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Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Cook Inlet Beluga Whale Study
Study Plan Section 9.17

Initial Study Report
Part C: Executive Summary and Section 7

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

LGL Alaska Research Associates, Inc., and R2 Resource Consultants, Inc.

June 2014

TABLE OF CONTENTS

LIST OF ATTACHMENTS

EXECUTIVE SUMMARY

Cook Inlet Beluga Whale Study 9.17	
Purpose	The goals of this study are to (1) provide current, fine scale information on Cook Inlet Beluga Whale (*Delphinapterus leucas*; CIBW) distribution and movements within the Susitna River delta, (2) correlate these data with information on the ecology and habitat parameters of CIBW prey species, including eulachon (*Thaleichthys pacificus*) and Pacific salmon (*Onchorynchus spp.*), and (3) record incidental observations of all marine mammals sighted during beluga whale studies. This information will facilitate future analysis of the potential effects that may result from the construction and operation of the Project.
Status	This is a multi-year study. Data collection began in 2013 with implementation of aerial surveys and deployment of remote video and still cameras.
Study Components	Study components include (1) aerial surveys to document CIBW and other marine mammals within the Susitna River delta, (2) a combination of video and still cameras to increase ability to detect CIBWs and to document group composition and behavior, and (3) development of a model to describe the relationships between river discharge and water surface elevation in CIBW foraging habits at the delta.
2013 Variances	AEA implemented the methods as described in the Study Plan with the exception of the following variances. The significance of these variances is discussed within the ISR. Section 9.17.4.2.1 - Observers did not document the angle of aerial survey sightings because this function within the Mysticetus software program was deemed unnecessary. Angles to sightings can be used to develop sightability curves, to develop density estimates. However, estimating density was not an objective of the study. Section 9.17.4.2.1 – Rather than using the median of CIBW group counts made by the observers, each observer independently counted the number of animals in each group during multiple passes (up to five). Observers then discussed their results and agreed upon a "best" count for each CIBW group. Section 9.17.4.2.2 – Video cameras at PRM 6 were installed at the west camera station on June 24 and the east camera station on July 12; however, the live-feed function of the cameras was not operational until September 25, 2013. From September 13 through September 24, video from the cameras fixed at a wide-angle view of the river was recorded onto hardrives for later review. Additionally, two still cameras were installed at each video camera station on September 3 and they collected an image every 5 seconds through

Cook Inlet Beluga Whale Study 9.17	
	October 17.
Steps to Complete the Study	A Modified Revised Study Plan (MRSP) has been provided as Attachment 1 to the ISR. This MRSP applies to study plan activities that will occur in 2014 and 2015. AEA is planning the following activities for 2014: limited vessel-based surveys for CIBW and their prey in the Susitna River delta (MRSP Section 9.17.4.1) and development of a 2015 Implementation Plan (MRSP Section 9.17.4). In 2015, AEA plans to complete all remaining data collection and analysis for this study to fully achieve the three objectives listed in the Study Plan (RSP Section 9.17.1) using the methods described in the Modified Revised Study Plan (Attachment 1).
Highlighted Results and Achievements	Seventeen aerial surveys were flown from May 6 through October 11. CIBWs were sighted during 12 of the 17 aerial surveys, including all surveys between May 6 and August 30, except for an incomplete survey on June 27. Although four surveys were flown from September through early October, no CIBWs were observed after the survey on August 30. The number of CIBW groups observed during each survey ranged from zero to nine and the monthly sighting rate of CIBW groups was highest in July and August. Locations of CIBW sightings varied among flights with most sightings occurring within two miles of the Cook Inlet shoreline in the Susitna River Delta. Aerial surveys detected five groups of whales in the Susitna River between PRM 0 and PRM 2. These sightings were on May 19 (one CIBW), June 21 (two groups of two CIBWs each and one group of one CIBW), and August 30 (one CIBW). No whales were incidentally observed upstream of PRM 2 during any of the other AEA field studies conducted in 2013. CIBW group sizes ranged from 1 to 109 across all surveys, with consistently larger groups observed in July and August. Peaks in the average group size per survey occurred in late May and early June and again in late July and August; coincident with the timing of spawning migrations of eulachon and adult salmon. CIBW group composition remained relatively constant across the months of the survey. Overall, 92 percent of observed belugas were classified as “white”, 7.5 percent as “gray”, and 0.5 percent as “dark gray”. Technical difficulties delayed remote video monitoring in the Susitna River until September 25. Video was recorded for later review from September 3 through September 24, during which nine video sightings of whales were recorded; seven on September 20 and two on September 22. All the whales were traveling. No CIBWs were detected during live-feed video monitoring

Cook Inlet Beluga Whale Study 9.17	
	from September 25 through October 17. Over 650,000 photographs were taken by eight still cameras mounted at various locations along the Lower River which operated with different start and stop dates (depending on location) between July 1 and October 8. Only one group, composed of two beluga whales, was positively identified. These whales were recorded on September 4 by cameras positioned at PRM 6. No beluga whales were photographed by still cameras positioned from PRM 11 through 16. A total of twenty-four observations of harbor seals were made during 12 of the 17 aerial surveys, with the total number observed in each survey ranging from 4 to approximately 722. Harbor seals were observed hauled out on sand bars at low tide, and were occasionally observed in mixed groups with beluga whales.

7. COMPLETING THE STUDY

7.1. Proposed Methodologies and Modifications

Based upon evaluation of the overall effectiveness of the methods implemented during the 2013 study season, AEA has developed significant modifications to this study's methods for activities in 2014 and 2015. Accordingly, AEA has developed a Modified Revised Study Plan (MRSP) (Attachment 1). The modified methods will improve AEA's ability to meet all of the objectives of the Cook Inlet Beluga Whale Study as described in the RSP Section 9.17.1.

Activities in 2014 will include limited testing of vessel-based surveys in the Susitna River delta. These vessel-based surveys will use visual observers and sonar to document the distribution and relative abundance of CIBW and their prey as well. In addition, in 2014, AEA plans to develop and file with the Commission a technical memorandum that includes a decision whether to extend the fluvial geomorphology (Study 6.6) and water quality modeling (Study 5.6) below PRM 29.9. Prior to finalizing this technical memorandum, AEA will seek the input of the Fish and Aquatic Resource Technical Workgroup. Finally, informed by AEA's evaluation of the efficacy of the 2014 vessel-based surveys and AEA's decision regarding extension of the modeling below PRM 29.9, AEA will develop of an implementation plan for 2015 activities. The 2015 Implementation Plan will be filed with the Commission in 2014.

As will be documented in the 2015 Implementation Plan, activities in 2015 will include 1) additional vessel-based surveys based on results from 2014 activities, 2) land-based visual observations near Big Island in the Susitna River, and, 3) potentially, the use of extended geomorphology and water quality modeling, should it be deemed necessary, to assess potential impacts on beluga whale foraging habitat. These activities are described in the MRSP provided as Attachment 1. These activities will be further described in the 2015 Implementation Plan.

7.1.1. Decision Points from Study Plan

There were no decision points in the FERC-approved Study Plan to be evaluated for this study following the completion of 2013 work. The Decision Points for extending the geomorphology and water quality modeling further down river are described in Study 6.6 and Study 5.6, respectively.

7.1.2. Modifications to Study Plan

Given the scale of modification to the Study Plan, AEA has developed a Modified Revised Study Plan (MRSP) (Attachment 1) for study activities in 2014 and 2015. The MRSP retains the same study objectives outlined in the RSP (RSP Section 9.17.1), with new methods that improve AEA's ability to meet the approved study objectives. On May 7 and May 22, 2014, AEA discussed the 2014 activities with representatives of the National Marine Fisheries Service (NMFS). NMFS representatives provided informal feedback on the 2014 activities. This feedback has been incorporated into the MRSP. Additional informal collaboration will be conducted during development of the 2015 Implementation Plan.

The following is a description of AEA's modifications to the RSP, which are further detailed within the MRSP (Attachment 1).

