FY14 NON-PROGRAM
PROJECT PROPOSAL FORM

Project Title: EVOS Legacy: Reducing Cordova Snowmelt Pollution to Marine Habitat

Project Period: FY 15 – FY 16 (Feb. 1, 2014 – January 31, 2016)

Primary Investigator(s): Kristin Carpenter, M.P.P., Executive Director, Copper River Watershed Project

Abstract:

The Copper River Watershed Project (CRWP) proposes to demonstrate that application of best management practices to managing snow in a developed community will improve the water quality of snowmelt discharges that flow directly into the Cordova harbor and Orca Inlet, the habitat range of the majority of PWS juvenile herring. Synthesized research on the long-term effects of the *Exxon Valdez* oil spill found that chronic persistence of oil has sub-lethal impacts on marine populations. Over the course of a winter, contaminants that commonly accumulate in snow include oil, grease, sediment, nitrogen, phosphorous, and metals. The CRWP will work with the City of Cordova and the Alaska Department of Transportation & Public Facilities to examine current snow handling practices in Cordova, identify Best Management Practice procedures and structures that could help reduce the concentration of contaminants in snow melt run-off, implement BMP structures at three snow storage sites, conduct water quality testing to assess the effectiveness of the BMP structures, and produce a guidance report for distribution to other municipalities.

Estimated Budget:
EVOSTC Funding Requested:

FY14	FY15	FY16	FY17	FY18	TOTAL
$103,817.88	**$137,590.49**				

(Funding requested must include 9% GA)

Non-EVOSTC Funds to be used:

FY14	FY15	FY16	FY17	FY18	TOTAL
$6,900	**$6,900**				

Date: September 3, 2013

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I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

Non-point source stormwater run-off is among the leading contaminants degrading water quality in the U.S. today (National Water Quality Inventory, 2003, EPA). Stormwater run-off occurs when precipitation from rain or snowmelt flows over the land surface, and picks up and carries with it many different pollutants that are found on paved surfaces such as sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides and metals (Center for Watershed Protection, cwp.org). The snowmelt component of stormwater run-off has particular characteristics that contribute to pollution. Researcher Torsten Meyer at the University of Toronto observes that "During the winter months, contaminants accumulate in the snow. When the snow melts, these chemicals are released into the environment at high concentrations. One of the main findings is that there is a peak contaminant flush at the very beginning of the melt" (University of Toronto Media Room, March 2011).

In eastern Prince William Sound, where two-thirds of the juvenile herring population were observed in June, 2013 (S. Pegau, personal communication), stormwater run-off from rain and snowmelt is discharged directly into the Cordova harbor and into Orca Inlet. Unlike sewer system flows, most often there is no "end of pipe" treatment for stormwater run-off. Yet research comparing stormwater run-off alone with a combination of sewage and stormwater shows marginal differences in contaminant levels (Haile, 1996; Novotny and Olem, 1994; R. Pitt, 2000; Moffa & Associates, R. Pitt and SAVIN Engineers, 2001). Pacific herring, identified as an injured resource that is not recovering by the *Exxon Valdez* Oil Spill (EVOS) Trustee Council, were fished commercially in Prince William Sound until 1999 but have not been able to generate sufficient biomass since then to support commercial fishing.

Cordova has a maritime climate strongly influenced by the proximity of the Gulf of Alaska to the south and the heavily glaciated Chugach Mountains to the north. Annual precipitation is 162 inches. The annual average snowfall in Cordova is 108 inches, resulting in an average snowpack of 13 inches (DOWL HKM Engineering, 2012).

The Copper River Watershed Project (CRWP) proposes to demonstrate that application of best management practices for managing snow removal in a developed community will improve the water quality of snowmelt discharges that flow directly into the Cordova harbor and Orca Inlet, the habitat range of the majority of PWS juvenile herring. The CRWP has developed a partnership with the City of Cordova and the Alaska Department of Transportation & Public Facilities (ADOT/PF) to identify solutions for mitigating the effects of snow storage on our salmon and herring habitat waterbodies. Harmful contaminants in plowed snow are well documented in the national literature (Novotny and Olem, 1994; Meyer, Lei and Wania, 2010). Plowed snow is currently dumped in Cordova's harbor, into Orca Inlet, and stored immediately adjacent to Eyak Lake and Odiak Pond. Photographs from several places around Cordova document that storing snow immediately adjacent to fresh and marine water bodies is a common practice. A City street sweeper truck does sweep sand from the streets, but the sand is not collected.

