publish final Year 1 data to portal ● Annual PI meeting for progress checks	$48,000
Year 3	● Submission of Year 2 data & metadata ● Data standards & metadata QC ● Annual PI meeting for progress checks ● Publish final Year 2 data to portal ● Archive project data (Nearshore fish project)	$46,000
Year 4	● Submission of Year 3 data & metadata ● Data standards & metadata QC ● Annual PI meeting for progress checks ● Publish final Year 3 data to portal ● Archive project data (Nesting ecology project, Status and recovery of	$47,000

	murrelett in K Bay- surveys)	
Year 5	● Submission of Year 4-5 data & metadata ● Metadata QC ● Publish final Year 4-5 data to portal ● Annual PI meeting for progress checks ● Archive project data (PIGU, Seabird status and trends projects, Status and recovery of murrelett in K Bay- habitat)	$42,000

Table 4. Cost estimates for Axiom subaward broken out by year and by project to incorporate data management services for new Non-Program projects. Cost estimates in this table do not include 9% GA; however, the submitted revised budget request does.

Project	Year 1	Year 2	Year 3	Year 4	Year 5
19110853 Pigeon Guillemot Restoration project ($285k)	$18,000 *	$12,000	$8,000	$8,000	$18,000
Status and trends of marbled murrelet, Kittlitz's murrelet, and pigeon guillemot in a changing northern Gulf of Alaska ($836K)	$9,000	$8,000	$8,000	$8,000	$18,000
Status and recovery of Kittlitz's murrelet and marbled murrelet within the EVOS affected area ($686k)	$12,000	$8,000	$8,000	$12,000 ǂ	$6,000
Nesting ecology of the marbled murrelet in the Kodiak Archipelago ($1.1mil)	$12,000	$9,000	$8,000	$19,000	$0
Nearshore fish community assemblages associated with different river-estuary settings ($191K)	$9,000	$8,000	$11,000	$0	$0
Gulf Watch Ocean Acidification Monitoring ($63k)	$3,000	$3,000	$3,000	$0	$0

** Methods require curation of five or more prior years of data in order to update population statuses and trends. At the project onset, some historical data salvage effort will be required.*

‡ This proposal timeline indicated publication and most of the data wrap up in the 4th year. We assume that publication in Year 4 means the PIs would be focusing attention of final curation and archival of data to meet any data archive requirements by the journal(s). Since the data analysis timeline also bleeds into Year 5 of the project, we allocated a smaller amount of funding into Year 5 to do any of the curation wrap-up not covered in Year 4.

PROGRAM COORDINATION AND COLLABORATION

A. Within an EVOSTC-funded Program

Provide a list and clearly describe the functional and operational relationships with any EVOSTC-funded Program (Herring Research and Monitoring, Long-Term Research and Monitoring or Data Management Programs). This includes any coordination that has taken or will take place and what form the coordination will take (shared field sites or researchers, research platforms, sample collection, data management, equipment purchases, etc.).

Gulf Watch Alaska

Overall coordination of the data management effort is provided by Dr. Janzen, the Data Management Program Lead (AOOS), who is responsible for ensuring coordination between this program and the GWA Program. AOOS time dedicated to the EVOSTC programs is focused on data management oversight for all GWA projects. Coordination across the program projects occurs through email, phone communications and regularly scheduled in-person meetings. Axiom representatives from the Data Management team attend the annual PI meeting in the fall, and Dr. Janzen (AOOS) and Stacey Buckelew (Axiom) join the regularly scheduled Program Management Team phone calls to help ensure a seamless response to data management and decision-support needs.

Regular communications are maintained between the Axiom data managers and the GWA Program Lead as well as the individual project PIs within the GWA Program. These communications are a continuation of effective working relationships developed with the science teams in the first five-year effort. Regular communications with individual project PIs are through annual one-on-one meetings, and regular email and/or phone conversations. One-on-one meetings are held with each project and program PI during the fall PI meetings to track project and data submittal progress and provide hands-on support for data organization, formatting, and metadata authoring. The data managers also use email to inform individual PIs of their data submission progress using the data inventory table. The data management team can then respond to PI inquiries and/or requests for additional assistance. Depending on the location of individual PIs, this assistance is provided through the most practical communication method (e.g., email, phone correspondence, or scheduled meetings).

Herring Research and Monitoring

Overall coordination of the data management effort is provided by Dr. Janzen, the Data Management Program Lead (AOOS), who is responsible for ensuring coordination between this program and the HRM Program. AOOS time dedicated to the EVOSTC programs is focused on data management oversight of all HRM projects. Coordination across the program projects occurs through email, phone communications, and regularly scheduled in-person meetings. Axiom representatives from the Data Management team attend the annual PI meetings in fall, and Dr. Janzen (AOOS) and Stacey Buckelew (Axiom) join the regularly scheduled Program Management Team phone calls to help ensure a seamless response to data management and decision-support needs.

Regular communications are maintained between the Axiom data managers and the HRM Program Lead as well as the individual project PIs within the HRM Program. Regular communications with individual project PIs are through annual one-on-one meetings, and regular email and/or phone conversations. One-on-one meetings

were held with each project and program PI during the fall PI meetings to track project and data submittal progress and provide hands-on support for data organization, formatting, and metadata authoring. The data managers also use email to inform individual PIs of their data submission progress using the data inventory table. The data management team can then respond to PIs inquiries and/or requests for additional assistance. Depending on the location of individual PIs, this assistance is provided through the most practical communication method (e.g., email, phone correspondence, or scheduled meetings).