7.1.2.1. General Description of the Proposed Study

Section 9.17.1 of the RSP provided a general description of the Cook Inlet Beluga Whale Study, including the three objectives for the study. The MRSP does not modify the study objectives.

7.1.2.2. Existing Information

Section 9.17.2 of the RSP provided a summary of relevant information about Cook Inlet Beluga Whales. AEA has updated this section to include the findings from AEA's 2013 study activities in the context of the existing information.

7.1.2.3. Study Area and Timing

Section 9.17.3 of the RSP described the study area and study season for the Cook Inlet Beluga Whale Study. The Modified Revised Study Plan does not change the study area or timing for activities in 2015.

7.1.2.4. Study Methods

AEA has updated the introduction in this section to describe the phased approach for completing study activities in 2014 and 2015 to meet study objectives.

Section 9.17.4 of the RSP described the methods to be used to meet each of the three study objectives. The MRSP has also modified the methods for each study objective as described below.

7.1.2.4.1. Vessel-based Surveys

Section 9.17.4.1 of the RSP provided that aerial surveys would be used to document CIBW and other marine mammal presence within the Susitna River delta. In the MRSP, AEA has modified the study to eliminate aerial surveys and is planning to use vessel-based surveys to document both beluga whale presence as well as the distribution of beluga whale prey species (eulachon and adult salmon). A detailed description of the survey approach and data collection is provided in Section 9.17.4.1 of the MRSP. The modified methods will better support AEA's efforts to document CIBW and other marine mammal presence within the Susitna River delta (Objective 1) and improve AEA's ability to correlate those data with information on the ecology and habitat requirements of CIBW prey species.

7.1.2.4.2. Land-based Surveys

Section 9.17.4.2 of the RSP provided that a combination of remote live-feed video camera systems and high-resolution still cameras would be used to document CIBW group size, group composition and behavior in the Susitna River (Objective 2). In the MRSP, AEA has modified the study to eliminate the use of video and still cameras and instead use observers to document CIBW in the Susitna River. Observers would conduct CIBW surveys near the 2013 camera

observation stations and members of the eulachon study team (Study 9.16) would be utilized to survey for beluga whales further upriver. A description of the survey approach and data collection is provided in Section 9.17.4.2 of the MRSP and additional details will be provided in the 2015 Implementation Plan. The modified methods will better support AEA's efforts to document CIBW within the Susitna River (Objective 2).

7.1.2.4.3. Habitat Modeling

Section 9.17.4.3 of the RSP provided that AEA would develop a water surface elevation (WSE) model to evaluate the influence of Project operations on CIBW foraging habitats (Objective 3). In the MRSP, AEA has modified the study to eliminate the use of a WSE model and instead use ongoing modeling in the Geomorphology Study (Study 6.6) and Water Quality Study (Study 5.6) to evaluate potential Project effects on CIBW foraging habitat. A description of those modeling efforts and the future decision points as to whether those models will be conducted downstream of PRM 29.9 is provided in Section 9.17.4.3 of the MRSP. The modified methods will better support AEA's efforts to describe potential impacts to CIBW foraging habitats (Objective 3).

7.1.2.5. Consistency with Generally Accepted Scientific Practices

Section 9.17.5 of the RSP provided support from the literature for the methods proposed to study Cook Inlet Beluga Whales. AEA has updated this section to include literature to support AEA's modified methods.

7.1.2.6. Schedule

Section 9.17.6 of the RSP provided the field and reporting schedule for the CIBW study. AEA has updated this section to reflect AEA's schedule for activities in 2014 and 2015.

7.1.2.7. Level of Effort and Cost

Section 9.17.8 of the RSP provided an estimate of the level of effort and cost to conduct the CIBW study. AEA has updated this section to reflect AEA's costs associated with its modified methods and activities in 2014. The remaining cost for completing the study will be determined after evaluating the efficacy of the 2014 study effort and development of the IP for 2015.

7.2. Schedule

In general, the schedule for completing the FERC-approved Study Plan is dependent upon several factors, including Project funding levels authorized by the Alaska State Legislature, availability of required data inputs from one individual study to another, unexpected weather delays, the short duration of the summer field season in Alaska, and other events outside the reasonable control of AEA. For these reasons, the Study Plan implementation schedule is subject to change, although at this time AEA expects to complete the Study Plan through the filing of the Updated Study Report by February 1, 2016, in accordance with the ILP schedule issued by FERC on January 28, 2014.

With regard to this specific study, AEA is planning the following activities for 2014:

- Limited vessel-based surveys for CIBW and their prey in the Susitna River delta (MRSP Section 9.17.6). In 2014, surveys will occur two or three times a week during the last week of May and all of June (except for June 3-12 when the National Marine Mammal Lab will be conducting aerial surveys of CIBW abundance). This timing is intended to capture at least one peak in the eulachon migration up the Susitna River, as well as some early portions of adult salmon runs.
- Development of a 2015 Implementation Plan including evaluation of modeling results from Studies 5.6 and 6.6 as presented in their technical memos (MRSP Section 9.17.1).

In 2015, AEA plans to complete all remaining data collection and analysis for this study.

7.3. Conclusion

Based upon the combination of 2013 efforts including variances (as described in Section 4), proposed work in 2014 and 2015 (as described in the Modified Revised Study Plan in Attachment 1), and integration with other studies (e.g., Studies 5.6 and 6.6), AEA expects to achieve all Study Plan objectives. Aerial surveys made progress toward achieving study objectives one and two in 2013, and vessel-based surveys are expected to achieve those objectives in the second phase of the study. Although video cameras were not functional until September in 2013, the combination of video, still photographs, observations during 21 roundtrip helicopter flights over the lower Susitna River, and the lack of CIBW observations during the Eulachon Study (ISR Study 9.16) provide information on CIBW presence in the Susitna River. Land-based observations in 2015 will enhance this information. Objective three will be addressed in 2015 using analysis of geomorphology and water quality modeling results from Studies 6.6 and 5.6, respectively.

PART C – ATTACHMENT 1: MODIFIED REVISED STUDY PLAN

Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Cook Inlet Beluga Whale Study
Study Plan Section 9.17

Initial Study Report
Part C – Attachment 1
Modified Revised Study Plan

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

LGL Alaska Research Associates, Inc., and

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June 2014

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

9.17. Cook Inlet Beluga Whale Study

9.17.1. Introduction

On December 14, 2012, Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (FERC or Commission) its Revised Study Plan (RSP), which included 58 individual study plans (AEA 2012). Section 9.17 of the RSP described the Cook Inlet Beluga Whale Study. The study plan focused on the methods for locating, describing, and assessing Cook Inlet Beluga Whales (*Delphinapterus leucas*; CIBW) within the Susitna River delta, which may be affected as a result of Project construction and operation. RSP 9.17 provided goals, objectives, and proposed methods for data collection regarding CIBW.

On February 1, 2013, FERC staff issued its study plan determination (February 1 SPD) for 44 of the 58 studies, approving 31 studies as filed and 13 with modifications. RSP Section 9.17 was one of the 31 studies approved with no modifications.

Based upon evaluation the overall effectiveness of the methods implemented during the 2013 study season, AEA has developed significant modifications to this study's methods for the activities that will occur in 2014 and 2015. The updated methods will improve AEA's ability to meet all of the study objectives.

Given the scale of modifications to the Study Plan, AEA has developed this Modified Revised Study Plan (MRSP) for study activities in 2014 and 2015. The MRSP retains the same study objectives outlined in the RSP (RSP Section 9.17.1), with new methods that improve AEA's ability to meet the approved study objectives. On May 7 and May 22, 2014, AEA discussed the 2014 activities with representatives of the National Marine Fisheries Service (NMFS). NMFS representatives provided informal feedback on the 2014 activities. This feedback has been incorporated into the MRSP.