Not only is stormwater run-off a widespread problem, but synthesized research on the long-term impacts of the *Exxon Valdez* oil spill found that chronic persistence of oil is a "major pathway" for sub-lethal population impacts in the marine environment:

> Laboratory experiments show that these multi-ringed polycyclic aromatic hydrocarbons (PAHs) from partially weathered oil at concentrations as low as 1 ppb [part per billion] are toxic to pink salmon eggs exposed for the months of development and to herring eggs exposed for 16 days (Marty et al., 1997 and Heintz et al., 2001 in Peterson et al., 2003).

In assessing 14 years of research on the *Exxon Valdez* oil spill, Peterson et al. (2003) conclude that research on chronic exposure to the spill's lingering oil points the way to a new understanding of ecotoxicology: "Our synthesis implies necessary modifications of environmental standards for water quality, stormwater control, chronic low-level oil releases, and other human activities."

The broader legacy of the *Exxon Valdez* oil spill, Dr. Charles Peterson observed, is "Recognition that chronic exposures of fish eggs to oil concentrations as low as a few parts per billion lead indirectly to higher mortality [showing] the critical need to better control stormwater run-off of petroleum hydrocarbons and other toxins. In a developed country like the United States, an amount of petroleum equal to the *Exxon Valdez* oil spill is spilled annually for every 50 million people" (Peterson, 2003, UNC press release).

With the challenge of "non-point source" pollution being that its sources are diffuse, small communities are currently more likely to ignore this slow drip of chronic pollution being discharged every day. Their Public Works departments are tasked with providing basic services like street repair and storm drain maintenance. There is little time for taking on the researching and experimenting with new methods in extreme climates to try approaches that might or might not work.

Guidance on "Snow Disposal Area Siting" provided by the Alaska Department of Environmental Conservation on its web site states that

> Snow removed from roads and parking lots has been shown to contain various pollutants, including road salt, sand, litter, animal waste, and automotive pollutants such as metals and oil. For instance, a 2006 study of fresh fallen snow collected from roads in Juneau and Anchorage exhibited a visual sheen, indicating the presence of oil or grease. These samples also showed exceedences of state water quality standards for cadmium, lead, zinc, and mercury (ADEC 2006). These substances are not normally characteristic of freshly fallen snow but are a result of particular land uses related to urbanization and human activities. As snow melts, these pollutants can be transported into surface water or groundwater (www.dec.alaska.gov).

Stormwater picks up whatever pollutants are present on a site; for developed sites these are frequently trash, oils and grease, fertilizers, pesticides, pet waste, and sediment. Stormwater drains typically discharge directly into a river, stream, lake or saltwater, so these pollutants are introduced directly into natural water bodies with no treatment. (City and Borough of Juneau, Manual of Stormwater Best Management Practices, p. 8). DOWL HKM engineers also note that "Removal of suspended sediments is of particular importance because many other pollutants such as heavy metals and organics, are attached to the sediment particles. Collecting and removing

suspended sediments is an effective strategy for removing organic and metal contaminants" (Odiak Pond Stormwater Assessment, 2012).

Under Alaska's Pollutant Discharge Elimination System (APDES) storm water program, Anchorage and Fairbanks are the only municipalities defined as "urbanized areas." They are the only communities in Alaska required to obtain an APDES permit and develop a storm water management program designed to prevent harmful pollutants from being washed by storm water run-off into local waterbodies (http://dec.alaska.gov/water/wnpspc/stormwater /sw_municipal.htm). In a small, rural community, this one-time request for assistance from the EVOS Trustee Council would go a long way toward helping the City of Cordova's Public Works crew take a comprehensive look at its operations.

