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Susitna-Watana Hydroelectric Project Document
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Title: Cook Inlet beluga whale study, Study plan Section 9.17 : Initial study report	**SuWa 207**
Author(s) – Personal:	
Author(s) – Corporate: Prepared by HDR, Inc.	
AEA-identified category, if specified: Draft initial study report	
AEA-identified series, if specified:	
Series (ARLIS-assigned report number): Susitna-Watana Hydroelectric Project document number 207	**Existing numbers on document:**
Published by: [Anchorage : Alaska Energy Authority, 2014]	**Date published:** February 2014
Published for: Alaska Energy Authority	**Date or date range of report:**
Volume and/or Part numbers: Study plan Section 9.17	**Final or Draft status, as indicated:** Draft
Document type:	**Pagination:** 80 p. in various pagings (including both parts)
Related work(s):	**Pages added/changed by ARLIS:**
Notes: The following parts of Section 9.17 appear in separate files: Main report ; Appendices.	

All reports in the Susitna-Watana Hydroelectric Project Document series include an ARLIS-produced cover page and an ARLIS-assigned number for uniformity and citability. All reports are posted online at http://www.arlis.org/resources/susitna-watana/

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SUSITNA-WATANA HYDRO

Susitna-Watana Hydroelectric Project (FERC No. 14241)

Cook Inlet Beluga Whale Study
Study Plan Section 9.17

Initial Study Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

HDR, Inc.

February 2014 Draft

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LIST OF ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

Abbreviation	Definition
AEA	Alaska Energy Authority
ASLC	Alaska SeaLife Center
cfs	cubic feet per second
CIBW	Cook Inlet Beluga Whales
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
ft	feet
GPS	global positioning system
ISR	Initial Study Report
MMO	marine mammal observers
NEPA	National Environmental Policy Act
NMFS	NOAA National Marine Fisheries Service
PCE	primary constituent elements
PM&E	protection, mitigation and enhancement
PRM	Project River Mile
Project	Susitna-Watana Hydroelectric Project
RSP	Revised Study Plan
SPD	Study Plan Determination
WSE	water surface elevation

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	[As explained in the cover letter to this draft ISR, AEA's plan for completing this study will be included in the final ISR filed with FERC on June 3, 2014.]
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 observed upstream of PRM 2 during any of the 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 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 river mile 6. No beluga whales were photographed by still photographs positioned from project river miles 11 through 16.

Cook Inlet Beluga Whale Study 9.17	
	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.

1. INTRODUCTION

On December 14, 2012, Alaska Energy Authority (AEA) filed its Revised Study Plan (RSP) with the Federal Energy Regulatory Commission (FERC or Commission) for the Susitna-Watana Hydroelectric Project (FERC Project No. 14241), which included 58 individual study plans (AEA 2012). Section 9.17 of the RSP described the Cook Inlet Beluga Whale Study. On February 1, 2013, FERC staff issued its study 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.

This RSP section focuses on the methods for locating, describing, and assessing Cook Inlet Beluga Whales (*Delphinapterus leucas*; CIBW) within the Susitna River delta which may potentially be affected as a result of Project construction and operation. RSP 9.17 provided goals, objectives, and proposed methods for data collection regarding CIBW.

Following the first study season, FERC's regulations for the Integrated Licensing Process (ILP) require AEA to "prepare and file with the Commission an initial study report describing its overall progress in implementing the study plan and schedule and the data collected, including an explanation of any variance from the study plan and schedule." (18 CFR 5.15(c)(1)) This Initial Study Report (ISR) on Cook Inlet Beluga Whale has been prepared in accordance with FERC's ILP regulations and details AEA's status in implementing the study, as set forth in the RSP approved by FERC's February 1 SPD (referred to herein as the "Study Plan")."

2. STUDY OBJECTIVES

The goals of this study are to (1) provide current, fine scale information on 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.

Three specific objectives were 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.

3. STUDY AREA

As established by RSP Section 9.17.3, the study area encompasses the Upper Cook Inlet nearshore along the Susitna River delta upstream to the upper extent of CIBW distribution,

across the inlet to Point Possession, and southwest to Tyonek (Figure 3-1). Surveys extended up the Susitna River to Project River Mile (PRM) 50, 10 to 20 miles upstream of existing whale sightings.

4. METHODS AND VARIANCES IN 2013

4.1. Document CIBW and Other Marine Mammal Presence within the Susitna River Delta

4.1.1. Aerial Surveys

Aerial surveys for CIBWs were scheduled throughout the duration of the open-water season, from May (ice-out) to October 2013.

The survey schedule was intended to allow for increased effort during the expected eulachon spawning season (May and June), during peak runs of adult salmon (June through August), and during times when beluga calves may be present (July and August). However, weather constraints and the unexpectedly short duration of the eulachon run, which likely occurred during the first week of June near the mouth of the Susitna River, precluded surveys that coincided with the peak run into the Susitna River.

Surveys were scheduled around low, high, and intermediate tides. Some surveys captured both a high or low tide and an intermediate tide. Surveying during low tide is effective because it reduces the overall area that must be searched due to the large areas of exposed mud flats. Surveying during high tide is advantageous for determining the upstream extent of CIBW in the Susitna River, and examining travel to and from feeding grounds within the study area. Due to the rapidly changing tide heights and limited periods of good weather, surveys were also conducted during intermediate tides and these provided opportunities to observe animals in transition between areas.

From May 6 through June 21, survey flight paths were primarily focused on nearshore areas between the Little Susitna River and the Beluga River. Survey lines were oriented perpendicular to the north shore of Cook Inlet with straight-line connections between them creating a "zipper" pattern. The southern or offshore extent of these surveys was determined by the aerial survey crew and fluctuated relative to the tidal stage. After discussions with NMFS in June, survey tracklines were changed to a "sawtooth" pattern with the southern limit formed by the boundary of the study area (Figure 3-1). Thus, offshore areas towards Point Possession and behind Fire Island were added to the survey design beginning on June 27. Alterations to the flight path after June 27 were a result of commercial air traffic at the Anchorage Airport or due to mechanical problems. Most surveys included coverage of the Susitna River as far upstream as PRM 15, with some going as far as PRM 20.

Surveys were conducted at 1,000 feet to avoid disturbance to marine mammals. The target survey speed was 170-180 km/hour (105-115 miles/hour).

The survey aircraft was a high-winged Cessna 180 Skywagon which was equipped with floats for water landing after June 27. One observer was seated at a bubble window and the other looked through a flat window. An intercom allowed communication between observers and the pilot. Communications were not restricted as strict line-transect protocols were not used since CIBW density estimates were not an objective.

The aerial survey team included one pilot and two experienced marine mammal observers (MMOs), observing on opposite sides of the aircraft. Due to personnel availability, the first flight was conducted with only one MMO. The MMOs scanned the water visually to locate CIBWs and other marine mammals via unaided eyes. Each time CIBW's were observed the aircraft broke from the survey transect and circled the group to collect the data described in the following paragraph.

Data were recorded on paper data sheets and a laptop computer connected to a hand-held global positioning system (GPS) programmed with the Mysticetus data acquisition program. This duplicate data recording ensured proper quality control after each flight and provided hard copy back up of data. For each sighting, the time and position of CIBWs or other marine mammals were captured through the GPS-enabled data program when the group was positioned below and immediately adjacent to the airplane. Data collected for each marine mammal sighting included location, best estimate of group size, group composition by color (white, gray, or dark gray), group behavior, group spacing and alignment, and direction of travel. Environmental data were collected at the beginning of each survey and were updated as conditions warranted, including environmental conditions that affected sighting probability (e.g., high sea state and glare).

For CIBWs, each observer independently counted the number of animals in each group, and multiple passes (up to five) were conducted to get the most accurate count of each CIBW group. The two observers compared results after each count and agreed to the "best" count for each CIBW group. A still camera was used to document encounters, when possible, but was not used for group counts. A high resolution camera was available beginning July 17; a lower resolution camera was used until then. Additionally, the team was prepared to immediately report any observations of stranded or distressed marine mammals to NMFS.

Sighting rates of CIBW groups were calculated for each one-mile band of Cook Inlet as measured from a normalized Cook Inlet shoreline between the Beluga and Little Susitna rivers (this includes the mouth of the Susitna River). The number of one-mile bands between the northern and southern shorelines of upper Cook Inlet varied among high, intermediate, and low tides. Sighting rates were calculated by dividing the total number of groups sighted in each one-mile band by the amount of effort (flight time) spent in each band.

Harbor seal (*Phoca vitulina*) groups were photographed and counted from still photos. Accuracy of counts was enhanced beginning July 17 with the acquisition of the high resolution camera.

4.1.2. Variances

Section 9.17.4.2.1 of the RSP provided that the observers would enter the angle of aerial survey sightings, which would be obtained from an inclinometer to obtain the degrees relative to the survey aircraft. Although the Mysticetus software program can be set up to use angle to

calculate distance to CIBWs, this function was deemed unnecessary and therefore was not utilized. Angles to sightings are used to develop sightability curves, which are used to develop density estimates. Estimating density was not an objective of the study. This change had no bearing on the accuracy of sighting data, as all CIBWs and other marine mammal groups were counted multiple times by both observers until a best count for each group was obtained. This change will continue in the next year of study.

Section 9.17.4.2.1 of the RSP provided that all counts from both observers will be combined and the median will be used to achieve the most accurate group size and reduce the effect of outliers within counts. Instead, 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. This change increased confidence in the accuracy of the count recorded and will continue in the next year of study.

4.2. Document CIBW Group Size, Group Composition and Behavior in the Susitna River

Data collected during aerial surveys described in section 4.1.1 were used to characterize CIBW group size, composition, and behavior in the Susitna River delta; however, aerial surveys are relatively infrequent and of limited duration. To increase the ability to detect CIBW presence in the Susitna River and to document group composition and behavior (e.g., traveling, foraging), a combination of remote live-feed video camera systems and high-resolution still cameras was utilized.

4.2.1. Camera Stations

4.2.1.1. Video Cameras

Two stations with live-feed video camera arrays were established near PRM 6 of the Susitna River (Figure 4.2-1; Appendix A). Each station included two video cameras; one to provide wide-angle coverage maximizing the field of view and likelihood of detecting CIBWs, and one to focus on groups or individual animals, providing more detailed behavioral and group composition data. The 36x optical zoom video cameras were in a weatherproof housing that provided continuous 360 degrees horizontal pan and 180 degrees vertical pan. The camera CCDs contained approximately 380,000 effective pixels producing 540 horizontal lines in NTSC format. The camera systems were mounted to 9-meter steel towers embedded in the ground (Appendix A) and each had a field of view of 120 degrees. Batteries, electronics, and recharging systems were located in hard cases mounted at the base of the steel towers.

Installation of video cameras and associated equipment was completed on June 24 at the west camera station and on July 12 at the east camera station (Figure 4.2-1). Logistical and technical difficulties (see Section 4.4) delayed streaming of live video until September 25, 2013. Because of the difficulties with deployment of the live-feed video system, an external hard drive was connected to each video camera so that video could be recorded for later viewing. External drives were installed at both camera stations on September 13. Both external drives had 30-day capacities. Video from September 13 through September 24 was downloaded manually from the field sites and transferred to a server.

From September 25 through October17, live-feed video was monitored and directly recorded to a server. Live images were transmitted via microwave signal to a receiver in Anchorage. The video cameras utilized remotely-operated camera technology, which allowed observers to remotely manipulate cameras (e.g., pan, zoom, capture still images, wipe lens, etc.) in real-time via a microwave link.

Therefore, video data of any kind (recorded or live-feed) were only collected between September 13 and October 17, 2013.

4.2.1.2. Still Cameras

In addition to external hard drives, four still cameras were installed at each video camera station on September 3 (Figure 4.2-2). The still cameras used were Reconyx PC800 Hyperfire Professionals that had 3.1 mega-pixel CCDs and could be programmed to collect photos at specified intervals. Two cameras operated simultaneously at each station, providing a 180 degree field of view. These two cameras took photos every five seconds, from 7 AM to 7 PM, for one week, after which the second set of two cameras took photos every five seconds for one week. Two cameras operated from September 3 through October 17, 2013.

Four additional still cameras of the same type described in the previous paragraph were installed and deployed further upstream by July 1, 2013 (Figure 4.2-2; Appendix B). Two cameras were located in different channels near PRM 11. The other cameras were located near PRM 12 and PRM 16. Each camera had a 90 degree field of view. These cameras took photos every minute from 7 AM to 9 PM. Two cameras operated through October 8, 2013, but the other two were lost during high-water events sometime between August 17 and October 8.

