August 24, 2016

Elise Hsieh, Executive Director
Exxon Valdez Oil Spill Trustee Council
4210 University Drive
Anchorage, AK 99508-4626

Dear Elise:

Final FY 2017-2021 Proposal Submittal for Long-term Monitoring

17120114-L. The Seward Line – Marine Ecosystem monitoring in the Northern Gulf of Alaska

Gulf Watch Alaska, the long-term monitoring program of the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC), has finalized our program and project proposals for fiscal years 2017-2021 funding based on comments received from EVOSTC's Science Panel on May 19, 2016. Below is the final budget summary and response to Science Panel comments for the Seward Line project.

EVOSTC Funding Requested *(including 9% GA)*

FY17	FY18	FY19	FY20	FY21	TOTAL
$132,700	$136,100	$139,500	$143,000	$146,600	$697,900

Non-EVOSTC Funding Available

FY17	FY18	FY19	FY20	FY21	TOTAL
$297,000	$311,000	$314,800	$319,000	$323,500	$1,565,300

Science Panel comments: *The Science Panel notes that this transect of moorings has value as professed in the proposal for purposes of assessing long-term environmental forcing of the base of the pelagic food chains.*

PI Response:

- Thank you for the comment.

  Based on two Science Panel comments: 1) Project costs for 17120114-J Oceanographic Monitoring in Cook Inlet and Kachemak Bay seemed high and 2) the value of additional nutrient monitoring within the Alaska Coastal Current (2014 Science Synthesis Workshop), we have revised this project's proposal to include additional sampling at GAK-1, RES2.5 on the Seward Line, and a more nearshore location to be determined. We proposed to take advantage of day-cruises already proposed by the GAK-1 project, adding a few hours of additional sampling to those cruises to collect nutrients, chlorophyll, and zooplankton. This will result in the Seward Line's end-members (GAK-1 and RES2.5) being sampled with more similar temporal coverage to that now occurring within Kachemak Bay and Prince William Sound, and with a comparable spectrum of chemical and biological measurements accompanying its current physical oceanographic profiles. Funds have been moved laterally within the Environmental Drivers component, from Project 17120114-J Oceanographic Monitoring in Cook Inlet and Kachemak Bay to 17120114-L Seward Line, to support these changes.

Sincerely,

Mandy Lindeberg
Gulf Watch Alaska Program Lead designate

Attachment: Gulf Watch Alaska: Environmental Drivers Component Project Proposal: 17120114-I—The Seward Line – Marine Ecosystem monitoring in the Northern Gulf of Alaska

EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
PROGRAM PROJECT PROPOSAL SUMMARY PAGE

Project Title

Gulf Watch Alaska: Environmental Drivers Project:

17120114-L—The Seward Line – Marine Ecosystem monitoring in the Northern Gulf of Alaska

Primary Investigator(s) and Affiliation(s)

Russell R Hopcroft, Principal Investigator, University of Alaska Fairbanks

Seth L Danielson, University of Alaska Fairbanks

Kenneth O. Coyle, University of Alaska Fairbanks

Date Proposal Submitted

24 August 2016

Project Abstract

Long times-series are required for scientists to tease out pattern and causation in the presence of substantial year-to-year variability. For the 5-year period beginning in 2017, we propose continued multi-disciplinary oceanographic observations begun in fall 1997 in the northern Gulf of Alaska. Cruises occur in early May and early September to capture the typical spring bloom and summer conditions, respectively, along a 150-mile cross shelf transect to the south of Seward, Alaska. The line is augmented by stations in the entrances and deep passages of Prince William Sound. We determine the physical-chemical structure, the distribution and abundance of phytoplankton, microzooplankton, and mesozooplankton, and survey seabirds and marine mammals. These observations enable descriptions of the seasonal and inter-annual variations of this ecosystem. Our goal is to characterize and understand how different climatic conditions influence the biological conditions across these domains within each year, and what may be anticipated under future climate scenarios.

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

FY17	FY18	FY19	FY20	FY21	TOTAL
$132.7	$136.1	$139.5	$143.0	$146.6	$697.9

Non-EVOSTC Funding Available

FY17	FY18	FY19	FY20	FY21	TOTAL
$297.0	$311.0	$314.8	*$319.0**	*$323.5**	$1,565.3

* anticipated funding following current 5-year grant

1. Executive Summary

We live in a constantly changing world, influenced by a combination of stochastic events, natural cycles, longer-term oscillations, and the accelerating impact of human activities. Once thought to house relatively stable ecosystems, the oceans are now known to fluctuate between multiple states or "regimes" apparently coupled to major climatic shifts such as the Pacific Decadal Oscillation (PDO). This knowledge derived initially from long-term and global views of physical changes in the ocean and atmosphere, but most importantly from long-term biological observations that demonstrate the impact of "regime shifts" (Francis & Hare 1994, Manuta *et al.* 1997). Such regime shifts may be common (Hare & Mantua 2000), and we are beginning to identify the mechanisms by which these physical changes impact ecosystems (McGowan *et al.* 1998, Beaugrand 2004).

Our understanding of community level changes would not be possible without long-term observation programs (LTOPs), whose value is becoming increasingly apparent as our understanding of ecosystem change and its drivers becomes more sophisticated. Biological time-series such as the North Atlantic CPR (Beaugrand 2004), the North Pacific CalCOFI (McGowan *et al.* 1998), Station/Line P (Mackas *et al.* 2004), and the younger CPR program (Batten & Freeland 2007) in the subarctic Pacific are proving invaluable at documenting regime shift-related changes in species distributions (Beaugrand & Reid 2003) and timing of life histories (Mackas *et al.* 1998). The 1976 Pacific Decadal Oscillation (PDO; Mantua et al. 1997) triggered an ecological regime shift by pushing the Northern Gulf of Alaska (GOA) over a tipping point, resulting in a change from a shrimp-dominated fishery to one dominated by pollock, salmon and halibut (Anderson & Piatt 1999). The PDO and the second mode of North Pacific variability as expressed by the North Pacific Gyre Oscillation (NPGO; Di Lorenzo et al. 2008) are dominant extremes among a continuum of Pacific-wide patterns of oceanic variability. Dominated by a strong seasonal cycle (Waite & Mueter 2013), the GOA ecosystem does not respond in a currently predictable way to intermittent basin-scale events such as El Niño or to longer-term regime shifts such as the PDO (Stabeno et al. 2004), perhaps because the ecosystem is highly adapted to great variability. Nonetheless, it is profoundly affected by warmer years, fresher years, and light conditions in spring, that influence the timing of planktonic processes, but not necessarily their ultimate abundance or biomass (Figure 1). In contrast, temperature is much less variable during late summer, although biological communities continue to show high variability, including increased prevalence of southern species during warmer years. Furthermore, our observations suggest that the recent North Pacific warm-water anomalies impacted rates of *Neocalanus* lipid accumulation and their overwintering health. Understanding how complex pelagic ecosystems work, and how they might be affected by climate change, was the fundamental goal of the Global Ocean Ecosystems Dynamics (GLOBEC) program that occupied the Seward Line from 1997 to 2004. The core questions and related hypotheses can only be addressed by an observational program of sufficient length to encompass long-term (decadal-scale) change and repeated observations of disturbance at different temporal and spatial scales. These observations will allow us to elucidate