Since 2008, we have commissioned a series of reports on stormwater pollution:

- Cordova Stormwater Design Study Report, Bratslavsky Consulting Engineers (2008): this study characterized watersheds within the City of Cordova and identified causes and sources of pollution likely to exist within the defined watersheds. No sampling or testing was included in the scope of this study, but it estimated likely pollutants based on land use type and national averages for pollutant loading.
- Cordova Stormwater Design Study Report, Jacobs Engineering (2009): this report provided recommendations for stormwater treatment alternatives and non-point source pollution remedies for watersheds within the City of Cordova. The engineers identified Best Management Practices (BMPs) in four categories – structural, educational, source control, and maintenance – and discussed the feasibility of implementing each recommendation.
- Odiak Pond Stormwater Assessent, DOWL HKM Engineers (2012): as part of an Odiak Pond restoration effort, the engineers developed a run-off model to predict pollutant loading to prioritize water treatment efforts for reducing stormwater pollution in Odiak Pond.

Each of these reports specifically recommends developing and implementing a snow management plan for Cordova: "Development of a comprehensive snow storage plan, educational BMPs, and establishing snow storage sites away from receiving waterbodies are recommended" (Jacobs Engineering, 2009).

The CRWP has not been able to secure funding to conduct baseline water quality testing of snow melt run-off in Cordova. But using published values that account for development density and land use types, DOWL HKM engineers predicted sediment, biological oxygen demand, heavy metals, hydrocarbons and fecal coliform as contaminants that are discharged into the Odiak Pond watershed. The residential, commercial and industrial land use types in this part of town are representative of other Cordova sub-basins, though the North and South fill sub-basins that drain to the Cordova harbor have a higher percentage of industrial land use.

B. Summary of Project to Date. Not applicable.

C. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Discuss how the project will evaluate the hypotheses or questions posed in the Invitation. Describe the results you expect to achieve during the project, the benefits of success as they relate to the category

under which the proposal was submitted, and the potential recipients of these benefits. Describe how this project addresses restoration of injured services or resources.

Development of a snow management plan, including implementation of three storm water pollutant mitigation Best Management Practice (BMP) structures in Cordova, will further the EVOS Trustee Council's objective of reducing "pollution in the marine environment to contribute to the recovery of injured natural resources" (p. 16, EVOS TC FY '12 Invitation). This proposal focuses on the Storm Water subject area identified in the Council's FY '12 Invitation and will benefit water quality in the marine coastal environment as well as the recovery for PWS herring populations, an injured *Exxon Valdez* oil spill resource that has not recovered.

Stormwater run-off in Cordova drains to three primary receiving waterbodies: Orca Inlet, Eyak Lake, and Odiak Pond (see attached Cordova sub-basin illustration).

Cordova's largest stormwater outfall (6 ' diameter culvert) into Orca Inlet is the discharge point for approximately 265 acres of drainage, encompassing most of downtown Cordova as well as residential and industrial lands. The primary concerns for the area are sediment, debris and petroleum loading (Jacobs, 2009). The discharge point is just outside the harbor breakwater, on the southwest corner of the Cordova Harbor. At low tide, Orca Inlet is miles of exposed mudflats, critical forage habitat for migrating shorebirds. The marine inlet also hosts Pacific herring, once a highly valuable commercial species for Prince William Sound fishermen, before the *Exxon Valdez* oil spill, but one that is currently listed by the EVOS Trustee Council as "not recovering" (www.evostc.state.ak.us/recovery). Orca Inlet is also valuable habitat for other commercial fishing species including pink salmon, for spawning and migration, and coho salmon for migration.