Data Management

The AOOS data management technical infrastructure is collaborative in the sense that the Research Workspace is designed to give open access across the GWA and HRM program teams for file sharing and transparency of data progress. Backing this infrastructure is a data management team that is well-coordinated with GWA and HRM program leads and science teams for timely data submissions and accuracy of metadata authoring, ensuring data and products are available to general science and resource management communities. Through this collaborative work structure, the Data Management Program team is positioned to respond to the needs of the GWA and HRM programs as well as Non-Program projects funded by the EVOSTC. The team is providing both the required technical support and requested modifications to the Workspace platform to enhance accessibility and utility to scientists.

This workplan covers the FY20 Data Management Program for EVOSTC funded GWA, HRM, as well as ongoing in-kind support for allowing PIGU Restoration and Lingering Oil projects access to the Research Workspace for submitting EVOSTC reports. It also covers the addition of data management tasks for six Non-Program projects that are not directly associated with the GWA, HRM or DM programs, but are/or will be EVOSTC funded projects.

B. With Other EVOSTC-funded Projects

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the EVOSTC that are not part of a EVOSTC-funded program.

The Data Management team has been interacting with other EVOSTC-funded projects, including the PIGU Restoration and Lingering Oil projects, by providing them access to the Research Workspace to store data and final project reports. Though the Data Management team is not officially offering or funded to provide full data management services to these projects in the same way we are with GWA and HRM, the team works with the EVOSTC Science Coordinator and maintains a Research Workspace group for information exchange between these EVOSTC funded projects and EVOS Trustees. This allows the Trustees to access final reports and other project document loaded by the PIGU and Lingering Oil project PIs, and has streamlined access to up-to-date reports while alleviating sending large documents by email.

Starting in 2020, the Data Management team is being asked by the EVOSTC to include data management for six projects that are not part of the EVOSTC funded GWA or HRM Programs and are not part of the original proposed Data Management Program. These projects are listed and briefly described in Table 2 in Section 2.C. AOOS proposes to provide the same data management services for these projects as are provided to the GWA and HRM programs, and will report on their progress directly to the EVOSTC Science Director. The data generated by the projects will be added to the data submission inventory as standalone projects. A data submission inventory table will be maintained for these new additional projects and the combined inventories will be used for reporting to the EVOSTC in the annual report and workplan. A subset project inventory update will be submitted quarterly to the individual project PIs to help them keep track of data submission expectations. As with the projects under both the GWA and HRM programs, regular communications will occur

with individual project PIs through annual one-on-one meetings, and regular email and/or phone conversations. A one-on-one meeting will be held with each PI in the fall of each year to track project progress and provide hands-on support for data organization, formatting, and metadata authoring. The data managers will also use email to inform individual PIs of their data submission progress and to respond to PIs inquiries and/or requests for additional assistance. Depending on the location of individual PIs, this assistance will be provided through the most practical communication method (e.g., email, phone correspondence, or scheduled meetings).

C. With Trustee or Management Agencies

Please discuss if there are any areas which may support EVOSTC trust or other agency work or which have received EVOSTC trust or other agency feedback or direction, including the contact name of the agency staff. Please include specific information as to how the subject area may assist EVOSTC trust or other agency work. If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project, note this and explain why.

AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this EVOSTC-funded Data Management Program. For one, AOOS is a certified Regional Association (RA) under the authority of the Integrated Coastal and Ocean Observation System Act of 2009 (ICOOS Act). The ICOOS Act directs NOAA to certify and integrate RAs into the U.S. Integrated Ocean Observing System (IOOS). Such integration formally establishes the role of the RA within the U.S. IOOS and ensures that the data collected and distributed by the RA are managed according to the best practices, as identified by NOAA. To become certified, applicants must demonstrate they meet the requirements established by the U.S. IOOS's Regulations to Certify and Integrate Regional Information Coordination Entities.

As the AOOS Data Management team, Axiom works to provide data management, visualization and preservation services, including providing access to and facilitating the use of the Research Workspace. The team offers similar services to a number of other programs that receive funding from or are administered or overseen by representatives from the Trustee Council and associated agencies. EVOSTC trustee agencies include: 1) National Oceanographic and Atmospheric Administration (NOAA); 2) US Department of Agriculture/US Forest Service; and 3) the US Department of the Interior (Bureau of Ocean Energy Management, US Fish and Wildlife Service, National Park Service and the US Geological Survey). Three state agencies are also represented by the EVOSTC and include: 1) Alaska Department of Fish and Game (ADF&G); 2) Alaska Department of Environmental Conservation; and 3) Alaska Department of Labor.

The EVOSTC-funded Data Management Program benefits trustee or management agencies on many levels. For one, all data and final data products produced by the GWA and HRM programs are (or will be) made accessible and publicly available through the AOOS hosted Gulf of Alaska Data Portal and the DataONE Member Node, both of which are no-cost services that can be accessed by any member of the public. Other programmatic and statewide datasets are also accessible via the AOOS data system, and can be accessed by the same end user accessing the GWA and HRM datasets. DataONE provides access to data across multiple member repositories, supporting enhanced search and discovery of earth and environmental data. The Data Management Program also supports the Lingering Oil and PIGU Restoration Projects as described in Section 3B. Other associated programs affiliated with EVOSTC and affiliated management agencies are given below (Table 5).