9.17.1.1. General Description of the Proposed Study

The goals of this study are threefold: (1) to provide current, fine scale information on Cook Inlet Beluga Whale (*Delphinapterus leucas*; CIBW) distribution and movements within the Susitna River delta, (2) to correlate these data with information on the ecology and habitat parameters of CIBW prey species, including eulachon and Pacific salmon, and (3) to record incidental observations of all marine mammals sighted during beluga whale studies. Information is needed regarding CIBWs and their prey in the Susitna River and delta to facilitate future analysis of the potential effects that may result from the construction and operation of the Project. CIBW prey species information (i.e., eulachon and salmon) will be coordinated with fish studies currently ongoing in the Lower River (see Fish Distribution and Abundance in the Middle and Lower River (Study 9.6), Salmon Escapement (Study 9.7), and Eulachon Run Timing, Distribution, and Spawning (Study 9.16)). Collectively, this information will be used by FERC in its National Environmental Policy Act (NEPA) and licensing processes, for the NMFS Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) reviews, and for the development of potential protection, mitigation, and enhancement (PM&E) measures.

Three specific objectives have been identified for this study:

1. Document CIBWs and other marine mammals in the Susitna River delta, focusing on CIBW distribution and upstream extent.
2. Document CIBW group size, group composition, and behavior within the Susitna River delta.
3. Develop a model to describe the relationships between river flows, water surface elevation, and CIBW foraging habitats in the Susitna River.

9.17.2. Existing Information and Need for Additional Information

9.17.2.1. Distribution

9.17.2.1.1. Cook Inlet

Cook Inlet beluga whales reside in Cook Inlet year-round, which makes them geographically and genetically isolated from other beluga whale stocks in Alaska (Allen and Angliss 2012). Given their limited geographic range, changes in environmental conditions, including temperature and prey distributions among others, have the potential to influence CIBW distribution within the Inlet. Since the early 1990s, a variety of studies have been conducted to assess CIBW spatial and temporal distribution. Beginning in 1993, aerial surveys have been conducted annually by NMFS-National Marine Mammal Laboratory. These surveys have been flown annually in June and August with the focus of survey effort concentrated along northern, coastal waters of the Inlet (within 1.5 kilometers [0.9 miles] from shore) and a reduced survey effort in the middle and southern portions of the Inlet (NMFS 2008; Hobbs et al. 2011). Historic aerial surveys for beluga whales also were completed in 1982 and 1983 (Harza-Ebasco 1985). In addition to aerial surveys, land- and boat-based surveys have been conducted to investigate CIBW movement and residency patterns in the Susitna Flats State Game Refuge and adjacent areas. These latter efforts have been focused on characterizing distribution and habitat use by individuals and groups of whales (Funk et al. 2005; Prevel-Ramos et al. 2006; Markowitz and McGuire 2007; Markowitz et al. 2007; Nemeth et al. 2007; McGuire et al. 2008; McGuire and Kaplan 2009; McGuire et al. 2009, 2011a, b).

From 1999 to 2003, researchers applied satellite tags to 14 CIBW individuals to examine year-round movements (Goetz et al. 2012). The tagged whales were documented moving in Upper Cook Inlet even when ice was present. The whales present were documented in dispersed groups and they spent more time in offshore waters, south of the Susitna River delta (Rugh et al. 2000). In a separate study, Hobbs et al. (2005) reported that CIBWs dive deeper in the winter than during summer which suggests that shallow, ice-covered mudflats are not the primary winter foraging grounds. These data indicate a reduced likelihood of beluga whale presence in the Susitna delta habitats during winter.

Passive acoustic monitoring (PAM) has been used to monitor whales in Cook Inlet (ADF&G 2010). Results of this study showed varied CIBW residency patterns throughout the year which may be difficult to interpret due to challenges with this technology. The ability to detect marine mammals acoustically depends on several factors including the type of equipment, proximity of the animal to the recording device, vocal behavior of the animal, and environmental factors such as high flow noise, which may mask marine mammal calls (e.g., river discharge and tidal fluctuations). Therefore, the absence of an acoustic detection does not necessarily indicate the

absence of whales. These false negatives impose a high level of uncertainty on acoustic-based distribution studies.

The Susitna River delta mudflats in upper Cook Inlet may be a calving ground for CIBWs (Huntington 2000) and seasonal use of the Susitna mudflats by CIBWs has been well documented (McGuire et al. 2009, 2011a, b; Hobbs et al. 2012). Although studies have documented large aggregations of CIBWs in Upper Cook Inlet in late summer and fall (summarized in NMFS 2008), they have not documented specific fine-scale information on the spatial and temporal use of the Susitna River delta by belugas and their prey.

As described in detail in the ISR Study 9.17 Sections 4, 5, and 6, the first season of research, conducted from May through October 2013, included aerial surveys of the Susitna River delta. Seventeen aerial surveys were conducted between May 6 and October 11, 2013. Six surveys were flown during high tide, six during low tide and five during the intermediate tide between high and low. CIBWs were sighted during 12 of the 17 aerial surveys, including all surveys between May 6 and August 30, except for an incomplete survey on June 27. Although surveys were flown into October, no CIBWs were observed in the Susitna River delta after the survey on August 30. Locations of CIBW sightings varied among flights, with most sightings occurring within two miles of the Cook Inlet shoreline in the Susitna River Delta (between the Beluga and Little Susitna rivers). The number of CIBW groups observed during each survey ranged from zero to nine and the monthly sighting rate of CIBW groups (among months that had any sightings) was highest in July and August and lowest in June. Measured on an individual whale basis (i.e. CIBWs observed per hour of survey effort), sighting rates increased steadily from May to July and were highest from July to August. The observed spatial distribution is generally consistent with previous studies that included the survey area during some of the same months (e.g. Rugh et al. 2004; Goetz et al. 2012; Sims et al. 2012; Shelden et al. 2013). The temporal pattern of abundance is consistent with other studies that also showed increased presence of CIBWs in the Susitna River Delta in May and June, and again in mid- July through August (Hobbs et al. 2005; Funk et al. 2005; McGuire et al. 2008, 2009, 2011; McGuire and Kaplan 2009; McGuire and Bourdon 2009, 2012). As suggested above, these patterns are likely in response to seasonal migrations of fish (NMFS 2008). Additional information on CIBW distribution and movement patterns relative to their prey within the Susitna River delta is needed to understand the potential for Project-related effects on CIBWs.

9.17.2.1.2. Susitna River

Site-specific data on use of the Susitna River above the delta is limited. As described in detail in the ISR Study 9.17, the first season of research, conducted from May through October 2013, included aerial surveys and a combination of live-feed video and still cameras. Various logistical and technical issues limited the duration of time the camera systems were in place and operating. During video sampling between September 3 and 24 at Project River Mile (PRM) 6, CIBWs were sighted nine times; seven sightings on September 20 and two on September 22. A single group of one white individual and one gray individual was captured in a still photograph on September 4, also at PRM 6. No beluga whales were photographed by still cameras positioned from PRM 11 through PRM 16. Given these observations, additional information is needed to describe specifically how and when the CIBWs use Susitna River habitats.

9.17.2.2. Critical Habitat

The existing information on CIBWs listed above is incomplete and depicts only a partial picture of CIBW habitat needs. However, additional information is available regarding habitat that has been deemed essential to the conservation of this species. The CIBW was listed as an endangered species under the ESA in October 2008 (73 FR 62919) and critical habitat for CIBWs was designated in April 2011 (76 FR 20180). When determining critical habitat, NMFS also identified the following five primary constituent elements (PCEs) essential to the conservation of the CIBWs:

1. Intertidal and subtidal waters of Cook Inlet with depths <30 feet (mean lower low water; MLLW) and within 5 miles of high and medium flow anadromous fish streams.
2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.
3. Waters free of toxins or other agents of a type and amount harmful to CIBWs.
4. Unrestricted passage within or between the critical habitat areas.
5. Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by CIBWs.