Stormwater run-off has been identified as a pollutant in Cordova from testing conducted by the CRWP. In 2005 – 2006, CRWP staff followed the Kenai Watershed Forum's lead and worked with NOAA's Auke Bay Laboratory to deploy sampling "pucks" in Eyak Lake. The pucks are designed to mimic bio-accumulating aquatic organisms. Immersed in a waterbody for thirty days, they can be used to monitor long-term, chronic hydrocarbon exposure. We deployed pucks at five sites in Eyak Lake. Two locations showed evidence of hydrocarbon exposure: (1.) offshore of the Cordova Electric Cooperative's diesel power plant clean-up site; and (2.) 15 feet into the lake from the largest stormwater outfall pipe on Eyak Lake. NOAA researchers concluded that

> "PAH [polycyclic aromatic hydrocarbon] composition patterns were heavily petrogenic, indicating that uncombusted oil such as spills or urban run-off was the source. Concentrations of PAH were greatest during fall, presumably associated with stormwater run-off from fall precipitation. . . . Although well below the Alaska Water Quality Criteria of 15,000 ng L^{-1} for total PAH, the highest of these concentrations are near the threshold for toxicity to salmon embryos, but any such impacts are likely to be sporadic and localized because incubation in upwelling habitats would protect embryos from exposure. (Short et al., December 2006)."

In a study of the persistence of stranded oil on shoreline ecology and recovery, Cordova's harbor has also been identified as a concentrated source of hydrocarbon pollution (Miles et al., 2001). And although the study did not determine whether the source of the hydrocarbon pollution, identified as "diesel/light fuel", was from boat use in the harbor or elsewhere, the Cordova harbor does have seven stormwater culverts discharging untreated run-off directly into the harbor (Bratslavsky Consulting Engineers, 2008).

Cordova's harbor and the large stormwater outfall pipe just outside the harbor both drain directly into Orca Inlet, a highly tidally influenced body of water that flushes twice a day into Prince William Sound (drainage in the northern two-thirds of Orca Inlet flows north and west into Prince William Sound on an ebb tide). According to aerial surveys, this area hosts the heaviest populations of juvenile herring in Prince William Sound. Specifically, Scott Pegau, Research Scientist and Program Manager of the Oil Spill Recovery Institute in Cordova, reported that of 1,980 schools of one-year old herring observed in June, 2013 aerial surveys, 1,200 schools were observed in eastern Prince William Sound between Cordova and Sheep Bay (personal communication, 8/12/13).

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

Long-term research conducted as a result of the *Exxon Valdez* oil spill has documented that chronic pollution, such as stormwater pollution, has harmful effects in marine environments:

> "Now synthesis of 14 years of *Exxon Valdez* oil spill studies documents the contributions of delayed, chronic, and indirect effects of petroleum contamination in the marine environment" (Peterson et. al., 2003).

The CRWP's hypothesis holds that the water quality of snow melt-water and stormwater discharges can be improved by applying Best Management Practices to snow handling and storage in Cordova. We have four objectives for improving water quality from melt-water run-off discharged from snow piles formed from clearing City of Cordova streets:

- Analyze City of Cordova snow management practices and make recommendations to help reduce snow melt-water pollution being discharged into aquatic and marine environments. By analyzing costs, efficiency and environmental impacts, a plan will be developed that includes: (1.) a long-term plan for snow management; (2.) short- and long-term improvements to snow management practices; and (3.) identification of potential snow storage and treatment sites for reducing snow melt-water run-off.
- Implement Best Management Practice (BMP) filtration structures at up to three sites around Cordova for filtering snow melt-water. Referred to as "structural BMPs," these constructed treatment areas "are designed to control the rate and volume of stormwater run-off, release of pollutants to receiving waters, and/or remove pollutants once they are incorporated into the stormwater run-off" (Shannon and Wilson, 2006, BMP Effectiveness Report 18-9001-15 Fairbanks, AK).
- Monitor stormwater run-off water quality before and after implementation of BMPs. Since the goal is to reduce downstream pollutant loads and concentrations of pollutants, we will follow a water quality testing regime that determines whether the effluent (or downstream water quality) is cleaner than the influent (or upstream water quality).

- Synthesize results on the effectiveness of BMPs (maintenance required, results of water quality monitoring) and the cost-effectiveness of each approach applied with regard to water quality improvements in a "BMP Guidance Report" that will be distributed to other small, coastal municipalities.

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen.

