

2009 ANNUAL MARINE MAMMAL MONITORING REPORT

CONSTRUCTION AND SCIENTIFIC MARINE MAMMAL MONITORING ASSOCIATED WITH THE PORT OF ANCHORAGE MARINE TERMINAL REDEVELOPMENT PROJECT

{In Accordance with the USACE 404/10 Permit and the NMFS 2009 Letter of Authorization}



United States Department of Transportation
Maritime Administration
1200 New Jersey Avenue, S.E.
Washington, DC 20590



2000 Anchorage Port Road
Anchorage, Alaska 99501

Prepared by



Integrated Concepts & Research Corporation
421 West First Avenue, Suite 200
Anchorage, Alaska 99501

February 2010

This page intentionally left blank.

TABLE OF CONTENTS

1.0 INTRODUCTION AND PURPOSE.....	1
1.1 Annual Reporting for USACE and NMFS Permits	1
2.0 MTR In-Water PROJECT WORK.....	2
2.1 North Extension Construction	2
2.2 Barge Berth Construction	2
3.0 SAFETY AND HARASSMENT ZONES.....	3
3.1 Safety Zones	3
3.2 Harassment Zones	3
3.3 Take Count.....	4
4.0 MARINE MAMMAL MONITORING PROGRAMS.....	4
4.1 Construction Observer Marine Mammal Monitoring Program	5
4.1.1 Marine Mammal Sighting Form – Construction Observers.....	6
4.2 Scientific Marine Mammal Monitoring Program - Alaska Pacific University.....	6
4.2.1 Marine Mammal Observation Log – Scientific Observers	6
5.0 In-Water CONSTRUCTION ACTIVITIES.....	7
5.1 Recording Pile Driving Hours	7
5.1.1 Comparison of Pile Driving Hours	7
5.1.2 Construction Pile Driving Shutdowns	8
6.0 MARINE MAMMAL MONITORING DATA.....	8
6.1 Construction Marine Mammal Monitoring Data	8
6.1.1 Marine Mammal Takes.....	9
6.2 Scientific Marine Mammal Monitoring Data	10

LIST OF TABLES

Table 1	2009 Cumulative Summary of Marine Mammal Sightings and In-Water Pile-Driving Hours: 28 March through 14 December - In Accordance with the USACE 404/10 Permit
Table 2	2009 Cumulative Summary of Marine Mammal Sightings and In-Water Pile Driving Hours: 15 July through 14 December – In Accordance with the NMFS Letter of Authorization

LIST OF FIGURES

Figure 1	Project Location
Figure 2	Project Phasing Plan
Figure 3	North Extension Construction
Figure 4	Wet and Dry Barge Berths
Figure 5	Construction Observer in Scissor Lift
Figure 6	Observation Station - Remote on-shore - north of Cairn Point
Figure 7	Construction Marine Mammal Sighting Form (4 pgs)
Figure 8	Cairn Point Station on Elmendorf Air Force Base
Figure 9	Scientific Observer at Cairn Point Station

LIST OF APPENDICES

Appendix A	U.S. Army Corps of Engineers 404/10 Permit Conditions
Appendix B	NOAA/NMFS 2009 Letter of Authorization
Appendix C	Alaska Pacific University 2009 Scientific Marine Mammal Monitoring Annual Report

1.0 INTRODUCTION AND PURPOSE

Located within the Municipality of Anchorage on the Knik Arm of Cook Inlet, the Port of Anchorage (Port) handles 90 percent of all consumer goods and cargo for 85 percent of the population of the state of Alaska (Figure 1). The Port is currently operating at or above sustainable practical capacity for the majority of the cargo types handled. Existing facilities and structures are substantially beyond reasonable design life and degraded to levels of marginal operation safety; many are functionally obsolete. The U.S. Department of Transportation, Maritime Administration (Maritime Administration) under a Memorandum of Understanding with the Municipality of Anchorage, owner and operator of the Port, is overseeing the rebuilding effort, the Port of Anchorage Marine Terminal Redevelopment Project (MTR Project). Integrated Concepts & Research Corporation (ICRC), prime contractor for the Maritime Administration, is managing the MTR construction and permitting process. Port construction activities (Figure 2) were authorized under the U.S. Army Corps of Engineers (USACE) 404/10 Permit POA-2003-502 (Appendix A) issued in August 2007.

The pile-driving equipment used for construction of the wharf generates sound waves within the water, which have the potential to present a physical hazard to marine mammals. To address and comply with NMFS concerns, the POA and the Maritime Administration applied for and received an Incidental Harassment Authorization (IHA); the IHA went into effect on 15 July 2008 and expired 14 July 2009; the Final IHA Report was submitted in October 2009. ICRC then applied for and received the 2009 Letter of Authorization (LOA) from the NMFS for the period 15 July 2009 through 14 July 2010 (Appendix B). The LOA allows Level B “takes” of marine mammals during MTR in-water construction activities. The regulations governing the issuance of the LOA allow the incidental, but not intentional, take of marine mammals under certain circumstances; these regulations are codified in 50 Code of Federal Regulations (CFR) Part 217, Subpart U. The Marine Mammal Protection Act (MMPA) defines Level B harassment as an act that has the potential to disturb a marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering. Where applicable, the LOA stipulations supersede the 404/10 SC-IV.

1.1 Annual Reporting for USACE and NMFS Permits

The POA and the Maritime Administration have implemented NMFS-approved marine mammal monitoring programs that are designed to minimize the number of takes and collect information

on marine mammal behavior in the vicinity of the Port. Details of these programs are described in the 2009 Marine Mammal Monthly Reports.

This *2009 Annual Marine Mammal Monitoring Report* serves to comply with the USACE 404/10 Permit and the NMFS LOA and will be submitted to the NMFS with the upcoming LOA renewal application. This report is provided to meet the marine mammal monitoring reporting requirements of the NMFS LOA, specifically for 15 July 2009 through 14 December 2009, and to meet the USACE 404/10 reporting requirement for 1 January 2009 through 31 December 2009.

2.0 MTR IN-WATER PROJECT WORK

Construction activities for 2009 were conducted in the North Extension and Barge Berth areas (Figure 3) and are described below.

2.1 North Extension Construction

Construction activities for 2009 began in April at the North Extension area and involved the following activities:

- In-water and out-of water placement of fill material was performed; this continued through mid-December 2009.
- In-water and land-based placement and driving of steel sheet pile for construction of the waterfront bulkhead was conducted.
- Dredging of submarine soils to improve pile driving conditions was completed at selected areas.
- Land-based vibrocompaction to consolidate deep fill materials was implemented.
- Storm drain elements, including inlet structures, piping, and an oil-water separator, were installed.

2.2 Barge Berth Construction

The following construction activities initiated in 2008 at the dry and wet barge berths continued during 2009 (Figure 4):

- In-water construction of the bulkhead structure for the barge berth area was completed; this included installation of steel sheet pile as the basic structure of the wet barge berth.
- Dredging of subsurface soils was completed at one area of the wet barge berth to allow inspection of the installed sheet pile.

- Land-based vibracompaction was implemented to densify fill previously placed in-water.
- In-water installation of ship fendering systems and out-of-water construction of mooring appurtenances at the dry barge berth was performed.

3.0 SAFETY AND HARASSMENT ZONES

As required by the USACE 404/10 Permit and the LOA, the POA and the Maritime Administration have established safety and harassment zones at the Project site, which were monitored during 2009 for the presence of marine mammals before, during, and after in-water work activities. If the applicable safety and harassment zones were not visible because of fog, poor light, darkness, sea state, or any other reason, in-water construction activities were shut down until the area was once again visible.

3.1 Safety Zones

The LOA established conservative safety zones to prevent MTR in-water construction activities from physically harming marine mammals in the Project area. The following procedures were in force during the 2009 construction season, and will be in force during the upcoming 2010 MTR construction season. When marine mammals are sighted either approaching the safety zones or surfacing within the safety zones, all in-water construction activities must be suspended until the marine mammal has moved to a safe distance or had not been sighted within the safety zones for at least 15 minutes. The enforced safety zones are:

- 50 meters (m) from in-water Project activities that do not involve vibratory or impact pile driving (e.g., dredging, fill placement)
- 200 m from either vibratory or impact pile driving

3.2 Harassment Zones

The LOA established conservative harassment zones established for MTR in-water construction to limit the number of takes occurring by Level B Harassment. The following harassment zones and protocols were in force during the 2009 construction season, and will be in force during the upcoming 2010 MTR construction season:

- 350 m from impact pile driving
- 1300 m from vibratory pile driving

Suspension of in-water pile driving when marine mammals approach or are sighted within these zones is encouraged, but not mandatory, *with the following exceptions:*

- Level A Harassment (injury/mortality) takes are prohibited.
- No Level B takes of beluga whale calves are allowed when a beluga calf or calves are sighted approaching the harassment zones or are sighted within the harassment zones.
- To limit the number of takes and avoid exceeding the authorized take limit, when a group of five or more marine mammals is sighted approaching the harassment zones, in-water pile driving is suspended.

Under the preceding conditions, which were in force during the 2009 construction season and will be in force for the upcoming 2010 construction season, in-water pile driving activities are suspended until the marine mammal(s) are sighted 1) outside of, and moving away from, the harassment zones or 2) have not been sighted within a harassment zone for at least 15 minutes. In addition, for compliance with the stipulations of both the USACE and NMFS permits, no in-water impact pile driving is conducted within two hours of published low tide occurrence.

3.3 Take Count

Failure to shut down in-water construction activities before a marine mammal has been sighted within the safety and harassment zones constitutes a take. The 2009 LOA allowed the POA and the Maritime Administration to *take by harassment*: 34 beluga whales (*Delphinapterus leucas*), 20 harbor porpoises (*Phocoena phocoena*), 20 harbor seals (*Phoca vitulina*), and 5 killer whales (*Orcinus orca*) during MTR construction activities. Construction marine mammal observers are contractually required to keep an accurate take count of marine mammals sighted within the safety and harassment zones and report the take(s) on an NMFS-approved sighting form. Once the allowable number of takes for a marine mammal species has been reached, the harassment zones are treated as exclusion zones.

4.0 MARINE MAMMAL MONITORING PROGRAMS

The Maritime Administration is responsible for the implementing both the Scientific Marine Mammal Monitoring Program and the Construction Marine Mammal Monitoring Program. The marine mammal monitoring area includes all waters within the Knik Arm of Upper Cook Inlet visible from the site of the in-water construction activities located near and offshore of the Port harbor. During marine mammal monitoring and data collection activities in 2009, emphasis was placed on documenting the abundance and frequency of marine mammal presence within and near the construction area, and on evaluation of the responses of marine mammals to construction activities; this emphasis will continue during the 2010 construction season. The

marine mammal monitors at the MTR construction site provide real-time information to the construction crew so that mitigation measures could be swiftly implemented.

4.1 Construction Observer Marine Mammal Monitoring Program

The Construction Marine Mammal Monitoring Program requires construction observers to be present at the Project site at all times during in-water construction activities and also 30 minutes prior to commencement of in-water pile driving. During 2009, four trained observers were placed at the Port at the best vantage points practicable to monitor the waters of Knik Arm. Each observer worked up to four hours at each station, then rotated among the stations to avoid fatigue. Three 50-foot high scissor lifts were used to elevate construction observers; the lifts were located at South Backlands, for improved viewing of marine mammals approaching the project site from the south; the south end of the North Extension; and north of the North Extension area (Figure 5). A fourth station, where a conex was maintained to ensure observer safety, was located on the shore north and around the bend from Cairn Point bluff. This remote location, one kilometer north of the Project area, provided optimal viewing of marine mammal movement before marine mammals entered the 1300 m harassment zone. The fourth monitoring station was often not accessible on foot due to high tide, and the observer had to take a skiff to reach the conex. Additional safety precautions were necessary at this location because bears frequently pass through the area on their way to the tidal flats (Figure 6).