Table 5. Associated EVOS Trustee Council programs and agencies for which AOOS and Axiom coordinate data management as well as other services.

Group, Agency	**Level and Type of Coordination and How the project assisted EVOSTC trust or agency work**	**Representative**
Regional Coastal Ocean Observing System: Alaska Ocean Observing System (AOOS). Integrated Ocean Observing System (IOOS), National Ocean and Atmospheric Administration (NOAA)	Develop the integration of ocean and coastal observing capabilities, in collaboration with Federal and non-Federal partners, to maximize access to data and generation of information products, inform decision making, and promote economic, environmental, and social benefits Through the IOOS grant, AOOS provides partial support on a few GWA supported projects (e.g, Seward Line environmental drivers shiptime support). AOOS has invested a significant portion of their IOOS support to host the regions most sophisticated data acquisition system, which hosts the GWA Website and the Gulf of Alaska Data Portal as subsystem. This data system is highly leveraged by other large research and ecosystem-based programs (listed here). AOOS supports all the related EVOSTC and management agency projects by providing the backbone and base support to keep this data system operational, and also by providing data management services to all these groups and their projects.	Carl Gouldman, Director, IOOS Dave Easter, Division Chief, IOOS
Integrated Ocean Observing System (IOOS), National Ocean and Atmospheric Administration (NOAA)	Develop community standards for sensor observations; make regional data nationally accessible. This supports all the data management activities for GWA and HRM as well as other projects listed here, and provides data in the correct formats to meet national and international data archival requirements and standards.	Derrick Snowden, Data Management and Coordination (DMAC) System Architect, IOOS

Alaska Ocean Observing System (AOOS) Data Management, (AOOS grants support funded through NOAA's IOOS Program)	Provide data management; cyberinfrastructure support. Works directly with member and non-member organizations to ingest and document new datasets as well as historical data assets that might not be available elsewhere or in a consistent useful format; data visualizations and product development Support data collection, data sharing and acquisition for the entire region of Alaska, including the Gulf of Alaska. These data are provided to the public and all interested users free of charge via the AOOS data system. The AOOS Data System leverages their own data portal system to support other programs listed in this table.	Molly McCammon, Executive Director, AOOS
Central and Northern California Ocean Observing System (CeNCOOS) Data Management, NOAA	Provide data management; cyberinfrastructure. Works directly with member and non-member organizations to ingest and document new datasets; visualizations Tools developed for CenCOOS can be leveraged for other projects listed on this table, as well as ingestion capability of new data types. Activities undertaken for CenCOOS can be leveraged across the national IOOS data system and other regions using the AOOS data system platform.	Henry Ruhl, Executive Director, CenCOOS
Southeast Coastal Ocean Observing Regional Association (SeCOORA) Data Management, NOAA	Provide data management; cyberinfrastructure. Works directly with member and non-member organizations to ingest and document new datasets; visualizations Tools developed for SeCOORA can be leveraged for other projects listed on this table. as well as ingestion capability of new data types. Activities undertaken for SeCOORA can be leveraged across the national IOOS data system and other regions using the AOOS data system platform.	Debra Hernandez, Executive Director, SeCOORA
Beluga Sightings Database Visualization, NOAA-National Marine Fisheries Service (NMFS)	Produces visualizations, guidance on building community standards for submitting marine mammal stranding observations. AOOS hosts The Cook Inlet Beluga Whale Ecosystem Portal.	Mandy Migura, Marine Mammal Specialist, NOAA (2018) (Current position, Broad Conservation LLC)

Russian-American Long-term Census of the Arctic (RUSALCA), NOAA	Provides access to Workspace; guidance on data and metadata management; archiving; visualizations in support of mission. RUSALCA was an international consortium effort to coordinate biological, geological, chemical and physical oceanographic sampling strategies to be pursued in the Bering Strait and the Chukchi Sea. The cruise objectives for the United States partner were to support the U.S. interagency Study of Environmental Arctic Change (SEARCH) Program, the NOAA Ocean Exploration Program and the Arctic Ocean Census of Marine Life (ArcOcCoML).	Kathy Crane, Program Manager Arctic Research Program, U.S. Mission Coordinator for RUSALCA, NOAA (2015) (Current position, ArcticLynx LLC, and Univ. of Hawaii SOEST)
Building coupled storm surge and wave operational forecasting capacity for Western Alaska, NOAA-IOOS Program - OTT (Ocean Technology Transition)	Provide data management and outreach support for transitional project that is developing a multi-scale, multi-process integrally coupled wave-surge forecast modeling system, refined and validated with a focus on transition to operations while resolving key issues that presently limit forecast reliability in western Alaska. The system will be designed to fit into the NOAA ESTOFS Pacific Storm Surge Guidance System framework. The specific goal is to enable significant advancement of NOAA's high-fidelity operational surge and wave models, ADCIRC and WAVEWATCH III, within the northern Pacific Ocean, Bering, Chukchi and Arctic Seas.	Joannes Westerink, Civil and Environmental Engineering and Earth Sciences, University of Notre Dame, IN
Core Program, North Pacific Research Board (NPRB)	Provide guidance given on data and metadata best practices; access to and facilitation of the Workspace; organization and archiving of historical projects; Now the data management team for NPRB. NPRB funds are administered through the EVOSTC. Data management from the NPRB programs is being managed by Axiom Data Science, and is leveraging the Research Workspace and the data system developed by AOOS to make data public and available for sharing, and standardized for long-term, national archival.	Matthew Baker, Science Director, NPRB Jo-Ann Mellish, Program Manager, NPRB
Arctic Integrated Ecological Research Program (AIERP), NPRB	Fully facilitate data and metadata management working directly with PIs, from initial sharing within the group to long-term archiving at NPRB	Danielle Dickson, Program Manager, NPRB
Arctic Marine Biological Observation Network (AMBON), Bureau of Ocean Management (BOEM)	Coordinate all data management activities for AMBON using the Workspace	Katrin Iken, Lead Principal Investigator, Professor, College of Fisheries and Ocean Sciences, University of Alaska, Fairbanks