For conducting a snow management analysis of City of Cordova and Alaska Department of Transportation & Public Facilities snow handling procedures, our primary method will be to contract with DOWL Engineers for an analysis of snow management practices within Cordova city limits. DOWL HKM Engineering conducted a similar study for the City and Borough of Juneau in 2010, and the City of Fairbanks contracted for an analysis of suitable BMPs as part of its Fairbanks Stormwater Best Management Practice Development Project (Shannon & Wilson, 2006). In year 1 of the project, the analysis in Cordova will consist of documenting snow removal routes and timing of snow collection, historic snow fall records, amount of sand applied to roads, locations of snow dumps and their proximity to aquatic and marine water bodies, and equipment used. We will conduct water quality monitoring at selected snow dump sites in year 1, before any modifications to City of Cordova and ADOT/PF snow handling practices are made. Analysis tools will include interviews of City of Cordova Public Works operators, examination of maps of snow removal routes and location of snow dumps, photo documentation of snow management practices over the course of a winter season, and preliminary modeling to anticipate pollutants of concern for use in identifying appropriate stormwater treatment BMPs.

Conducting this analysis will involve two site visits per year by DOWL HKM Engineers. During the first visit, in the first project year, the engineers will interview Cordova Public Works staff to document their current practices. The engineers will also create maps (from aerial imagery or CAD maps) to illustrate snow management practices. Before the snow clearing season begins, the engineers will visit each snow storage site to analyze its drainage patterns and site conditions.

During the winter season, CRWP staff will assist with documenting current City practices by taking photos of each snow storage site. We expect that DOWL HKM engineers will make a site visit to Cordova during the first project year winter to track whether actual snow management practices match what was discussed during the initial City Public Works staff conversations.

Such an analysis is a critical first step in identifying solutions for snow melt run-off:

> The amount of pollutants in urban snow is affected by a number of factors including land use, traffic load, type of traffic in the time between snowfall and removal, type of deicers applied to the roadway surface, and the time of year. The pollutant pathway is also affected by snow handling activities and winter climate conditions. Quick removal of snow from roadways reduces the potential for an increased amount of pollutants in

the snow caused by traffic. Average annual snowfall for Cordova is 108 inches. Years of excessive snowfall, such as the winter of 2011/2012 when Cordova recorded 325 inches of snowfall, can lead to emergency snow storage practices including storing snow in and near wetlands, stream channels, and other fresh waterbodies. Such practices have direct, adverse effects on water quality (Odiak Pond Stormwater Assessment, DOWL HKM engineers, 2012).

In the Year 2 BMP trial project phase, we will work with City of Cordova and ADOT/PF staff to select three sites for implementing structural BMPs to help improve snow melt water quality run-off. CRWP staff will also work with the project engineers, City of Cordova and ADOT/PF staff to monitor the implementation of recommendations to revise snow handling practices.

Selection of appropriate BMPs "is dependent on specific site characteristics and constraints, including stormwater flow rates and treatment volumes, target pollutants, available area, cost, permitting requirements, required maintenance, and community support" (Odiak Pond Stormwater Assessment, 2012). Structural BMPs that are likely to be considered for implementation in Cordova include:

- Provide ponds for early season meltwater detention and for late season sedimentation
- Maintain a vegetated buffer between the site and any surface water bodies.
- Maintain [or establish] a vegetated site surface where possible
- Provide aggregate to armor drainageways and treat meltwater through infiltration and percolation prior to flowing offsite (Odiak Pond Stormwater Assessment, 2012).
- Use of a passive 'V-swale' pad configuration tested by Anchorage investigators (Wheaton, Rice, 2003) may also be considered for implementation.

When we implement structural BMPs for treating snow melt-water at locations upstream of the stormwater discharge point, we'll be relying on engineered drawings and contractor services to create the treatment area. Methods used to track achieving this objective include quantitative methods such as "was the treatment structure constructed within the specified budget and timeline, and according to design drawings?" We will also monitor the treatment area to ensure that the recommended practice is being followed or the treatment site is being maintained as called for by the BMP specifications in winter 2014/2015 and 2015/2016 of the project. We will compare year 1 practices to year 2 practices to determine how costs and environmental impacts are affected after recommendations have been implemented.