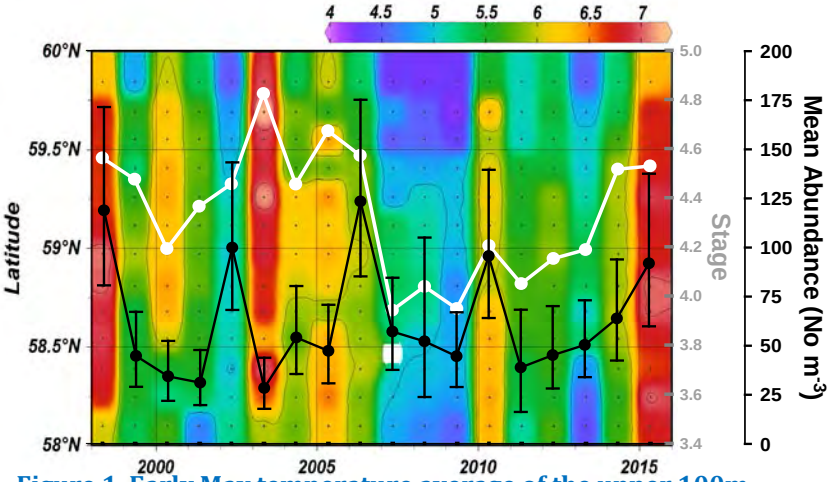

Figure 1. Early May temperature average of the upper 100m along the Seward Line, with abundance (black) and mean stage (white) of *Neocalanus* spp.

the mechanisms underlying adaptation, resilience, diversity and potential tipping points (e.g., Beaugrand et al. 2010, Wiltshire et al. 2008).

Our proposed research will continue long-term multi-disciplinary oceanographic sampling in the GOA, to provide insights into ongoing ecosystem changes in the North Pacific.

Specifically, cruises:

1. Determine thermohaline, velocity, and nutrient structure of the GOA shelf, emphasizing the Seward Line, and Prince William Sound (PWS).
2. Determine the state of carbonate chemistry (i.e., Ocean acidification – Alaska Ocean Observing System [AOOS] funded)
3. Determine the patterns of macronutrient availability across the sampling domain
4. Determine phytoplankton biomass distribution (as chlorophyll)
5. Determine composition and biomass of phytoplankton and microzooplankton (North Pacific Research Board [NPRB] funded).
6. Determine the distribution, abundance and taxonomic composition of zooplankton.
7. Determine the distribution and abundance of seabirds and marine mammals (NPRB funded).

Hypotheses

- ***Climate variations propagate through changes in physical and chemical oceanography, impacting the biological communities in the Gulf of Alaska in terms of composition, magnitude and phenology***
- ***Cross-shelf zonation arises from gradients in the availability of nutrients as well as mixing energy, and is associated with significant gradients in the composition and biomass of phyto-, micro- and mesozooplankton; these in turn result in cross-shelf gradients in seabird communities.***
- ***Standing stocks of plankton communities along the Seward Line, and within PWS, provide useful indices of favorable conditions for higher trophic levels such as fish and seabirds.***

2. Relevance to the Invitation for Proposals

Our proposed research will continue the long-term multi-disciplinary oceanographic sampling program in the Gulf of Alaska. Given the potential for profound climatic impact, the Seward Line Long-term Observation Program (http://www.sfos.uaf.edu/sewardline/) provides these critical observations on the current state of the Northern Gulf of Alaska ecosystem. The work seeks to build a clearer understanding of the dynamics of the North Pacific ecosystems that enables effective long-term management and sustainable use of marine resources through the long-term multidisciplinary monitoring of marine environment.

The Seward Line represents the most comprehensive long-term multidisciplinary sampling program in the coastal GOA; it provides observation of changes in the oceanography of this region that is critical to Alaska's fisheries, subsistence and tourist economies. Seward Line observations over the past 18 years have fundamentally revised our understanding of the coastal GOA ecosystem and allow us an appreciation of not only its major properties, but also their inter-annual variability. It is also essential that time-series are already in place when unforeseen events occur, either due to human activities (e.g., oil spills) or natural

events such as the recent North Pacific Warming and current El Niño. Recent warm years have shown an influx of California Current System zooplankton, several of which have not been previously observed in these waters; these may be previews of changes that will occur in a future warmer Gulf of Alaska.

To date, the Seward Line has shown that the quantity and composition of both late spring and summer zooplankton, appear to be significantly correlated with PWS hatchery pink salmon survival in this region (Mundy et al. 2010, Doubleday & Hopcroft 2015). Thus, springtime abundance of zooplankton along the Seward Line appears to be an index of generally favorable years for higher trophic levels throughout the GOA. The recent Gulf of Alaska Integrated Ecosystem Research Program, for which the Seward Line provides an oceanographic foundation, is exploring broader regional patterns as well as looking for relationships between oceanography and other species of forage and commercial fish.

3. Project Personnel

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Please see 2 page CVs at end of this document

4. Project Design

A. Objectives

The scientific purpose of this project is to develop an understanding of the response of this marine ecosystem to climate variability, and provide baselines against which to access any other anthropogenic influences on the GOA ecosystem. Toward this end, the Seward Line cruises on the GOA shelf determine the physical-chemical structure, primary production and the distribution and abundance of zooplankton, along with their seasonal and inter-annual variations. Some of the data are compared with historical data sets whereas other data sets are a product of this continuing systematic sampling effort on this shelf.

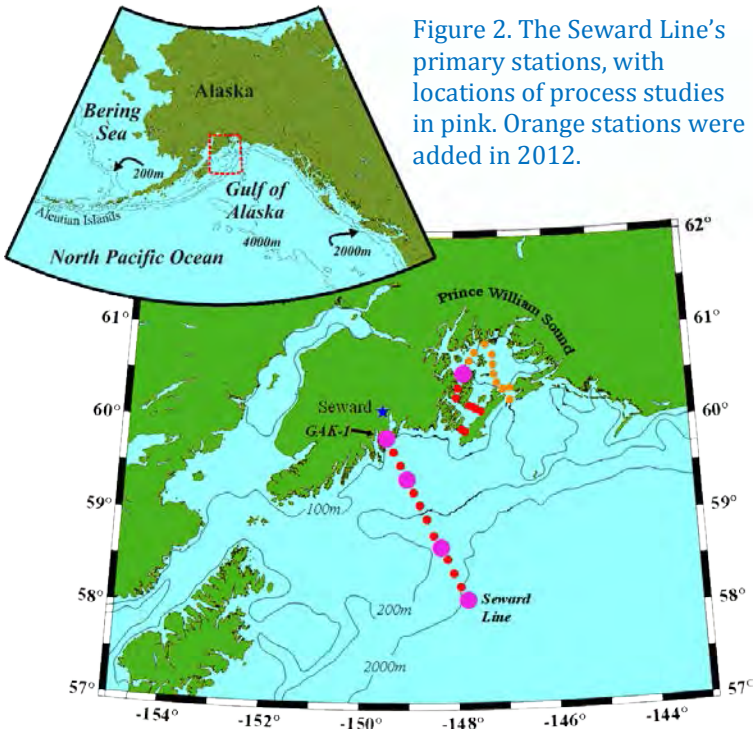

Figure 2. The Seward Line's primary stations, with locations of process studies in pink. Orange stations were added in 2012.