Arctic Ecosystem Integrated Synthesis (Arctic EIS), BOEM	Provide guidance to program management on data and metadata best practices; access to and facilitation of the Workspace; organization and archiving of completed projects	Franz Mueter, Lead Principal Investigator, Associate Professor, College of Fisheries and Ocean Sciences, University of Alaska, Fairbanks
Marine Arctic Ecosystem Study (MARES), BOEM	Develop data management plans for each sampling effort; access to and facilitation of the Workspace; acquire and ingest into AOOS Arctic Data Portal environmental datasets identified by program PIs as important context for MARES program; facilitate conversion of data into long-term preservation-ready formats; submission of datasets to long-term archives	Francis Wiese, Lead Project Manager, Stantec
Central Beaufort Sea Wave and Hydrodynamic Modeling Study (BOEM)	Provide data management and outreach support for a joint data synthesis and modeling effort between the University of Alaska, Fairbanks (UAF), the University of Alaska Anchorage (UAA), and the U.S. Geological Survey (USGS) Coastal & Marine Geology Program-Pacific Coastal & Marine Science Center (PCMSC). The Alaska Ocean Observing System (AOOS) and the AOOS data management contractor Axiom Data Science are providing data management services and outreach for this project. Through field observations, historical and new, the goal is to adequately document wave and sediment transport conditions within Stefansson Sound/Foggy Island observationally and provide input data assimilation and validation support for project modeling activities.	Jeremy Kasper, Lead Principal Investigator, University of Alaska, Institute of Northern Engineering

3. PROGRAM DESIGN

A. Overall Program Objectives

Identify the primary objectives for your project as submitted in your original proposal.

OBJECTIVE 1*. Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities.*

OBJECTIVE 2. *Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration.*

OBJECTIVE 3. *Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Research Workspace.*

OBJECTIVE 4. *Provide, maintain, and modify technical infrastructure for user groups to access information produced or processed by the GWA and HRM Programs.*

OBJECTIVE 5. *Publish and promote data collected by the GWA and HRM Programs, making it available for research, management, and general audiences.*

OBJECTIVE 6. *Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.*

OBJECTIVE 7. *Verify data and metadata completeness and final transfer at the term completion (FY21).*

The proposed Objectives for FY20 include:

1. Objective 3. Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Research Workspace.
2. Objective 4. Provide, maintain, and modify technical infrastructure for user groups to access information produced or processed by the GWA and HRM Programs.
3. Objective 5. Publish and promote data collected by the GWA and HRM Programs, making it available for research, management, and general audiences.
4. Objective 6. Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.
5. **NEW in FY20 - Objective 8. Perform original Data Management Program Objectives 1-7 for newly-funded EVOSTC Non-Program projects listed in Table 2.

Note: Objectives 1 and 2 for GWA and HRM were completed in FY17 and FY18 (as listed in the 2017-2021 data management program proposal form) but will be revisited as needed. Objective 7 will take place in FY21 for all projects (GWA, HRM and New Non-Program projects to date), and if the Data Management Contract for the new projects is extended, final transfer of those assets will occur at the individual terms of completion. Objective 8 is new to the FY20 Data Management Workplan, and includes the same objectives for the GWA and HRM Programs, including first year Objectives 1 and 2.

The Alaska Ocean Observing System (AOOS) is the recognized Alaska regional component of the national Integrated Ocean Observing System (IOOS) and serves as the regional Data Assembly Center for oceanographic and coastal data and information products in Alaska waters. This makes AOOS the logical entity to lead the data management component of EVOSTC program and Non-Program marine science and related projects, since its mission is to address regional and national needs for ocean information, gather specific data on key coastal and

ocean variables, and ensure timely and sustained dissemination and availability of these data to stakeholders that include scientists, natural resource managers, and the public. Axiom Data Science serves as the technical manager of the AOOS data management system, focused on developing scalable cyberinfrastructure that can be leveraged across a variety of users. Together, AOOS and Axiom will provide access to the existing AOOS cyberinfrastructure as well as a myriad of stakeholder networks for which information collected through the GWA and HRM Programs and these Non-Program projects will be disseminated.

B. Changes to Program Design and Objectives

If the project design has changed from your original proposal, please identify any substantive changes and the reason for the changes. Include any information on problems encountered with the research or methods, if any. This may include logistic or weather challenges, budget problems, personnel issues, etc. Please also include information as to how any problem has been or will be resolved. This may also include new insights or hypotheses that develop and prompt adjustment to the project.