CRWP will collect water quality samples following a sampling plan developed with the project engineers. The CRWP has an ADEC-approved Quality Assurance Project Plan (QAPP) that was approved in 2009 for the purpose of collecting stormwater run-off samples in Odiak Pond, Eyak Lake, and at the stormwater outfall culvert in Orca Inlet. We will collect samples for analyzing TSS, TAH, and TAqH using approved EPA testing methods. The sampling method from that plan will need to be modified to account for collecting snowmelt, and we were advised by ADEC that we will likely want to design a plan that allows us to look at multiple parameters so there is potential for answering more than one question (S. Serrano, ADEC, personal communication, 8/20/13). Parameters we anticipate focusing on include pollutant analytes, amount of snowmelt flow and time of season, and rate of snow melt –snow piles can be designed to facilitate faster or slower rates of melting, and orientation of the snow pile might be an important factor in this process. Slowing the rate of snow pile melting allows for more control of the discharge, and controlling the

discharge means being able to facilitate more filtration of contaminants from the snow melt run-off.

Samples will be collected during "dry" periods to establish a water quality baseline, during snowmelt periods, and during "wet" storm events. CRWP staff will collect water quality samples in the first year of this project during the first few hours of storm events and during dry periods of one week or longer. Water quality samples will be collected at the Orca Inlet stormwater outfall, and at selected snow dump sites during the spring melt.

Dissemination of useful findings to other small communities with similar snowfall levels and water quality concerns will be the final phase of this project. As mentioned earlier, only two municipalities in Alaska are required to obtain a stormwater discharge permit, and they have dedicated resources to compliance because of the permit requirement. Other Alaska communities are left to develop plans on their own that follow ADEC guidance and consider the impacts of snow handling on water quality (see "Coordination and Collaboration" section below for more detail on dissemination of project results).

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?

D. Description of Study Area

Where will the project be undertaken? Describe the study area, including if applicable decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates). The formula for converting from degree minute seconds to decimal degrees is: degrees + (minutes/60) + (seconds/3600) so 121°8'6" = 121. + (8/60) + (6/3600) = 121.135

Our primary study area will be snow storage locations and snow removal routes within the City of Cordova. Stormwater run-off in Cordova drains to three primary receiving waterbodies: Orca Inlet (tidal mudflats and marine ecosystem), Odiak Pond (freshwater and tidally influenced) and Eyak Lake (pink, sockeye and coho spawning system). The attached map shows a hydrological delineation of Cordova's drainage sub-basins. Fifty-three percent of Cordova's stormwater run-off drains to Orca Inlet (Bratslavsky Consulting Engineers, 2008).

E. Coordination and Collaboration

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the Trustee Council. Describe any coordination that has taken or will take place (with other Council funded projects, ongoing agency operations, activities funded by other marine research entities, etc.) and what form the coordination will take (shared field sites, research

platforms, sample collection, data management, equipment purchases, etc.). 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.

We anticipate that this work will be a valuable resource to other small, coastal communities in Alaska who are looking for field-tested examples of snow management BMPs that benefit water quality. The Alaska Department of Environmental Conservation's Section Manager for Storm Water and Wetlands agreed that the Department could assist with circulating our BMP Guidance Report via a "targeted e-mail distribution of the hyperlink to communities" (depending on the final report's relevancy) and that the Department could also post a link on its web page for snow management resources to the City of Cordova's or the EVOS Trustee Council's web page (e-mail communication with J. Rypkema, ADEC, 8/15/13) for the final project report.

We would also work to distribute our project results through professional networks. Shane Serrano, Environmental Program Specialist at the Alaska Department of Environmental Conservaton, recommended contacting the Alaska Association of Port and Harbor Administrators with our project results to propose making a presentation at its annual meeting. We will also contact the Alaska Rural Water Association (AWRA) and other professional associations that serve as resources to municipalities to help distribute project results.