4.2.2. Data Collection and Summary

4.2.2.1. Video Cameras

Video recorded from September 3 through September 24 was retrieved and all recorded video from daylight hours was reviewed by an observer. When CIBWs were sighted, observers recorded the number of animals in the group, group composition (the number of white, grey or dark grey individuals), and the group behavior. The location of each group within the study area was recorded using a numbered grid covering the field-of-view of the cameras at each station.

Beginning on September 25, observers were able to remotely monitor the video cameras using the live-feed system. Monitoring was conducted over a continuous 8-hour period for five out of every seven days from September 25 through October 17. Two camera observers were assigned to each video camera station for each 8-hour monitoring period. All monitoring occurred during daylight hours but start and end times varied to focus on high tides. During each monitoring period, observers remotely scanned the study area with one of the two video cameras at each station every 20 minutes. For each scan, observers focused the camera at the farthest south or north position and slowly moved the camera focal point across the study area. Camera movement was in timed increments, not continuous. With each movement the observers paused the camera long enough (typically <10 seconds) to determine if whales were present before moving the camera to the next increment. Scans usually lasted between 10 and 15 minutes, but

were longer if CIBWs were present. During intervals between scans, cameras were focused on a single location and checked frequently for opportunistic sightings. The focus of the cameras between scans was the area with the greatest possibility of having an opportunistic sighting, determined by distance from the camera and visibility due to tidal stage. During the detailed scanning process, the second camera remained stationary and set at a wide angle view.

A detailed protocol for recording CIBW group location by grid number, the number of animals in the group, group composition (white, grey, dark grey), group behaviors, and groups splitting apart or joining together was in place, but never used as no CIBWs were observed while monitoring the live-feed video. Presence and behavior of any other marine mammals or humans (including vessel traffic), were also recorded and all video footage was digitally archived.

In addition, the protocol provided that each CIBW sighting would be assigned two identification numbers: a "day group" number that reflected the order of when a specific group was detected that day and an "archive group" that defined the group and thus, remained constant for all sightings. For example, a group sighted on four successive camera scans in one day would have been assigned "day group" numbers of 1, 2, 3, and 4, and if it was the first unique group of that day the "archive group" number would be 1. If a single group of whales split 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 merged into one. In such an instance, e.g., Group 1 joined 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, CIBW sightings will be in reference to archive groups to accurately reflect the total number of groups and individuals observed. Sightings are also in reference to behavior, composition, and/or location data recorded within the confines of a single scan (day group) to reflect dynamic changes within the study area by a single group.

4.2.2.2. Still Cameras

All photos were retrieved from the field and stored for later viewing. All images were examined for approximately two seconds to determine if CIBWs were present. If objects of interest were detected during that initial scan, images were investigated more closely to determine if CIBWs were present. When CIBWs were present in the image, observers recorded the general location, the number of animals in the group, and group composition (white, grey, or dark grey). Glare and weather, primarily fog and rain, impacted image clarity and the ability to detect CIBWs, especially at increasing distances from the camera; however, environmental data affecting overall visibility within each image were not recorded during the review process.

4.2.3. Variances from Study Plan

Section 9.17.4.2.2 of the RSP provided that monitoring of the live-feed video cameras at PRM 6 would be conducted from May through September. Live-feed video cameras were installed on June 24 at the west camera station and on July 12 at the east camera station; however, live feed from video cameras was not functional until September 25. Because of technical problems with the live-feed video cameras, still cameras were installed at video stations on September 3 to

capture images every 5 seconds. External drives were then connected to the video cameras on September 13 to record video for later viewing. Still photos and video were, therefore, simultaneously collected from September 3 through October 17.

In July, still cameras were installed between PRMs 11 and 16. These still cameras were operational from July 1 through October 17. The purpose of these still cameras was to assist in documenting the upstream extent of CIBW use of the Susitna River while the video cameras were not functioning.

In addition, the lower Susitna River was surveyed by air 15 times from May 6 through October 11.

Information on CIBW presence/absence within the Susitna River was also collected during activities required to install, maintain, troubleshoot, and repair video equipment, and from other studies. Installation, troubleshooting, repair, and removal of video equipment required 21 roundtrip helicopter flights over the lower Susitna River from June 3 through October 19. No CIBWs were observed during these helicopter flights. From May 28 through June 16, crews from the Eulachon Study (Study 9.16) surveyed the Susitna River by boat from PRM 10 to PRM 30 daily, and occasionally surveyed upstream to PRM 50. Again, no CIBWs were observed during this vessel activity.

4.3. Develop a model to describe the relationships between river flows, water surface elevation, and CIBW foraging habitats in the Susitna River delta.

The study team did not initiate development of a river discharge versus water surface elevation model in 2013 as envisioned in the Study Plan.

4.3.1. Variances

Section 9.17.4.3 of the RSP indicated that the development of a model would be initiated in 2013. This study component has been deferred until the next year of study. AEA does not anticipate that the deferral of this component will impact successfully achieving the study objectives.

5. RESULTS

Data developed in support of the ISR is available for download at:
http://gis.suhydro.org/reports/isr/9/9.17

5.1. Document CIBWs and Other Marine Mammals in the Susitna River Delta

Seventeen aerial surveys were conducted between May 6 and October 11, 2013 (Table 5.1-1). Surveys ranged from 2 to 5.5 flight hours, depending on weather conditions and the number of sightings. Six surveys were flown during high tide, six during low tide and five during the intermediate tide between high and low. The six surveys from May 6 through June 21 were primarily focused on nearshore areas between the Little Susitna River and the Beluga River. Offshore areas towards Point Possession and behind Fire Island were added to the survey design beginning on June 27 (Appendix C). Seven of the 17 aerial surveys covered up to PRM 20, eight went as far as PRM 15, and two surveys (June 27 and July 30) did not cover any substantial portion of the Susitna River. Specific routes varied somewhat among flights due to weather or other flight conditions and diversions required by air traffic controllers to avoid heavy commercial traffic approaching Anchorage International Airport.

CIBWs were sighted during 12 of the 17 aerial surveys (Table 5.1-1), 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 after the survey on August 30 (Table 5.1-1). 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 (Figure 5.1-1). 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 the highest from July to August (Figure 5.1-1). Details on group size, composition, and behavior are presented below in section 5.2.

Most marine mammal sightings occurred along the north shore of Cook Inlet in the Susitna River delta (Figure 5.1-2). Locations of CIBW sightings varied among flights (Appendix D), with most sightings occurring within two miles of the Cook Inlet shoreline in the Susitna River Delta (between the Beluga and Little Susitna rivers) (Table 5.1-2; Figures 5.1-3 and 5.1-4; Appendix C). Five groups totaling seven CIBWs were observed between PRM 0 and PRM 2 of the Susitna River (Figure 5.1-3). These sightings were on May 19, June 21, and August 30. No CIBWs were observed upstream of PRM 2 during aerial surveys. Two CIBW groups were sighted in mid-inlet waters and two groups were observed along the coastline near Point Possession (Figure 5.1-3).

Eighteen groups of CIBWs were observed during low tide, 10 during high tide, and 20 during intermediate tide. Of the 12 groups observed within deeper channels at intermediate or low tide (Table 5.1-1), three were within the Susitna River from PRM 0 to PRM 2, three were near the Little Susitna River, one was near the Beluga River, and five were between the Susitna and Beluga rivers (Appendix C). The three groups sighted near the mouth of the Susitna River during intermediate tide on June 21 included only five individuals. The sighting rate of CIBW groups was highest during low tide surveys and lowest during high tide surveys (Figure 5.1-5).

Harbor seals were sighted during 12 of the 17 aerial surveys (Table 5.1-1; Figure 5.1-6). No harbor seals were observed after the survey on September 20. Harbor seals were observed in groups ranging from two individuals to approximately 700 individuals. The single group of approximately 700 individuals (three blind independent counts from photographs were

conducted and ranged from 689-722 animals) was observed hauled out on June 11, 2013. Harbor seals were primarily observed hauled out on sand bars at low tide, and were occasionally observed in mixed groups with CIBWs.

Five groups of harbor seals were observed between PRM 2 and PRM 6 of the Susitna River (Figure 5.1-6). These sightings were on May 19 (one seal), August 24 (2 groups of 24 seals and 193 seals), August 30 (one group of 155 seals), and September 20 (1 group of 16 seals). All groups in the Susitna River were hauled out on sand bars except for a single seal observed in the water on May 19.

5.2. CIBW Group Size, Group Composition, and Behavior within the Susitna River Delta

5.2.1. Aerial Surveys

Compared to shore-based observations conducted in-person or using remote video cameras, aerial surveys are infrequent and generally provide more limited information on group composition and behavior. In this study, however, only data from aerial surveys are available to describe CIBW group size, composition, and behavior in the Susitna River Delta.

The numbers of CIBW groups observed during each aerial survey ranged from zero to nine (Table 5.1-1; Figure 5.2-1) and were highest in July and August, as were the total numbers of individuals. Group sizes ranged from 1 to 109 across all surveys, with consistently larger groups observed in July and August. However, because of the single large group of 74 CIBWs observed during the June 11 survey, the average monthly group size was similar from June through August (Figure 5.2-2). Peaks in the average group size per survey occurred in late May and early June and again in late July and August (Table 5.1-1; Figure 5.2-3). From July 17 through August 30 only three of the 22 (14 percent) CIBW groups were of fewer than six individuals. Prior to July 17, 19 of 26 (73 percent) CIBW groups were of fewer than six individuals. The number of CIBW groups and individuals observed per survey by tidal stage are shown in Figure 5.2-4. Overall, fewer groups were sighted during high tide surveys. Within surveys conducted during the same tidal stage, the seasonal trend of more CIBW groups and individuals being observed in July and August is still apparent (Figure 5.2-4).

CIBW group composition remained relatively constant across the months of the survey (Figure 5.2-5). Overall, 92 percent of observed belugas were classified as “white”, 7.5 percent as “gray”, and 0.5 percent as “dark gray”. The five “dark gray” individuals were observed during the four surveys that occurred on July 17, July 30, August 24, and August 30 (Table 5.1-1). There were eleven individual belugas observed during the surveys, ten of which were “white” and one was “gray”.

Sixteen of the 48 total CIBW group sightings were of tightly packed groups. These groups were mostly observed traveling northeast or southwest along the shoreline. The remaining CIBW groups were observed in more dispersed groups, which were more often associated with other behaviors, including diving and suspected feeding.

Overall, traveling/moving was recorded as the primary behavior of 70 percent of the 47 CIBW groups for which behavior was recorded (Figure 5.2-6). Suspected feeding was recorded for 10 groups (two of which had traveling/moving recorded as their primary behavior) and occurred during the same surveys when large groups were observed (Table 5.1-1). On May 13, May 27, and August 24, CIBWs in suspected feeding behaviors were leaving distinct trails in the mud at the mouth of the Beluga River during intermediate tides, suggesting that they were pursuing fish or benthic invertebrates in the substrate. This behavior was not noted near the mouth of the Susitna River. Milling, diving, and resting motionless at the surface were each recorded for ≤ 10 percent of all observed CIBW groups.

5.2.2. Video Cameras

Environmental factors such as whitecaps, glare, heavy precipitation, or low light levels due to very dense cloud cover or morning/evening light levels reduced the quality of the recorded video from September 3 to September 24 and likely impacted the probability of detecting whales during approximately 17 percent of the hours reviewed. In addition, the camera was noted as shaking or jerking for 12 percent of the remaining time, resulting in a minimum of 29 percent of available recorded hours of video being of poor quality for detecting CIBWs.

CIBWs were sighted nine times on video recorded from September 3 to September 24, 2013 (Table 5.2-1; Figures 5.2-7 and 5.2-8). Seven CIBW sightings were recorded on September 20 and two on September 22, 2013 (Table 5.2-2). Sightings on September 20 occurred from 7:00 am to 7:40 pm and again from 1:20 pm to 5:20 pm. Estimated tidal heights ranged from -0.5 ft to 28.5 ft. The sighting on September 22 occurred at 8:48 am at an estimated tidal height of 28.5 ft. All sightings were at the west video station. All individuals were white and were traveling (Table 5.2-2; Figure 5.2-8). One sighting on September 20 and the sighting on September 22 were of two individuals and the rest were single individuals. It is likely that many sightings on September 20 were of the same one or two whales. Because these sightings were on recorded video from only one camera, we cannot determine if these CIBWs moved up or downstream.

No CIBWs were observed during monitoring of live-feed video from September 25 through October 17; however, reduced image quality caused by environmental conditions or camera shaking was recorded during 65 percent of the hours monitored.