During the last (2012-2016) and current (2017-2021) EVOSTC five-year funding cycles, the Alaska Ocean Observing System (AOOS) has provided data management services for both the "Long-Term Monitoring of Marine Conditions and Injured Resources and Services" Program, referred to as Gulf Watch Alaska (GWA), and the "Herring Research and Monitoring" (HRM) Program. These two programs leverage the existing data management capacity of AOOS, but also help inform and improve AOOS's overall role in serving data and information products that aid in the understanding of Alaska's marine ecosystem. The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) requires for all of its programs and funded projects a consistent and cohesive data management program that delivers tools covering the entire data lifecycle, from immediately after data collection, to long-term preservation, data discovery and reuse. Because of past EVOSTC investments in the AOOS Data Management team, the AOOS team and infrastructure are best situated to provide data services to the EVOSTC for both GWA and HRM Programs and the additional Non-Program projects to maintain continuity and build upon the ongoing efforts and data management system development.

AOOS currently delivers data management services under the EVOSTC program entitled Data Management Program to support the GWA and HRM Programs facilitate the access and curation of data. In a July 9, 2019 communication, the EVOSTC expressed interest in adding Non-Program projects to the suite of data resources managed under the Data Management Program. These projects, still under consideration by the EVOSTC, are therefore being added to the Data Management workplan for FY20 and include an additional funding request that differs from the original proposal.

There will be no other changes to the Data Management Program design, other than to add data management services for these additional Non-Program projects. The new projects start in 2020 and span a 3- to 5-year period, which exceeds the current 5-year Data Management Program timeline. The current 5-year programs will be ending in FY21, whereas the new projects are expected to run through 2022 to 2024. The data management services for these project do not change much from year-to-year, with the exception of the initial year when new projects are being initiated (thus transferring, formatting, and documenting any associated legacy datasets) and in the final year when datasets are being curated for archive. Slight variation is seen between the project budgets relative to anticipated data volumes and data workflow across years. The additional costs for providing data services to these new projects is highest in year 2020 as a result, but estimates will be provided annually. The combined GWA, HRM and new project annual costs are now shown in the revised annual budget table in the Abstract of this FY20workplan.

4. PROGRAM PERSONNEL – CHANGES AND UPDATES

If there are any staffing changes to Primary Investigators or other senior personnel please provide CV's for any new personnel and describe their role on the project.

No staffing changes occurred in the first half of FY19. Ian Gill, Data Coordinator with Axiom Data Science, will be added to the data management team in FY20 to support creating and orienting PIs to their new Non-Program projects in the Research Workspace, creating data management plans, facilitating data management communications with PIs, and for assisting with formatting of the Non-Program legacy data submitted to the Research Workspace. A CV is included in Appendix 1.

PROGRAM BUDGET

A. Budget Forms (See GWA FY20 Budget Workbook)

Please see budget form compiled for the program.

Additional text as needed.

B. Changes from Original Project Program

If your FY20 funding request differs from your original proposal, provide a detailed list of the changes and discuss the reason for each change.

The FY20 funding request differs from the original proposal in relation to add newly-funded Non-Program projects to the services provided by this program. Details about these changes and costs estimates can be found in Sections 2.C and 4.B.

5. SOURCES OF ADDITIONAL PROGRAM FUNDING

Identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal. Please attach documentation from additional project funding sources which confirms and describes matching funds, including date(s) the matching funds are/will be authorized.

AOOS is making available one additional week of in-kind salary for Dr. Janzen (Operations Director, AOOS) bringing her commitment to the Data Management Program to 4 weeks in order to fulfill Program Lead duties under this award and to oversee program data integration activities into the AOOS data system. The value of Dr. Janzen's in-kind support (includes salary, benefits, fiscal sponsor fees) will be $14,358.50, with annual values of $2704.49 in FY17, $2785.62 FY18, $2869.19 FY19, $2955.27 FY20, and $3043.93 in FY21. This funding comes from the Alaska Ocean Observing System (AOOS) core program budget through NOAA NOS grant-NA16NOS0120027. A letter from the Executive Director of AOOS is attached to this report verifying this in-kind support for the Data Management Program.

6. FY17-19 PROGRAM PUBLICATIONS AND PRODUCTS

Products include publications (include in prep and in review), published and updated datasets, presentations, and outreach starting in FY17-FY19.

Publications

n/a

Published and updated datasets

Datasets generated by GWA and HRM programs from 2012 to 2016 that are stored in the Research Workspace and made publicly available in the Gulf of Alaska Data Portal and replicated and published in the DataONE repository with a digital object identifier (DOI) for long-term preservation. Final 2017 datasets are available in the Gulf of Alaska Data Portal. Final 2018 datasets will be made available to the Gulf of Alaska Data Portal at the end of FY19 (January 31, 2019).

Table 6. A summary of the 2017 finalized data and provisional 2018 and 2019 data from GWA and HRMs programs available through the Research Workspace and the Gulf of Alaska Data Portal as of 15 August 2019. The numeric codes "2" : Obligation to publish data has been met; "1" : Obligation to share data to Workspace has been met; "0.5" : Obligation to share data has been partially met; "0" : No data from this season was shared for the project; "n/a" : The project was not funded during this season; "P": process study with data not expected until end of project. Note that 2018 data are not required to be published until 31 January 2020