At the local level, the CRWP will incorporate the work done under this project into its monthly outdoor education sessions on stormwater run-off conducted at Odiak Pond with Cordova's seventh grade science class. Since 2009, the Copper River Watershed Project has coordinated monthly stormwater education class sessions with the Cordova School District's seventh grade science class. The class visits Odiak Pond for these sessions because it's so close to the school. This class began its Odiak Pond program with setting minnow traps in the Odiak Pond inlet creek (under the supervision of a local AK Department of Fish & Game fish biologist). The traps captured coho salmon fry in November, 2009 and April, 2010, which the class used to complete and submit, with 27 student signatures, a nomination of Odiak Pond to the State Catalogue of Anadromous Waters.

Starting with the 2010-2011 school year, students added an assessment of stormwater debris entering Odiak Pond. Each month a small group of students walks the drainage area around Odiak Pond, collecting and counting the different types of garbage they find. At the conclusion of the school year students generate graphs based on their data and develop outreach materials promoting stormwater stewardship with the broader Cordova community. These projects include trash sculptures, posters, boxholder mailings, movies, radio podcasts, and newspaper articles. The stormwater assessment is continuing this school year, with students adding turbidity to their regular water quality observations. Lessons learned from the snow management assessment will be incorporated into this program and into student outreach projects (see attached Cordova Times article by 7th grade student).

CRWP will continue to work at the public meeting level to keep the City Council and Planning & Zoning Commission apprised of the progress and improvements made through analyzing the City's snow management practices. We also use the Cordova Times newspaper as a way of communicating with a broader audience, and will continue our public education work around

pollutants associated with storm water run-off. We will also coordinate public education outreach, integrating our messages and the timing of outreach efforts, with the Cordova Clean Harbor initiative if this proposal and that effort receive EVOS Trustee Council funding.

III. CV's/RESUMES

The resumes of all principal investigators and other senior personnel involved in the proposal must be provided. **Each resume is limited to two consecutively numbered pages** and must include the following information:

- A list of professional and academic credentials, mailing address, and other contact information **(including e-mail address)**.
- A list of up to five of your most recent publications most closely related to the proposed project and up to five other significant publications. Do not include additional lists of publications, lectures, etc.
- A list of all persons (including their organizational affiliations) in alphabetical order with whom you have collaborated on a project or publication within the last four years. If there have been no collaborators, this should be indicated.

IV. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding. Please format your information like the following example.

Objective 1. Analyze City of Cordova snow management practices and make recommendations to help reduce snow melt-water pollution being discharged into aquatic and marine environments.
To be met by September 2014

Objective 2. Implement Best Management Practice (BMP) filtration structures at up to three sites around Cordova for filtering snow melt-water.
To be met by November 2014

Objective 3. Monitor stormwater run-off water quality before and after implementation of BMPs.
To be met by January 2016

Objective 4. Synthesize results on the effectiveness of BMPs and the cost-effectiveness of each approach applied with regard to water quality improvements in a "BMP Guidance Report".
To be met by January 2016.

B. Measurable Project Tasks

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed. This information will be the basis for the

quarterly project progress reports that are submitted to the Trustee Council Office. Please format your schedule like the following example.