Based on these criteria, NMFS identified two specific marine area types in Cook Inlet that contained one or more PCEs. Type 1 critical habitat encompasses 1,909 square kilometers (738 square miles) of Cook Inlet northeast of a line from the mouth of Threemile Creek to Point Possession. Type 1 critical habitat has the highest concentrations of beluga whales from spring through fall. Type 2 critical habitat consists of 5,891 square kilometers (2,275 square miles) of known fall and winter use areas. It is located south of Type 1, and includes nearshore areas along the west side of the Inlet and Kachemak Bay on the east side of the lower inlet. Type 1 critical habitat extends into the Susitna River approximately 8.6 nautical miles from MLLW. Because the critical habitat designations include the lower Susitna River it is important to understand the potential for the Project to affect the habitat of the CIBW.

9.17.2.3. Prey Species

Seasonal movement patterns of CIBWs, as well as site fidelity, appear to be closely linked to prey availability. Whale movement patterns coincide with seasonal salmon and eulachon concentrations (Moore et al. 2000). CIBWs have been documented upriver in Cook Inlet tributaries during spring, summer, and fall. Historic records also indicate that CIBWs have been seen in the eastern channel of the Susitna River as far as 30 to 40 miles upriver, yet are most commonly found within the first 5 miles of the Susitna River delta (Funk et al. 2005). It is thought that these excursions into tributaries are associated with foraging on prey species. Because these whales are likely following prey species into river habitats, any Project-related impacts to prey species abundance, run timing, and/or density have the potential to cause indirect impacts on CIBWs (PCE 2). It is, therefore, important to collect baseline information on CIBW prey species that will facilitate future analysis of potential Project impacts.

9.17.2.4. Other Marine Mammals

In addition to CIBWs, three other marine mammals are routinely documented in Cook Inlet. Harbor seals (*Phoca vitulina*), harbor porpoise (*Phocoena phocoena*), and killer whales *(Orcinus*

orca) may use Susitna River delta habitat. Harbor seals are distributed throughout Cook Inlet with higher concentrations in lower Cook Inlet compared to the upper inlet. However, sightings of harbor seals in the upper inlet have been increasing over the past few years. The most recent aerial survey documented approximately 1,750 harbor seals in the Susitna River delta (Shelden et al. 2011). Harbor seals in Alaska are not classified as strategic or depleted stocks under the MMPA and are not listed as threatened or endangered under the ESA (Allen and Angliss 2012). The most recent population estimate for the Cook Inlet/Shelikof Strait harbor seal stock is 22,900 (Allen and Angliss 2012). Harbor porpoise have been documented throughout Cook Inlet (Shelden et al. 2011; ADF&G 2009, 2010). Harbor porpoise in Cook Inlet belong to the Gulf of Alaska stock, which is not classified as a strategic or depleted stock under the MMPA and is not listed as a threatened or endangered species under the ESA (Allen and Angliss 2012). The most recent abundance estimate is 31,046 for Gulf of Alaska harbor porpoise. While unlikely, resident killer whales have also been acoustically detected in upper Cook Inlet (ADF&G 2010). The presence of these other species in upper Cook Inlet indicates the need to further consider the potential for them to utilize Susitna River delta habitats.

9.17.3. Study Area and Timing

The study area encompasses the Susitna River delta upstream to the upper extent of CIBW distribution. Since the upper extent of the distribution is unknown, surveys in 2015 will extend up to approximately PRM 50. The timing of surveys in 2015 will be provided in the IP. Due to logistics and safety concerns, as well as lower concentrations of belugas in the Susitna River delta during winter months (as documented through satellite tags), winter surveys (November through March) will not be conducted.

The vessel-based survey area during limited testing of methods in 2014 is the Susitna River Flats in Upper Cook Inlet between the Little Susitna and Beluga Rivers. The survey area in 2014 includes the Susitna River at the downstream end of Big Island into Cook Inlet 2 miles from PRM 0 (mean low tide), and within 2 miles of the coastline between Beluga River and Little Susitna River. The survey area will allow observations and sonar data collection over several types of habitat (intertidal, and coastal open-water) where beluga whales and their prey are expected to co-occur. In 2014, surveys will occur 2 to 3 surveys per week in June (except for June 3-12 when the National Marine Mammal Lab will be conducting aerial surveys of CIBW abundance). This timing is intended to capture at least one peak in the eulachon migration up the Susitna River, as well as some early portions of adult salmon runs. Surveys will be timed to collect data during both low and high tidal stages to the extent boat ramp conditions allow.

9.17.4. Study Methods

AEA is planning a phased implementation of this study. In 2014, AEA is planning to conduct limited testing of methods for vessel-based surveys of CIBW and their prey in the Susitna River delta (Section 9.17.4.1 below). Limited vessel-based surveys in 2014 will be used to develop recommendations for survey methods in 2015 to meet Objective 1 (Section 9.17.4.1).

In addition, in 2014, AEA plans to develop a technical memorandum that includes a decision whether to extend the water quality modeling below PRM 29.9 (Section 9.17.4.3). Prior to finalizing this technical memorandum, AEA will seek the input of the Fish and Aquatic Resource Technical Workgroup on this decision.

Based upon the results of the 2014 test surveys and AEA's decision regarding whether to extend the geomorphology and water quality modeling downstream from PRM 29.9, AEA will prepare a 2015 Implementation Plan detailing the study methods for the 2015 field season. AEA will informally collaborate with NMFS on the development of the 2015 Implementation Plan. AEA plans to file the 2015 Implementation Plan with the FERC in 2014.

The 2015 Implementation Plan will include detailed methods for documenting CIBWs and other marine mammals in the Susitna River delta; documenting CIBW group size, group composition, and behavior within the Susitna River delta; and describing modeled impacts to CIBW foraging habitats in the Susitna River. This Implementation Plan will allow AEA to incorporate the results of 2014 vessel-based surveys. The Implementation Plan will also allow AEA to coordinate modeling efforts in 2014 and develop methods to meet Objective 3 (Section 9.17.4.3).

9.17.4.1. Vessel-based Surveys

Vessel-based surveys have previously resulted in good documentation of CIBW group composition, likely as a result of the closer proximity to the whales and longer encounter durations when compared to aerial surveys (Funk et al. 2005; McGuire et al. 2008, 2009, 2011; McGuire and Kaplan 2009; McGuire and Bourdon 2012). The use of vessel-based surveys would also provide a platform from which data on beluga prey species (primarily eulachon and adult salmon) could be collected simultaneously with data on beluga distribution, behavior, and group composition. Split-beam sonar has been successfully used in Upper Cook Inlet to document fish densities over relatively large spatial and temporal scales (Nemeth et al. 2007) as well as at smaller scales within a large river system (Stables et al. 2005). Combining these two sampling techniques may provide valuable insights into where beluga prey are located within the Susitna River delta and how CIBW groups are distributed relative to prey distribution. This information would be highly valuable in understanding potential direct and indirect impacts to CIBW from the Project. Such combined surveys intended to collected fine-scale spatial data have not, to our knowledge, been previously conducted in a similar environment; therefore, we propose to conduct the following research activities in 2014 to determine if these methods are feasible and appropriate for filling the identified data gaps.

9.17.4.1.1. MMPA Guidelines

The presence of the vessel in Cook Inlet has the potential to disturb or "take" marine mammals in the study area and observers must follow the guidelines of the Marine Mammal Protection Act (MMPA). The MMPA prohibits the harassment ("any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding, sheltering") of all marine mammal species in U.S. waters. The Endangered Species Act (ESA) also prohibits the "take" of species listed as endangered. CIBW were designated as endangered in 2008 and the survey area falls within CIBW critical habitat that was designated in 2011.

To avoid marine mammal take by harassment and stay in compliance with the MMPA and ESA, in 2014 the vessel will remain at least 200 m (~219 yd) from beluga whales and survey activities in the vicinity of the same group of whales will be limited to 30 min (Figure 4-1). The vessel

will avoid excessive speed or sudden changes in direction should marine mammals approach the boat and care will be exercised so as not to separate animals in a group that might approach the vessel. In the event that CIBW approach the vessel, engines will be idled or turned off and the vessel anchored or let drift until the whales move away from the vessel. The decision to anchor or let drift will depend on the current conditions and the safest course of action for both the whales and the vessel crew.