All sightings of marine mammals were documented by the construction observer on an NMFS-approved marine mammal sighting form. Each construction observer was trained in the detection, identification, and distance estimation of marine mammal species; equipped with high-powered binoculars and other proper viewing materials; and stationed at a location that provides optimal sight range. The observers had no other construction-related task and were required to be fully engaged while monitoring. A comprehensive marine mammal monitoring plan (Plan) was provided by the construction observation team for ICRC review in order to meet the requirements of the POA, the Maritime Administration, and the NMFS. The Plan contained all the contractual and permit requirements of the USACE 404/10 and the NMFS 2009 LOA.

Conformance of the construction subcontractors with the construction observer Plan was discussed at weekly meetings to ensure the procedures were working and to identify and implement any revisions that were necessary to improve the Plan.

4.1.1 Marine Mammal Sighting Form – Construction Observers

The NMFS-approved sighting form used for 2009 is provided in this report (Figure 7). Construction observers documented what type of in-water work was being conducted at the time of each sighting. When a marine mammal was sighted, the construction observer immediately notified the operator of the pile-driving hammer (or other equipment) of the marine mammals' direction of travel and if a shut-down is necessary.

4.2 Scientific Marine Mammal Monitoring Program - Alaska Pacific University

An independent scientific beluga whale monitoring team from the Alaska Pacific University (APU) Environmental Science Marine Biology Department implemented the 2009 NMFS-approved scientific monitoring plan. Observers documented 1) abundance and frequency at which beluga whales and/or other marine mammals were inside or outside of the Project footprint; 2) habitat use, behavior, direction of travel, and group composition; and 3) observed reactions or changes in behavior of marine mammals in response to in-water activities occurring at the time of sighting.

APU observers conducted scientific monitoring from the Cairn Point Station on Elmendorf Air Force Base, which directly overlooks the MTR Project (Figure 8). Trained graduate and undergraduate marine biology students utilized high-powered binoculars and a surveyor's theodolite connected to a laptop computer in order to track marine mammal movement. Two field observers monitored during a four-hour shift, and were then relieved by a second team to complete the 8-hour monitoring day. These teams worked four days per week during two tide cycles per observation day (Figure 9). Scientific observers worked in collaboration with the construction observers to immediately communicate the presence of beluga whales or other marine mammals in the area. The scientific monitoring team was notified of anticipated construction schedules and any changes during observation shifts.

APU's 2009 monitoring plan was approved by NMFS prior to implementation of their scientific monitoring program. APU prepared a monthly and an annual marine mammal monitoring report that was provided to the POA, the Maritime Administration, the USACE and the NMFS.

4.2.1 Marine Mammal Observation Log – Scientific Observers

The data form the Scientific Observers used to record marine mammal sighting information is provided at the end of the APU annual report (Appendix C).

5.0 IN-WATER CONSTRUCTION ACTIVITIES

ICRC managed the scientific marine mammal monitoring team and contractually required the 2009 MTR construction subcontractor to provide marine mammal observers at the construction site, as stipulated by conditions of the NMFS LOA and the USACE 404/10 Permit. ICRC provided close coordination between each monitoring team and the construction subcontractor. In-water construction and construction monitoring for 2009 ended on 14 December, when ice formation and poor visibility impeded further in-water fill placement and pile driving activities.

5.1 Recording Pile Driving Hours

At the request of NMFS, ICRC recorded the number of hours per day of in-water construction activities including hours per day for each method of in-water pile driving: impact hammer, vibratory hammer, and vibratory stabbing. During the 2009 field season, 3,321.94 hours of in-water pile-driving took place between 28 March and 14 December (Table 1).

5.1.1 Comparison of Pile Driving Hours

Under the USACE permit reporting requirements, during 2009, construction activities related to in-water pile driving with an impact hammer took place over 173 days for a total of 1,425.50 hours, an average of 8.2 *intermittent* hours per day; in-water pile driving with a vibratory-hammer took place on 194 days, for a total of 1,724.84 hours, an average of 8.9 *intermittent* hours per day; and vibratory stabbing took place on 53 days, for a total of 171.6 hours, an average of 3.2 *intermittent* hours per day (Table 1).

Under the NMFS LOA reporting requirements, during 15 July 2009 through 14 December 2009, construction activities related to in-water pile driving with an impact hammer took place over 132 days for a total of 1,143.0 hours, an average of 8.65 *intermittent* hours per day; in-water pile driving with a vibratory-hammer took place on 127 days, for a total of 1,192.99 hours, an average of 9.40 *intermittent* hours per day; and vibratory stabbing took place on 25 days, for a total of 68.35 hours, an average of 7.60 *intermittent* hours per day (Table 2).

It is important to note that in-water pile driving is not conducted continuously for extended periods of time. Pile driving hammers are operated for short periods of time (from less than 1 minute to approximately 3.5 minutes within a one-hour period for vibratory hammers, and from approximately 3 to 20 minutes within a one-hour period, for impact hammers), followed by a period of down time to move and reset the hammer (from 1 or 2 minutes up to 15 minutes).

5.1.2 Construction Pile Driving Shutdowns

Under the USACE permit and during marine mammal sightings, 59 construction shutdowns were documented by marine mammal observers during the 2009 field effort. Within the LOA period, 45 shutdowns were documented during marine mammal sightings. The construction subcontractor documented a total of 75 in-water construction shutdowns during marine mammal sightings or when the radii were not visible due to high winds and other sea state conditions. The peak month for shutdowns and delays in 2009 was August, when 25 shutdown/delays were recorded. Most of these occurred when marine mammals were sighted approaching or surfacing just inside the harassment zone.

6.0 MARINE MAMMAL MONITORING DATA

The following sections summarize data results for the marine mammal monitoring programs conducted during 2009, in compliance with the NMFS and USACE permits.

6.1 Construction Marine Mammal Monitoring Data

Construction observers recorded the location of the marine mammals on a grid map (page three of the sighting form), according to the distance of the animal(s) from the noise source at the construction site. The number of animals per sighting; the number of adults, juvenile, and calves; and the behavior of the marine mammals were also recorded. The individual sighting forms filled out by the construction observers were provided in the monthly reports to the USACE and NMFS from April 2009 through December 2009.

Within the USACE reporting period, the construction observers recorded 167 marine mammal sightings and a total of 1,281 animals sighted (Table 1). There were 1,221 beluga whales (604 white, 514 gray, and 103 were dark gray); 34 harbor seals (31 adults, 2 juveniles, and 1 pup); 20 harbor porpoises (15 adults and 5 unknown age); 3 Steller sea lions (one adult, believed to be a single animal seen 3 times); and 3 unidentified pinnipeds.

Within the LOA reporting period, the construction observers recorded 122 marine mammal sightings and a total of 1,127 total animals sighted (Table 2). There were 1,094 beluga whales (516 white, 481 gray, and 97 dark gray); 17 harbor seals (15 adults and 2 juveniles); 15 harbor porpoises (10 adults and 5 unknown age); and one unidentified pinniped.

The highest number of sightings (51) and number of marine mammals sighted (576) occurred in August (572 of this number were beluga whales: 234 white; 277 gray; and 61 dark gray). The

fewest number of sightings for a 30-day period were recorded in April, when only 8 marine mammals were sighted.

6.1.1 Marine Mammal Takes

The USACE Permit does not address marine mammal takes. The NMFS LOA annual take reporting requirement during 2009 (1 January through 31 December), documented 24 beluga whale takes, 6 harbor seal takes, and 4 harbor porpoise takes (Table 1). However, the 4 beluga whale takes documented in May 2009 were accounted for in the 2008 IHA which expired 14 July 2009.

Under the LOA period from 15 July through end of December 2009, allowable takes per species are summarized below:

TAKES AUTHORIZED BY THE 2009 LOA

Maximum Allowable Takes 15 July 2009 – 14 July 2010	Takes 2009 Construction Season 15 July – 14 December	Remaining Allowable Takes through 14 July 2010
Beluga Whale: 34	<u>20 Beluga Whales:</u> ➤ 9 white ➤ 9 gray ➤ 2 dark gray	14
Harbor Seal: 20	<u>5 Harbor Seals:</u> ➤ 4 adults ➤ 1 unknown age	15
Harbor Porpoise: 20	<u>4 Harbor Porpoises:</u> ➤ adults	16

Of the 20 beluga whale takes recorded under the LOA, 3 were in August, 1 in September, 1 in October, and 15 in November (during one sighting). The 15 beluga whales sighted on 4 November (6 white; 8 gray; and 1 dark gray) were initially seen south of Cairn Point at approximately 950 m from in-water pile driving. Pile driving was shut down for 40 minutes while the animals were in view (traveling and swimming) just west of the North Extension area. No

behavior changes were recorded. The animals were subsequently resighted north of Cairn Point heading north along the shoreline.

Measures to maintain and not exceed the remaining allowable takes through 14 July 2010 will be carefully and conservatively monitored. The 2010 Construction Marine Mammal Monitoring Program will address those measures to ensure compliance.

6.2 Scientific Marine Mammal Monitoring Data

For 86 days, from 4 May through 18 November 2009, trained graduate and undergraduate marine biology students conducted approximately 783 hours of scientific monitoring and documented approximately 166 beluga whales (120 white; 42 gray; and 4 dark gray). One harbor seal was also documented. The 2009 Scientific Marine Mammal Monitoring Report is provided as Appendix C.

TABLES

This page intentionally blank

Table 1. 2009 Cumulative Summary of Marine Mammal Sightings and In-Water Pile Driving Hours: 28 March through 14 December
In Accordance with the USACE 404/10 Permit