Specifically, cruises:

1. Determine thermohaline, velocity, and nutrient structure of the GOA shelf, emphasizing the Seward Line, and PWS stations (Figure 2).
2. Determine the state of carbonate chemistry (i.e., Ocean acidification – AOOS funded)
3. Determine the patterns of macronutrient availability across the sampling domain
4. Determine phytoplankton biomass distribution (as chlorophyll)
5. Determine composition and biomass of phytoplankton and microzooplankton (NPRB funded).
6. Determine the distribution, abundance and taxonomic composition of zooplankton.
7. Determine the distribution and abundance of seabirds and marine mammals (NPRB funded).

B. Procedural and Scientific Methods

The Seward Line stretches across the GOA Shelf approximately 150 miles, and is augmented by over a dozen stations in PWS. Our cruises capture the major spring-late summer gradient in this seasonality, while retaining a focus on important periods for the life cycles of various zooplankton species. It consists of two cruises each year. The early May period was selected to capture the peak productivity associated with the spring bloom. The consistent timing of the May cruise has allowed us to look at phenological shifts in the large *Neocalanus* copepods that dominate the spring. The September cruise coincides with the end of the low productivity oceanographic summer, when smaller phyto- and zooplankton dominate, and precedes the stormy fall overturn. Using the U.S. Fish and Wildlife Service (USFWS) vessel *Tiglax*, these cruises collect data on the physical-chemical structure, algal biomass, and the distribution, abundance, biomass

and productivity of micro- and mesozooplankton. Together, the spring and fall cruises enable us to explore seasonal and inter-annual variations, as we seek to understand how different climatic conditions influence the biological conditions in each year. It provides a reference dataset against which other Gulf Watch Alaska components can index basic environmental conditions.

Methods remain as employed for the past 5-20 years, with details provided on the Gulf Watch Alaska Ocean Workspace (Program Management > Sampling Protocols > Revise Protocols). In brief, physical parameters are measured with a Seabird CTD (Janout et al. 2010). Water samples are collected at up to 12 depths per station with a CTD rosette, then analyzed for nutrient (Childers et al. 2005) and carbonate chemistry (Evans & Mathis 2013). Samples for chlorophyll, phytoplankton and microzooplankton are removed from a subset of the same bottles (Strom et al 2007a,b). Zooplankton are collected to 100 m depth with two types of plankton nets: a vertically-hauled 150-µm net CalVet during daytime that targets the smaller and most numerous animals, and an obliquely-towed 505-µm Multinet during nighttime that targets larger and more mobile animals (Coyle & Pinchuk 2003, 2005). Seabird and marine mammal observations are made from the flying bridge using strip-transect methodology (USFWS 2008) on all daytime transits between stations.

Beginning this 5-year cycle, we propose to add additional chemical and biological observations to 6 of the monthly day-trip CTD casts presently ongoing at GAK-1, as well as to the RES2.5 station (centrally located in Resurrection Bay and sampled during Seward Line cruises) and a third station selected by the Nearshore component project. Sampling with be conducted with an SBE-25 CTD and 12-bottle SBE-32SC rosette at depth. Macronutrients and chlorophyll with be collected from the bottles at depths consistent with the Seward Line cruises, filtered and frozen for later analysis. Zooplankton will be sampled at these stations with the same 150 µm nets employed by Seward Line cruises, and analyzed following established protocols.

C. Data Analysis and Statistical Methods

Physical and chemical datasets are examined for trends, often after reducing them to anomalies and variances calculated over the observation period. Biological data sets are also examined for species trends, while community analyses often consider similarity coefficients and use nonparametric multi-dimensional scaling (nMDS) to look for patterns across space and time, and relate these to associated meteorological, physical and biological parameters (Clarke et al. 2014).

D. Description of Study Area

The main Seward Line (Figure 2) consists of 15 stations stretched from Resurrection Bay (~60°N 149.5°W) 150 nm across the shelf to deep offshore waters (to 57.8°N 147.5°W), and includes an equal number of stations within the main passages and entrances to PWS, plus 2 tidewater glaciers (59.9-61°N 146.75-148.25°W).

5. Coordination and Collaboration

WITHIN THE PROGRAM

This project links tightly with the GAK-1 mooring, providing a cross shelf context for its observations. It complements the continuous plankton recorder, PWS, and Lower Cook Inlet/Kachemak Bay long-term monitoring efforts by providing more detailed oceanographic evaluation of the Gulf of Alaska shelf and the major passages in PWS than is provided by the other programs. These components overlap relatively little in their sampling locations — enough to ensure comparability between datasets, but not enough to be duplicative and wasteful of resources. The addition of monthly sampling in Resurrection Bay aligns sampling periodicity with other Environmental Driver component projects.

Hopcroft has served on the Gulf Watch Alaska Science Coordinating Committee since its inception, with Danielson now also involved, ensuring all components are linked to environmental drivers that assess oceanographic change in the region. The additional monthly sampling in Resurrection Bay and at GAK-1 provide oceanographic context for Nearshore component project activities underway within Resurrection Bay.

WITH OTHER EVOSTC-FUNDED PROGRAMS AND PROJECTS

The Seward Line makes physical and biological data available to the Herring Research and Monitoring program.

WITH TRUSTEE AND MANAGEMENT AGENCIES

Like other Environmental Driver components, Seward Line data is available to the Alaska Department of Fish and Game for salmon forecasting, and provided to the National Oceanographic and Atmospheric Administration for their GOA Ecosystem Status reports.

WITH NATIVE AND LOCAL COMMUNITIES

Seward Line status is presented annually at the Alaska Marine Science Symposium which is well-attended by residents of the coastal GOA. A seminar will be presented annually at a selected coastal community in the GOA.

6. Schedule

PROJECT MILESTONES

Project Milestones (Table 1) essentially revolve around the execution of cruises each May and September and the delivery of data. Dependent on the type of data, delivery occurs within 6 months to 1 year of collection. Other milestones include the annual principal investigators meeting and presentation of results at the Alaska Marine Science Symposium.