Program	Project	Dataset	2017	2018	2019	Comments
GWA	Environmental drivers: Continuous Plankton Recorders	Plankton data	2	1	0	
		Temperature data	2	1	0	
GWA	Environmental drivers: Gulf of Alaska Mooring (GAK1)	CTD data	2	0	0	
		Mooring data	2	2	0	
GWA	Environmental Drivers: Oceanographic Conditions in Prince William Sound	Chlorophyll data	2	1	0	
		CTD data	2	1	0	
		Zooplankton data	2	0.5	0	
GWA	Environmental Drivers: Oceanographic monitoring in Cook Inlet and Kachemak Bay	CTD data	2	1	0.5	
		KBNERR meteorological data	2	0.5	0	data undergoing NERRS quality review
		KBNERR nutrient data	2	0.5	0	data undergoing NERRS quality review
		KBNERR water quality data	2	0.5	0	
		Zooplankton data	2	0	0	2018 zooplankton data still being processed
GWA	Environmental Drivers: Seward Line	Chlorophyll data	2	1	0	
		CTD data	2	1	0	
		Nutrient data	2	1	0	
		Seabird data (Kuletz)	2	1	0	
		Zooplankton data	2	0	0	2018 zooplankton data still being processed
GWA	Nearshore: Ecological trends in Kachemak Bay	Rocky intertidal community data	2	1	0	
		Mussel data	2	1	0	
		Rocky intertidal data	2	1	0	
		Substrate data	2	1	0	
		Seagrass data	2	1	0	
GWA	Nearshore: Intertidal Systems in Gulf of Alaska	Oystercatcher diet & nest density data	2	1	0	
		Eelgrass data	2	n/a	n/a	This dataset was not collected after 2017.
		Invertebrate and algae data	2	1	0	
		Marine birds and mammal data	2	1	0	
		Water quality data	2	1	0	
		Sea otter survey data	2	1	0	
		Sea otter scat data	2	1	0	

GWA	Pelagic: Fall and Winter seabird abundance	Seabird survey data	2	1	0	
GWA	Pelagic: Forage fish distribution, abundance, and body condition	Forage fish count data	2	2	0	
		Forage fish morph data	2	2	0	
		Seabird diet data	2	2	0	
		Hydroacoustic data	2	2	0	
		Water chemistry (CTD & nutrients) data	2	2	0	
		Zooplankton data	2	0	0	2018 zooplankton data still being processed
GWA	Pelagic: Humpback whale predation on herring	Fluke id catalog	2	1	0	
		Energetic/stable isotope data	2	2	0	
		Whale survey data	2	2	0	
		Porpoise survey data	2	2	0	
		CTD data	2	2	0	
GWA	Pelagic: Long-term killer whale monitoring	Acoustic catalog	2	1	0	
		Photo catalog	2	1	0	
		Biopsy data	n/a	n/a	0	No biopsy data was collected in 2017 or 2018
		Orca genetic sampling	1	.5	0	Data in the Workspace, but is not ready for publication.
		Prey genetic sampling	1	0	0	Data in the Workspace but is not ready for publication.
		Orca database	0	0	0	Delayed - expected Summer 2019.
GWA	Pelagic: Prince William Sound Marine Birds	Summer bird survey data	n/a	0	0	no surveys conducted in 2017
Herring	ADFG Surveys: surveys and age, sex, and size collection	aerial biomass observation & routes data	2	1	0	
		aerial survey marine bird & mammal observations data	2	1	0	
		ASL data	1	1	0	ASL re-reads in progress for 2014-17
Herring	Adult acoustic biomass surveys	raw acoustic data	2	1	0	
		processed acoustic data	2	1	0	
		biomass summary	2	2	0	
Herring	Aerial surveys of juvenile herring	raw survey data	2	2	2	
		age 1 index	2	2	2	
Herring	Herring disease program	prevalence summary	1	1	0	
		raw lab data	1	1	0	P
Herring	Modeling and stock assessment of herring population dynamics in Prince William Sound	age composition	2	2	0	
		model codebase	2	2	0	
		output data	2	2	0	
Herring	Studies of reproductive maturity	lab analysis (weight, length, gonad) database	1	1	0	P
		collection database	1	1	0	P
		scales database	1	1	0	P
		histology database	1	1	0	P
Herring	Annual herring migration cycle	collected fish data	1	1	0	P

Table 7. Summary statistics of data submissions by 15 August 2019 (19 projects composing 58 datasets). PIs have until December 1, 2018 to submit 2017 data to the Research Workspace, and December 1, 2019 to submit 2018 data. Some datasets are routinely delayed due to longer sample processing times, data processing times, and late-in-the-year or delayed sampling schedules. Datasets that were not collected in a given year are not included in the metrics below. 'Process' datasets do not have an obligation to publish annually to the Gulf of Alaska Data Portal and are excluded from the percentages. Current year 2019 is not included in this update.

Data Submission Metrics	**2016**	**2017**	**2018**
Obligation to shared datasets in the RW, % complete	100%	98%	86%
Obligation to published through the GOA portal, % complete	100%	91%	28%

Presentations

Buckelew, S. 2017. Research Workspace: Organization and navigation. Oral presentation. 2017 Herring Program PI Meeting, Cordova, AK. 16 November 2017.

Buckelew, S., Gill, I., and Turner, C. 2017. Metadata 411. Metadata Workshop. 2018 Alaska Marine Science Symposium, Anchorage, AK. 22-26 January 2017.

Buckelew, S. 2018. Data management update. Oral presentation. Gulf Watch Alaska Program meeting. 2018 Alaska Marine Science Symposium, Anchorage, AK. 23 January 2018.

Buckelew, S., Turner, C., and Janzen, C. 2018. Data management update for the Gulf Watch Alaska Program. Oral presentation. 2018 Herring Program PI Meeting, Anchorage, AK. 14 November 2018.