Day/Month	Total: Marine Mammal Sightings	Total: Marine Mammals Sighted	Marine Mammal Species, Number, and Group Composition ¹	Animals in Safety Zones ²	Animals in Harassment Zones ³	Shutdowns and Delays ⁴	Takes: beluga whale ⁵	Takes: harbor seal ⁵	Takes: harbor porpoise ⁵	Reaction ⁶	Total Days: In-water Pile Driving	Total Hours: In-water Pile Driving	Total Hours: In-water Pile Driving <i>Impact Hammer</i>	Total Hours: In-water Pile Driving <i>Vibratory Hammer</i>	Total Hours: In-water <i>Stabbing (Vibratory)</i>
28 March - 30-April	4	8	Beluga whale: 8 (4 white; 4 gray; 0 dark gray)	7	7	2	0	0	0	No	19	125.5	0	70.75	54.75
1 May - 31 May	17	122	Beluga whale: 118 (83 white; 29 gray; 6 dark gray) Harbor Seal: 3 (adults) Unidentified pinniped: 1	9	16	7	4 (2 white; 1 gray; 1 dk gray)	0	0	No	26	245.25	36	182.75	26.5
1 June - 30 June	23	23	Beluga whale: 1 (white) Harbor porpoise: 5 (adults) Harbor seal: 1 (pup); 12 (adults) Steller Sea Lion: 3 (adults) Unidentified pinniped: 1	4	7	5	0	1 adult	0	No	22	392.85	173.5	202.6	16.75
1 July - 31 July	10	19	Beluga whale: 8 (5 white; 1 gray; 2 dark gray) Harbor porpoise: 5 (adults) Harbor seal: 3 (adults); 2 (juv) Unidentified pinniped: 1	3	8	7	0	0	3 adults	No	22	434.25	192	228	14.25
1 August - 31 August	51	576	Beluga whale: 572 (234 white; 277 gray; 61 dark gray) Harbor porpoise: 2 (adults) Harbor seal: 2 (adults)	379	433	25	3 (1 white; 1 gray; 1 dk gray)	1 unknown age	0	No	30	636.75	325	290.25	21.5
1 Sept. - 30 Sept.	24	240	Beluga whale: 231 (136 white; 78 gray; 17 dark gray) Harbor seal: 9 (adults)	67	101	4	1 (white)	3 adults	0	No	29	667.51	260.75	400.99	5.77
1 Oct. - 31 Oct.	21	146	Beluga whale: 137 (76 white; 53 gray; 8 dark gray) Harbor Porpoise: 7 (3 adults; 4 unknown age) Harbor seal: 2 (adults)	9	62	4	1 (white)	1 adult	1 adult	Yes ⁷	30	485.5	228	245	12.5
1 Nov. - 30 Nov.	11	130	Beluga whale: 129 (52 white; 68 gray; 9 dark gray) Harbor Porpoise: 1 (unknown age)	46	108	4	15 (6 white; 8 gray; 1 dk gray)	0	0	Yes ⁸	25	261.33	169.75	82.5	9.08
1 Dec. - 14 Dec.	6	17	Beluga whale: 17 (13 white; 4 gray; 0 dark gray)	9	15	1	0	0	0	No	11	73	40.5	22	10.5
CUMULATIVE TOTALS: 2009 CONSTRUCTION SEASON 28 MAR. – 14 DEC.	167	1,281	Beluga whale: 1,221 (604 white; 514 gray; 103 dark gray); Steller Sea Lion: 3 (adults); Harbor porpoise: 20 (15 adults; 5 unknown age); Harbor seal: 34 (31 adults; 2 juveniles; 1 pup) Unidentified pinniped: 3	533	757	59	24	6	4	N/A	214	3,321.94	1,425.50	1,724.84	171.6

1 Distribution of white, gray, and dark gray beluga whales

2 Safety zones under the LOA: 200 meters (m) from either vibratory or impact pile driving; 50 m from other in-water project activities. Animals that entered in the safety zones also entered the harassment zones.

3 Harassment zones under the LOA: 350 m from impact pile driving; 1,300 m from vibratory pile driving. Some of the animals that entered the harassment zones also entered the safety zones.

4 In-water construction activities were shut down or delayed until marine mammal(s) left the harassment zones.

5 The NMFS LOA (15 July 2009 - 14 July 2010) allows 34 takes of the beluga whale; 20 takes of the harbor seal; 20 takes of the harbor porpoise; and 5 takes of the killer whale.

6 Reaction to project construction and other activities in the harbor.

7 On 7 October, 44 beluga whales were initially sighted 1,950 m north of the Port area heading south; vibratory pile driving was shut down. Animals changed direction and headed away from construction site and dredge barges after attempting to navigate around the two barges.

8 On 4 November, when 15 beluga whales were initially sighted inside the harassment zone, pile driving was shut down. It appeared that the belugas were trying to avoid the dredge barges.

Table 2. 2009 Cumulative Summary of Marine Mammal Sightings and In-Water Pile Driving Hours: 15 July through 14 December
In Accordance with the NMFS 2009 Letter of Authorization

Day/Month	Total: Marine Mammal Sightings	Total: Marine Mammals Sighted	Marine Mammal Species, Number, and Group Composition ¹	Animals in Safety Zones ²	Animals in Harassment Zones ³	Shutdowns and Delays ⁴	Takes: beluga whale ⁵	Takes: harbor seal ⁵	Takes: harbor porpoise ⁵	Reaction ⁶	Total Days: In-water Pile Driving	Total Hours: In-water Pile Driving	Total Hours: In-water Pile Driving <i>Impact Hammer</i>	Total Hours: In-water Pile Driving <i>Vibratory Hammer</i>	Total Hours: In-water <i>Stabbing</i> <i>(Vibratory)</i>
15 July - 31 July	9	18	<u>Beluga whale:</u> 8 <i>(5 white; 1 gray; 2 dark gray)</i> <u>Harbor porpoise:</u> 5 (adults) <u>Harbor seal:</u> 4 (2 adults; 2 juv) <u>Unidentified pinniped:</u> 1	3	8	7	0	0	3 adults	No	15	280.25	119	152.25	9
1 August - 31 August	51	576	<u>Beluga whale:</u> 572 <i>(234 white; 277 gray; 61 dark gray)</i> <u>Harbor porpoise:</u> 2 (adults) <u>Harbor seal:</u> 2 (adults)	379	433	25	3 <i>(1 white; 1 gray; 1 dk gray)</i>	1 unknown age	0	No	30	636.75	325	290.25	21.5
1 Sept. - 30 Sept.	24	240	<u>Beluga whale:</u> 231 <i>(136 white; 78 gray; 17 dark gray)</i> <u>Harbor seal:</u> 9 (adults)	67	101	4	1 <i>(white)</i>	3 adults	0	No	29	667.51	260.75	400.99	5.77
1 Oct. - 31 Oct.	21	146	<u>Beluga whale:</u> 137 <i>(76 white; 53 gray; 8 dark gray)</i> <u>Harbor Porpoise:</u> 7 <i>(3 adults; 4 unknown age)</i> <u>Harbor seal:</u> 2 (adults)	9	62	4	1 <i>(white)</i>	1 adult	1 adult	Yes ⁷	30	485.5	228	245	12.5
1 Nov. - 30 Nov.	11	130	<u>Beluga whale:</u> 129 <i>(52 white; 68 gray; 9 dark gray)</i> <u>Harbor Porpoise:</u> 1 <i>(unknown age)</i>	46	108	4	15 <i>(6 white; 8 gray; 1 dk gray)</i>	0	0	Yes ⁸	25	261.33	169.75	82.5	9.08
1 Dec. - 14 Dec.	6	17	<u>Beluga whale:</u> 17 <i>(13 white; 4 gray; 0 dark gray)</i>	9	15	1	0	0	0	No	11	73	40.5	22	10.5
<u>CUMULATIVE TOTALS:</u> 2009 CONSTRUCTION SEASON 15 JULY – 14 DEC.	122	1,127	<u>Beluga whale:</u> 1,094 <i>(516 white; 481 gray; 97 dark gray)</i> ; <u>Harbor porpoise:</u> 15 (10 adults; 5 unknown age); <u>Harbor seal:</u> 17 <i>(15 adults; 2 juveniles)</i> <u>Unidentified pinniped:</u> 1	513	727	45	20	5	4	N/A	140	2,404.34	1,143.00	1,192.99	68.35

1 Age distribution of the beluga whale: white, gray, and dark gray.

2 Safety zones under the LOA: 200 meters (m) from either vibratory or impact pile driving; 50 m from other in-water project activities. Animals that entered the safety zones also entered the harassment zones.

3 Harassment zones under the LOA: 350 m from impact pile driving; 1,300 m from vibratory pile driving. Some of the animals that entered the harassment zones also entered the safety zones.

4 In-water construction activities were shut down or delayed until marine mammal(s) left the harassment zones.

5 The NMFS LOA (15 July 2009 - 14 July 2010) allows 34 takes of the beluga whale; 20 takes of the harbor seal; 20 takes of the harbor porpoise; and 5 takes of the killer whale.

6 Reaction to project construction and other activities in the harbor.

7 On 7 October, 44 beluga whales were initially sighted 1,950 m north of the Port area heading south; vibratory pile driving was shut down. Animals changed direction and headed away from construction site and dredge barges after attempting to navigate around the two barges.

8 On 4 November, when 15 beluga whales were initially sighted inside the harassment zones, pile driving was shut down. It appeared that the belugas were trying to avoid the dredge barges.