Table 1. Schedule of Measurable Program Tasks

Task	FY17				FY18				FY19				FY20				FY21			
	Quarter (EVOSTC FY beginning Feb. 1)																			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Cruises																				
May survey		X				X				X				X				X		
Sept survey			X				X				X				X				X	
Data delivery	X			X	X			X	X			X	X			X	X			X
Task 3 Reporting																				
Annual reports	X				X				X				X				X			
Annual PI meeting				X				X				X				X				X
FY work plan (DPD)			X				X				X				X					

MEASURABLE PROJECT TASKS

FY 2017 (Year 6)

FY17, 1st quarter (February 1, 2017 - April 30, 2017)
February: *Annual reports submitted (first 5-year program)*
April: *Daytrip-cruise (Little Dipper)*

FY17, 2nd quarter (May 1, 2017 - July 31, 2017)
May: *Sampling cruise (R/V Tiglax)*
June and July: *Daytrip-cruise (Little Dipper)*

FY17, 3rd quarter (August 1 2017 - October 31, 2017)
August: *Daytrip-cruise (Little Dipper)*
September: *Sampling cruise (R/V Tiglax)*
October: *Daytrip-cruise (Little Dipper)*

FY17, 4th quarter (November 1, 2017 - January 31, 2018)
November: *Annual PI meeting*
December: *Daytrip-cruise (Little Dipper); most sample processing completed for cruises through May, preliminary data available for summer and fall cruises*
January: *Results presented at AMSS*

FY 2018 (Year 7)

FY18, 1st quarter (February 1, 2018 - April 30, 2018)
February: *Annual reports submitted*
April: *Daytrip-cruise (Little Dipper)*

FY18, 2nd quarter (May 1, 2018 - July 31, 2018)
May: *Sampling cruise (R/V Tiglax)*
June and July: *Daytrip-cruise (Little Dipper)*

FY17, 3rd quarter (August 1 2018 - October 31, 2019)
August: *Daytrip-cruise (Little Dipper)*
September: *Sampling cruise (R/V Tiglax)*
October: *Daytrip-cruise (Little Dipper)*

FY18, 4th quarter (November 1, 2018 - January 31, 2019)
November: *Annual PI meeting*
December: *Daytrip-cruise (Little Dipper); most sample processing completed for cruises through May, preliminary data available for summer and fall cruises*
January: *Results presented at AMSS*

FY 2019 (Year 8)

FY19, 1st quarter (February 1, 2019 - April 30, 2019)
February: *Annual reports submitted*
April: *Daytrip-cruise (Little Dipper)*

FY19, 2nd quarter (May 1, 2019 - July 31, 2019)
May: *Sampling cruise (R/V Tiglax)*
June and July: *Daytrip-cruise (Little Dipper)*

FY19, 3rd quarter (August 1, 2019 - October 31, 2019)
August: *Daytrip-cruise (Little Dipper)*
September: *Sampling cruise (R/V Tiglax)*
October: *Daytrip-cruise (Little Dipper)*

FY19, 4th quarter (November 1, 2019 - January 31, 2020)
November: *Annual PI meeting*
December: *Daytrip-cruise (Little Dipper); most sample processing completed for cruises through May, preliminary data available for summer and fall cruises*
January: *Results presented at AMSS*

FY 2020 (Year 9)

FY20, 1st quarter (February 1, 2020 - April 30, 2020)
February: *Annual reports submitted*
April: *Daytrip-cruise (Little Dipper)*

FY20, 2nd quarter (May 1, 2020 - July 31, 2020)
May: *Sampling cruise (R/V Tiglax)*
June and July: *Daytrip-cruise (Little Dipper)*

FY20, 3rd quarter (August 1, 2020 - October 31, 2020)
August: *Daytrip-cruise (Little Dipper)*
September: *Sampling cruise (R/V Tiglax)*

October: *Daytrip-cruise (Little Dipper)*

FY20, 4th quarter (November 1, 2020 - January 31, 2021)
November: *Annual PI meeting*
December: *Daytrip-cruise (Little Dipper); most sample processing completed for cruises through May, preliminary data available for summer and fall cruises*
January: *Results presented at AMSS*

FY 2021 (Year 10)

FY21, 1st quarter (February 1, 2021 - April 30, 2021)
February: *Annual reports submitted*
April: *Daytrip-cruise (Little Dipper)*

FY21, 2nd quarter (May 1, 2021 - July 31, 2021)
May: *Sampling cruise (R/V Tiglax)*
June and July: *Daytrip-cruise (Little Dipper)*

FY21, 3rd quarter (August 1, 2021 - October 31, 2021)
August: *Daytrip-cruise (Little Dipper)*
September: *Sampling cruise (R/V Tiglax)*
October: *Daytrip-cruise (Little Dipper)*

FY21, 4th quarter (November 1, 2021 - January 31, 2022)
November: *Annual PI meeting*
December: *Daytrip-cruise (Little Dipper); most sample processing completed for cruises through May, preliminary data available for summer and fall cruises*
January: *Results presented at AMSS*

7. Budget

BUDGET FORMS (ATTACHED)

Please see the attached project budget form included in the program budget workbook.

SOURCES OF ADDITIONAL FUNDING

This proposal seeks the Exxon Valdez Oil Spill Trustee Council's continuation in a consortium with NPRB and AOOS that currently funds the Seward Line. Full annual costs are ~$400K, with ~$200K coming from NPRB and $100K from AOOS. Half of these costs are associated with vessel charter. Additional ancillary data come from National Science Foundation and National Oceanic and Atmospheric Administration-funded projects that participate on cruises. The proposal also leverages on existing equipment provided by the PIs as well as the consolidation of historical and contemporary information in the GOA through associated activities.

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PROFESSIONAL PREPARATION:

University of Guelph, Ontario, Canada	Marine Biology	B.Sc. 1983
University of Guelph	Marine Ecology	M.Sc. 1988
University of Guelph	Marine Biology	Ph.D. 1997
Monterey Bay Aquarium Research Institute (MBARI)	Zooplankton Ecology	1997-1999
University of Massachusetts Dartmouth	Zooplankton Ecology	1999-2000

APPOINTMENTS:

Professor, Institute of Marine Science, University of Alaska Fairbanks, 2010-present
Associate Professor, IMS/UAF, 2005-2010
Assistant Professor, IMS/UAF, 2000-2005

MOST RELEVANT PUBLICATIONS: (out of 95)

Sousa, L., K.O. Coyle, R.P. Barry, T.J. Weingartner, & **R.R. Hopcroft**. *Accepted*. Climate-related variability in abundance of mesozooplankton in the northern Gulf of Alaska 1998-2009. *Deep-Sea Res. II.*

Li, K.Z., A.J. Doubleday, M.D. Galbraith, & **R.R. Hopcroft**. *Accepted*. High abundance of salps in the coastal Gulf of Alaska during 2011: a first record of bloom occurrence for the northern Gulf. *Deep-Sea Res. II.*

Ershova, E.A., **R.R. Hopcroft**, K.N. Kosobokova, K. Matsuno, R. J. Nelson & A. Yamaguchi. 2015. Long-term changes in summer zooplankton communities of the western Chukchi Sea, 1945-2012. *Oceanography* **28:**100-115.

Doubleday, A. & **R.R. Hopcroft.** 2015. Seasonal and interannual patterns of larvaceans and pteropods in the coastal Gulf of Alaska, and their relationship to pink salmon survival. *J. Plankton Res.* **37**:134-150.

Coyle, K.O., G.A. Gibson, K. Hedstrom, A. Hermann, & **R.R. Hopcroft.** 2013. Zooplankton biomass, advection and production on the northern Gulf of Alaska shelf from simulations and field observations. *J. Mar. Sys.* **128**: 185-207.