For 2015, AEA intends to apply for a scientific research permit to allow surveys to 100 m (109 yd). Throughout the course of this study, a paramount goal will be to not cause any disturbance to the whales.

9.17.4.1.2. Survey Approach

In 2014, surveys will be conducted using an adaptive sampling approach to combine large and fine-scale sampling techniques. Fine-scale sampling will be triggered by detections of large aggregations of eulachon. In order to avoid the potential for incidental harassment of CIBW, no fine-scale sampling (i.e. direct approach-depart sampling techniques) will be conducted in response to CIBW sightings. Survey speed will typically be between 2 and 3 mph (1.7 and 2.6 knots) for optimum sonar performance. Surveys are expected to last approximately 10 hours including transit to and from the Port of Anchorage. Two observers, one sonar technician, and a skipper will participate in each survey.

The survey approach in 2015 will be described in the Implementation Plan, based on the results of 2014 activities and informal collaboration with NMFS.

9.17.4.1.2.1. Large-Scale Surveys

The large-scale survey design features a zig-zag or "S" pattern along the shoreline within the study area. It is intended to document the overall geographic distribution of CIBW groups and fish densities within the Susitna Flats. This generalized course will be followed during each survey, typically starting at the mouth of the Little Susitna River and progressing westward to the Beluga River. Transect paths will range from the shoreline to approximately 2 mi offshore and the total length is approximately 30 mi. Upon approaching the shore, the vessel will slowly turn seaward when depths approach 3 m (~10 ft). Harbor seals are known to haul out on exposed mudflats in this region and the vessel will turn away from shore at a greater distance if such a haulout is detected in the vicinity. During the large scale survey, two observers will collect environmental data and visually scan for belugas using binoculars and the naked eye while a third crew member will operate the split-beam sonar and monitor the depth finder as the vessel moves along the trackline.

To collect acoustic data on fish presence and densities, a split-beam sonar transducer will be mounted on an aluminum pole attached at midship and lowered to one meter below the surface of the water. The transducer will typically be oriented directly downward toward the seafloor, but occasionally it will be angled outward perpendicular to the boat where it will record data out to a range of approximately 40 m (131 ft). The sonar return signal will be combined with DGPS location data and stored on an onboard computer. The sonar system will be a BioSonics DT-X® split-beam echo-sounder with BioSonics Acquisition Software. The echo-sounder is programmed to transmit at 206 kHz, which is outside the range of beluga whale hearing (Castellote et al. 2014).

9.17.4.1.2.2. Fine Scale Surveys

The vessel will begin to perform a fine-scale survey when an aggregation of fish is detected on the split-beam sonar if the MMPA compliance can be maintained (Section 9.17.4.1.1). When large aggregations of fish are observed in the sonar data, the vessel will maneuver to find the nearest endpoint of the aggregation and then begin a tight zig-zag sampling pattern that will encompass the entire length and width of the aggregation to allow for estimation of the aggregation size and density.

9.17.4.1.3. Data Collection

Data collected during each survey will include a continuous trackline from a GPS, a continuous log of depth from a depth finder, the data stream from the split-beam sonar, environmental records every 30 minutes or when conditions change (i.e., sightability increases or decrease), and sightings records of beluga whales.

9.17.4.1.3.1. Sighting Data Collection

Although direct approaches of CIBW will not be conducted as a part of this study, the following information will be recorded at the beginning, end, and at five minute intervals during each CIBW sighting. Sighting data will be collected using a combination of PSOTracker and paper datasheets (Appendix A). Observers will use the "New Sighting" button on PSOTracker to capture a timestamp and GPS coordinates at the beginning of a sighting as well as generate a unique Sighting ID. For each 5 minute sampling or resight during a sighting, the "New Record" button will be used capture subsequent timestamps, coordinates, and unique Record IDs. Corresponding sighting and record numbers will be recorded on the paper datasheet so these data can be linked at the completion of each survey. Photographs of each sighting will be taken when possible.

9.17.4.1.3.2. Environmental Data Collection

Environmental data will be collected at the beginning of the survey, at the end of the survey, and once every 30 minutes during the survey, or sooner if conditions affecting visibility change rapidly. Environmental data should also be collected at least once during every fine scale sampling period. Environmental data are collected using PSOTracker (Appendix B). All cells in the form must be filled in. In addition to recording the entry values in the Environmental Effort form, observers should include comments in 'Comments' to describe what is happening whenever they feel something might need more explanation or is not adequately captured by the codes in the data fields. Observers should also include comments anytime a "variable" code is used.

9.17.4.2. Land-based Surveys of the Susitna River in 2015

While the vessel-based surveys described in 9.17.4.1 are appropriate to document the spatial distribution of CIBWs and their prey in the Susitna River delta, these surveys are not designed to evaluate CIBW use of the Susitna River itself. To increase the ability to detect CIBW presence in the Susitna River, both land-based and vessel-based observers may be utilized in 2015. Land-based observers would provide continuous data over longer time periods than aerial or vessel-

based surveys and allow for data collection without disturbing study animals (Funk et al. 2005; McGuire and Bourdon 2009; Cornick et al. 2010). In addition, on-water activities for Study 9.16 will provide an opportunity for incidental observations of CIBWs in the Lower River.

9.17.4.2.1. Survey Stations

If land-based surveys occur in 2015, survey stations would be located near Big Island in the Susitna River close to the location of video observations conducted in 2013.

9.17.4.2.2. Data Collection

Two observers would be assigned to each station for each 8-hour monitoring period. Upon sighting a group of whales, one observer would conduct focal group sampling, while the second observer would continue to scan the study area for the presence of other groups of whales. Presence and behavior of any other marine mammals or humans (including vessel traffic), would also be recorded.

To record the location of CIBW activity, the study area would be divided into segments using a numbered grid covering the station's field-of-view. When beluga whales are present, observers would record the group location by grid number, the number of animals in the group, group composition, and behavior. Once a group enters the field-of-view, one observer would begin focal group sampling and would remain focused on that group for as long as is possible given the time of observation within the monitoring period, the presence of other CIBW groups or other marine mammals, and environmental conditions. The goal of focal group sampling would be to extract the most information possible from the group without compromising data from additional groups.

9.17.4.2.3. Behavior Logs

Observers would record beluga behavior using three activity codes to indicate primary, secondary and tertiary group activities. The primary activity would be defined as that which best describes the activity of the group as a whole (e.g., traveling). The secondary and tertiary activities would be defined as behaviors of individuals within the group such as tail slapping and/or eye spying. If observers were able to obtain close-up photographs of whales with distinctive markings they would be shared with other researchers for potential photo-identification.

9.17.4.2.4. Group Counts

Each whale sighting would be assigned two identification numbers: a "day group" number that reflects the actual order of when a specific group was detected that day and an "archive group" that defines the group and thus, remains constant for all sightings during the study period. For example, a group sighted four times in one day would be assigned "day group" numbers of 1, 2, 3, and 4, and if it is the first unique group of that day the "archive group" number would be 1. If a single group of whales splits into distinct segments, letters would be used to denote archival subgroups of the same parent group (e.g., 1a, 1b, etc.). The only time that an archival group number would change is if two known groups merge into one. In such an instance, e.g., Group 1 joins Group 2, the combined group would be given the archive group number of the group that

joined, in this case, Group 2. This method of documentation allows for detailed tracking of animal groups, movements, and interactions without inflating animal numbers.

For reporting purposes, beluga whale sightings would be in reference to archive groups in order to accurately reflect the total number of groups and individuals observed. Sightings data such as behavior, composition, and/or location would be reported by "day group" in order to reflect dynamic changes within the study area by a single group.

Data would be recorded in real time by the visual observers. In addition, post-processed data would be presented in monthly reports that reflect monitoring effort and beluga whale activity (presence, group size, location, composition) as well as environmental conditions. While not the focus of this study, if photographs were high quality enough to be used for photo-identification purposes, AEA would include this information in the CIBW photo-ID catalogue.