FIGURES

This page intentionally blank



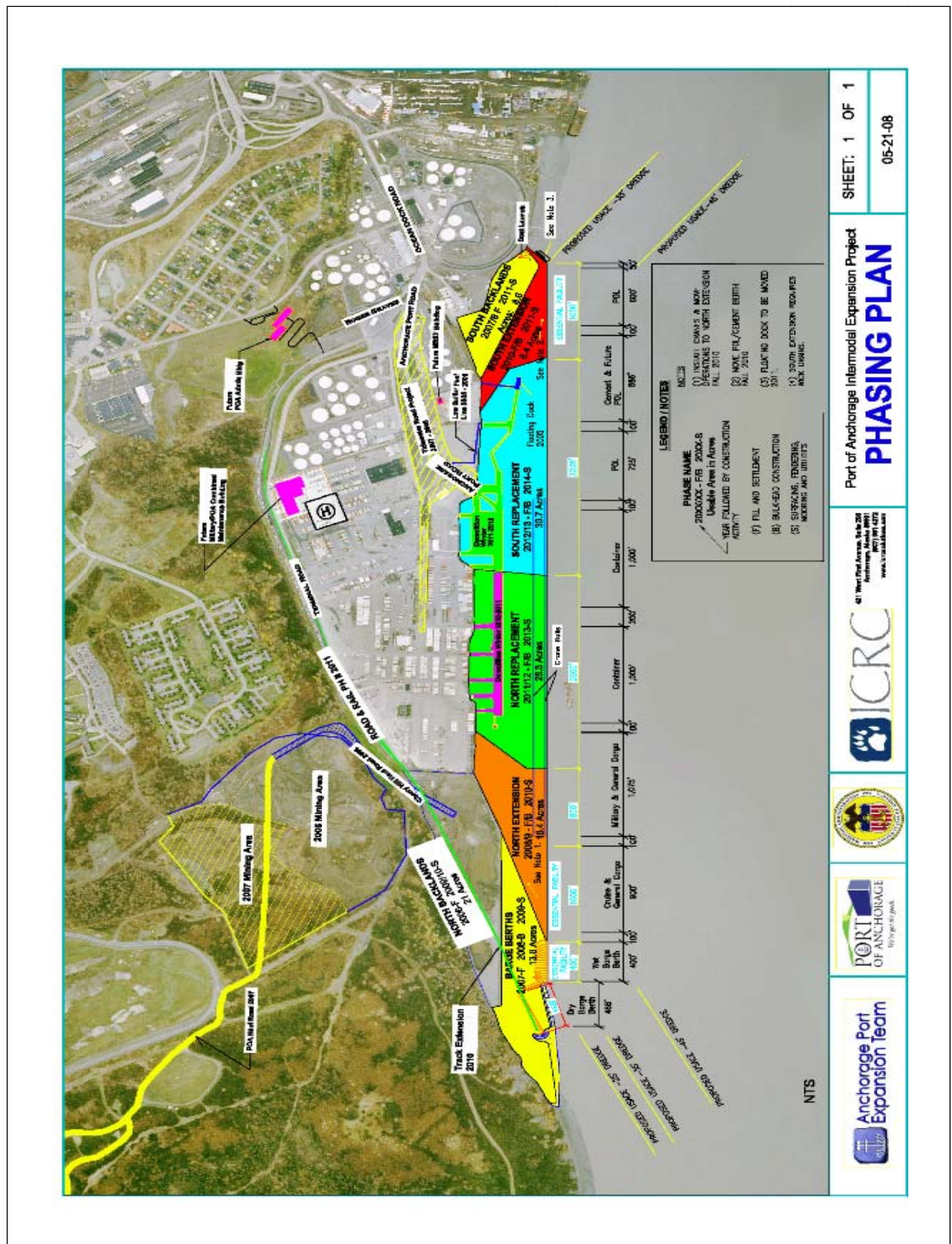


Figure 2 – Project Phasing Plan



Figure 3. North Extension Construction



Figure 4. Wet and Dry Barge Berths



Figure 5. Construction Observer in Scissor Lift



Figure 6. Observation Station (Red Conex) Remote

Marine Mammal Sighting Form – Project Construction Subcontractor Port of Anchorage Marine Terminal Redevelopment Project								
Date of Observation: _____			Observer Name & Affiliation: _____					
Observation Station (location): _____					Take Count this Sighting: _____			
Sighting #: _____ (1 st sighting of the day is Sighting # 1)					If Take occurs, report immediately.			
Time of First Sighting ↓	Time of Last Sighting ↓	Weather Conditions (circle) ↓	Species (circle) ↓	Number of Marine Mammals Sighted ↓		Number of Marine Mammals in Each Classification ↓	Initial Heading (circle) ↓	Final Heading (circle) ↓
		sunny	beluga whale	Inside Harassment Zones: Outside Harassment Zones:		Use these color classifications for beluga whales:	N	N
		sun/clouds	harbor seal			White _____	NE	NE
		overcast	harbor porpoise			Gray _____	E	E
		light rain	killer whale			Dark Gray/Calf: _____	SE	SE
		rain	<u>Other:</u>			***** Other marine mammals:	S	S
		light snow				Adults _____	SW	SW
		snow				Juveniles _____	W	W
		<u>Other:</u>				Calves /Pups _____	NW	NW
Distances of marine mammal(s) from in-water noise source: (meters) (Even if no in-water work in progress) Initial Distance = _____ Closest Distance = _____ Final Distance = _____								
Tidal Stage at time of sighting: (circle): low slack low ebb low flood high slack high ebb high flood								
Beaufort Sea State: (circle) 0 1 2 3 4 5								
In-Water Project Activities at time of sighting: (check box that applies) <input type="checkbox"/> Soft start <input type="checkbox"/> Stabbing w/ vibratory hammer <input type="checkbox"/> Vibratory hammer <input type="checkbox"/> Impact hammer <input type="checkbox"/> Other (non-pile driving)** <input type="checkbox"/> Stabbing (no hammer) <input type="checkbox"/> NO in-water activity **Describe other in-water, non-pile-driving activity at time of marine mammal sighting: _____								

Figure 7 (1 Of 4). Construction Observer Marine Mammal Sighting Forms/Maps

Sighting # _____ / Date _____													
<input type="checkbox"/> <i>Project activities</i> (circle one) Shut Down or Delayed from _____ to _____ (time). <input type="checkbox"/> <i>Project activities</i> <u>Were Not</u> shut down. Explanation Required:													
<p>Behavior of Marine Mammal: (mark X to indicate behaviors)</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">() traveling</td> <td style="width: 25%;">() diving</td> <td style="width: 25%;">() resting</td> <td style="width: 25%;">() milling</td> </tr> <tr> <td>() swimming</td> <td>() swimming toward construction</td> <td>() swimming away from construction</td> <td>() fleeing</td> </tr> <tr> <td>() feeding observed</td> <td>() feeding suspected</td> <td>() mating</td> <td>() other</td> </tr> </table> <p><i>Describe initial group cohesion:</i> (orientation; how far apart) _____</p> <p><i>Describe final group cohesion:</i> _____</p> <p><i>Change in behavior?</i> (in response to construction or other Port activities) <input type="checkbox"/> NO <input type="checkbox"/> YES → <i>Time:</i> _____</p> <p><u><i>Describe behavioral change:</i></u></p> <p><i>Construction activity</i> (if activity different than the activity recorded on page 1) _____</p>		() traveling	() diving	() resting	() milling	() swimming	() swimming toward construction	() swimming away from construction	() fleeing	() feeding observed	() feeding suspected	() mating	() other
() traveling	() diving	() resting	() milling										
() swimming	() swimming toward construction	() swimming away from construction	() fleeing										
() feeding observed	() feeding suspected	() mating	() other										
<p>Additional Information: (describe additional behaviors and/or patterns observed)</p> 													
<p>Maps (pages 3 & 4) ↓</p>	<p>To the best of your ability, mark your location, the location of the noise source, and the approximate location of the marine mammal(s) on one or both maps as applicable.</p>												

Figure 7 (2 Of 4).

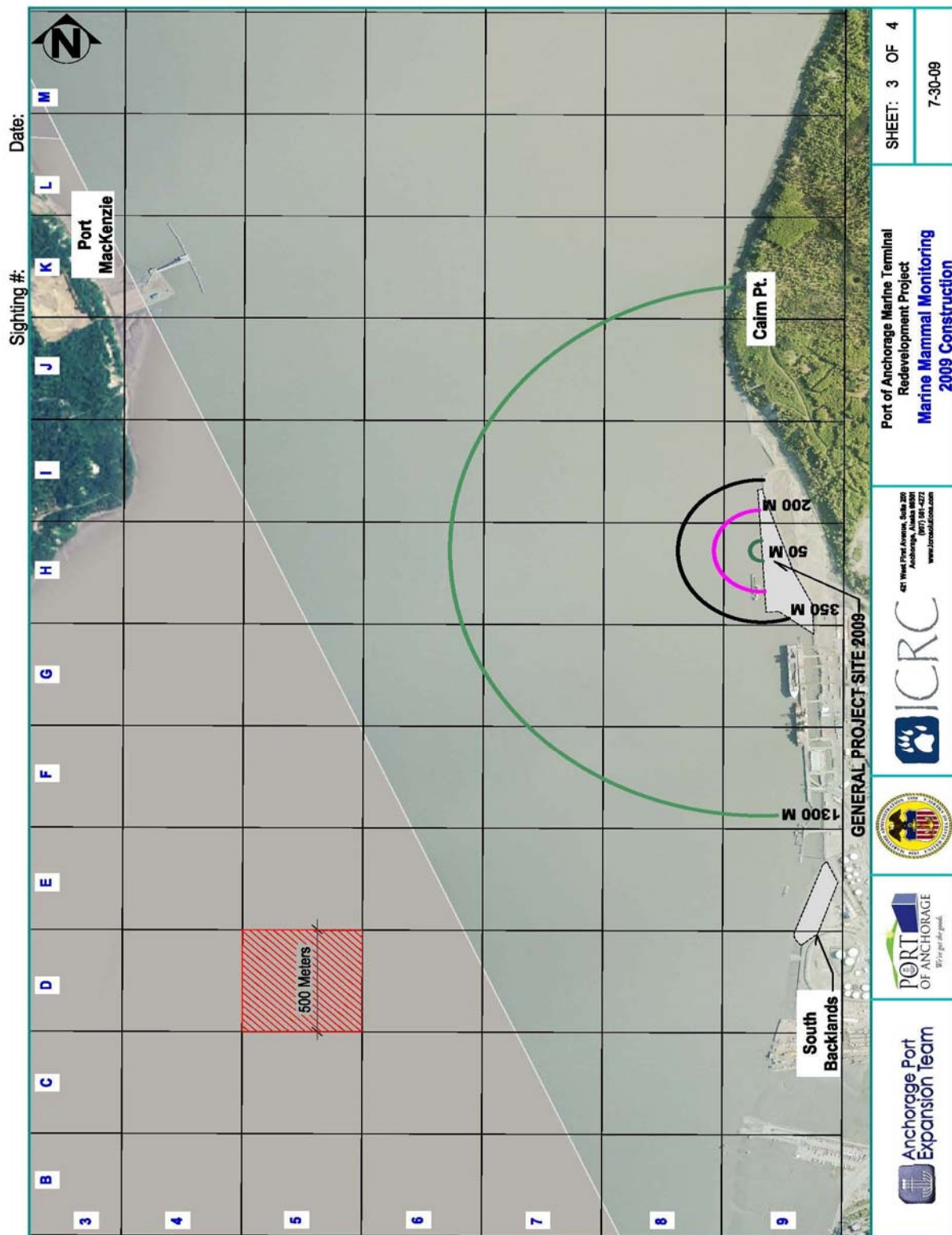


Figure 7 (3 Of 4).

Sighting # _____
Date _____





Figure 8. Cairn Pt Station on Elmendorf Air Force Base



Figure 9. Scientific Observers at Cairn Pt Station

This page intentionally blank

APPENDICES

This page intentionally blank

APPENDIX A

USACE 404/10 Permit: POA-2003-502-N

This page intentionally blank

DEPARTMENT OF THE ARMY PERMIT

Permittee: Port of Anchorage

Permit No.: POA-2003-502-N

Issuing Office: U.S. Army Engineer District, Alaska

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

This permit authorizes work necessary for the construction of the Marine Terminal Redevelopment (Port Expansion) Project to expand, reorganize and improve the existing facilities at the Port of Anchorage to replace functionally obsolete structures; increase POA capacity, efficiency, and security; and accommodate the needs of the U.S. military for rapid deployment. The project involves the construction of a new open cell sheet pile (OCSP) dock in the tidelands west, northwest, and southwest of the existing dock. This permit authorizes the following work:

1. The discharge of fill material over 20.5 acres of wetlands associated with the development of the Cherry Hill and North End Runway borrow pits;
2. The dredging of approximately 258,000 cubic yards of sediment over approximately 21 acres necessary for the construction of the expanded dock and the discharge of the material at the existing Port of Anchorage maintenance dredging disposal site;
3. The discharge of approximately 9,663,420 cubic yards of clean fill material over 111 acres of intertidal and nearshore subtidal waters of Knik Arm necessary for the construction of the expanded dock.

All work will be performed in accordance with the attached plan, 9 sheets, dated July 2007.

Project Location:

The Port of Anchorage is located in the Knik Arm of Upper Cook Inlet, within section 31, T. 14 N., R. 3 W.; and sections 6 & 7, T. 13 N., R. 3 W.; Seward Meridian; Latitude 61° 15' N., Longitude 149° 52' W.; in Anchorage, Alaska. The gravel extraction sites are located within sections 5 & 6, T. 13 N., R. 3 W.; and within sections 27, 28, 33, and 34, T. 14 N., R. 3 W.; Seward Meridian; on Elmendorf Air Force Base, northeast of the Port of Anchorage. Construction dredge material will be disposed at the designated maintenance dredging disposal area, located approximately 3,000 feet west of the existing dock.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **August 31, 2014**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good

faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

I. Navigation:

The following conditions are to preserve free navigation, prevent navigational hazards, and to protect the interests of the United States in existing and future federal projects [(33 CFR Part 320.4(o)(3)].

1. Your use of the permitted activity must not interfere with the public's right to free navigation on all navigable waters of the United States.
2. You must install and maintain, at your expense, any safety lights and signals prescribed by the United States Coast Guard (USCG), through regulations or otherwise, on your authorized facilities. The USCG may be reached at the following address and telephone number: Commander (DPW), 17th Coast Guard District, P.O. Box 25517, Juneau, Alaska 99802; (907) 463-2269.
3. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
4. Appropriate and practicable mitigation measures shall be employed as needed to minimize adverse affects to federal dredging operations, adjacent properties, and/or flow patterns of waters of the U.S. from temporary changes in sedimentation patterns during the construction phases of the project. The Port of Anchorage shall cooperate with adjacent industrial businesses (e.g., barge terminals) to ensure that all appropriate and practicable mitigation measures are implemented during construction to both minimize and compensate for adverse affects to their operations.