OTHER SIGNIFICANT PUBLICATIONS:

Mundy, P., D. Allen, J.L. Boldt, N.A. Bond, S. Dressel, E. Farley Jr., D. Hanselman, J. Heifetz, **R.R. Hopcroft**, M.A. Janout, C. Ladd, R. Lam, P. Livingston, C. Lunsford, J.T. Mathis, F. Mueter, C. Rooper, N. Sarkar, K. Shotwell, M. Sturdevant, A.C. Thomas, T.J. Weingartner & D. Woodby. 2010. Status and trends of the Gulf of Alaska Coastal region, 2003-2008. pp. 142-195. *In:* S.M. McKinnell & M. Dagg (ed.) Marine Ecosystems of the North Pacific Ocean; 2003-2008. *PICES Spec. Pub. 4. 393p.*

Pinchuk, A.I., K.O. Coyle & **R.R. Hopcroft**. 2008. Climate-related variability in abundance and reproduction of euphausiids in the northern Gulf of Alaska in 1998-2003. *Prog. Oceanogr.* **77**:203-216.

Liu, H. & **R.R. Hopcroft**. 2008. Growth and development of *Pseudocalanus* spp. in the northern Gulf of Alaska. *J. Plankton Res.* **30**: 923-935.

Pinchuk, A.I. & **R.R. Hopcroft**. 2007. Seasonal variations in the growth rate of euphausiids (*Thysanoessa inermis*, *T. spinifera*, and *Euphausia pacifica*) from the northern Gulf of Alaska. *Mar. Biol.* **151**: 257-269

Liu, H. & **R.R. Hopcroft**. 2006. Growth and development of *Neocalanus flemingeri/plumchrus* in the northern Gulf of Alaska: validation of the artificial cohort method in cold waters. *J. Plankton Res.* **28**: 87-101.

SYNERGISTIC ACTIVITIES:

Public outreach through contributions to magazines (National Geographic, Current: the Journal of Marine Education), radio, newspaper, and television on Arctic ecosystems

Educational web-pages:
http://www.arcodiv.org
http://www.sfos.uaf.edu/sewardline/

Steering Group – Gulf Watch Alaska, Gulf of Alaska Integrated Research Program, Census of Marine Life's (CoML) Arctic Ocean Biodiversity (ArcOD) & Census of Marine Zooplankton (CMarZ), Executive Committee member - Northeast Pacific GLOBEC, US member – Plankton Experts Lead, Circumpolar Biodiversity Monitoring Program

Editorial Board – Marine Biodiversity (Springer), Plankton and Benthic Research (Japan)

Reviewer: manuscripts reviewed for ~15 primary journals, proposals for 6 funding agencies, NSF OPP & BO panel member.

SUBMERSIBLE AND ROV EXPERIENCE:

Johnson-Sea-Link, Ventana, Tiburon, Global Explorer (~100 dives total)

RESEARCH CRUISE EXPERIENCE:

~1000 at-sea days on cruises up to 45 days duration aboard vessels ranging in size from 15-120 m.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators (outside UAF): Bodil Bluhm (UiT), Ann Bucklin (UConn), Lee Cooper (UMCES), Lisa Eisner (NOAA), Jackie Grebmeier (UMCES), Hans-Jurgen Hirche (AWI), Petra Lenz (UH), Ksenia Kosobokova (RAS), Kathy Kuletz (USFWS), Carol Ladd (NOAA), Dhugal Lindsay (JAMSTEC), Jeremy Mathis (NOAA), Calvin Mordy (JISAO), John Nelson (UVic), Torkel Nielsen (DMU), Robert Pickart (WHOI), Phyllis Stabeno (NOAA), Suzanne Strom (WWU)

Graduate advisor: John C. Roff (Acadia U)

Postdoctoral advisors: Bruce Robison & Francisco Chavez (MBARI), Brian Rothchild (UMass)

Graduate Students: Imme Rutzen, Jennifer Questel, Elizaveta Ershova (all Ph.D. *in progress*); Caitlin Smoot (M.Sc. 2015), Ayla Doubleday (M.Sc. 2013), Jenefer Bell (M.Sc.2009), Hui Liu (Ph.D. 2006), Alexei Pinchuk (Ph.D. 2006), Laura Slater (M.Sc. 2004).

SETH LOMBARD DANIELSON

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PROFESSIONAL PREPARATION

University of Alaska Fairbanks, Ph.D. Oceanography, 2012
University of Alaska Fairbanks; M.S. Oceanography, 1996
Lehigh University; B.S. Electrical Engineering, 1990, with honors

APPOINTMENTS

Research Assistant Professor of Oceanography, IMS-UAF, Fairbanks, AK, 2013-present
Research Professional, IMS-UAF, UAF, Fairbanks, AK, 1997–2013
Driller, Polar Ice Coring Office, IMS-UAF, Fairbanks AK, 1993-1994 and UNL, Lincoln, NB, 1996-1997
Research Assistant, Institute of Marine Science, UAF, Fairbanks, AK, 1994-1996
Junior Engineer, Allen Organ Company, Macungie, PA, 1990-1992

MEMBERSHIPS

American Geophysical Union
The Oceanography Society

5 SELECTED PEER-REVIEWED PUBLICATIONS

Danielson. S. L., L. Eisner, C. Ladd, C. Mordy, L. de Sousa, and T. J. Weingartner (in press) A comparison between late summer 2012 and 2013 water masses, macronutrients, and phytoplankton standing crops in the northern Bering and Chukchi Seas, Arctic Eis DSR-II Special Issue

Danielson, S. L., T. W. Weingartner, K. Hedstrom, K. Aagaard, R. Woodgate, E. Curchitser, and P. Stabeno, (2014), Coupled wind-forced controls of the Bering–Chukchi shelf circulation and the Bering Strait through- flow: Ekman transport, continental shelf waves, and variations of the Pacific–Arctic sea surface height gradient. Prog. Oceanogr. http://dx.doi.org/10.1016/j.pocean.2014.04.006

Grebmeier, J. M., B. A. Bluhm, L. W. Cooper, **S. L. Danielson**, K. R. Arrigo, A. L. Blanchard, J. T. Clarke, R. H. Day, K. E. Frey, R. R. Gradinger, M. Kedra, B. Konar, K. J. Kuletz, S. H. Lee, J. R. Lovvorn, B. L. Norcross, S. R. Okkonen. (2015) Ecosystem Characteristics and Processes Facilitating Persistent Macrobenthic Biomass Hotspots and Associated Benthivory in the Pacific Arctic, *Prog. Oceanogr.*, V136, August 2015, pp. 92-114, doi:10.1016/j.pocean.2015.05.006

Danielson, S. L., K. Hedstrom, K. Aagaard, T. Weingartner, and E. Curchitser (2012), Wind-induced reorganization of the Bering shelf circulation, *Geophys. Res. Lett.*, 39, L08601, doi:10.1029/2012GL051231.

Danielson, S. L., E. N. Curchitser, K. Hedstrom, T. J. Weingartner, and P. Stabeno (2011) On ocean and sea ice modes of variability in the Bering Sea, *J. Geophys. Res.*, doi:10.1029/2011JC007389

OTHER PUBLICATIONS RELATED TO THE SEWARD LINE

Stabeno, P. J. S. Bell, W. Cheng, **S. L. Danielson**, N. B. Kachel, C. W. Mordy (in press) Long-term observations of Alaska Coastal Current in the northern Gulf of Alaska, *Deep-Sea Res. II*

Janout, M. A., T. J. Weingartner, T. C. Royer, **S. L. Danielson** (2010), On the nature of winter cooling and the recent temperature shift on the northern Gulf of Alaska shelf, JGR Oceans, 2009JC005774R, DOI: 10.1029/2009JC005774

Wu, J., A. Aguilar-Islas, R. Rember, T. Weingartner, **S. L. Danielson**, and T. Whitledge (2009), Size-fractionated iron distribution on the northern Gulf of Alaska, *Geophys. Res. Lett.*, 36, L11606, doi:10.1029/2009GL038304.