9.17.4.3. Modeling CIBW foraging habitats in the Susitna River delta.

Satellite tagging of CIBWs and hydrodynamic statistical modeling of CIBW distribution from aerial surveys and tagging data indicate that seasonal CIBW distributions are correlated with water temperature, ice coverage, and the seasonal flow patterns of various rivers (Goetz et al. 2012). Additional data suggests that availability of salmon and other prey fish, such as eulachon, in river mouths can influence CIBW movements (Ezer 2011). CIBWs are known to be present in the Susitna River delta from late April through September (NMFS 2008) and this timing is coincident with the spawning migrations of eulachon and then Pacific salmon into the river.

The degree of Project effects on instream flow and geomorphology in the Susitna River delta is likely insignificant or discountable compared to the high tidal flux in the delta. However, it is believed that CIBW use bathymetric features like river channels to improve their foraging ability in the Susitna River delta.

Therefore, to describe potential impacts of the Project on Susitna River hydrology and CIBW foraging habitat, AEA will determine whether to extend the 1-D Bed Evolution Model (Study 6.6; designed to assess the potential for Project operations to change channel width, sediment transport volume, bed elevation, and flow depth and velocity) and water quality modeling (Study 5.6; designed to assess the potential for Project operations to change water turbidity, temperature, dissolved oxygen, and salinity) downstream of PRM 29.9. To determine if the 1-D Bed Evolution Model needs to be extended below PRM 29.9, the results of the 1-D Bed Evolution Model in Geomorphic Reach LR-4 (PRM 44.6 to PRM 32.3) and the portion of LR-5 (PRM 32.3 to PRM 23.9) upstream of PRM 29.9 will be compared for the pre-Project condition and Post-Project condition represented by the maximum load-following scenario. The comparison will be performed to estimate the potential for changes to the geomorphology and hydraulics (depth and velocity) downstream of PRM 29.9 and in particular the lower portions of Geomorphic Reach LR-6, the area of most interest in terms of CIBW habitat. The geomorphic criteria represent the potential for long-term channel change related to alteration in flows and sediment supply due to Project operations that could result in changes to habitat. The hydraulic criteria represent the potential for immediate changes in habitat related to alteration in flows due Project operations (see ISR 6.6 Section 7.1.1.1.2). A decision on the need to extend water quality modeling will use a similar approach. AEA will compare water quality parameters for pre-Project conditions with water quality parameters for post-Project conditions including the maximum load-following scenario in the areas modeled upstream of PRM 29.9. If there is little difference between the

water quality parameters between the two simulations, then potential Project effects on CIBW habitat will be considered negligible and the water quality model will not be extended (see ISR 5.6 Section 7.1.1.2).

The results of the pre- and post-Project model runs, evaluation of the decision criteria, and a decision whether to extend the modeling below PRM 29.9 will be presented in a technical memorandum in 2014. Prior to finalizing this technical memorandum, AEA will seek the input of the Fish and Aquatic Technical Workgroup.

If it is determined that extending the 1-D Bed Evolution Model or the water quality model below PRM 29.9 is unnecessary, then the analysis of these model results in Geomorphic Reach LR-4 (PRM 44.6 to PRM 32.3) and portions of LR-5 (PRM 32.3 to PRM 23.9) used to support that decision will also be used to explain the limited probability of any potential impacts to CIBW foraging habitat from Project operations. Should modeling be extended below PRM 29.9, those results will be used to support analysis of the nature of potential impacts to CIBW foraging habitat. Details regarding the biological interpretation of the impact on CIBW foraging habitat of any physical or chemical changes in the Lower Susitna River predicted by the water quality or geomorphic modeling will be presented in the 2015 Implementation Plan to be filed with the FERC in 2014.

9.17.5. Consistency with Generally Accepted Scientific Practices

The study methods presented here are consistent with methods commonly followed in investigations of CIBW. Vessel-based surveys have been used to document the distribution of beluga whales in Upper Cook Inlet including the Susitna Flats and Knik Arm (Funk et al. 2005) as well as for distribution and photo-identification purposes (McGuire et al. 2008, 2009, 2011; McGuire and Kaplan 2009; McGuire and Bourdon 2012). Split beam sonar is a well-established tool for conducting fisheries research and has been used to document fish densities in Upper Cook Inlet (Nemeth et al. 2007) and the Fraser River in British Columbia, Canada (Stables et al. 2005). Land-based visual observations of CIBW have been conducted to document whale usage of, and potential reactions to anthropogenic activities at, a number of locations in Upper Cook Inlet including Knik Arm (Funk et al. 2005; Prevel-Ramos et al. 2006; Cornick et al. 2010), Turnagain Arm (Markowitz et al. 2007), Fire Island (McGuire and Bourdon 2009), and near Tyonek (Nemeth et al. 2007; Prevel-Ramos et al. 2008).

9.17.6. Schedule

The anticipated field schedule for the limited testing of survey methods in 2014 will be 2 to 3 surveys per week from late May through the end of June, except for June 3-12 during the National Marine Mammal Laboratory aerial surveys of CIBW abundance. This schedule is intended to cover a peak in spawning of eulachon, an important CIBW prey species, as well as the beginning of the adult salmon spawning season. The exact survey schedule will be determined by weather and tidal conditions.

The field schedule for vessel-based surveys in 2015 will depend on results from the planned 2014 surveys. If implemented in 2015, land-based observations would also occur during ice-free months.

Quality Assurance (QA)/Quality Control (QC) reviews of the data analyses will be completed by the end of November each year.

Reporting will be completed in the February 2016 Updated Study Report. Progress on the study will be presented at the Technical Workgroup meetings.

9.17.7. Relationship with Other Studies

The Cook Inlet Beluga Whale Study will interrelate with at least seven of AEA's other Project studies. The flow of information into the CIBW Study is anticipated to occur over the entire study period through an iterative process.

Information from the following studies will be synthesized with the beluga whale study results to provide an ecologically based description of beluga whale distribution and habitats. The Salmon Escapement Study (Section 9.7) and Eulachon Run Timing, Distribution and Spawning in the Susitna River Study (Section 9.16) will provide information on the distribution of beluga whale prey species in the Lower River while the Baseline Water Quality Study (Section 5.5), Water Quality Modeling Study (Section 5.6), Geomorphology studies (Sections 6.5 and 6.6), and the Fish and Aquatics Instream Flow Study (Section 8.5) will provide information on physical and chemical processes that may influence distributions of CIBWs and their prey species. In addition, information from these studies will be used for the environmental analysis that will be prepared in support of AEA's FERC License Application. Additional formal data sharing will occur among studies after completion of QA/QC procedures with the delivery of the Updated Study Report (February 2016).

9.17.8. Level of Effort and Cost

The limited 2014 fieldwork will occur 2 or 3 times per week from late May through June. The vessel-based survey team will consist of four people (one skipper, two visual observers, and one sonar technician). Approximate cost of the 2014 surveys is $250,000. The remaining cost for completing the study will be determined after evaluating the efficacy of the 2014 study effort and development of the IP for 2015.

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9.17.10. Figures

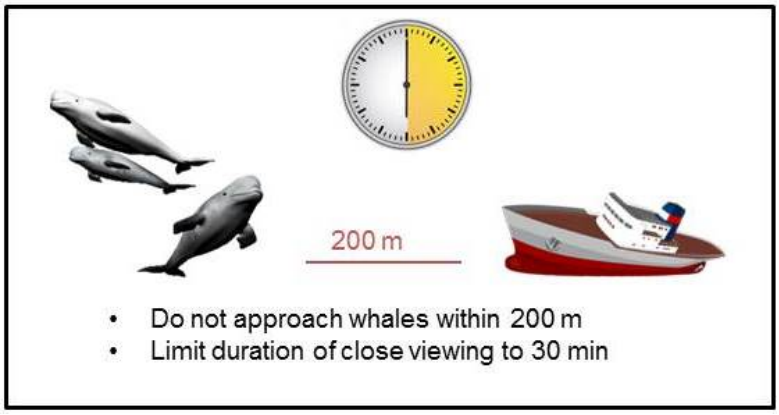


Figure 4-1. Guidelines to be followed during CIBW surveys.