II. Cultural Resources

The following two conditions are to ensure compliance with Section 106 of the National Historic Preservation Act and at the request of the applicant.

1. Procedures for managing inadvertent discoveries of cultural resources or skeletal remains shall be employed as described in the Cultural Resources Monitoring Plan for Cherry Hill and North End Material Extraction report (Anchorage Port Expansion Team, April 2006, or approved revisions).
2. Prior to ground disturbing activities, POA shall photograph and document site conditions of and around the trees of interest identified by representatives of the Native Village of Eklutna (Anchorage

Port Expansion Team, Cultural Resources Survey: Port of Anchorage Haul Road, Appendix D; October, 2006.).

III. Borrow Pits:

The following condition is to prevent and minimize impacts to nesting migratory birds. Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703), it is illegal to "take" migratory birds, their eggs, feathers or nests.

1. To prevent impacts to nesting migratory birds, no vegetation clearing, fill placement, excavation, stockpiling, grading or other disturbing construction activities at the material extraction sites shall be conducted between 1 May and 15 July, except at sites that have been sufficiently disturbed or altered to the extent that suitable nesting habitat has been eliminated (e.g., covered or otherwise removed) prior to 1 May. If disturbing construction activities in areas containing potential nesting habitat are proposed after 1 May, the Port of Anchorage shall submit a plan to the Corps that demonstrates how compliance with the MBTA will be ensured. This plan must be coordinated with the USFWS and approved by the Corps prior to commencement of work that would potentially affect nesting habitat between 1 May and 15 July.

The following two conditions are necessary to prevent and minimize impacts to wetlands and aquatic organisms

2. The POA will establish a buffer between ground disturbing activities at the gravel extraction sites and adjacent wetland areas as necessary to prevent hydrological disturbances from development activities. Additionally, a buffer area shall be established around the Triangle/Fish Lake wetland complex and delineated onsite with silt fencing and signage and verified as adequate by the Corps prior to commencing extraction activities within 600 feet of the wetland complex. The extent and/or distance of the buffer boundaries shall be determined onsite based on vegetation, topography and hydrology as necessary to prevent an adverse disturbance to the wetland complex. The POA shall install and monitor a series of groundwater wells or piezometers in the western portion of the North End Borrow Pit to assure that gravel mining activities do not adversely affect adjacent wetland hydrology.
3. POA shall, to the extent practicable, limit disturbances to wetlands and open water areas where wood frogs are present to periods of time other than those known for breeding and tadpole growth (1 April to 15 July).

IV. Beluga Whales:

The following conditions are to prevent and minimize adverse impacts to marine mammals and to ensure compliance with the Marine Mammal Protection Act.

1. The POA has submitted petitions for an Incidental Harassment Authorization (IHA) for the 2007 construction season and a Letter of Authorization (LOA) for construction seasons 2008-2012 (Anchorage Port Expansion Team, Final Petition; January 2007) for Small Take Authorizations from the NOAA/NMFS under the Marine Mammal Protection Act (MMPA) for the incidental and unintentional taking of marine mammals. The conditions of the IHA and LOA Small Take Authorizations under the MMPA will be carried as special conditions of this DA permit unless otherwise noted by the Corps. The POA shall comply with the interim mitigation measures listed below to minimize project related adverse impacts to beluga whales. Upon receipt of the IHA and/or LOA MMPA authorizations, the Corps will reevaluate the terms or conditions of this permit and modify any conflicting conditions, if necessary.
 - A. The POA shall measure and evaluate construction and operationally generated noise introduced in Knik Arm at the Port of Anchorage. The applicant shall develop a 'Sound Index' to accurately represent noise levels associated with Port of Anchorage operations and construction activities, which must specifically include noise levels generated from pile driving, dockside activities, vessel traffic in the channel, dredging, and docking activities. The evaluation shall characterize current baseline operational noise levels at the Port of Anchorage and develop an engineering report that identifies structural and/or operational noise reduction measures, if necessary, to minimize the baseline operational noise levels at the expanded port to the maximum extent practicable. The final report will be provided to the NMFS two years prior to construction completion.

The Port of Anchorage Sound Index will be collaborated with the concurrent beluga whale monitoring program to correlate construction and operationally generated noise exposures with beluga whale presence, absence, and any altered behavior observed during construction and operations (i.e., a dose-response analysis). An annual review of beluga observations and noise exposure data shall be provided to NMFS no later than 1 Feb annually. The annual review shall also identify relevant technological advances in sound attenuation. The POA shall employ practicable noise minimization measures identified in the annual reports in subsequent POA construction activities.

- B. In collaboration with the NMFS, the Port of Anchorage shall continue to develop and maintain a beluga monitoring program to estimate the frequency at which beluga whales are present in the project footprint; characterize habitat use and behavior of belugas near the Port during ice free months; map sound levels and distance attenuation related to POA background noise and expansion activity; and to characterize and assess the impacts of received noise from the POA on beluga whale behavior and movements. POA shall consult with NMFS to develop the program and shall include the following:
 - a. Include visual observations (shore-based and opportunistic vessel observations) to monitor beluga movements, timing, group size, locations, identifiable behaviors and patterns, and use of the area in the vicinity of the Project during operations through the construction period. The POA will also provide one year of post-construction monitoring in continued consultation with NOAA/NMFS.
 - b. Include a passive acoustic monitoring plan to correlate with visual observations. The POA shall install hydrophones (or employ other effective methodologies) necessary to detect and localize passing whales and to determine the proportion of belugas missed from visual surveys.
 - c. The POA will employ a marine mammal observation team, separate from the construction contractor observer activities, for the duration of all construction activities.
- C. The Port of Anchorage shall establish and enforce safety radii and shut down standards around the in-water pile driving areas. Initially, the safety radii requiring shut down shall be for any whale observed within 650 meters of pile driving. The Port of Anchorage shall conduct on-site underwater noise surveys to verify the 190, 180 and 160 dB re 1 μ Pa rms isopleths from in-water pile driving activities for the POA expansion. Safety zones appropriate to the POA site conditions and equipment will then be empirically determined and implemented. The 160 dB re 1 μ Pa rms safety zone should be in force unless the POA obtains authorization under the section 101 (a) of the Marine Mammal Protection Act for the incidental and unintentional taking of marine mammals; in which case the safety zones should be those provided within the authorization. The safety zone around pile driving areas shall be monitored for the presence of marine mammals before, during, and after any pile driving activity. If the safety radius is obscured by fog or poor lighting conditions, pile driving will cease until the entire safety radius is visible.
- D. Prior to the start of seasonal pile driving activities, the POA will require construction supervisors and crews, the marine-mammal monitoring team, the acoustical monitoring team, and all project managers to attend a briefing. The purpose of the briefing will be to establish the responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures.
- E. The Port of Anchorage shall formally notify the NMFS prior to the seasonal commencement of pile driving and provide weekly monitoring reports. A summary monitoring report will be submitted at the end of annual construction activities and a final report will be submitted at the end of the one year post construction monitoring season.
- F. The POA will establish daily "soft start" or "ramp up" procedures for pile-driving activities. The soft start technique will be used at the beginning of each piling installation to allow any marine mammal that may be in the area to leave before pile driving activities reach full energy. The soft start procedure will require contractors to initiate noise from vibratory hammers for 15 seconds at

reduced energy followed by a 1-minute waiting period. This procedure will be repeated two additional times. If an impact hammer is used, contractors will be required to provide an initial start of 3 strikes at 40-percent energy, followed by a 1-minute waiting period, then two subsequent 3-strike sets. If marine mammals are sighted within the safety zone prior to pile driving or during the soft start, the contractor will delay pile-driving continuation until the mammal has moved outside the safety zone. Pile installation will resume only after a qualified observer confirms that the marine mammal has moved outside the safety zone or after 15 minutes have elapsed since the marine mammal was last sighted.

- G. The POA will erect whale-notification signage in the waterfront viewing areas near the Ship Creek Public Boat Launch and within the secured Port entrance that is visible to all Port users. This signage will provide information on the beluga whale and notification procedures for reporting beluga whale sightings to the NMFS. The POA will consult with the NMFS to establish the signage criteria.
 - H. During in-water construction activities, the POA shall ensure that construction contractors delegate supervisory responsibility to include on-site construction personnel to observe, record, and report marine mammal sightings and response actions taken, to include shut down or delay.
 - I. The POA shall establish a long-term, formalized marine-mammal sighting and notification procedure for all Port users, visitors, tenants, or contractors prior to and after construction activities. The notification procedure shall clearly identify roles and responsibilities for reporting all marine mammal sightings. The POA will forward documentation of all reported marine mammal sightings to the NMFS.
2. In-water impact pile-driving, excluding work when the entire pile is out of the water due to shoreline elevation or tidal stage, shall not occur within two hours of either side of each low tide.

V. Fish

The following conditions are necessary to minimize impacts to anadromous fish populations.

- 1. The Port of Anchorage shall either avoid pile driving activities between 15 May and 15 August or conduct an on-site fish study to analyze the impacts of vibratory and impact hammer sheet pile driving activities on salmonids at various distances and measured sound pressure levels. The study plan shall be developed in consultation with local representatives of the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and approved by the Corps. The study plan should include a live cage fish study and hydroacoustic monitoring to assess the impacts of pile driving on the health and behavior of fish groups and individuals. The study plan shall be completed by 1 January 2008 and initiated in the 2008 construction season. The results shall be analyzed following the completion of the 2008 construction season and coordinated with the Corps and the aforementioned resource agencies. Based on the results of the study, this condition may be modified and/or supplemented to minimize adverse impacts to salmonids (including timing restrictions).
- 2. No in water fill placement or pile driving activities shall occur within a one week period following smolt releases from the Ship Creek Hatchery. The Port shall coordinate with hatchery staff to ensure compliance with this condition.
- 3. In-water sheet piles shall be driven with a vibratory hammer to the maximum extent possible (i.e., until desired depth is achieved and/or to refusal, prior to using an impact hammer).
- 4. The final design shall, wherever possible, incorporate end-of-phase construction joints that provide potential refuge habitat areas for salmonids in the non-structural voids. Although the spacing, size, and configuration of these structural joints will be dictated by stability and construction requirements, void spaces within these joints shall be developed to maximize the potential salmonid refuge value of the space. The design of the refuge area within the void space shall be approved by the Corps, in consultation with other federal resource agencies. The refuge area shall be monitored by the Port of Anchorage between 15 May and 15 August for a minimum of 2 years following construction to determine the extent and nature of use by salmonids. Based on the monitoring observations, this condition may be modified to improve the functional value of refuge areas if necessary.