5.2.3. Still Cameras

Approximately 437,000 photographs were retrieved from still cameras installed at the video camera stations near PRM 6 of the Susitna River in 2013 and examined (Table 5.2-3). Image clarity was sometimes affected by glare, precipitation, and other weather conditions. Data on environmental conditions affecting image quality were only available from September 3 through September 13. During that time, 27 percent of images had reduced image quality likely reducing the probability of detecting CIBWs in the images. A similar rate of poor quality images was likely present within the remaining images.

A single group including one white individual and one gray individual was photographed on September 4 at the "West Tower" location (Figure 5.2-9). This group was observed in images only from that camera on that day and was not detected by other cameras elsewhere along the Susitna River.

Approximately 216,000 photographs were retrieved from still cameras at the upriver sites between PRM 11 and PRM 16 in 2013 and examined (Table 5.2-3). Data on environmental conditions affecting image quality were recorded for all images and at least 8 percent contained conditions that likely reduced the probability of detecting CIBWs. No CIBWs were observed in these still images; however, a harbor seal was routinely photographed between July 8 and July 14 near PRM 11 (Camera 2 - Table 5.2-3), and another was routinely photographed between September 8 and September 14 near PRM 12 (Camera 3). Incidental sightings included three moose and six bears.

6. DISCUSSION

6.1. Document CIBWs and Other Marine Mammals in the Susitna River Delta

Aerial surveys for CIBWs were successfully conducted in 2013 and resulted in data adequate to meet this study objective. In 2013 CIBWs were primarily observed in nearshore areas along the northern shore of Upper Cook Inlet between the Beluga and Little Susitna rivers (alongshore extent of the study area) during all tidal stages. Within the survey area, the majority of groups were sighted near the mouths of the Susitna, Little Susitna, and Beluga rivers; however, CIBWs were never observed within the Susitna River upstream of PRM 2. This distribution is 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).

Observations of CIBWs during aerial surveys generally peaked in associated with the eulachon run in late May through early June and again with the run of adult salmon in July and August. No surveys were flown at the peak of the Susitna River eulachon run because of weather constraints and the relatively short and late timing of the run in 2013; however, during flights immediately preceding (May 27) and after (June 11) the peak of the eulachon run, more CIBW groups were observed near the Beluga and Little Susitna rivers than near the Susitna River (Appendix D). This pattern is consistent with other studies that also showed increased presence of CIBWs in the Susitna River Delta in May and June, and again in late 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; McGuire and Bourdon 2012). As suggested above, this pattern is likely in response to seasonal migrations of fish (NMFS 2008).

Only two lone CIBWs and two groups of two whales each were observed near Point Possession or in the open water between the Susitna River Delta and Point Possession. The two lone whales were observed traveling away from the Susitna River delta toward Turnagain Arm; the two groups of two whales near Point Possession were observed traveling alongshore toward Turnagain Arm.

The observation of large groups of harbor seals hauled out on sandbars in the Susitna River Delta is consistent with observation from NMFS aerial surveys (e.g. Shelden et al. 2013).

6.2. CIBW Group Size, Group Composition, and Behavior within the Susitna River Delta

Aerial surveys conducted in early June 2005-2012 by the NMFS reported the total number of CIBW present in the Susitna Delta (defined more broadly than in this study) on a daily basis averaged between 88 and 213 belugas (range 23 to 290) (Shelden et al. 2013). These counts are generally higher than those recorded during this study, however, the geographic limits of our study area was more limited and only two surveys were conducted at similar times as the NMFS aerial surveys are typically flown. The aerial surveys conducted by the NMFS are primarily intended to estimate abundance so group composition and behaviors are not routinely reported; however, data from boat-based and land-based surveys in the region provide useful comparisons to the data collected during this study.

During boat-based beluga whale photo-identification surveys in 2011 and 2012, McGuire et al. (2013) reported similar group sizes and general trends of increasing beluga whale presence in the Susitna River Delta in late May and early June, as well as late July and August. However, those boat-based surveys reported a higher percentage of calves and neonates (i.e. "dark gray" belugas) within the groups they counted and photographed (McGuire et al. 2013). Additionally, the proportion of animals recorded as "white" was substantial higher in the 2013 aerial survey results compared to data in McGuire et al. (2013). This suggests that "gray" and "dark gray" whales are likely underrepresented in the aerial survey data collected by this study. Boat based surveys of CIBWs in the Susitna River Delta reported generally similar types and proportions of behaviors as recorded during this study (McGuire et al. 2008, 2009, 2011; McGuire and Kaplan 2009; McGuire et al. 2013).

6.3. Relationship to Other Studies

Information from other Project studies was used to help guide 2013 efforts or will be used to guide efforts in the second year of study. Information was obtained from the Ice Processes Study (Study 7.6) throughout April and May in 2013 to help determine when aerial surveys should begin and when it was safe to install and deploy remote camera equipment. Information on presence of eulachon was provided in-season by the Eulachon Study (Study 9.16) to help guide scheduling of aerial surveys. Although surveys were conducted just before and after the eulachon run, the short duration of the run in 2013, combined with weather and mechanical delays, precluded surveys being conducted during the peak of the run. The survey schedule in the second year of study will be flexible to ensure coverage during the eulachon run.

Information from the Salmon Escapement Study (Study 9.7) and the Fish Distribution and Abundance studies (Study 9.6) is valuable for providing information on presence and relative abundance of potential prey items for CIBWs. Surveys were conducted over the period of salmonid migration into the Susitna River. Chinook salmon (*Oncorhynchus tshawytscha*) catch in the lower river peaked on June 12, whereas peak catches of pink (*O. gorbuscha*) and coho (*O. nerka*) salmon occurred on July 20 and August 3, respectively. Aerial surveys conducted on June

11, July 17, and July 30 correspond well to these estimates of peak run timing. In-season information in the second year of study will further help guide specific timing of aerial surveys.

Data from the Geomorphology studies (Studies 6.5 and 6.6) and the Instream Flow Study (Study 8.5) will inform this study in the second year. Those studies will assist in understanding the influence of physical processes of sedimentation and water flow, respectively, on the distribution of CIBW's, the character of and access to their habitats, and the character of the habitats of their prey.

Information from this study will also be used collaboratively with information from other studies in the second year of study to integrate information from both years of study to help evaluate potential Project effects on CIBWs. The Water Quality Monitoring Study (Study5.6) will develop a water quality model extending downstream to approximately PRM 19. No CIBWs were sighted upstream of PRM 6 in 2013; however, if CIBWs utilize the Susitna River above PRM 15, it will become important to characterize effects of any changes in water quality.

7. COMPLETING THE STUDY

[As explained in the cover letter to this draft ISR, AEA's plan for completing this study will be included in the final ISR filed with FERC on June 3, 2014.]

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9. TABLES

Table 5.1-1. Summary of aerial survey effort and Cook Inlet Beluga Whale (CIBW) sightings in 2013.

Date	Survey Start	Survey End	Primary Tide			No. CIBW Groups	No. CIBW Individuals				Mean CIBW Group Size	Suspected Feeding Observed	No. Harbor Seal Groups	No. Harbor Seals
			Stage	Time	Height		White	Gray	Dark Gray	Total				
May 6	10:00	12:30	L	12:01	-0.43	3	6	1	0	7	2.3	N	1	≈100
May 13	12:20	14:10	I	13:02	14.33	3	17	1	0	18	6.0	N	1	4
May 19	13:30	14:53	H	15:23	23.38	3	2	1	0	3	1.0	N	2	27
May 27	10:30	15:56	I	12:38	14.01	3	34	6	0	40	13.3	Y	2	51
Jun 11	14:30	16:35	L	16:22	-0.62	1	68	6	0	74	74	Y	3	≈700
Jun 21	15:00	17:03	I	15:57	13.15	4	25	0	0	25	6.3	N	0	0
Jun 27	09:45	13:10	H	10:42	31.28	0	0	0	0	0	0	-	0	0
Jul 5	12:00	16:31	L	13:53	6.99	9	33	6	0	39	4.3	Y	2	397
Jul 17	15:18	20:17	I	18:06	15.50	5	144	3	1	148	29.6	Y	1	154
Jul 30	14:10	17:40	H	14:23	24.04	3	123	13	1	137	45.7	Y	3	76
Aug 15	07:57	11:15	L	08:36	1.86	5	143	8	0	151	30.2	Y	3	135
Aug 24	11:31	14:30	I	13:30	15.73	5	67	10	1	78	15.6	Y	2	217
Aug 30	14:15	18:03	H	16:34	24.23	4	28	2	2	32	8	Y	3	202
Sep 20	14:30	17:20	L	15:20	-0.63	0	0	0	0	0	0	-	1	16
Sep 24	10:30	13:12	H	11:26	28.86	0	0	0	0	0	0	-	0	0
Sep 30	10:00	14:10	L	11:17	3.25	0	0	0	0	0	0	-	0	0
Oct 11	11:55	14:50	H	12:59	27.71	0	0	0	0	0	0	-	0	0

L = low tide, H = high tide, I = intermediate tide. Y = suspected feeding was recorded for at least one group during the survey, N = suspected feeding was not recorded for any of the observed groups.

Table 5.1-2. Summary of Cook Inlet Beluga Whale (CIBW) sightings and sighting rates in 2013 by tidal stage within 1-mile bins of the distance from a normalized shoreline of northern Cook Inlet.

Distance from Shore (miles)	Number of CIBW Groups Sighted			Flight Time (hours)	Sighting Rate (groups/hour)
	High Tide	Intermediate Tide[2]	Low Tide[3]		
<0 [1]	0	8	4	9.55	1.26
0-1	4	9	11	9.52	2.52
1-2	3	1	0	4.20	0.95
2-3	2	0	1	3.78	0.79
3-4	1	0	0	3.33	0.30
4-5	0	1	1	2.65	0.75
5-6	0	0	0	2.03	0.00
6-7	0	0	0	1.87	0.00
7-8	0	0	0	1.65	0.00
8-9	0	1[4]	0	1.42	0.70
9-10	0	0	1[4]	1.40	0.71
10-11	0	0	0	1.10	0.00
11-12	0	0	--	0.68	0.00
12-13	0	--	--	0.55	0.00
13-14	0	--	--	0.57	0.00
14-15	0	--	--	0.25	0.00

Notes:

1 Sightings categorized as <0 miles from the shoreline were within deeper exposed channels.

2 Distance between the north and south shores in the study area at intermediate tide is approximately 12 miles.

3 Distance between the north and south shores in the study at low tide is approximately 11 miles.

4 Sightings close to southern shore of Cook Inlet.

Table 5.2-1. Summary of Cook Inlet Beluga Whale (CIBW) sightings at PRM 6 on Big Island in the lower Susitna River in 2013 from video.

Location, Camera ID	PRM	Start Date	End Date	Video Hours Viewed	CIBW Sightings	
					Groups	Individuals
West Video (recorded)	6	September 13	September 24	156	7	9
West Video (live)	6	September 25	October 17	272	0	0
East Video (recorded)	6	September 13	September 24	156	0	0
East Video (live)	6	September 25	October 17	272	0	0

Live indicates when video feed was transmitted live and could be manipulated (pan, tilt, zoom). Recorded indicates when video was not transmitting, but was recording at the field site on fixed wide angle view. Hours viewed represents the combined hours from both cameras at each station.

Table 5.2-2. Numbers and activities of Cook Inlet Beluga Whales (CIBW) observed at PRM 6 near Big Island in the lower Susitna River in 2013 from video. Live indicates when video feed was transmitted live and could be manipulated (pan, tilt, zoom). Recorded indicates when video was not transmitting, but was recording at the field site on fixed wide angle view.

Camera ID, Date	CIBW Individuals			Primary Activity[1]
	White	Gray	Dark Gray	
West Video (recorded)				
September 20	7	0	0	1
September 22	2	0	0	1
West Video (live)				
September	0	0	0	--
October	0	0	0	--
East Video (recorded)				
September	0	0	0	--
East Video (live)				
September	0	0	0	--
October	0	0	0	--

Notes:

1 Activity Codes: 0-Unknown; 1-Traveling/Moving; 2-Diving; 3-Mating; 4-Spyhopping; 5-Breaching; 6-Feeding Observed; 7-Feeding Suspected; 8-Milling; 9-Startled Effect; 10-Tail Slapping; 11-Avoiding Predation; 12- Calving; 13-Abrupt Dive; 14-Disperse; 99-Other

Table 5.2-3. Summary of CIBW group sightings in the Susitna River in 2013 from still photographs.