Buckelew, S., Turner, C., and Janzen, C. 2018. Data management update for the Gulf Watch Alaska Program. Oral presentation. 2018 Gulf Watch Alaska Program PI Meeting, Anchorage, AK. 15 November 2018.

Buckelew, S., Gill, I., and Turner, C. 2019. Metadata 411. Metadata Workshop. 2019 Alaska Marine Science Symposium, Anchorage, AK. 30 January 2019.

Gill, I., Turner, C. and Wilson, M. 2019. Metadata Office Hours. Metadata Technical Support Session. 2019 Alaska Marine Science Symposium, Anchorage, AK. 31 January 2019.

Janzen, C., Buckelew, S., Turner, C. 2017. EVOS TC 2017-18 Data Management Program. Oral presentation. 2017 EVOS Trustee Council Meeting

Janzen, C., Buckelew, S. 2018. EVOSTC 2018-19 Data Management Program for GWA and HRM. Oral presentation. EVOSTC Meeting, Anchorage, AK. 17 October 2018.

Koeppen W., and Suryan, R. 2017. Demonstration of Jupyter Notebooks in the Research Workspace. Live demonstration. 2017 Gulf Watch Alaska Program PI Meeting, Cordova, AK. 15-17 November.

Koeppen, W. 2018. Jupyter Notebooks for Reproducible Workflows. Oral presentation. 2018 Gulf Watch Alaska Program PI Meeting, Anchorage, AK. 15 November 2018.

Turner, C., and Janzen, C. 2017. Data management update for the Gulf Watch Alaska Program. Oral presentation. 2017 Gulf Watch Alaska Program PI Meeting, Cordova, AK. 15-17 November.

Turner, C., and Janzen, C. 2017. Data management update for the Herring Program. Oral presentation. 2017 Herring Program PI Meeting, Cordova, AK. 16 November.

Koeppen, W. 2019. Jupyter Notebooks Boot Camp. Technical Workshop. 2019 Alaska Marine Science Symposium, Anchorage, AK. 29 January 2019.

Outreach n/a

LITERATURE CITED n/a

Response to EVOS Trustee Council and Science Panel FY17 Proposal Comments 9/10/2019

20120113 Data Management for Programs and Projects

Science Panel Comments

The Science Panel appreciates the data management program services that this program provides. The Panel agrees with the Science Coordinator on the value of having all data from TC-funded science projects managed by this program and would like more information regarding the costs.

The Data Management team appreciates the EVOSTC and Science Panel taking the time to share their positive impressions of this proposal, and for commending our efforts to improve the data management services provided in the previous five-year effort. Information related to the costs is provided in the below response to the Science Coordinator comments.

Science Coordinator Comments

The Data Management Team continues to provide valuable support to the programs for seamless uploading and sharing of data with PIs and making data publicly available. I appreciate the well-organized proposal, including details of all FY19 program accomplishments. The program is requesting an additional $71.7K for data management services for up to six non-program projects for FY20. The program is already managing data for the Gulf Watch Alaska and Herring Research and Monitoring programs. Data Management oversight of all TC-funded projects will ensure that data from all TC-funded science projects are consistently maintained, archived and made publicly available through AOOS and DataOne data portals. This will also help facilitate integration between all TC-funded program and non-program projects. However, I have requested the PI provide more detail as to why the cost is slightly higher per project for up to six non-program projects of FY20.

The PI for the Data Management Program is not requesting additional hours for program management of the Non-Program projects. The individual project data management services provided by Axiom for these projects do not change much from year-to-year, with the exception of the first year when the new projects are being initiated (thus transferring, formatting, and documenting any associated legacy datasets), and in the final year (when datasets are being curated for archive). Some projects will also require additional time to onboard funded PIs to the Research Workspace, entrain them to the data management procedures consistently used across EVOSTC programs, and to familiarize them with metadata tool and best practices for authoring preservation-

quality documentation in the first year. The 19110853 Pigeon Guillemot Restoration project will require curation of five or more prior years of data in order to update population statuses and trends. Thus, at the project onset, some historical data salvage effort will be necessary to consolidate, organize, standardize, format, and author standards-compliant metadata. The level of work for curating historical data requires effort beyond the routine annual data management workflow. Slight variation between projects on annual budgets are based on the project budgets provided us relative to anticipated data volumes and data workflow across years. The additional costs for providing data services to these new projects is highest in year 2020 as a result. Costs are also a little higher than middle-years during the last year of a project.

The data management services cost under the Axiom Data Science FY17-21 subaward alone for the Gulf Watch Alaska and Herring Research and Monitoring Programs is approximately $182,000 per year ($910,000 total across the 5 years, not including AOOS/ASLC charges or the 9% GA).

- In the FY17-21 work plan for restoration, research and monitoring project draft by the EVOSTC in FY19, there are seven projects generating data in the HRM program and 11 in the GWA program for 18 total projects.
- On average, the data management service cost per project over the lifetime of the 5-year program is $10,111 per year.

For the expanded data management services, the cost estimate provided in the FY20 workplan for the Axiom Data Science subaward is indeed highest in the first year at $63,000 for six projects (not including the AOOS/ASLC PI and contractual charges or the 9% GA). On average, the data management services cost under Axiom per project in FY2020 alone is $10,500 (6), which is slightly higher than the GWA and HRM project year average of $10,111. FY2020 is the first year for all the Non-Program projects, afterwhich the cost goes down for the next two years, increasing again near the end as needed for data curation and preparation for final archival. Assuming all projects are funded, the six projects total $246,000 over the next 5 years (not including the AOOS portion nor the 9% GA). Please see Tables 3 and 4 in the Workplan for more details.