Weingartner, T. J., L. Eisner, G. L. Eckert, **S. L. Danielson** (2008), Southeast Alaska: oceanographic

habitats and linkages (p 387-400), *J. of Biogeography*, DOI: 10.1111/j.1365-2699.2008.01994.x.

Weingartner, T. J., **S. L. Danielson**, T.C. Royer (2005), Fresh Water Variability in the Gulf of Alaska: Seasonal, Interannual and Decadal Variability, Deep-Sea Res. II, 52 (1-2): 169-191

Okkonen, S. R., T. J. Weingartner, **S. L. Danielson**, D. L. Musgrave and G. M. Schmidt (2003), Satellite and Hydrographic Observations of Eddy-Induced Shelf-Slope Exchange in the Northwestern Gulf of Alaska, JGR Oceans, 108 (C2): Art. No. 3033

SYNERGISTIC ACTIVITIES

Participant and presenter at the Pribilof Island *Bering Sea Days* week of ocean exploration for St. Paul Island and St. George Island students and community members 2011-present.

October 2010 BEST/BSIERP Professional Development Workshop in Anchorage, AK

October 2009 Center for Ocean Science Education Excellence (COSEE) "Salmon in the Classroom" teacher workshops in Fairbanks AK.

Reviewer for: *Geophysical Research Letters*, *Journal of Geophysical Research*, *Continental Shelf Research*, *Deep-Sea Research*, *Climate Dynamics;* EPSCOR, NOAA, NSF, NPRB

Creator of numerous outreach-directed marine science web pages, including:

- Retrospective analysis of Norton Sound benthic communities (www.ims.uaf.edu/NS/)
- GAK-1 long-term oceanographic monitoring timeseries (www.ims.uaf.edu/gak1/)
- GLOBEC NEP monitoring program (www.ims.uaf.edu/GLOBEC/)
- community-based satellite drifters in the Bering & Chukchi Seas (www.ims.uaf.edu/drifters/)

THESIS TITLES

Variability in the circulation, temperature, and salinity fields of the eastern Bering Sea shelf in response to atmospheric forcing, 2012 Ph.D. Thesis

Chukchi Sea Tidal Currents: Model and Observations, 1996 Masters Thesis.

RELATED ACTIVITIES

1997-2004: Global Ocean Ecosystem Dynamics (GLOBEC) program in the Gulf of Alaska (NSF)

2008-2014: Bering Sea Ecosystem Study (BEST) moorings and larval transport modeling (NSF)

2008-2014: Chukchi Sea Environmental Studies Program (CSESP, Shell/Conoco Phillips/Statoil)

2009-present: PI, Advisor and analyst for Glacier Bay National Park and Preserve oceanographic monitoring and associated process studies (NPS)

2012-2015: co-PI, Arctic Ecosystem Integrated Survey (Arctic Eis, BOEM)

2013-present: PI, Cook Inlet Model Computations (BOEM)

2014-present: PI, Ecosystem monitoring and detection of wind and ice-mediated changes through a year-round physical and biogeochemical mooring in the Northeast Chukchi Sea (NPRB, AOOS, Olgoonik-Fairweather, UAF)

2014-present: co-PI Measuring the pulse of the Gulf of Alaska: Oceanographic observations along the Seward Line (NPRB)

2015-present: co-PI, Arctic Marine Biodiversity Observing Network (AMBON; NOPP)

COLLABORATORS (OUTSIDE UAF)

Aagaard, Knut, UW; Arrigo, Kevin, Stanford; Bates, Nicholas, BIOS; Berge, Jorgen, AUN; Bluhm, Bodil, AUN; Bond, Nick, NOAA; Buckley, Troy, NOAA; Busby, Morgan NOAA; Carmack, Eddy DFO-IOS Canada; Cheng, Wei, NOAA; Clarke, Janet, Leidos; Cokelet, Edward, NOAA; Cosca, Catherine, NOAA; Cross, Jessica, JISAO; Curchitser, Enrique, Rutgers; Daase, Malin, AUN; Daly, Kendra, USF; Day, Robert, ABR, Inc.; De Robertis, Alex, NOAA; Drinkwater, Kenneth, IMR; Eisner, Lisa, NOAA; Evans, Wiley, NOAA; Feely, Richard, NOAA; Frey, Karen, Clark U; Gradinger, Rolf, AUN; Heintz, Ron, NOAA; Hop, Hakkon, NPI; Hunt, George, UW; Isla, Enrique, ICR; Jakobsson, Martin, Stockholm U; Karnovsky, Nina, Pomona College; Kedra, Monika, PAS; Kuletz, Kathy, USFWS; Ladd, Carol, NOAA; Laidre, Kristin, UW; Lauth, Robert, NOAA; Lee, Sang, PNU; Logerwell, Elizabeth, NOAA; Lovvorn, James, SIU; Martini, Kim, NOAA; Mathis, Jeremy, NOAA/UAF; Mordy, Calvin, NOAA; Murphy, Eugene, BAS; Overland, James, NOAA; Pickart, Robert, WHOI; Renaud, Paul, Akvaplanniva, Fram Centre; Salo, Sigrid, NOAA; Sigler, Michael, NOAA; Smith, Walker, VIMS; Sousa, Leandra, NSB; Stabeno, Phyllis, NOAA; Takahashi, Taro, Lamont-Doherty Earth Observatory; Trathan,

Philip, BAS; Whitehouse, Andrew, NOAA; Williams, William, DFO-IOS Canada; Wolf-Gladrow, Dieter, AWI; Wood, Kevin, NOAA; Woodgate, Rebecca, UW; Zarayskaya, Yulia, GI RAS

KENNETH O. COYLE
Institute of Marine Science
University of Alaska Fairbanks
Fairbanks, AK 99775-7220
907-474-7705, 907-474-7204 (fax)
coyle@ims.alaska.edu

Education:
University of Alaska Fairbanks, Ph.D. Oceanography, 1997
University of Alaska Fairbanks; M.S. Oceanography, 1974
University of Washington; B.S. Oceanography, 1972

Positions Held:
Research Associate, Institute of Marine Science, University of Alaska Fairbanks, 1988–present
Oceanographic Technician, University of Alaska, 1974–1988
Graduate Research Assistant, IMS, University of Alaska, January 1972–June 1973
Graduate Teaching Assistant, Microbiology, University of Alaska, September 1971–December 1971

Experience:
Zooplankton studies, Bering Sea and Gulf of Alaska (GLOBEC), 1997 - present
Scientific exchange: Murmansk Marine Biological Institute, November 1989; Marine Biological Institute, Vladivostok, June–July 1990
Amphipod energetics, sample collection and processing, data processing, publications, 1986–1994
Seabird studies with G. Hunt, U.C. Irvine: Zooplankton collections, hydroacoustic data collection and processing, northern Bering Sea and Pribilof Islands, Aleutian Islands, Bristol Bay, 1985–2005
Zooplankton collections, sample processing, data processing, publications, APPRISE project, 1985–1992
Bering Sea Ice Edge Ecosystem, sample collection, sample processing, data processing, publications, 1976–1978 (BLM, NOAA, OCS), 1981–1982 (Polar Programs)
Zooplankton and microplankton studies in the Bering, Chukchi and Beaufort Seas (BLM/NOAA, OCS), 1975–1977
Phytoplankton studies, sea ice and marginal ice zone, Beaufort and Chukchi Seas, 1972–1974

Translator: Russian-English translations:
Russian-English translation of articles from Voprosy Ikhtiologii, Gidrobiologicheskii Zhurnal and Okeanologiya for Scripta Publishing Co., 1985–1995

Thesis:
Coyle, K. O. 1974. The ecology of the phytoplankton of Prudhoe Bay, Alaska, and the surrounding waters.