PART C – ATTACHMENT 1

APPENDIX A: BELUGA WHALE SIGHTINGS DATA

SIGHTINGS DATA

PSOTracker

Click 'New Animal Sighting' to create a sighting record.

Click 'Resight, Same Animal' for sequential sightings every five minutes during fine-scale sampling periods.

Sighting

ID

Unique number # Unique number that is assigned by PSO Tracker to the sighting record.

Start Date and Time

MM/DD/YYYY_HH:MM:SS This is the start time and date of the **sighting**. PSO Tracker automatically assigns the date and time when a sighting record is created. PSOs can update this field if required. It must be entered in this **EXACT** format **MM/DD/YYYY_HH:MM:SS**. Time is entered in 24hr format.

Record

Lat (N)/ Long (W)

If the Bluetooth GPS is connected to PSO Tracker lat/long will automatically be entered as Decimal Degrees (Dec °). PSOs can enter lat/long as Dec ° or Degrees/Decimal minutes (Deg/min). Toggle the button (Deg/min or Dec °) to switch back forth between the fields shown above.

DDD.DDDD ###.#### Dec ° example= 32.30642° N; 122.61458° W

DDD°MM.MMM ###°##.### Deg/min example=32° 18.385'N; 122° 36.875' W

**The lat/long listed in both formats above refer to the same location. The computer performs a conversion when switching formats. Be aware of the format in which you are working.*

Record Date and Time

MM/DD/YYYY_HH:MM:SS This is the start time and date of the **record**. PSO Tracker automatically assigns the date and time when a record is created. If a sighting only has one record the date and time should be the same as the sighting start time (shown above). If a sighting has multiple records (resight, same animal), each record will have a unique start time. PSOs can update this field if required. It must be entered in this EXACT format MM/DD/YYYY_HH:MM:SS. Time is entered in 24hr format.

Paper Datasheets

Survey number	#	Number of the large-scale survey
Observer Details		Name and location of observers

Species *List of most common marine mammals in the Upper Cook Inlet.*

Gray Whale (Agvigluaq)	GW	**Harbor Porpoise**	HP
Humpback Whale	HW	**Harbor Seal**	HS
Beluga Whale (Sisuaq)	WW	**Killer Whale (Orca)**	KW

Mixed Species *Multiple species present in a single sighting*

Y		When several species are present, elaborate in "comments"
N		

Total Number of Animals

Total Individuals	#	The total number of individuals seen in the group being observed. For multiple-species groups, note the number of animals from each species in the comments section.

Group Composition

Number White	#	The number of positively identified white colored belugas in the group. If no white belugas, enter 0.
Number Gray	#	The number of positively identified gray colored belugas in the group. If no gray belugas, enter 0.
Number Dark Gray	#	The number of positively identified dark gray colored belugas in the group. If no dark gray belugas, enter 0.
Number Unknown	#	The number of individuals of unknown color. If all colors are known, enter 0.

Best Count *Best estimate of group composition*

Yes	Y	When a sighing only has a single record, Best Count is "YES". When a sighting has multiple records, choose the record that best represents the most accurate count of group composition as "YES", all other records "NO".
No	N	

Sighting Distance

# (m)	#	Distance (m) to animals as estimated by eye. Estimates done by eye should be rounded to the nearest 10 m. All distances should be relative to the observer. For large groups of animals in water, note the distance of the individual closest to the ship, and note the range of distances of animals to the ship under "comments". Also, estimate how many individuals in the group are inside the safety radius. For groups in water and on ice/land, calculate distance based on the animals on ice or land.

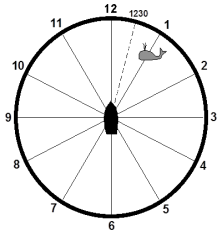
Vessel Heading

###	###	Heading of the vessel in degrees. Record using 3 digits (e.g., if heading is 30° record 030).

Location of MM

Where At

Animal's position relative to vessel, in clock face coordinates.

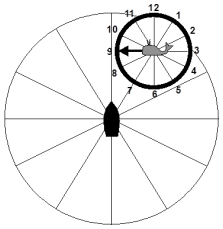


Example:

1200	Directly in front of the vessel.
1230	15º off vessel trackline to starboard.
600	Directly behind the vessel.
300	90º off vessel trackline to starboard.

Where To

Animal's direction of movement, in clock face coordinates.



Example:

1200	Traveling in the same direction as the vessel trackline.
930	Traveling almost perpendicular to the vessel trackline.
600	Traveling in opposite direction to the vessel trackline.
NO	No overall travel. Use for "milling" behavior.
U	Unknown, could not be determined

Behavior

Behav #1 *Primary behavior exhibited by group or individual.*

Behav #2 *Secondary Behavior observed. Enter "Unknown" if second behavior is not observed.*

If a group of animals are encountered, use the code that describes what the majority of animals in the group are doing.

Diving	DI	Animal(s) descend below the surface and are not seen again for a prolonged period of time.
Spyhop	SH	Cetacean seen raising its head vertically out of the water so that its eyes are clear of the surface.
Swim	SW	Animal(s) seen swimming at the surface of the water. Includes a series of short, shallow surface dives preceding a longer dive (as described above). Swimming should only be recorded in behavior #1 if no other behaviors are observed.
Traveling	TR	Majority of individuals in the group are swimming steadily in the same direction. No surface activity.
Surface active	SA	A combination of several behaviors that may include splashing, jumping, flipper or tail slaps, blows seen at surface of the water. Animal(s) may be swimming or milling about in one location. May involve social activity among more than one animal.
Surface-active travel	ST	Individuals in the group are surface active (see above definition) while moving in the same overall direction.
Milling	MI	Majority of individuals in the group are moving/oriented in varying directions, but remaining in the same general location. No surface active behaviors. Milling often occurs while animals are feeding. However, feeding is differentiated by the co-presence of feeding/diving birds and or fish, etc.
Feeding	FE	Animal(s) seen feeding (fish physically observed in mouth of animal)
Suspected Feeding	SF	Animal(s) seen exhibiting behavior commonly used in feeding (rapid dives, chasing after visible fish) or evidence of prey is observed at the location of the animal(s) (e.g. fish, dense aggregation of birds).
Resting	RE	Animal(s) lying motionless and resting at the surface of the water or on ice or land.
Other	OT	None of the above. Describe with a "comment".
Unknown	U	Not possible to determine.

Pace *The rate ("Pace") at which the marine mammal is performing a behavioral act.*

Sedate	SE	Animals that appear to be relatively relaxed or are moving slowly.
Moderate	MO	Animals that appear to be behaving at an intermediate pace.
Vigorously	VI	Animals that appear to be agitated, move frantically, or dive or move rapidly away from the source vessel.
Unknown	U	Pace cannot be determined.

Reaction		*Any visible reaction of the animal or group to something novel in their environment.*
Bowriding or wakeriding	BR	Animal rides the bow wave or stern wake of the vessel.
Change in direction	CD	Animal changes its direction of travel by 45º or more.
Decrease in speed	DS	Animal decreases speed noticeably.
Increase in speed	IS	Animal increases speed noticeably.
Look	LO	Looking at the vessel.
Rush	RH	Moving in to the water from ice or land (e.g., stampedes).
Interactions with gear	SG	Animal swims within the confines of the paravanes, bowrides on paravanes, approaches airguns, interacts with the towed seismic gear in any manner.
Splash	SP	Percussive behavior (e.g. tail slaps, breaching, thrash dives, flipper slaps).
No reaction observed	NO	If a reaction to the vessel is not observed and the animal appears to maintain pre-encounter activities.