Comparing the average annual cost per project per year normalizes the variable costs from year to year and the period of the programs (3 to 5 years).

Name	Total Proposed Cost	Total Number of Funded Projects	Total Project Years*	Average Project Cost
HRM & GWA Programs	$910,000	18	90	$10,111
Non-program projects	$246,000	6	25	$9,840

The GWA & HRM projects are anticipated to each be funded over a 5-year duration, as per the FY17-21 workplans. Therefore, the total project years is 18 project * 5 years = 90 project years. The duration of the non-program projects varied across projects from 3 to 5 years. 3 projects proposed a 5-year duration (15), 1 project proposed a 4-year duration (4), and 2 projects proposed a 3-year duration (6), which equals 25 project years.

Over the entire lifecycle of the proposal non-program projects, the average per project per year cost is $9,840, which is on par with the average GWA and HRM program project cost per year of $10,111. The actual data management service cost for the non-program projects will depend on the actual number of projects that are recommended for funding by the Science Panel.

Appendix 1.

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Ian Gill
Data Coordinator, Axiom Data Science, LLC
Phone: 907.305.1225; Email: ian@axiomdatascience.com

Professional Qualifications
University of Arizona, Tucson, AZ; Creative Writing, B.A., 1999
University of Alaska Southeast, Juneau, AK; Teaching, M.A., 2005
Western Washington University, Bellingham, WA; Environmental Science, M.S., 2011

Appointments

2016–Present	Data Coordinator, Axiom Data Science, Anchorage, AK
2014–2016	Science Editor, Alaska Department of Fish & Game, Anchorage, AK
2012–2014	Habitat Biologist, Alaska Department of Fish and Game, Anchorage, AK
2011–2012	Instructor, University of Alaska, Anchorage, AK
2009–2011	Graduate Researcher, Western Washington University, Bellingham, WA
2007–2009	Wildlife Technician, Alaska Department of Fish & Game, Anchorage, AK
2005–2007	Teacher, Sitka School District, Sitka, AK
2000–2004	Biological Technician, U.S. Forest Service, Wrangell, AK

Products and Publications
Bochenek, R., Foster, D., Martin, R., et al. (2017). The Research Workspace, a product of The ResearchWorkspace.com Corporation. https://researchworkspace.com

Gill, I.D., and J.M. Helfield. (2012). Alternative foraging strategies among bears fishing for salmon: a test of the dominance hypothesis. *Canadian Journal of Zoology* 90: 766-775.

Synergistic Activities
2016–Present As a Data Coordinator at Axiom Data Science, assist scientists in storing, managing, and sharing their data writing discoverable metadata. Develop and edit help documentation for cloud-based research and analysis software, the Research Workspace. Conduct one-on-one and small group tutorials with researchers teaching best practices for data management. Lead workshop on documenting scientific models for publication at Alaska Marine Science Symposium. Review and generate ISO-compliant metadata records. Assist with technical documentation.

2014–2016 As a Science Editor at the Alaska Department of Fish & Game, collaborate with biologists and editors statewide to produce timely, scientifically-sound reports online and in print. Communicate complex and highly detailed publication standards to authors with varying backgrounds and technical skills. Coordinate internal peer reviews and oversee the editorial review and publication of approximately 250 reports annually.

2012–2014 As a Habitat Biologist at the Alaska Department of Fish and Game, coordinate diverse stakeholder input to develop management plans for 3.2 million acres of state-managed refuges, sanctuaries, and critical habitat areas. Conduct ecological background research for resource inventories. Lead public scoping and outreach efforts. Foster collaborative relationships with other agencies and organizations. Draft regulatory language.

2011–2012 As an Instructor in the College Preparatory & Developmental Studies Department at the University of Alaska, Anchorage, taught English as a Second Language courses to students of diverse backgrounds. Developed and adapted curriculum. Explained complex grammatical topics clearly to foster student understanding. Tracked progress of individual students and provided constructive feedback. Created a safe and welcoming learning environment.

2009–2011 As a Graduate Researcher and Teaching Assistant at Western Washington University, conducted original research on bear-salmon predation dynamics. Developed a statistical model to predict the impact of intensive predation by bears on salmon populations. Assisted in the instruction of advanced undergraduate courses in environmental science, including courses on biostatistics, environmental impact surveys, and freshwater ecology.

2007–2009 As a Wildlife Technician for the Alaska Department of Fish & Game During, served as member of three-person field crew at the McNeil River State Game Sanctuary. Assisted in collecting data on bear demographics and abundance. Guided groups of visitors to view the largest known seasonal congregation of brown bears in the world. Assisted in the upkeep and maintenance of a remote field camp.

2005–2006 As a Teacher with the Sitka School District, served in several capacities at schools throughout the district to facilitate student achievement and growth, including coach, secondary Language Arts teacher, and guidance counselor. Developed curriculum. Delivered lessons. Conducted tutoring for individuals and small groups. Contributed to a safe and welcoming learning environment.

2000–2004 As a Forestry Technician for the U. S. Forest Service, served as a member of a four-person crew at the Anan Creek Wildlife Observatory. Assisted in collecting data on bear behavior and abundance. Supervised up to 60 visitors at a remote wildlife viewing facility in close proximity to black and brown bears. Trained new staff in human-bear interactions. Assisted in the upkeep and maintenance of a remote float camp.