FY 14, 1st quarter (February 1 – April 30, 2014)	
Feb. – April	Contractor reviews City of Cordova and AK DOT/PF snow management practices (maps, route schedules, location of snow dump sites)
Feb. – April	CRWP staff collect water quality samples during dry periods for baseline
FY 14, 2nd quarter (May 1, 2014- July 31, 2014)	
May – June	Contractor analyzes snow management practices
May - June	CRWP staff collect snow melt water quality samples
June – July	Contractor prepares draft (65%) snow management plan with recommendations for snow melt treatment structures
FY 14, 3rd quarter (August 1, 2014- October 31, 2014)	
September	Contractor and CRWP staff meet with City of Cordova and ADOT/PF to review snow management plan recommendations, discuss implementation
September	Contractor submits final Cordova Snow Management Plan
September	Contractor creates drawings for BMP structures
September - November	CRWP staff, City of Cordova staff, ADOT/PF staff and local contractors (if needed) coordinate implementation of BMP structures
FY 14, 4th quarter (November 1, 2014 – January 31, 2015)	
Nov. – Jan.	CRWP staff monitor snow management practices and structures for effectiveness in retaining snow and filtering snow melt-water (allowing for winter rain events).
Nov. – Jan.	CRWP staff collect water quality samples during dry or wet periods
FY 15, 1st quarter (Feb. 1 – April 30, 2015)	
Feb. – April	CRWP staff monitor snow management practices and structures for effectiveness in retaining snow and filtering snow melt-water (allowing for winter rain events).
Feb. - April	CRWP staff collect water quality samples during wet or dry periods
FY 15, 2nd quarter (May 1 – July 31, 2015)	
Early May	City of Cordova and ADOT/PF staff, contractor and CRWP staff meet to review lessons learned, implementation challenges and successes.
May - June	CRWP staff collect snow melt water quality samples
	Engineer drafts guidance report, CRWP circulates to project partners for review and comment.
FY 15, 3rd quarter (Aug. 1 – Oct. 31, 2015)	
	CRWP staff synthesizes water quality sampling results and changes in snow management practices for effectiveness in treating snow melt-water
	CRWP staff collect water quality samples
	CRWP staff present guidance report at October annual meetings of Alaska Rural Water Association and Alaska Association of Port and Harbor Administrators
FY 15, 4th quarter (Nov. 1 2015 – Jan. 31, 2016)	

	CRWP staff monitor snow management practices and structures for effectiveness in retaining snow and filtering snow melt-water (allowing for winter rain events).
	CRWP staff collect water quality samples
	CRWP presents project results to City of Cordova Council.

V. BUDGET

Budget Form (Attached)

Please complete a budget form for each proposed year of the project.

A grant request budget for developing a snow management plan for the City of Cordova is made up of the following project expenses:

Salaries

CRWP staff:

1.5 months per project year for CRWP Executive Director, 173 hours x $28.94 + 18% fringes in year one, 173 hours x $30.10 + 18% fringes in year 2) = $18,078.64.

1.5 months per project year for CRWP Project Technician, 173 hours x $22.05 + 18% fringes in year one, 173 hours x $23.15 + 18% fringes in year 2) = $13,840.69.

1 month in project year 2 for CRWP Program Director for work on community outreach and incorporating snowmelt run-off into monthly 7th grade science class field trips, 173 hours x $25.49 + 18% fringes = $5,203.53.

Contractual

DOWL HKM Engineering, analysis of City of Cordova snow management practices, $90,000 for work on conducting snow management analysis on City of Cordova and Alaska Department of Transportation and Public Facilities streets within City limits, for assistance with developing a water quality sampling plan, for assistance with designing three snowmelt filtration structures and with preparing a guidance report for distribution to other Alaska municipalities.

CRWP will conduct a competitive bid solicitation for contractor services to construct the three snow pile BMP structures. Contractor costs are estimated to be $8,000 per BMP structure, $24,000 total.

CRWP will contract for surveying services needed in construction of snow pile BMP structures, three structures x $2,000 per site = $6,000.

Water quality sampling: sampling for Total Suspended Solids (TSS), Total Aqueous Hydrocarbons (TAqH), and Total Aromatic Hydrocarbons (TAH) at one site costs roughly $500. We anticipate sampling during two "dry" events in each project year, and also sampling at three snow pile sites plus the Orca Inlet stormwater outfall four times during each project year. We have also allowed for shipping costs of transporting collected samples to testing lab in Anchorage. Total, $23,440.

Travel

DOWL HKM Engineers make four trips to Cordova from Anchorage, 2 people x $490 for round-trip airfare, and 2 trips by one person, round-trip from Anchorage - Cordova. We anticipate that the engineers will make 1 trip with two people and one trip with one person per project year.

Per diem costs are estimated at $200 per day per person.

Indirect Costs

The CRWP has a federally-approved indirect cost rate of 19.65%, $37,268.75.

Non-EVOS Funds

We anticipate an in-kind match of $13,800 from City of Cordova staff and from Alaska Department of Transportation and Public Facilities staff with their participation in the snow management analysis.