VI. Design Coordination:

The following three conditions are to prevent and minimize adverse impacts to public safety and security and to protect the interests of the United States in existing and future federal projects:

1. A final analysis of the global and internal structural stability of the open cell sheet pile structure under static and seismic conditions shall be submitted to the Corps of Engineers a minimum of two months prior to sheetpile installation activities of 2008. The analysis shall state the assumptions made, data used, computational analyses performed, modeling input criteria used and output results generated (where modeling is applicable) that led to the final analysis. Additionally, to the maximum extent practicable, the final analysis shall, at minimum, include the following:
 - a. Test the borrow source(s) to confirm the stability model input and determine the densification requirements. Provide your Quality Assurance Plan and the acceptance criteria for validating the densification of the backfill.
 - b. For each soil profile, run static stability models with six feet of over dredge below the design project depth and at a water elevation of -5 ft. MLLW.
 - c. Submit a plan that describes the proposed piezometer placements and all other instrumentation to be used to confirm how consolidation (and associated strength gain) is expected to occur, and to what degree. Additionally, the POA will submit annual reports of actual findings.
 - d. Conduct a parametric sensitivity analysis, investigating strength, modulus, and geometry, with the model for seismic loading to determine if the model is sensitive to small changes in input parameters. The study shall further evaluate possible failure modes, to include toe heave.
 - e. Define the target Factor of Safety for internal stability and model each construction phase area. All engineering parameters and design calculations for internal stability evaluation shall be included in the design analysis.
 - f. Further evaluate earthquake loading by considering a minimum of five accelograms, with no more than two being synthetic, and refined target design response spectra criteria in the analysis. Specifically, develop design target spectra based on deterministic spectra for MCE scenario earthquakes from the Castle Mountain fault and Megathrust sources using M_{max} and closest distance parameters. Use a suite of ground motion attenuation models that are appropriate for the region and source. Combine this suite of models either by a weighting or enveloping procedure to develop final target spectra and match the selected accelograms to the target spectra. Review the latest information on USGS Alaska seismic hazard maps to assist in the selection of parameters and ground motion attenuation models. The development of the final suite of design ground motions shall be conducted by a professional engineering seismologist experienced with current practice for developing design ground motions for critical facilities.
 - g. In light of the large strains predicted during an MCE, include laboratory residual shear strength tests in your analysis to investigate potential material responses.
 - h. Develop compatible designs for adjacent cells with different seismic performance objectives.
2. The POA shall submit Open Cell Sheetpile design modifications to the Corps for review.
3. The POA shall submit as-built drawings of the OCSP structures, approved and stamped by the Engineer-of-Record, following completion of construction phases and the overall structure.

VII. Fill Material:

The following conditions are required to minimize adverse impacts of the discharge on special aquatic sites and other waters outside of the project area [33 CFR 320.4 (r), 40 CFR 230.5 (j) and 40CFR 230 Subpart H, including parts 230.71, 230.72, 230.73, 230.75]

1. Fill material shall consist of clean fill, free of unsuitable material (e.g., trash, debris, asphalt, etc.), and free of toxic pollutants.

2. All fill material shall be stabilized as necessary to prevent erosion and encroachment of fill material outside the authorized footprint before, during, and after construction. No fill or construction materials shall be stockpiled on adjacent mudflats outside of the authorized project boundary.

VIII. Compensatory Mitigation:

The following conditions are required to compensate for resource losses important to the human and aquatic environment. (33 CFR 320.4(r) and 40 CFR Parts 230.41 and 230.42)

1. The Port of Anchorage shall provide funding equivalent to the monetary value of the debits of the authorized project impacts, as determined by the Anchorage Debit Credit Methodology, in accordance to the attached Memorandum of Agreement (MOA) concerning compensatory mitigation for the overall project. Compensatory mitigation funds from the account will be allocated primarily for construction related costs of selected mitigation projects, as specified in the MOA. In addition to the funding requirements, the Port of Anchorage shall provide for the project management actions necessary to obtain any applicable permits and/or authorizations, the preparation of necessary engineered designs, and monitoring of all selected mitigation projects as necessary.
2. In addition to the mitigation requirements specified above, the Port of Anchorage shall conduct a feasibility study to identify the most practicable and beneficial aquatic habitat restoration, enhancement, creation, and preservation projects available in the Lower Ship Creek watershed and estuary. The projects identified in this study will be used by the Corps, under consultation with a mitigation advisory committee (consisting of federal, state, and local resource agencies and other applicable stakeholders, as appropriate) to determine which project(s) shall be implemented and funded as part of the compensatory mitigation requirements of this permit. The content of the final feasibility study plan shall be approved by the Corps to ensure compliance with this requirement.

Special Information:

Any condition incorporated by reference into this permit by General Condition 5, remains a condition of this permit unless expressly modified or deleted, in writing, by the District Engineer or his authorized representative.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

() Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorization required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.


(PERMITTEE) AND TITLE

8-10-07
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.


KEVIN J. WILSON
COLONEL, CORPS OF ENGINEERS
DISTRICT COMMANDER

10 Aug 2007
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions have the transferee sign and date below.

(TRANSFEE)

(DATE)

This page intentionally blank

APPENDIX B

NOAA/NMFS 2009 LETTER OF AUTHORIZATION

(Authorization period 15 July 2009 through 14 July 2010)

This page intentionally blank

2009 Annual Marine Mammal Monitoring Report
Port of Anchorage Marine Terminal Redevelopment Project



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

JUL 14 2009

Governor William J. Sheffield
Director, Port of Anchorage
2000 Anchorage Port Road
Anchorage, Alaska 99501


Dear Governor Sheffield:

Enclosed is a Letter of Authorization (LOA) issued to the Port of Anchorage and U.S. Department of Transportation Maritime Administration, under the authority of Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361 *et seq.*) and the regulations governing the take of marine mammals incidental to the Port of Anchorage Marine Terminal Redevelopment Project (50 CFR 217 Subpart U). This LOA allows for the taking, by Level B harassment only, of Cook Inlet beluga whales (*Delphinapterus leucas*), harbor porpoises (*Phocoena phocoena*), killer whales (*Orcinus orca*), and harbor seals (*Phoca vitulina*) provided the mitigation, monitoring and reporting requirements are undertaken as required by the regulations and the LOA. This LOA expires on July 14, 2010.

You are required to comply with the conditions contained in the LOA and you must cooperate with any Federal, state or local agency monitoring the impacts of your activities. Please note an application for a subsequent LOA must be submitted to NMFS sixty (60) days before the expiration of your current LOA along with an annual report. This report must summarize all in-water construction activities, marine mammal monitoring from January 1- December 31, annually, and any discernable short or long term marine mammal related impacts from the Marine Terminal Redevelopment Project.

If you have any questions concerning the LOA or its requirements, please contact Jaclyn Daly, NMFS, Office of Protected Resources, at (301) 713-2289.

Sincerely,


James H. Lecky, Director
Office of Protected Resources

Enclosure





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

LETTER OF AUTHORIZATION

The Port of Anchorage and the U.S. Department of Transportation Maritime Administration are hereby authorized, under section 101(a)(5)(A) of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA) to take, by Level B harassment, small numbers of marine mammals incidental to in-water pile driving associated with the Port of Anchorage Marine Terminal Redevelopment Project, subject to the provisions of the MMPA, the Regulations Governing Small Takes of Marine Mammals Incidental to Specified Activities (50 CFR Part 217, Subpart U) (Regulations) and the following conditions:

1. This Authorization is valid from July 15, 2009 through July 14, 2010.
2. This Authorization is valid only for the incidental taking of the species of marine mammals identified in 50 CFR § 217.202 and Condition 3 of this Authorization incidental to in-water construction activities associated with the Marine Terminal Redevelopment Project, specifically pile driving, as described in the preamble to the final rule.
3. This Authorization is valid for the taking, by Level B harassment only, of 34 Cook Inlet beluga whales (*Delphinapterus leucas*), 20 harbor porpoises (*Phocoena phocoena*), 5 killer whales (*Orcinus orca*), and 20 harbor seals (*Phoca vitulina*). The taking by serious injury or death of these species, or the taking by harassment, injury or death of any other species of marine mammal, is prohibited and may result in the modification, suspension or revocation of this Authorization.
4. The taking of any marine mammal in a manner prohibited under this Authorization (i.e., Level A harassment (injury) or serious injury/mortality) or the taking of a species not authorized under this Authorization shall be reported to the NMFS Alaska Regional Office at (907) 271-5006, and to the NMFS Division of Permits, Conservation and Education, Office of Protected Resources at (301) 713-2289 within 48 hours of such taking.
5. The holder of this Authorization is required to cooperate with NMFS and any other Federal, state or local agency monitoring the impacts of the activity on marine mammals. The Holder or designees must notify the Regional Administrator, Alaska, at least one week prior to the commencement of seasonal in-water pile driving activities.



Printed on Recycled Paper



6. Mitigation Requirements:

The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 217.200 and Condition 2 of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence use. When conducting in-water activities, the following mitigation measures must be implemented:

(a) Through monitoring described under § 217.205, the Holder of a Letter of Authorization will ensure that no marine mammal is subjected to a sound pressure level (SPL) of 190 or 180 dB re: 1 microPa or greater for pinnipeds and cetaceans, respectively. If a marine mammal is detected within or approaching 200 m prior to in-water pile driving or chipping, those operations shall be immediately delayed or suspended until the marine mammal moves outside these designated zones or the animal is not detected within 15 minutes of the last sighting.

(b) If a marine mammal is detected within or approaching the Level B harassment zone designated for impact pile driving (350 m) prior to in-water impact pile driving, operations shall not commence until the whale moves outside this zone or the animal is not detected within 15 minutes of the last sighting.

(c) If a marine mammal is detected within or approaching the Level B harassment zone designated for vibratory pile driving (1,300 m) prior to in-water vibratory pile driving, operations shall not commence until the whale moves outside these designated zones or the animal is not detected within 15 minutes of the last sighting.

(d) In-water pile driving or chipping shall not occur when conditions restrict clear, visible detection of all waters within harassment zones. Such conditions that can impair sightability include, but are not limited to, fog and rough sea state.

(e) In-water impact pile driving shall not occur during the period from two hours before low tide until two hours after low tide.

(f) In-water piles will be driven with a vibratory hammer to the maximum extent possible (i.e., until a desired depth is achieved or to refusal) prior to using an impact hammer.

(g) A "soft start" technique shall be used at the beginning of each day's in-water pile driving activities or if pile driving has ceased for more than one hour to allow any marine mammal that may be in the immediate area to leave before piling driving reaches full energy. For vibratory hammers, the soft start requires the holder of the Letter of Authorization to initiate noise from the hammers for 15 seconds at reduced energy followed by 1-minute waiting period and repeat the procedure two additional times. If an impact hammer is used, the soft start requires an initial set of three strikes from the impact hammer at 40 percent energy, followed by a one minute waiting period, then two subsequent 3-strike sets.

(h) The following measures apply to all in-water pile driving, except during the “stabbing” phase, and all in-water chipping associated with demolition of the existing dock:

- (i) No in-water pile driving (impact or vibratory) or chipping shall occur if any marine mammal is located within 200m of the hammer in any direction. If any marine mammal is sighted within or approaching this 200m safety zone, pile-driving or chipping must be suspended until the animal has moved outside the 200m safety zone or the animal is not resighted within 15 minutes.
- (ii) If a group of more than 5 beluga whales is sighted within the Level B harassment isopleths, in-water pile driving shall be suspended. If the group is not re-sighted within 15 minutes, pile driving may resume.
- (iii) If a beluga whale calf or group with a calf is sighted within or approaching a designated harassment zone (as defined in Condition 6(b) and 6(c) above), in-water pile driving shall cease and shall not resume until the calf or group with calf is confirmed to be outside of the harassment zone and moving along a trajectory away from such zone. If the calf or group with a calf is not re-sighted within 15 minutes, pile driving may resume.

(i) If maximum authorized take is reached or exceeded for a particular species, any marine mammal of that species entering into the harassment or safety isopleths will trigger mandatory in-water pile driving shut down.

(j) For Port of Anchorage operated in-water heavy machinery work other than pile driving or chipping (i.e., dredging, dump scowles, tug boats used to move barges, barge mounted hydraulic excavators, or clamshell equipment used to place or remove material), if a marine mammal comes within 50 m, those operations will cease and vessels will reduce to the slowest speed practicable while still maintaining control of the vessel and safe working conditions.

(k) In the event the Port of Anchorage conducts out-of-water blasting, detonation of charges will be delayed if a marine mammal is detected anywhere within a visible distance from the detonation site.