Camera ID	PRM	Deployment Date	Removal Date	Images Retrieved	CIBW Sightings	
					Groups	Individuals
Video Stations						
West Tower Still (1)	6	September 3	September 24	115,461	0	0
West Tower Still (2)	6	September 3	September 24	115,373	1	2
East Tower Still (1)	6	September 3	September 24	117,960	0	0
East Tower Still (2)	6	September 3	September 24	118,079	0	0
PRM 11-16						
Camera 1	11	July 1	October 8	83,095	0	0
Camera 2	11	July 1	August 17	39,780	0	0
Camera 3	12	July 1	October 8	84,140	0	0
Camera 4	16	July 1	August 17	9,786	0	0

10. FIGURES

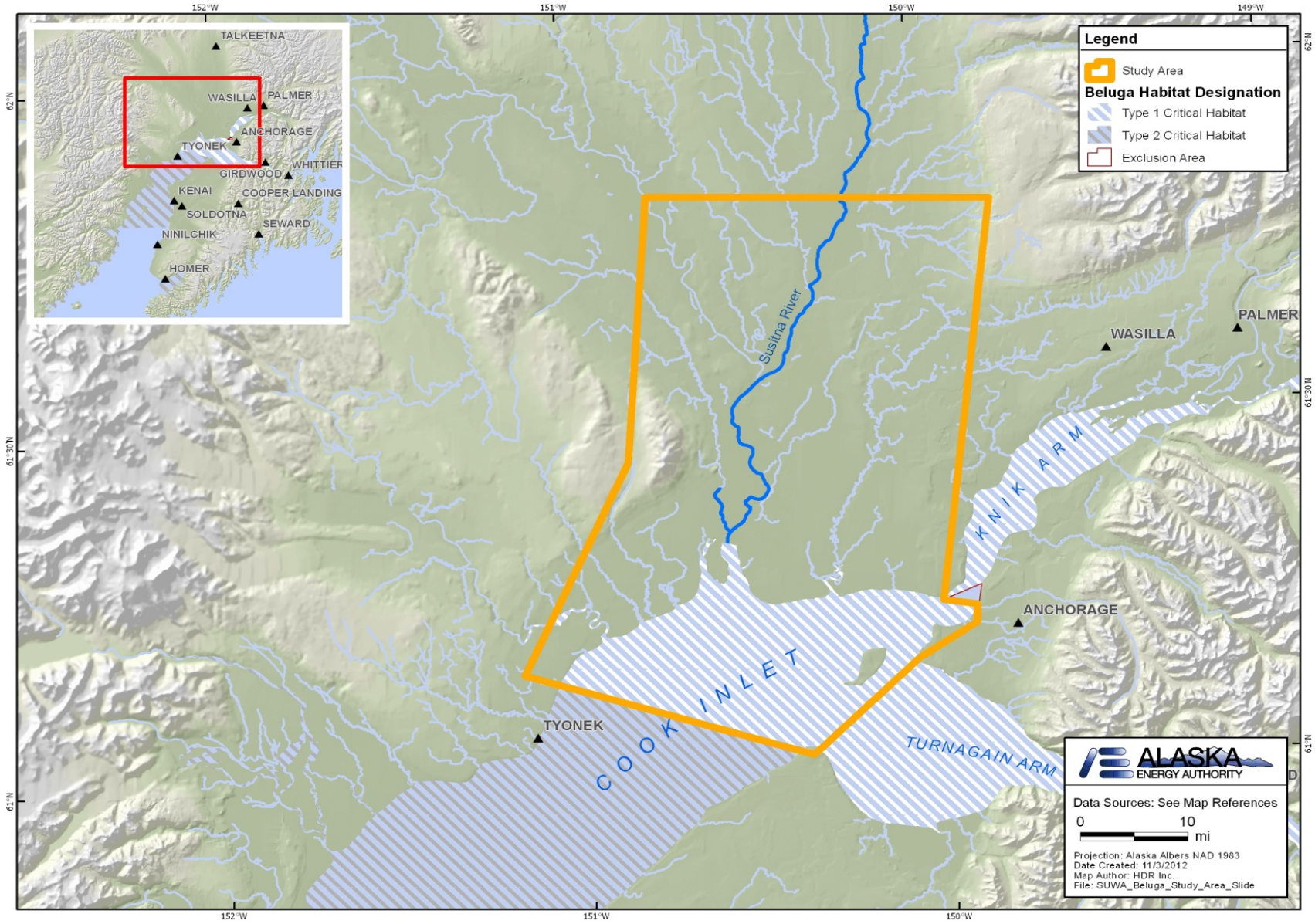

Figure 3-1. Study area for the Cook Inlet Beluga Whale Study including the Susitna River delta up to River Mile 50 (adapted from Fig 9.17-1 in RSP).

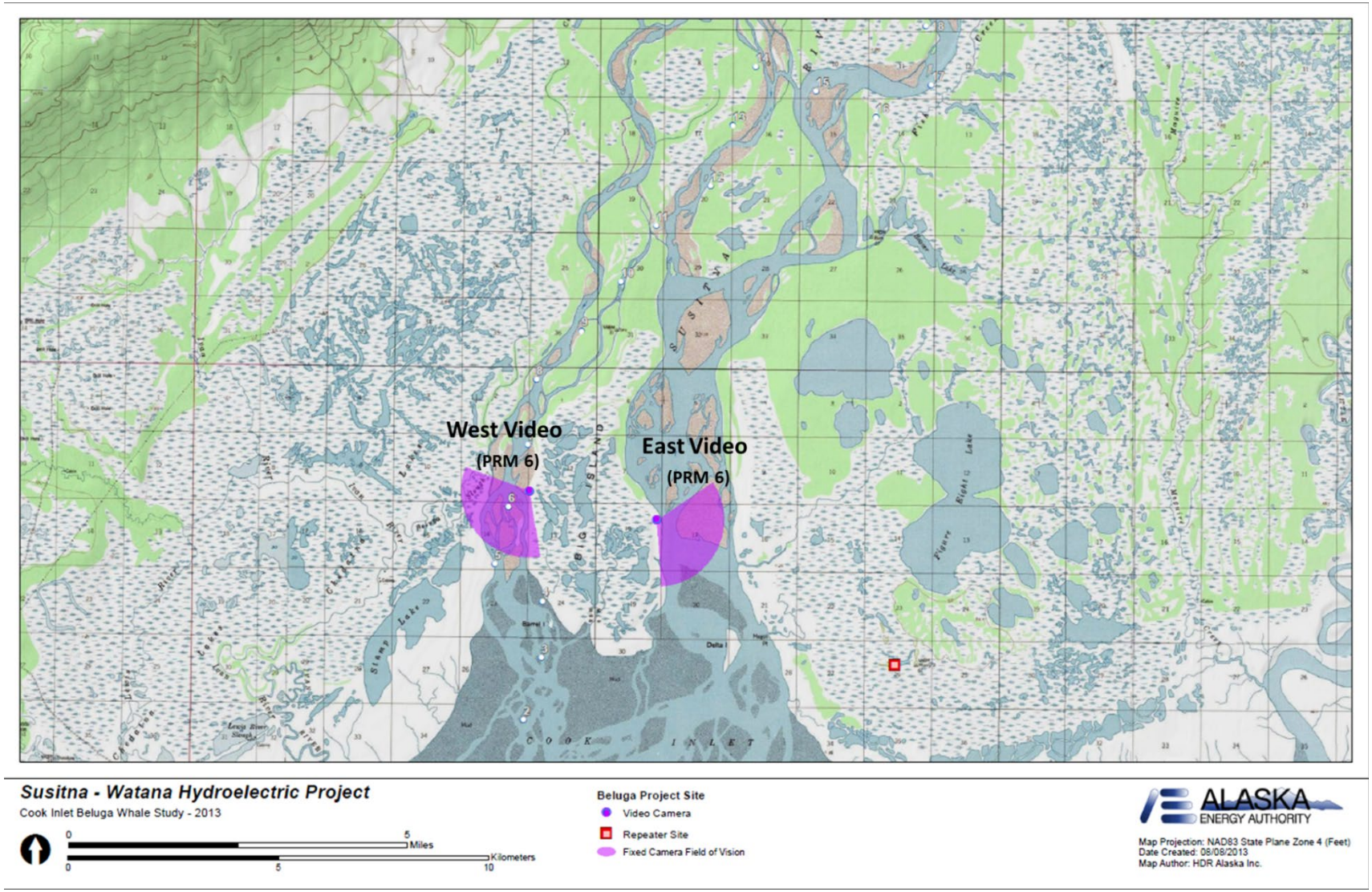

Figure 4.2-1. Map of video camera station locations including camera ID and field of view in the Susitna River in 2013.

PRM = project river mile.

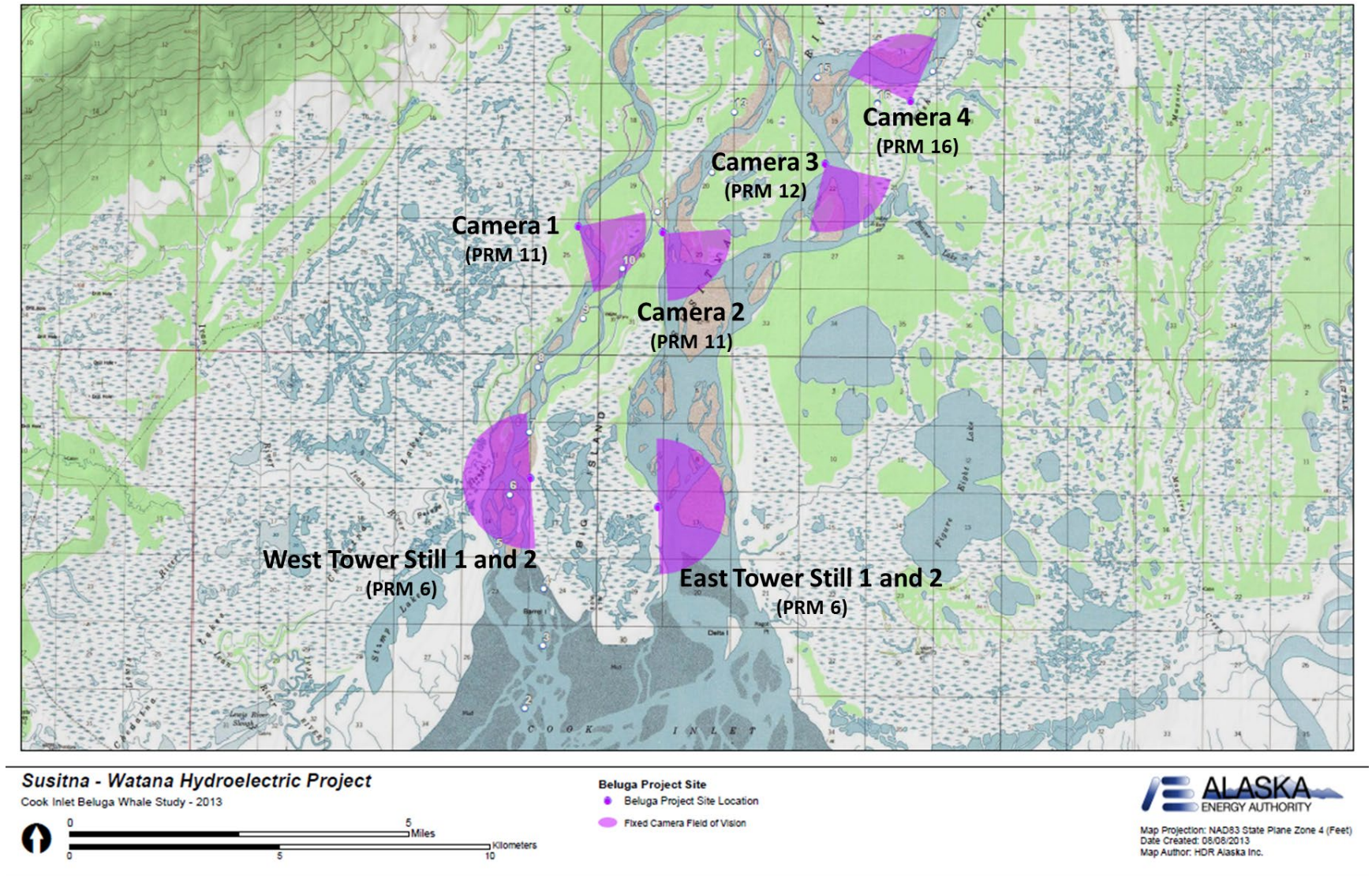

Figure 4.2-2. Map of still camera station locations including camera ID and field of view in the Susitna River in 2013.

PRM = project river mile. Distance of view is exaggerated to allow illustration of field of view. Distance viewed is generally bank to bank.