Dissertation
Coyle, K. O. 1997. Distribution of large calanoid copepods in relation to physical oceanographic conditions and foraging auklets in the western Aleutian Islands.

Relevant Publications:
Coyle, K. O., Gibson, G. A., Hedstrom, K., Hermann, A. J., Hopcroft, R. R. 2013. Zooplankton biomass, advection and production on the northern Gulf of Alaska shelf from simulations and field observations. Journal of Marine Systems, 128: 185-207.

Coyle, K. O., Cheng, W., Hinckley, S. L., Lessard, E. J., Whitledge, T., Hermann, A. H, Hedstrom, K. 2012. Model and field observations of effects of circulation on the timing and magnitude of nitrate utilization and production on the northern Gulf of Alaska shelf. Prog. Oceanogr. 103: 16-41.
Coyle, K. O., Eisner, L. B., Mueter, F. J., Pinchuk, A. I., Janout, M. A., Cieciel, K. D., Farley, E. V., Andrews, A. G. 2011. Climate change in the southeastern Bering Sea: impacts on pollock stocks and implications for the Oscillating Control Hypothesis. Fisheries Oceanography, 20(2): 139-156.
Coyle, K. O. 2005. Zooplankton distribution, abundance and biomass relative to water masses in eastern and central Aleutian Island passes. Fish. Oceanogr. 14(Suppl. 1): 77 – 92.
Coyle, K. O. and P. I. Pinchuk. 2005 Seasonal cross-shelf distribution of major zooplankton taxa on the northern Gulf of Alaska shelf relative to water mass properties, species depth preferences and vertical migration behavior. Deep Sea Res. II. 52: 217 – 245.

Recent Publications:

Coyle, K. O., Pinchuk, A. I., Eisner, L. B., Napp, J. M. 2008. Zooplankton species composition, abundance and biomass on the eastern Bering Sea shelf during summer: the potential role of water column stability and nutrients in structuring the zooplankton community. Deep Sea Res. II. (in press)
Coyle, K. O., Konar, B., Blanchard, A., Highsmith, R. C., Carroll, J., Carroll, M., Denisenko, S. G., Sirenko, B. I. 2007. Potential effects of temperature on the benthic infaunal community on the southeastern Bering Sea shelf: Possible impacts of climate change. Deep-Sea Research II, doi:10.1016/j.dsr2.2007.08.025
Coyle, K. O., Bluhm, B., Konar, B., Blanchard, A., Highsmith, R. C. 2007. Amphipod prey of gray whales in the northern Bering Sea: comparison of biomass and distribution between the 1980s and 2002 - 2003. Deep Sea Res. II doi:10.1016/j.dsr2.2007.08.026
Coyle, K. O. and P. I. Pinchuk. 2002. Climate-related differences in zooplankton density and growth on the inner shelf of the southeastern Bering Sea. Prog. Oceanogr. 55: 177-194.
Coyle, K. O. and G. L. Hunt. 2000. Seasonal differences in the distribution, density and scale of zooplankton patches in the upper mixed layer near the western Aleutian Islands. *Plankton. Biol. Ecol.*, 47: 31-42.

Synergistic Activities: Translation of Russian scientific articles and books into English; Development of database of software for analysis of BASIS Bering Sea fisheries and oceanographic data.

Collaborators:

Bodil Bluhm, University of Alaska, Fairbanks
George Hunt, School of Aquatic and Fishery Sciences, University of Washington
Evelyn Lessard, Dept of Oceanography, University of Washington
Sue Moore, National Marine Mammal Laboratory, NOAA, Seattle
Jeff Napp, National Marine Fisheries Service, Seattle
Phyllis Stabeno, Pacific Marine Environmental Lab, NOAA, Seattle
Suzanne Strom, Western Washington State University, Bellingham, Washington
Tom Weingartner, University of Alaska, Fairbanks
Steve Zeeman, University of New England, Biddeform, Maine

Graduate Advisors: Rita Horner, M.S., R. T. Cooney, Ph.D.
Graduate Student Advisor: C. Adams (PhD 2007), L. DeSousa (PhD, 2010)

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$83.2	$85.2	$87.2	$89.3	$91.4	$436.3	
Travel	$3.9	$4.0	$4.1	$4.3	$4.4	$20.7	
Contractual	$8.0	$8.3	$8.6	$8.8	$9.0	$42.6	
Commodities	$2.3	$2.4	$2.5	$2.7	$2.8	$12.7	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (*25% of non-equip.*)	$ 24.4	$ 25.0	$ 25.6	$ 26.2	$ 26.9	$ 128.1	
SUBTOTAL	$121.8	$124.9	$128.0	$131.2	$134.5	$640.280	
General Administration (9% of subtotal)	$11.0	$11.2	$11.5	$11.8	$12.1	$57.6	N/A
PROJECT TOTAL	$132.7	$136.1	$139.5	$143.0	$146.6	$697.9	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:

FY17-21

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

NON-TRUSTEE AGENCY SUMMARY PAGE

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft	Seward Line	0.5	16.1		8.0
Danielson	Seward Line	0.5	14.6		7.3
Coyle	Seward Line	0.5	10.3		5.1
Stockmar	Seward Line	6.0	8.9		53.5
Smoot	Seward Line	0.6	7.6		4.6
Shipton	Seward Line	0.6	7.8		4.7
					0.0
					0.0
					0.0
					0.0
		Subtotal	65.2	0.0	
				Personnel Total	$83.2

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
RT Fairbanks-Seward, by rented van ($600/year plus 10% increase/yea	0.7	1			0.7
Shared Lodging (shared lodging-10 ppl 2 ppl per room, 6 nights per trip		1	12	0.1	1.2
Meals & Incidentals (10 people for 10 days each per trip)		1	20	0.1	1.0
Ground Transportation ($200/trip plus 10% increase per year)		1	1	0.2	0.2
					0.0
RT Fairbanks - Anchorage - AMSS & PI Meetings					0.0
Airfare (base price of $200/trip plus 10% increase per year)	0.2	1			0.2
Lodging (3 nights per trip at $99/night)		1	3	0.1	0.3
Meals & Incidentals (4 days per trip, $60 per day)		1	4	0.1	0.2
Ground Transportation ($40/trip plus 10% increase per year)		1	1	0.0	0.0
					0.0
				Travel Total	$3.9