7. Monitoring

The Holder of a Letters of Authorization must designate qualified, on-site marine mammal observers (MMOs), approved in advance by NMFS, to:

- (a) Conduct visual marine mammal monitoring at the Port of Anchorage beginning 30 minutes prior to and during all in-water pile driving or chipping and out-of-water blasting.

(b) Record the following information on NMFS-approved marine mammal sighting sheets whenever a marine mammal is detected:

- (i) Date and time of initial sighting to end of sighting, tidal stage, and weather conditions (including Beaufort Sea State);
- (ii) species, number, group composition, initial and closest distance to pile driving hammer, and behavior (e.g., activity, group cohesiveness, direction and speed of travel, etc.) of animals throughout duration of sighting;
- (iii) Any discrete behavioral reactions to in-water work;
- (iv) The number (by species) of marine mammals that have been taken;
- (v) Pile driving, chipping, or out of water blasting activities occurring at the time of sighting and if and why shut down was or was not implemented.

(c) Employ a scientific marine mammal monitoring team separate from the on-site MMOs to characterize beluga whale abundance, movements, behavior, and habitat use around the Port of Anchorage and observe, analyze, and document potential changes in behavior in response to in-water construction work. This monitoring team is not required to be present during all in-water pile driving operations but will continue monitoring one-year post in-water construction. The on-site MMOs and this marine mammal monitoring team shall remain in contact to alert each other to marine mammal presence when both teams are working.

8. Reporting:

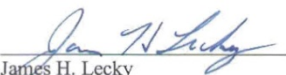
The holder of the Letter of Authorization must implement the following reporting requirements:

(a) Submit a monthly report, due no later than the 10th of each month, to NMFS' Headquarters Permits, Education and Conservation Division and the Alaska Region, Anchorage for all months in-water pile driving or chipping takes place. This report must contain the information listed in section 217.205(b) of the regulations and Condition 7(b) of this LOA.

(b) An annual report must be submitted at the time of application for renewal of a Letter of Authorization. This report will summarize all in-water construction activities and marine mammal monitoring from January 1- December 31, annually, and any discernable short or long term impacts from the Marine Terminal Expansion Project.

9. Failure to comply with the terms and conditions contained in Subpart U-Taking Of Marine Mammals Incidental To The Port of Anchorage Marine Terminal Redevelopment Project (50 CFR 217- Parts 217.200-209) may result in the modification, suspension or revocation of this Authorization.

10. A copy of this Authorization and the attached Subpart U of the regulations must be in the possession of each observer or group operating under the authority of this Letter of Authorization.


James H. Lecky
Director, Office of Protected Resources,
National Marine Fisheries Service

JUL 14 2009

Date

APPENDIX C

2009 SCIENTIFIC MARINE MAMMAL MONITORING REPORT

Alaska Pacific University

This page intentionally left blank.

**Distribution, Habitat Use and Behavior of Cook Inlet Beluga
Whales and Other Marine Mammals at the Port of Anchorage
Marine Terminal Redevelopment Project
May – November 2009**

**Scientific Marine Mammal Monitoring Program
2009 Annual Report**

Prepared for



**U.S. Department of Transportation
Maritime Administration**
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590



Port of Anchorage
200 Anchorage Port Road
Anchorage, Alaska 99501



Integrated Concepts & Research Corporation
421 West First Avenue, Suite 200
Anchorage, Alaska 99501

Prepared by



**Leslie A. Cornick, Ph.D.
Lindsey Saxon Kendall
Leigh Pinney**
Alaska Pacific University
Department of Environmental Science
4101 University Drive
Anchorage, Alaska 99508

26 January 2010

Table of Contents

1.0	Executive Summary	2
2.0	Program Objectives.....	3
3.0	Methods.....	4
3.1	Study Area and Observation Station	4
3.2	Sampling Effort.....	6
3.3	Sampling Protocols	6
3.3.1	Environmental Conditions.....	7
3.3.2	Port of Anchorage Activities	7
3.3.3	Beluga Whale Observations	7
3.3.4	Theodolite Tracking	8
3.3.5	500m x 500m Grid	9
3.3.6	Group Size, Composition and Behavioral Sampling.....	9
3.4	Data Entry and Analysis	9
3.4.1	Environmental Conditions.....	9
3.4.2	Temporal Distribution	9
3.4.3	Spatial Distribution.....	10
3.4.4	Group Size and Structure; Behavior.....	11
3.4.5	Other Marine Mammals	11
4.0	Results	11
4.1	Environmental Conditions	12
4.2	Beluga Whales	12
4.2.1	Sightings by time of day	14
4.2.2	Sightings by tidal stage.....	14
4.2.3	Sightings by season	15
4.2.4	Spatial distribution relative to the MTR Project footprint.....	16
4.2.5	Spatial distribution by tidal stage	18
4.2.6	Group Size and Structure	21
4.2.7	Movements and Behavior	21
4.2.8	Responses to pile driving	21
4.3	Interannual Comparisons	21
4.3.1	Interannual differences in beluga whale sightings.....	22
4.3.2	Interannual Differences in Spatial Distribution.....	24

4.4	Other Marine Mammals	34
5.0	Discussion	34
5.1	Beluga Whales	34
5.1.1	Temporal Distribution	34
5.1.2	Spatial Distribution.....	34
5.1.3	Group Size, Structure and Behavior.....	35
5.1.4	Responses to pile driving	35
6.0	Summary	35
7.0	Acknowledgements	36
8.0	Literature Cited.....	36

List of Tables

Table 4.1.	Summary of observational effort by month	11
Table 4.2.	Environmental conditions by month	12
Table 4.3.	Beluga whale sighting summary	13

List of Figures

Figure 3.1.	Map of study area with 500m x 500m grid overlay.	5
Figure 3.2.	Cairn Point Observation Station.....	6
Figure 3.3	Classification of daily tidal cycles into six stages of two hours each.....	10
Figure 4.1.	Beluga whale observations by time of day.....	14
Figure 4.2.	Beluga whale sightings by tidal stage.	15
Figure 4.3.	Beluga whale observations by season.....	16
Figure 4.4.	Spatial distribution of beluga whales.....	17
Figure 4.5.	Spatial distribution of beluga whale sightings during low tides.	19
Figure 4.6.	Spatial distribution of beluga whale sightings during high tides.....	20
Figure 4.7.	Total number of beluga whale groups and individuals 2007 – 2009.....	22
Figure 4.8.	Mean group size for all groups across three sample years.	23
Figure 4.9.	Mean group size for groups with calves across three sample years.	23
Figure 4.10.	Spatial distribution of beluga whale sightings from 2007 – 2009.	25
Figure 4.11.	Spatial distribution of beluga whale sightings summer 2008 and 2009.	26
Figure 4.12.	Distribution of beluga whale sightings fall 2007 – 2009.	27
Figure 4.13.	Spatial distribution of beluga whale sightings during low ebb tides.	28
Figure 4.14.	Spatial distribution of beluga whale sightings during low slack tides.	29

Figure 4.15. Spatial distribution of beluga whale sightings during low flood tides.	30
Figure 4.16. Spatial distribution of beluga whale sightings during high flood tides.	31
Figure 4.17. Spatial distribution of beluga whale sightings during high slack tides.....	32
Figure 4.18. Spatial distribution of beluga whale sightings during high ebb tides.....	33

Appendix

APU Marine Mammal and Environmental Data Sheets	38
---	----

1.0 Executive Summary

This report summarizes the 2009 activities of the Scientific Marine Mammal Monitoring Program (Scientific Program) conducted in support of the Port of Anchorage Marine Terminal Redevelopment (MTR) Project. The program was developed in consultation with Integrated Concepts & Research Corporation (ICRC), prime contractor for the MTR Project, based on the stipulations of the Marine Mammal Protection Act (MMPA) as administered by the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS).

The Scientific Program was designed to meet the scientific monitoring objectives set forth by NMFS, within the project scope agreed upon by the Port of Anchorage (POA), ICRC, NMFS, and the U.S. Department of Transportation, Maritime Administration (Maritime Administration), the lead federal agency for the MTR Project. The Scientific Program was conducted by trained graduate and undergraduate student observers from the Alaska Pacific University (APU) Marine Biology program under the Letter of Authorization (LOA) issued to the POA and the Maritime Administration by NOAA/NMFS. *The Scientific Marine Mammal Monitoring 2009 Annual Report* presents information required by the LOA on Cook Inlet beluga whale (*Delphinapterus leucas*) and other marine mammal presence, habitat use and behavior within and near the Port of Anchorage (Port) in Southcentral Alaska.

In addition to marine mammal monitoring and data collection efforts, APU observers provided real-time information (e.g., marine mammal sightings, proximity of animals to the construction site) to the Construction Site Marine Mammal Observers (MMOs) working with the MTR construction crew at the Port. During APU's monitoring and data collection activities, particular emphasis was placed on documenting the presence of beluga whales within and near the construction area and evaluating, as practicable, the potential responses of beluga whales to construction activities. This information was provided to the MMOs so that mitigation measures could be swiftly implemented in order to enhance the marine mammal monitoring program managed by the construction contractor.

A total of ~783 hours of observational effort was completed across 86 days from 4 May 2009 through 18 November 2009. Overall sighting conditions during the entire study period were moderate to excellent. A total of 166 beluga whales (120 white, 42 gray, 4 dark gray calves) were observed during the monitoring period. Mean group size was $3.0 \pm .36$ individuals. Only four groups contained identified calves, all of which were sighted within the MTR Project footprint. The total number of whales, total number of calves, and mean group size with calves were lower than those observed in 2008 with comparable sampling efforts, but these differences were not statistically significant.

Beluga whale habitat use, movements and behavior during 2009 were consistent with previous years, and there were no observed behavioral changes (e.g., abrupt behavioral changes, rapid descents) or other indicators of response to pile driving or other MTR in-water construction activities.

2.0 Program Objectives

The Scientific Program addresses the following objectives:

1. Estimate the frequency at which beluga whales are present within and adjacent to the MTR Project footprint;
2. Characterize habitat use and behavior of beluga whales near the Port during ice-free months in the Knik Arm of Upper Cook Inlet; and
3. Observe, analyze and document potential changes in beluga whale behavior in response to in-water construction work, including pile driving and fill placement, and observe, analyze and document potential changes in beluga whale behavior in response to other Port activities.

APU provided field observers, under the supervision of Associate Professor Dr. Leslie Cornick, Environmental Science Department, to staff the Cairn Point Marine Mammal Monitoring Station (Cairn Point Station) located on Elmendorf Air Force Base (EAFB). Marine mammal observers worked up to four days per week, eight hours per day. During in-water construction activities, APU observers informed the MMO Supervisor of the proximity of beluga whales to the MTR Project footprint so that shutdown of construction activities could be implemented when whales approached the Level B Harassment Zone of 350 meters (m) for in-water impact pile driving or the Level B Harassment Zone of 1300 m for in-water vibratory pile driving.

3.0 Methods

Under the supervision of Dr. Leslie Cornick, the Scientific Marine Mammal Monitoring Team (Scientific Team) received training in marine mammal identification and behavior, shore-based observational methodologies, and ICRC, POA and EAFB safety and security protocols. Schedules and training were coordinated by two graduate student supervisors. All observations were conducted by teams of two observers.

3.1 Study Area and Observation Station

The study area included all waters of the Knik Arm of Upper Cook Inlet visible from the Cairn Point Station (Figure 3.1). The station directly overlooks the MTR Project construction area (Figure 3.2). An observation platform at the site provided height above sea level near the shoreline (62.0 m/203 ft. above mean low low water; MLLW).