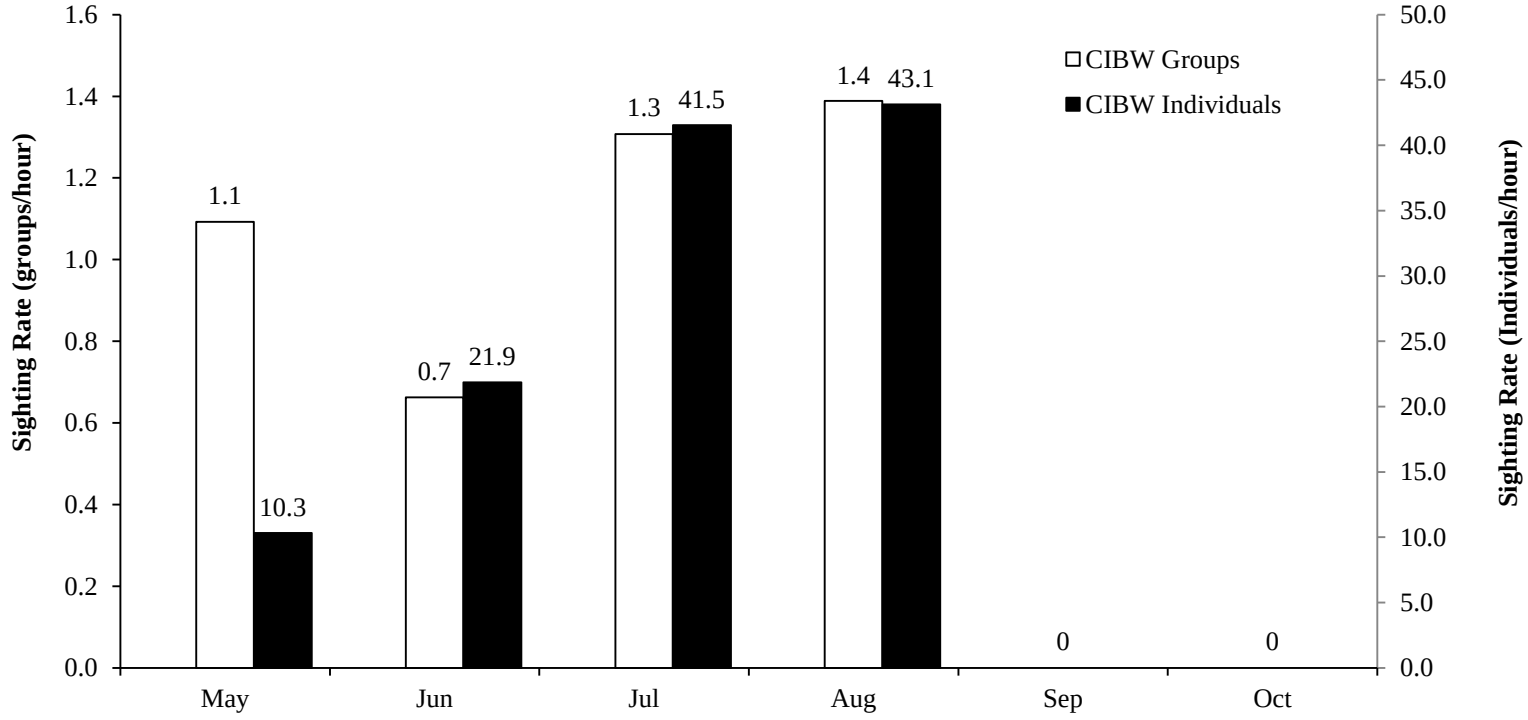

Figure 5.1-1. Monthly group and individual sighting rates of Cook Inlet Beluga Whales (CIBW) from aerial surveys in 2013.

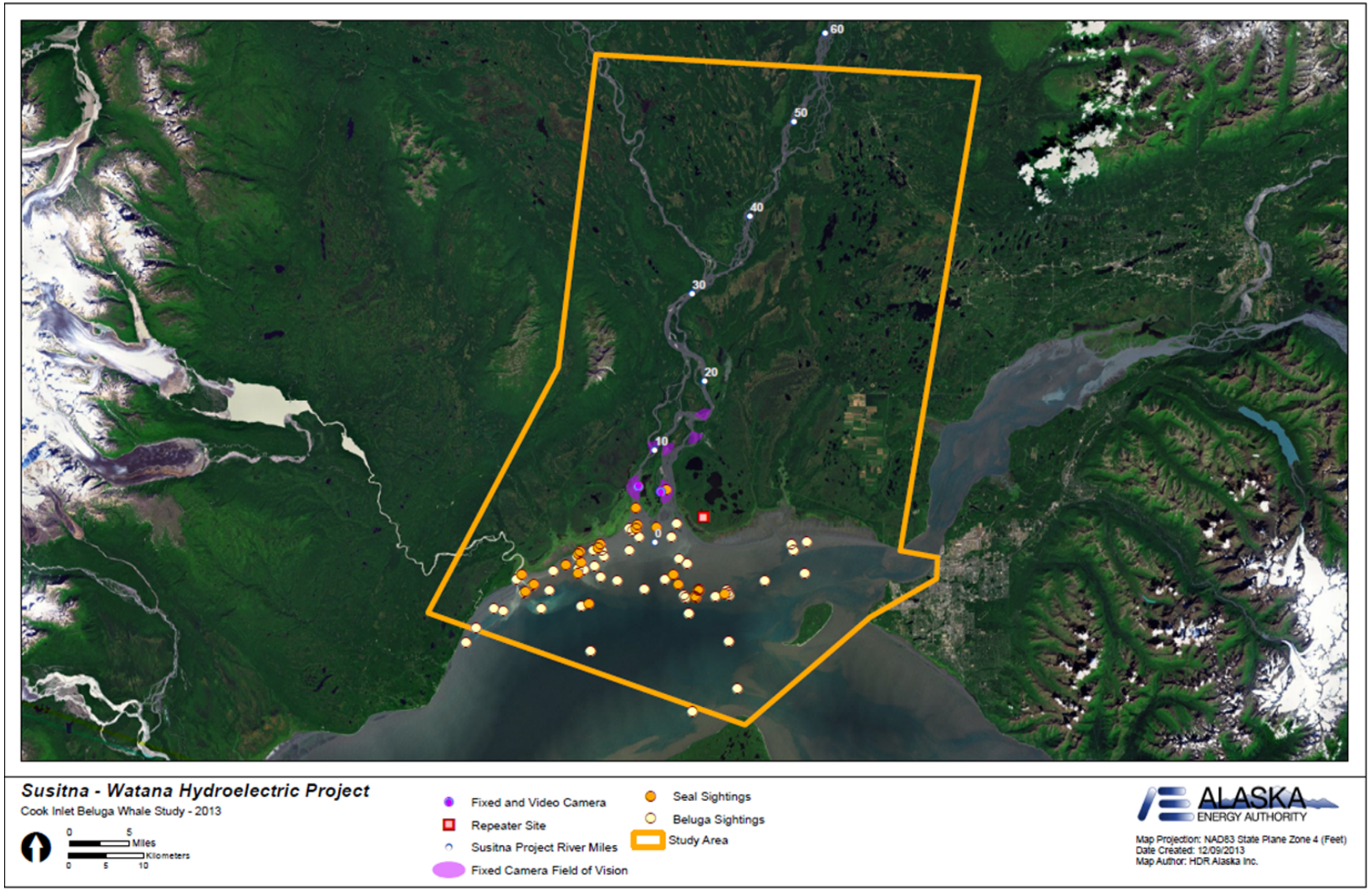

Figure 5.1-2. Composite map of Cook Inlet beluga whale and harbor seal sightings during aerial surveys in 2013 relative to entire study area including locations of video and fixed (still) cameras.

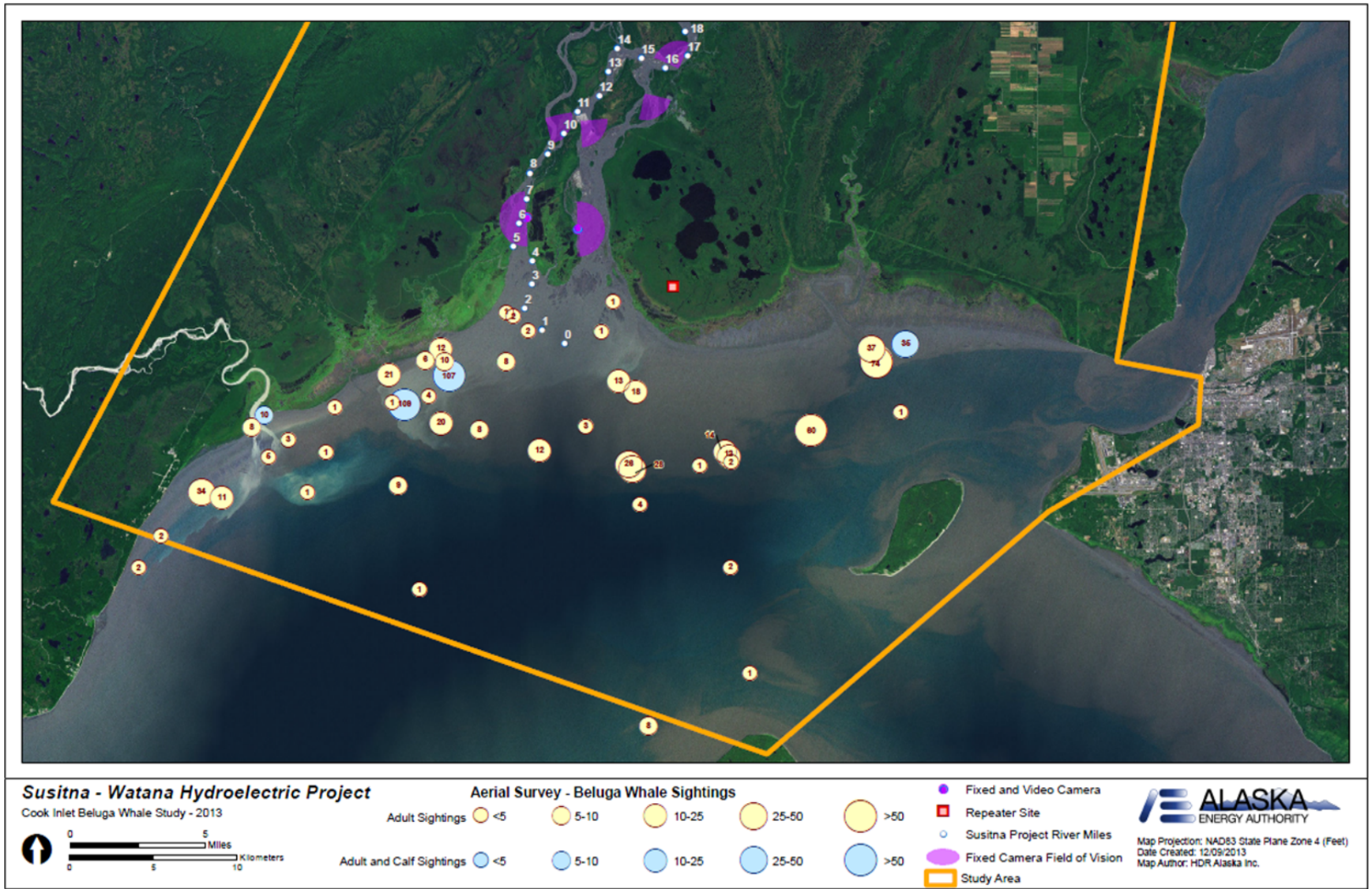

Figure 5.1-3. Composite map of Cook Inlet Beluga Whale sightings during aerial surveys in 2013. Camera details provided in Figures 4.2-1 and 4.2-2.

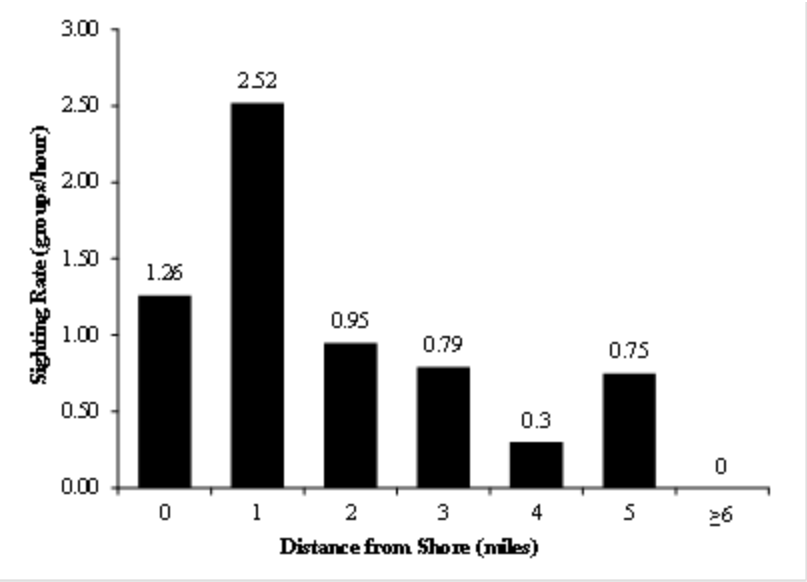

Figure 5.1-4. Cook Inlet Beluga Whale (CIBW) group sighting rates during aerial surveys in 2013 categorized by the distance from a normalized shoreline of northern Cook Inlet.