Group Formation		*Arrangement of marine mammals in a group relative to each other*
Circular	CL	Animals grouped in a circle
Parallel	PL	Animals swimming next to each other moving in the same direction (I I I I)
Linear	LI	Animals swimming in front of one another moving in the same direction (- - -)
Echelon	EC	Animals in close proximity to each others' side, one slightly in front of the other (e.g. mother and calf)
No Formation	NF	No visible formation

InterIndividual Distance *Distance between individuals in a group*

<1 body length	1
1-3 body lengths	3
4-7 body lengths	7
8-12 body lengths	12
>12 body lengths	13

Comments

Use the comment box to provide additional information that is not captured in the data already. Include additional observations regarding habitat or location of the whales (e.g. river channel, near sandbar) if any.

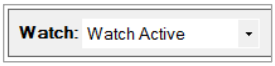
PART C – ATTACHMENT 1

APPENDIX B: VESSEL-BASED SURVEY EFFORT AND ENVIRONMENTAL DATA

EFFORT DATA

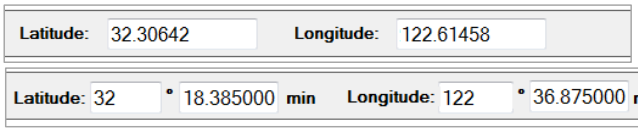
Click 'New Effort' to create an effort record. Effort must be collected every 30 min or when conditions change. Follow the guidelines below for proper data entry. Please QA/QC your data.

1. Watch



Watch Start	WS	The start of continuous observation session; not the start of an individuals person's shift. A watch session may last many consecutive hours, and include more than one observer over several shifts
Watch Active	W	A period during continuous observer watch; the watch period between WS and WE.
Watch End	WE	The end of (or break in) monitoring when observers are not on-watch.

2. Latitude and Longitude



Lat (N)/ Long (W)

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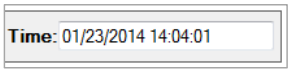
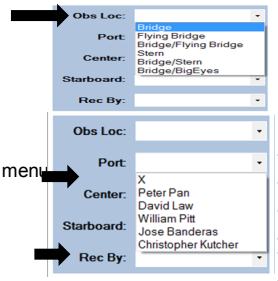
3. Date and Time



Date	MM/DD/YYYY_ HH:MM:SS	Date and time is automatically captured when observers click the New Effort button. Date is captured as DD/MM/YYYY: 01/23/2014.
Time		Time is captured using 24-h clock (e.g.,02:04:01PM: 14:04:01). observers can manually enter date and time into tracker. It must be entered in this EXACT format MM/DD/YYYY_HH:MM:SS.(_ indicates a space).

4. Observer



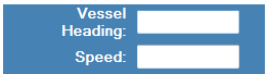
Observer Location			*Identify location of the observation station.*
Landing Craft	LC		Every location on board the survey vessel.
Position on Vessel			
Port	Initials		Enter name of observers on-duty at specific locations in drop-down menu
Center	Initials		Enter X if location is unoccupied. Do not leave it blank.
Starboard	Initials		Enter X for all locations if off watch or watch end.
Rec. by	Initials		Name of observer recording the line of data.

5. Vessel Heading

Heading of the vessel in degrees. Record using 3 digits (e.g., if heading is 30° record 030).

6. Vessel Speed

Vessel speed over ground (kt). Use zero if stationary.



7. Vessel Activity

Activity-General Activity		*Use the drop down menu to enter vessel activity.*
Other	OT	Non-specific activity including vessel transit. Write comment to explain OT.
Inactive	IA	Vessel in neutral, not moving through the water, no other activities, engines off.
Idle	ID	Vessel in neutral, no other activities, engines on.

8. Survey Activity

Line Number		*Guns*	
Line Number	#	On/Off	Survey line number
X	X	On/Off	Not on a survey line (transit to survey)

Number of Guns		*Guns*	
0	0	Off	No airguns firing.

Array Volume		*Guns*	
0	0	Off	No airguns firing.

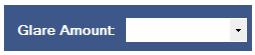
9. Environmental Conditions

Visibility km

# km	#	Greatest distance in km the observer can see to the horizon clearly from the vessel. Maximum value is 10 km, use the decimals when under 1 km (e.g., 250 m = 0.25 km).
> 3.5 or < 3.5	#	Code variable visibility as >3.5 or <3.5 km and include a written "comment" approximating range of visibility.
<0.1	<0.1	Use when visibility is less than 0.1 km (100 m).

Daylight Amount

Light	L	Observations during daylight, before the sun sets far enough below the horizon to have total darkness.
Twilight	T	Observation periods where the sun has set and observation distances may be reduced due to lack of light.
Dark	D	Observations during darkness, when it is too dark to see a marine mammal even close to the vessel, except in the vessel's lights.



Glare Amount

None	NO	No glare present
Light	LI	Little glare present, but a marine mammal could still be seen (with a bit of difficulty) in the area of glare.
Moderate	MO	Moderate glare present that would fall between LI and SE glare amounts.
Severe	SE	Severe glare such that a marine mammal could not be detected in the area of glare.

Glare From

Clock face #	####	Position where glare starts from. Glare position is described as hours on a clock face moving in the clockwise direction, with 12 o'clock directly in front of the vessel (e.g., Glare From 1200, Glare To 0130).
X	X	Use X if no glare is present.
Variable	VAR	Use **only** in the **'Glare From'** box. Use this code if the vessel is idling or circling and the position of the glare is constantly changing. Please describe in comments.

Glare To

Clock face #	####	Position of where glare goes to. Glare is described as hours on a clock face moving in the clockwise direction. (E.g., Glare From 1200, Glare To 0130)
X	X	Use X if no glare is present or if glare does not cover more than one clock face direction.
Forward	FOR	Use **only** in **'Glare To'** box if you use the 'Variable' code and the glare is primarily forward (0900 to the 0300) of the vessel. If glare is abeam code it 'Forward'.
Aft	AFT	Use **only** in **'Glare To'** box if you use the 'Variable' code and the glare is primarily aft (towards the stern) of the vessel.

11. Human Activity Information

 # Other Vessels within 10 km

# other vessels	#	Total number of other vessels (e.g., tugs, barges, drillship, etc.) visible within 10 km. Describe any additional activities (aircraft, etc) in comments.
0	0	Enter '0' if no vessel present within 10 km.

Closest Vessel Name

Vessel Name	Name	Full name of closest vessel within 10 km.
X	X	Enter 'X' if no vessel present.

Closest Vessel Distance

# km	#	Distance (km) of closest other vessel. Exact distance can be obtained from radar. Do not record vessels >10 km away.
X	X	Enter 'X' if no vessel present.

12. Water Depth and Wind Force

Water Depth: m

Wind Force (BF):

Water Depth

# m	#	Water depth (m) to sea floor.
X	X	Enter 'X' if not available and explain in comments.

Wind Force (BF)	*Wind Speed (kt)*	*Wave Height (m)*	
0	<1	0	Sea like a mirror.
1	1-3	0.1	Ripples with the appearance of scales are formed, but without foam crests.
2	4-6	0.1-0.5	Small wavelets, short but more pronounced. Crests have glassy appearance & don't break.
3	7-10	0.5-1.25	Large wavelets. Crests begin to break. Perhaps scattered white caps.
4	11-16	1.25-2.5	Small waves, becoming longer. Fairly frequent white caps.
5	17-21	2.5-4	Moderate waves, taking a pronounced long form. Many white caps. Chance of spray.
6	22-27	4-6	Large waves forming; white foam crests more extensive everywhere. Probably spray.

12. Comment

Use the comment box to provide additional information that is not captured in the data already. If a variable code is used, please explain in comments.

USE THE COMMENT BOX TO DESCRIBE WHAT IS HAPPENING WHENEVER THE OBSERVER FEELS SOMETHING MIGHT NEED MORE EXPLANATION OR IS NOT ADEQUATELY CAPTURED IN THE DATA FIELDS. FOR EXAMPLE: "LEAVING GULFPORT TO HEAD OUT TO STUDY AREA"; OR "GUNS STOPPED BECAUSE OF A COMPUTER PROBLEM."; OR "ACTIVELY MANAGING ICE".