FY17

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Shipping to/from Seward	1.0
Crane and Dock fees	1.3
2 hrs extra/cruise Little Dipper	1.4
Nutrients -- assume 12x3/cruisex8cruise@$15	4.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$8.0

Commodities Costs: Description	Commodities Sum
Supplies	1.3
Chloro supplies	1.0
Commodities Total	$2.3

FY17

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY17

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft	Seward Line	0.5	16.4		8.2
Danielson	Seward Line	0.5	14.8		7.4
Coyle	Seward Line	0.5	10.5		5.3
Stockmar	Seward Line	6.0	9.1		54.8
Smoot	Seward Line	0.6	7.8		4.7
Shipton	Seward Line	0.6	8.0		4.8
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	66.7	0.0	
				Personnel Total	$85.2

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
RT Fairbanks-Seward, by rented van ($600/year plus 10% increase/yea	0.7	1			0.7
Shared Lodging (shared lodging-10 ppl 2 ppl per room, 6 nights per trip		1	12	0.1	1.2
Meals & Incidentals (10 people for 10 days each per trip)		1	20	0.1	1.0
Ground Transportation ($200/trip plus 10% increase per year)		1	1	0.2	0.2
					0.0
RT Fairbanks - Anchorage - AMSS & PI Meetings					0.0
Airfare (base price of $200/trip plus 10% increase per year)	0.2	1			0.2
Lodging (3 nights per trip at $99/night)		1	3	0.1	0.3
Meals & Incidentals (4 days per trip, $60 per day)		1	4	0.1	0.2
Ground Transportation ($40/trip plus 10% increase per year)		1	1	0.0	0.0
					0.0
				Travel Total	$4.0

FY18

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Shipping to/from Seward	1.1
Crane and Dock fees	1.5
2 hrs extra/cruise Little Dipper	1.4
Nutrients--assume 12x3/cruisex8 cruise@$15	4.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$8.3

Commodities Costs: Description	Commodities Sum
Supplies	1.4
Chloro supplies	1.0
Commodities Total	$2.4

FY18

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY18

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft	Seward Line	0.5	16.7		8.4
Danielson	Seward Line	0.5	15.1		7.6
Coyle	Seward Line	0.5	10.7		5.4
Stockmar	Seward Line	6.0	9.4		56.2
Smoot	Seward Line	0.6	8.0		4.8
Shipton	Seward Line	0.6	8.2		4.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	68.1	0.0	
				Personnel Total	$87.2

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
RT Fairbanks-Seward, by rented van ($600/year plus 10% increase/yea	0.8	1			0.8
Shared Lodging (shared lodging-10 ppl 2 ppl per room, 6 nights per trip)		1	12	0.1	1.2
Meals & Incidentals (10 people for 10 days each per trip)		1	20	0.1	1.0
Ground Transportation ($200/trip plus 10% increase per year)		1	1	0.3	0.3
					0.0
RT Fairbanks - Anchorage - AMSS & PI Meetings					0.0
Airfare (base price of $200/trip plus 10% increase per year)	0.3	1			0.3
Lodging (3 nights per trip at $99/night)		1	3	0.1	0.3
Meals & Incidentals (4 days per trip, $60 per day)		1	4	0.1	0.2
Ground Transportation ($40/trip plus 10% increase per year)		1	1	0.1	0.1
					0.0
				Travel Total	$4.1

FY19

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Shipping to/from Seward	1.2
Crane and Dock fees	1.6
2 hrs extra/cruise Little Dipper	1.4
Nutrients--assume 12x3/cruisex8@$15	4.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$8.6

Commodities Costs: Description	Commodities Sum
Supplies	1.5
Chloro supplies	1.0
Commodities Total	$2.5

FY19

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY19

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft	Seward Line	0.5	17.1		8.5
Danielson	Seward Line	0.5	15.4		7.7
Coyle	Seward Line	0.5	10.9		5.5
Stockmar	Seward Line	6.0	9.6		57.6
Smoot	Seward Line	0.6	8.2		4.9
Shipton	Seward Line	0.6	8.4		5.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	69.6	0.0	
				Personnel Total	$89.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
RT Fairbanks-Seward, by rented van ($600/year plus 10% increase/yea	0.9	1			0.9
Shared Lodging (shared lodging-10 ppl 2 ppl per room, 6 nights per trip)		1	12	0.1	1.2
Meals & Incidentals (10 people for 10 days each per trip)		1	20	0.1	1.0
Ground Transportation ($200/trip plus 10% increase per year)		1	1	0.3	0.3
					0.0
RT Fairbanks - Anchorage - AMSS & PI Meetings					0.0
Airfare (base price of $200/trip plus 10% increase per year)	0.3	1			0.3
Lodging (3 nights per trip at $99/night)		1	3	0.1	0.3
Meals & Incidentals (4 days per trip, $60 per day)		1	4	0.1	0.2
Ground Transportation ($40/trip plus 10% increase per year)		1	1	0.1	0.1
					0.0
				Travel Total	$4.3

FY20

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Shipping to/from Seward	1.3
Crane and Dock fees	1.7
2 hrs extra/cruise Little Dipper	1.4
Nutrients--assume 12x3/cruisex8 cruise@$15	4.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$8.8

Commodities Costs: Description	Commodities Sum
Supplies	1.7
Chloro supplies	1.0
Commodities Total	$2.7

FY20

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY20

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft	Seward Line	0.5	17.4		8.7
Danielson	Seward Line	0.5	15.7		7.9
Coyle	Seward Line	0.5	11.1		5.6
Stockmar	Seward Line	6.0	9.8		59.1
Smoot	Seward Line	0.6	8.4		5.1
Shipton	Seward Line	0.6	8.6		5.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	71.1	0.0	
				Personnel Total	$91.4

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
RT Fairbanks-Seward, by rented van ($600/year plus 10% increase/yea	1.0	1			1.0
Shared Lodging (shared lodging-10 ppl 2 ppl per room, 6 nights per trip)		1	12	0.1	1.2
Meals & Incidentals (10 people for 10 days each per trip)		1	20	0.1	1.0
Ground Transportation ($200/trip plus 10% increase per year)		1	1	0.3	0.3
					0.0
RT Fairbanks - Anchorage - AMSS & PI Meetings					0.0
Airfare (base price of $200/trip plus 10% increase per year)	0.3	1			0.3
Lodging (3 nights per trip at $99/night)		1	3	0.1	0.3
Meals & Incidentals (4 days per trip, $60 per day)		1	4	0.1	0.2
Ground Transportation ($40/trip plus 10% increase per year)		1	1	0.1	0.1
					0.0
				Travel Total	$4.4

FY21

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Shipping to/from Seward	1.4
Crane and Dock fees	1.8
2 hrs extra/cruise Little Dipper	1.4
Nutrients--assume 12x3/cruisex8 cruise @$15	4.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$9.0

Commodities Costs: Description	Commodities Sum
Crusie supplies	1.8
Chloro supplies	1.0
Commodities Total	$2.8

FY21

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY21

Project Title: Seward Line
Primary Investigator: Russ Hopcroft

FORM 3B
EQUIPMENT DETAIL