Sightings that occurred closer to the southern Cook Inlet shoreline near Point Possession have been omitted from this figure but are shown in Table 5.1-2.

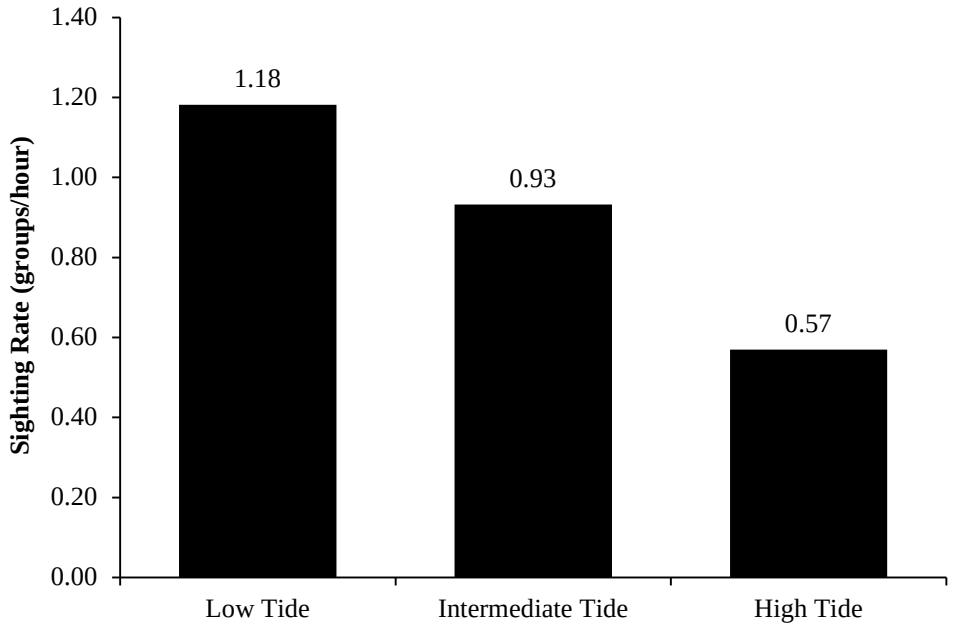

Figure 5.1-5. Cook Inlet Beluga Whale (CIBW) group sighting rates during aerial surveys at low, intermediate, and high tidal stages in 2013.

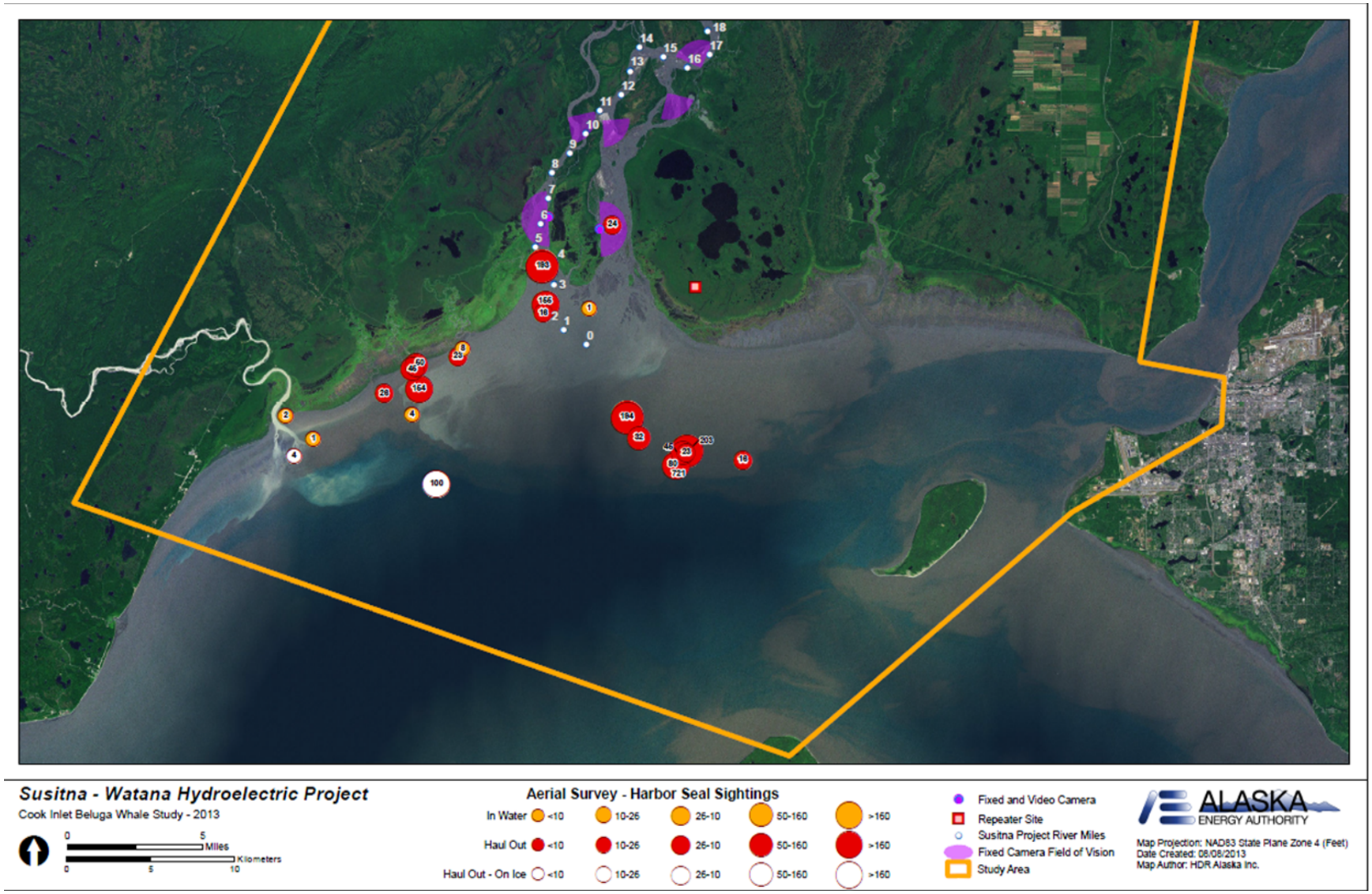

Figure 5.1-6. Composite map of harbor seal sightings during aerial surveys in 2013. Camera details provided in Figures 4.2-1 and 4.2-2.

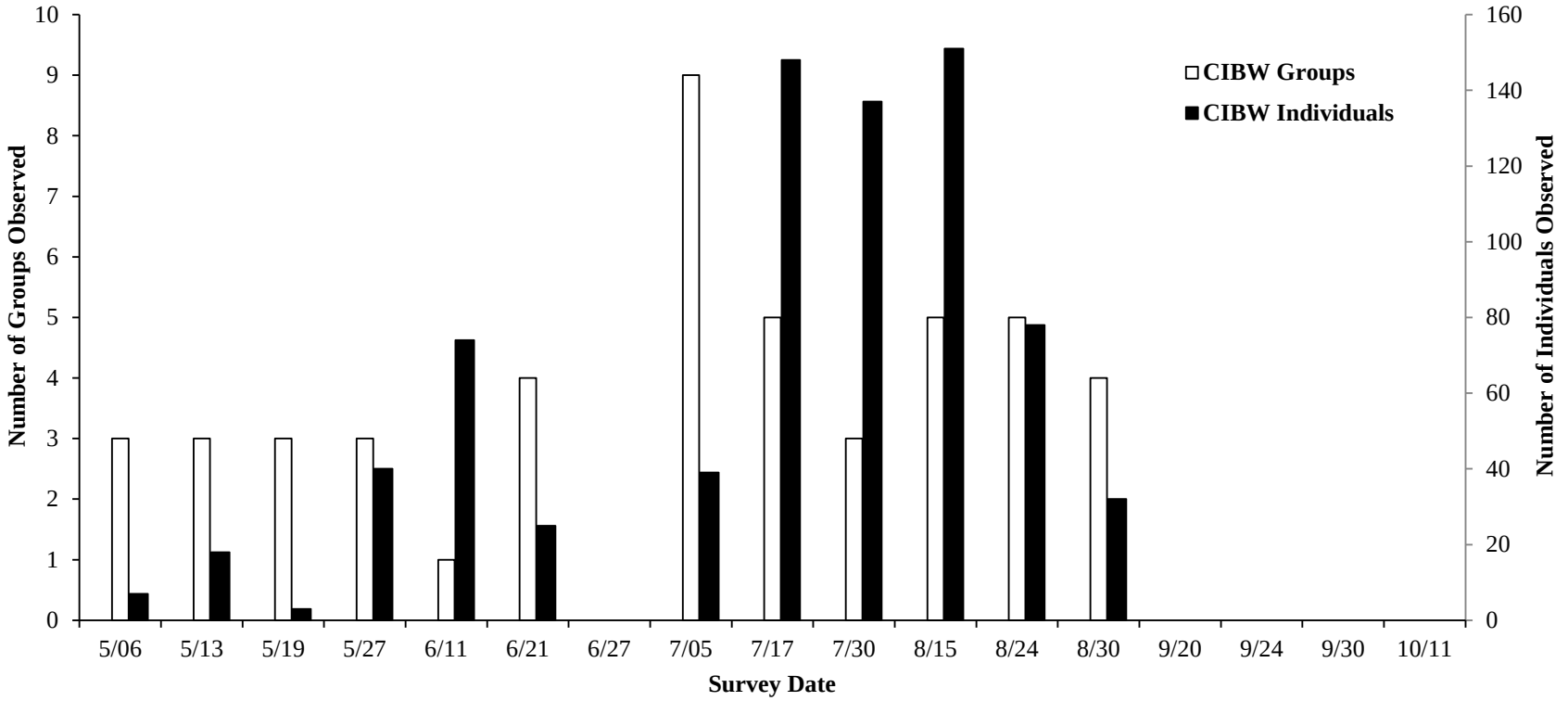

Figure 5.2-1. The number of Cook Inlet Beluga Whale groups and total individuals observed shown by survey date in 2013.

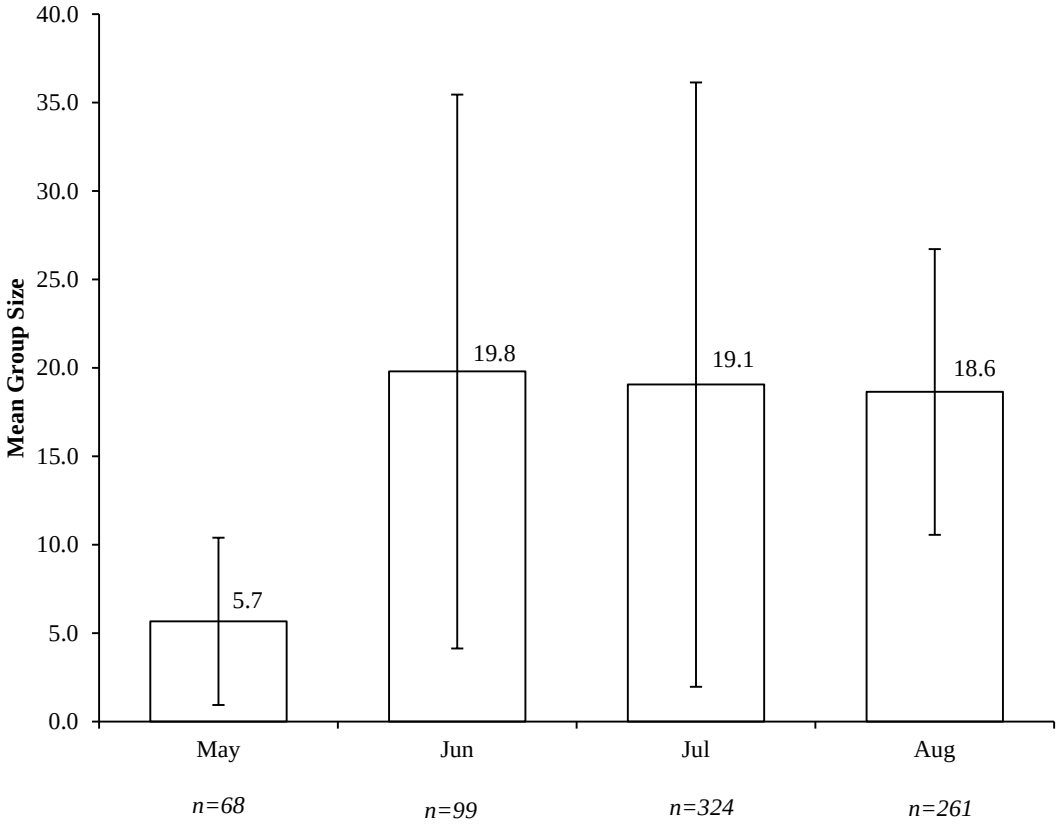

Figure 5.2-2. Mean Cook Inlet Beluga Whale group size by month from aerial surveys in 2013.

n is the total number of individual CIBWs observed in each month. Error bars represent one standard deviation from the mean.

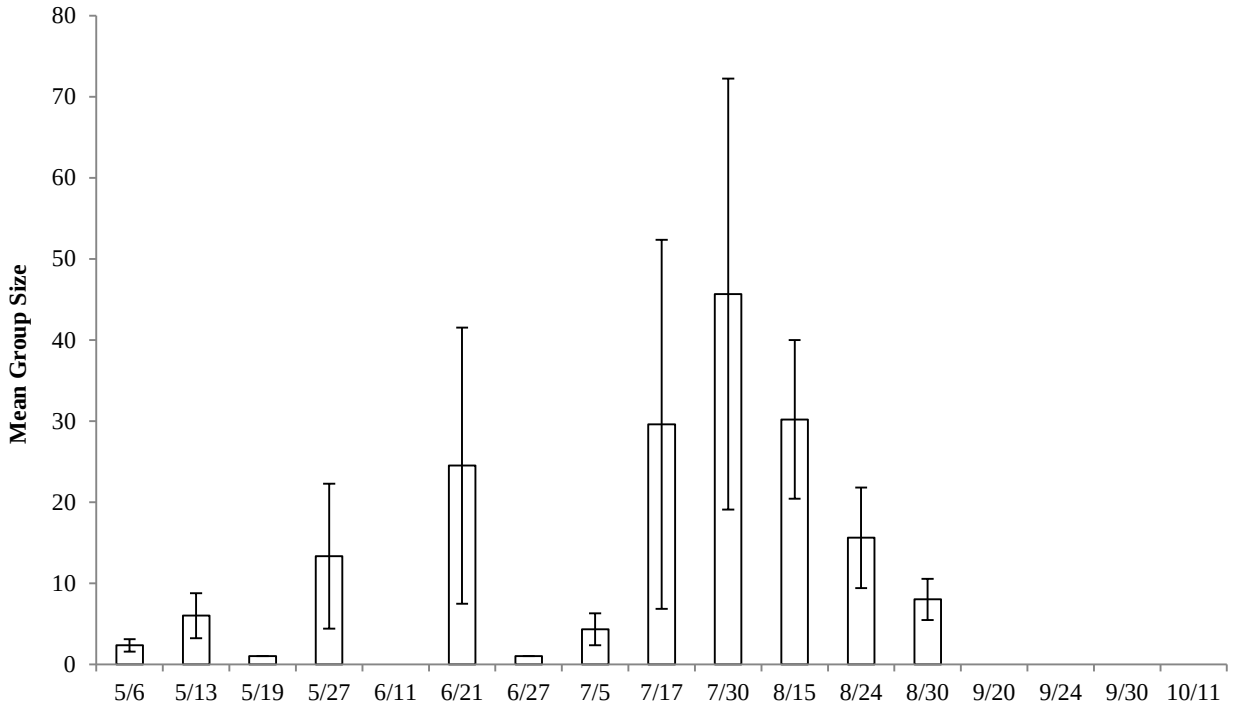

Figure 5.2-3. Mean Cook Inlet Beluga Whale group size for each aerial survey in 2013.

Error bars represent one standard deviation from the mean.

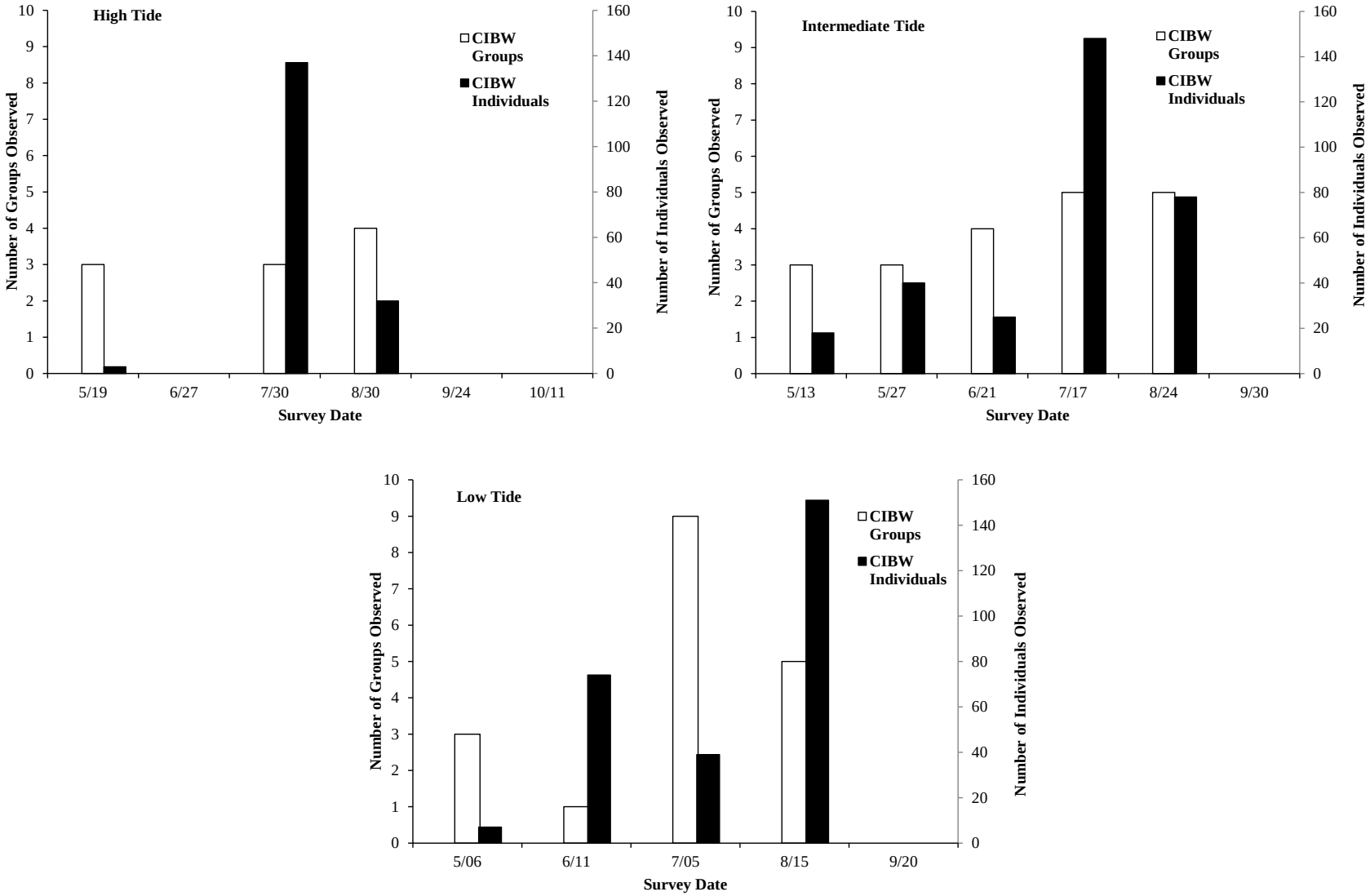

Figure 5.2-4. The number of Cook Inlet Beluga Whale groups and total individuals observed grouped by tidal stage during which the aerial survey occurred in 2013.

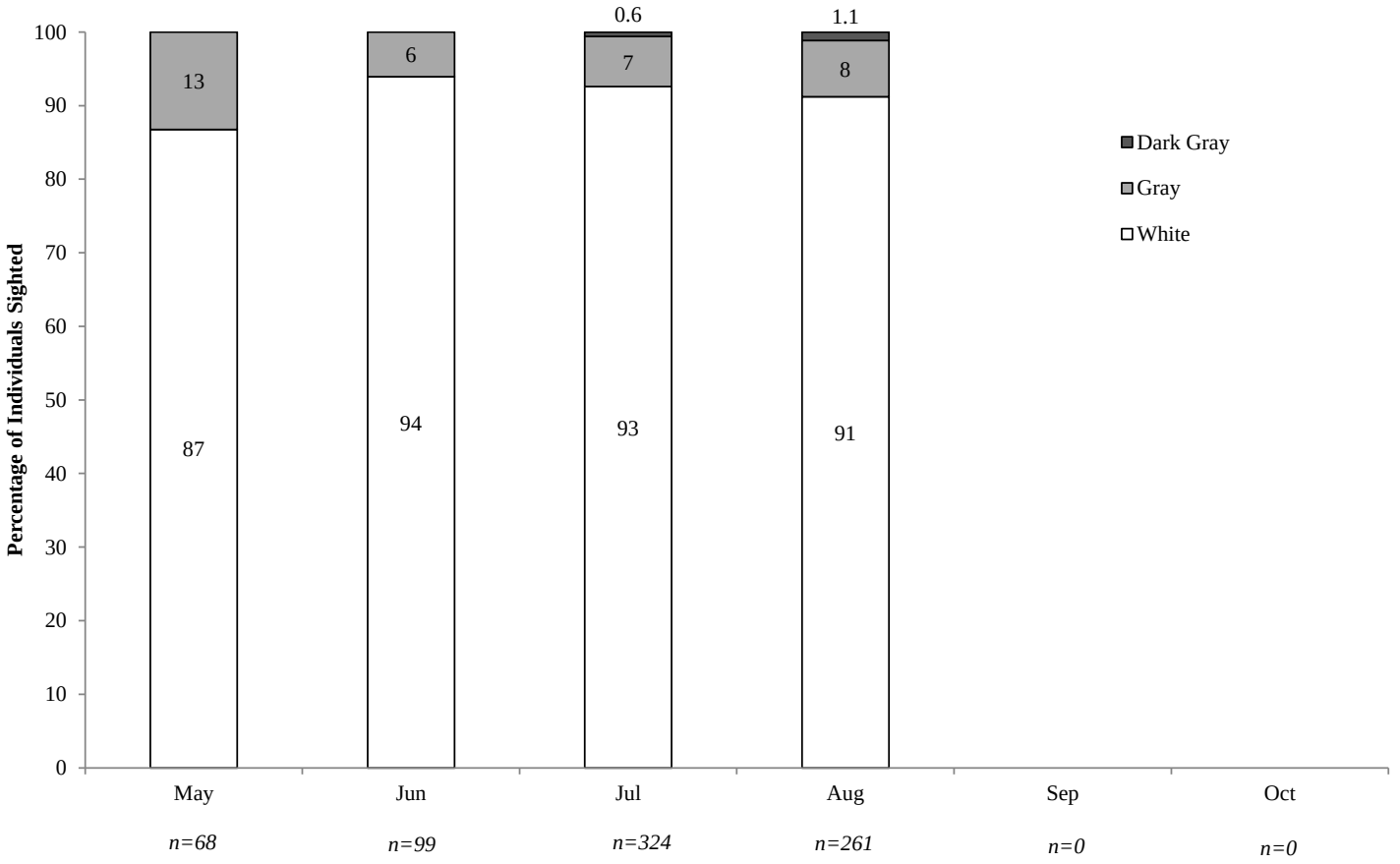

Figure 5.2-5. Cook Inlet Beluga Whale group composition (defined by individual whale color) expressed as a percentage of the total individuals observed in each month during aerial surveys in 2013.

n is the total number of individual CIBWs observed in each month.

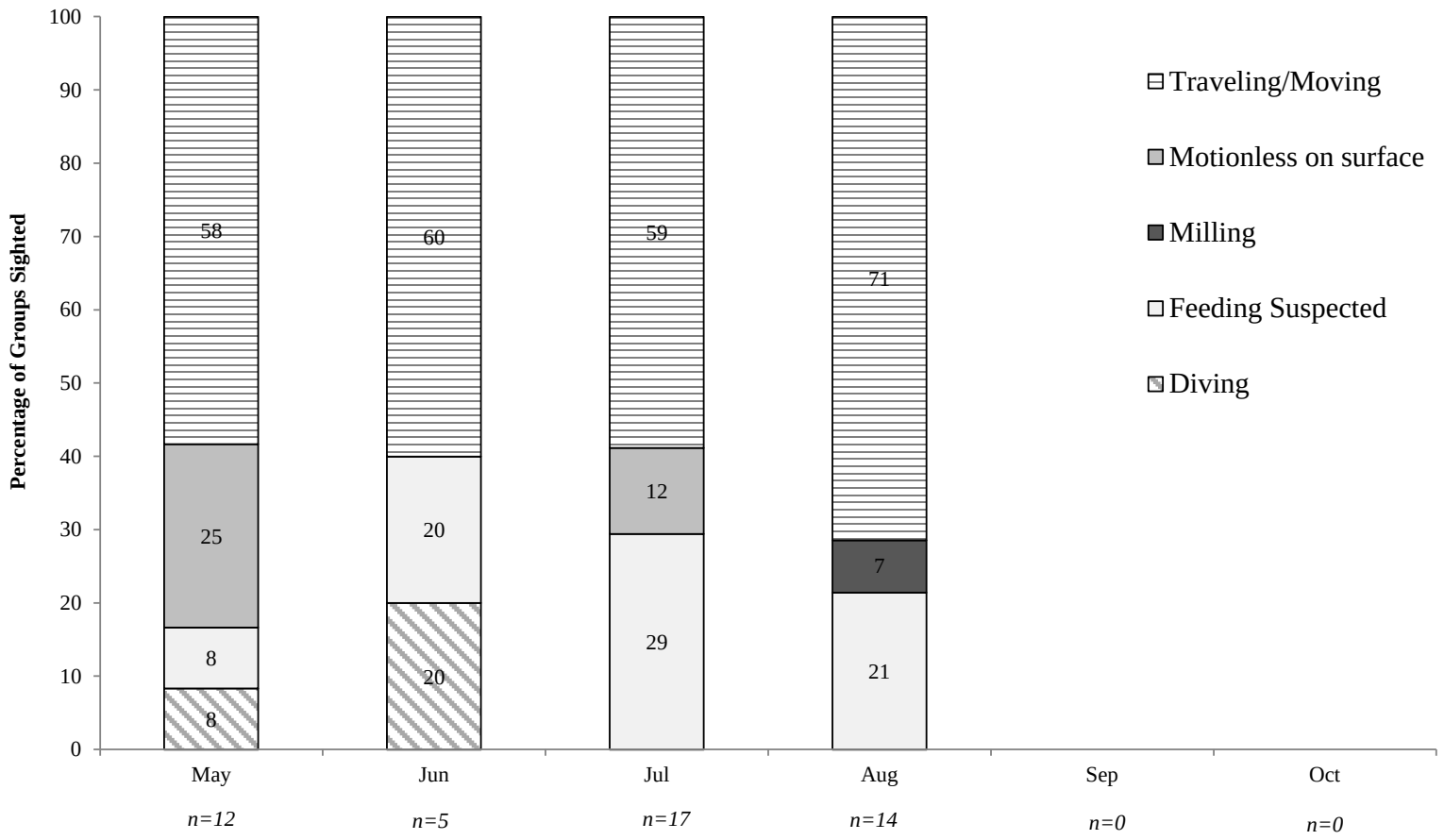

Figure 5.2-6. Behaviors of Cook Inlet Beluga Whale groups observed during aerial surveys in 2013 shown as a percentage of groups observed in each month.

n is the total number of CIBW groups observed in each month

Figure 5.2-7. Image of a Cook Inlet Beluga Whale (circled) at the mouth of the Susitna River.

Image was taken as a screen shot from the video footage. Image quality is lower with a screen shot than when recorded live.

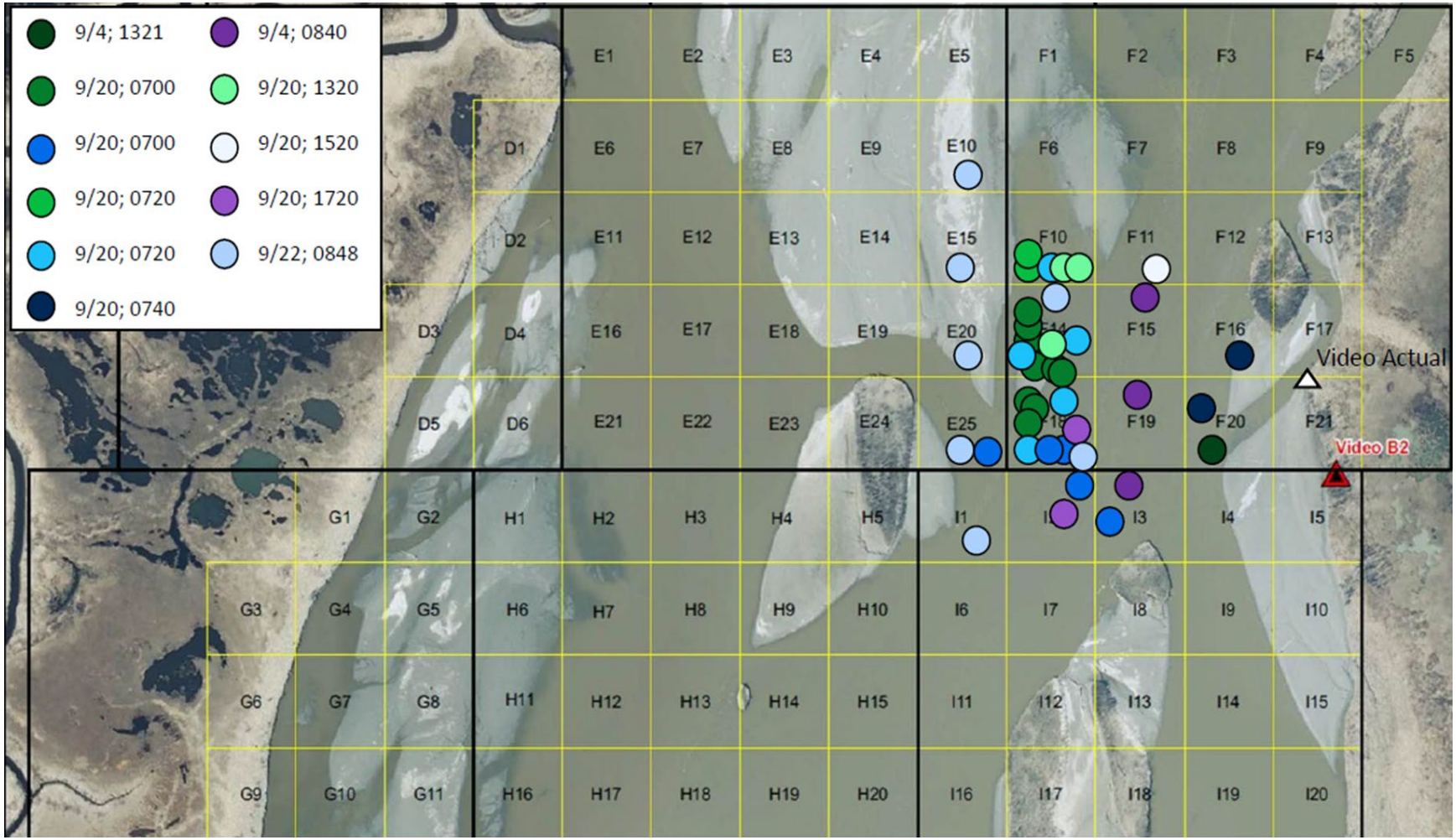

Figure 5.2-8. Locations of Cook Inlet Beluga Whales (CIBWs; colored circles) from video and still images at the west camera station near project river mile 6 on Big Island in 2013.

Video B2 was the proposed camera station; Video Actual was the actual camera station. All sightings represent individual CIBWs except on September 4 when two CIBWs were sighted at the same location. Tide was high on September 4 and September 20 pm, and low September 20 am and September 22. Tide was low when underlying photograph was taken.

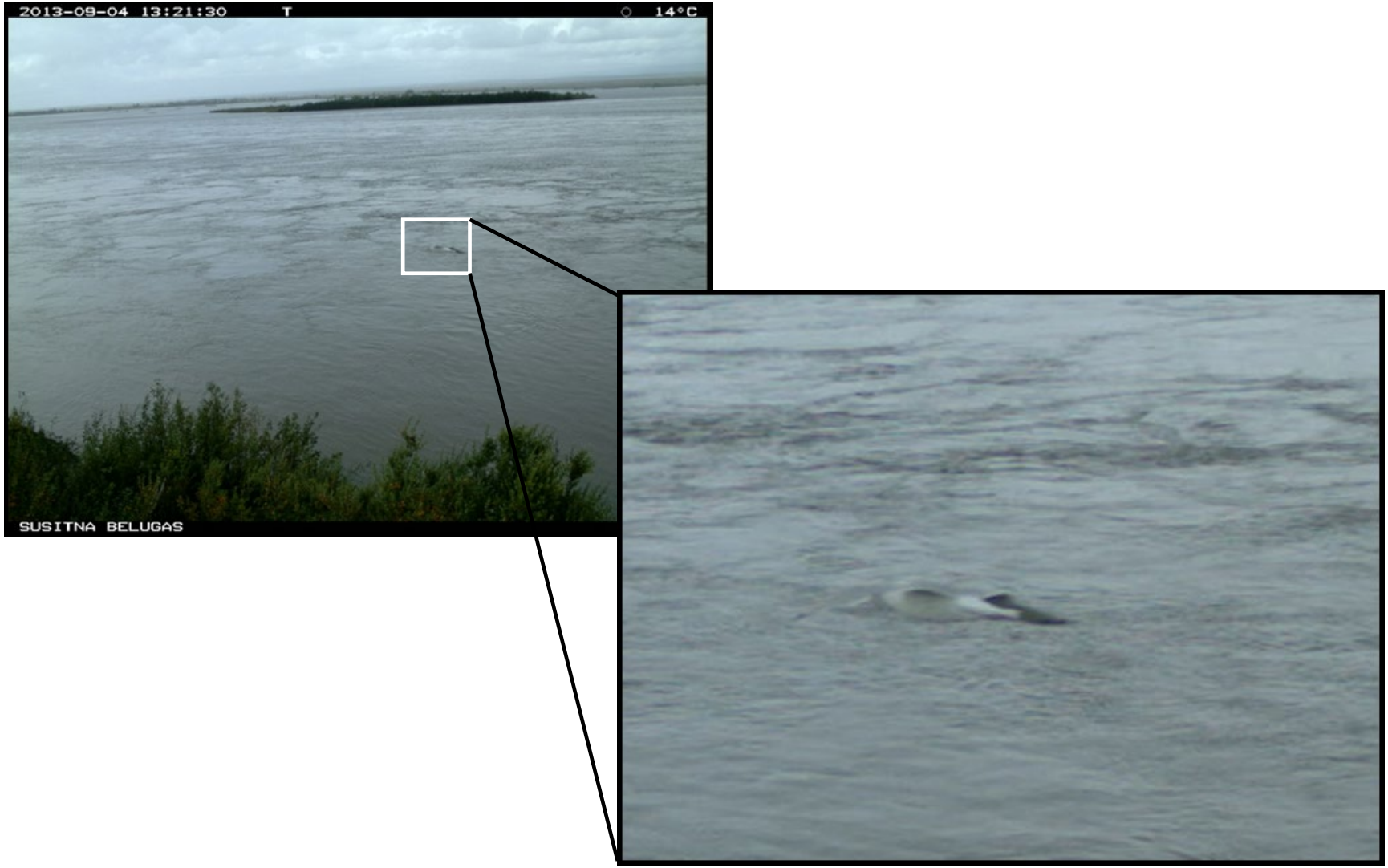

Figure 5.2-9. Images from "West Tower Still" camera of Cook Inlet Beluga Whales near project river mile 6 of the Susitna River on September 4, 2013.

Call out image on the right shows a magnified section with two individuals (one white and one gray) traveling in the river.

APPENDIX A: VIDEO CAMERAS AND EXAMPLE IMAGES

[See separate file for Appendix A.]

APPENDIX B: STILL CAMERAS AND EXAMPLE IMAGES

[See separate file for Appendix B.]

APPENDIX C: COMPOSITE SIGHTINGS FOR AERIAL SURVEYS DURING HIGH, INTERMEDIATE, AND LOW TIDES

[See separate file for Appendix C.]

APPENDIX D: INDIVIDUAL AERIAL SURVEY MAPS FOR 2013

[See separate file for Appendix D.]