The added height of the platform maximized the probability of detecting beluga whales in and around the Port. The POA holds a Right-Of-Entry Permit from EAFB to access Cairn Point for the purpose of conducting marine mammal monitoring activities.

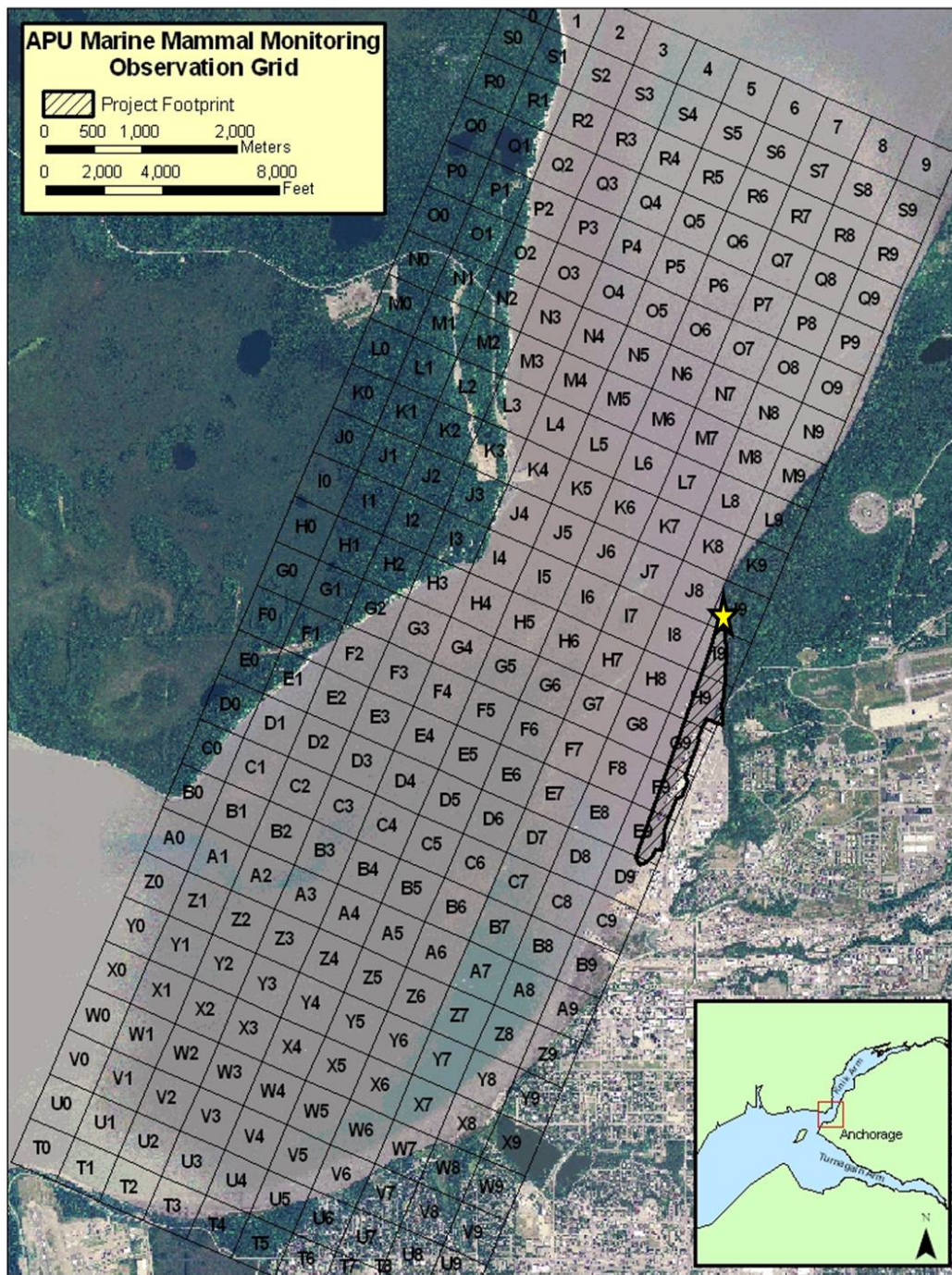


Figure 3.1. Map of study area with 500m x 500m grid overlay. Grid cells encompassing the project footprint are D9 – J9 and are outlined and cross hatched. The Cairn Point Marine Mammal Observation Station is in grid cell J9, denoted by the yellow star.



Figure 3.2. *Cairn Point Observation Station at Elmendorf Air Force Base, Anchorage, Alaska (theodolite facing west).*

3.2 Sampling Effort

Marine mammal monitoring was conducted up to 4 days per week in 4 to 6 hour shifts up to 32 hours per week, covering the full range of tidal cycles as practicable during hours of access to the observation station (Monday through Friday 07:00 – 19:00, Saturday 10:00 – 18:00). Observation start and end times were adjusted according to changes in daylight across seasons. Monitoring days were scheduled to provide a sample of beluga whale habitat use and behavior under varying conditions (e.g., noise, vessel traffic, environmental conditions), while accommodating the logistical, safety and security concerns of POA, EAFB, ICRC and APU.

3.3 Sampling Protocols

The following sections describe APU's data collection, analysis and reporting protocols for conducting the Scientific Program. APU regularly evaluated and improved these protocols throughout the observation period to ensure accurate data collection and reporting.

3.3.1 Environmental Conditions

Environmental data pertaining to sighting conditions were logged hourly during observation sessions. These conditions included air temperature, wind speed, sea state (Beaufort scale), swell height, glare (when present), percent cloud cover, ice cover and precipitation.

3.3.2 Port of Anchorage Activities

The number and type of vessels at the Port were documented during monitoring sessions throughout the observation period. Project activities, including pile driving, dredging and in-water fill placement, were noted at regular intervals during all observation periods in order to facilitate examination of beluga whale occurrence and behavior with respect to these activities. When pile driving was recorded, this activity was further categorized as soft start, impact pile driving or vibratory pile driving based on visual and auditory signatures of each activity and communication with the MMOs. The duration of the pile driving activity and other in-water construction activities (e.g., in-water fill placement) was also recorded.

3.3.3 Beluga Whale Observations

Each observer of the two-person team, equipped with binoculars (Bushnell 7x50 with internal compass and range-finding reticle; Nikon Monarch ATB 10x42), conducted beluga whale observations using 10-minute scan samples. Detailed observation protocols can be found in the *Scientific Marine Mammal Monitoring Plan*.

During July 2009 whales were classified by age (adult, juvenile, calf, unknown). After consultation with NMFS and based upon the best available data on field classification of beluga whales, the method of classification was changed from age to color (white, gray, dark gray) in August 2009. White beluga whales are typically adults and gray beluga whales are typically juveniles; however there is considerable variation in the age at which beluga whales acquire their full white color. Therefore, color cannot be used reliably to determine maturity. Gray beluga whales (normally considered juveniles) have been reported closely associated with calves, suggesting that they may be reproductively mature (NMFS, unpublished data).

Scans were recorded on standardized marine mammal monitoring forms (Appendix). When beluga whales were observed, date, time, number of whales sighted, color

classification (white, gray, dark gray), heading, activity, location and group swimming formation were recorded. Detailed data were also collected as feasible and practicable regarding the locations, movements and behavior of beluga whales near the Port. Locations were initially classified according to a grid-cell mapping system using bearings obtained from sighting binoculars and distances estimated by eye (Figure 3.1). Focal group sampling was used to document the behavior of whales (Mann 2000). Whales were tracked and behaviors were recorded until they were no longer in view, and the standard 10-minute scanning protocols were resumed.

Other marine mammals were also recorded during the scan samples described above. However, beluga whales were by far the most frequently observed, and with the exception of a single harbor seal (*Phoca vitulina*; see Section 4.4), were the only marine mammals present in the study area long enough to document behavior and movements.

3.3.4 Theodolite Tracking

A tripod-mounted surveyor's theodolite (Topcon D-200) connected to a laptop computer was used to track beluga whale movement patterns (Prevel Ramos *et al.* 2006). Horizontal (azimuth) and vertical (declination) readings from the theodolite were used to calculate the position of whales. Accurate assessment of whale group locations was facilitated by precise measurement of height and location of the station and input of tide tables to account for tidal variation during the sample. Tide tables were derived from J Tides (<<http://www.arachnoid.com/JTides>>) a tidal prediction program that incorporates a worldwide database of tide and current reporting stations. The Anchorage (Knik Arm) NOAA reporting station located at the Port (station ID 9455920) was used for the purposes of this study.

Fixes of multiple objects provided information about distance between objects (e.g., whales) and orientation (toward, away or neutral). Location and other data were captured by instantaneous download into *Pythagoras* software (free download and information available at <http://www.tamug.edu/mmnp/pythagoras/>) for calculation of position, movement and distance in real time. Time stamping of horizontal and vertical angle-fix information, input of other observations (e.g., group size, behavior, and environmental parameters) and rapid, real-time longitude-latitude position and movement pattern calculations were also recorded using the *Pythagorus* software. GIS-

compatible whale tracks were calculated to estimate distances between whales and shore and record movements of beluga whale groups.

3.3.5 500m x 500m Grid

In order to maintain sighting consistency and allow for simplified display of spatial data with respect to the MTR Project footprint, APU also continued to employ a grid system (500m x 500m grids) to monitor the locations and movements of beluga whales in Knik Arm (Funk *et al.* 2005). Observers used a combination of compass bearings taken from binoculars and landmarks to place the locations of whale groups in grid cells during each sampling interval. Grid cell locations were updated as the whales moved through the area. The MTR Project footprint is located within cells D9 to J9 of the grid (Figure 3.1).

3.3.6 Group Size, Composition and Behavioral Sampling

When whales were sighted during scan samples, detailed focal group behavior was recorded continuously until whales were out of view (Martin and Bateson 1986, Mann 2000). Behavioral state (traveling, milling, resting, feeding), swimming formation, inter-individual distance/group spread and noteworthy behavioral events (e.g., spy hopping, vocalizations, rapid chases) were documented for each group.

3.4 Data Entry and Analysis

All observations including marine mammal activity, environmental conditions and vessel activity were documented on standardized datasheets (Appendix). Data were then checked for accuracy and entered into SPSS v. 15 for Windows and/or Microsoft Excel for Windows for storage and analysis. Sampling intervals were classified into their observational hour by the start time of the interval. Observational hours are defined as each hour on the hour from 08:00 – 19:00 in order to encompass the entire range of effort.

3.4.1 Environmental Conditions

Environmental conditions were summarized for each month in order to characterize the predominant viewing conditions.

3.4.2 Temporal Distribution

Beluga whale sightings were summarized for monthly reporting purposes by time of day, month, tidal stage and season. Seasons are defined as spring (May - June), summer (July – September) and fall (October – November). One-way analysis of variance

(ANOVA) was used to examine differences in mean durations of whale sightings and number of groups and total number of whales across time of day, tidal stage and season. For this report, data were compiled for all years from 2007 – 2009 and sightings were analyzed by time of day, tidal stage, season and year. Alpha levels were set at $p < .05$. All values are reported as mean \pm 1 standard error unless otherwise noted.

Tidal stages derived from J-Tides were verified, and if necessary corrected, based on the NOAA Tides and Currents website (www.tidesandcurrents.noaa.gov). Tide data from the NOAA reporting station at the Port were used for the purposes of this study. Daily tidal heights were classified into six stages, each two hours long and defined as hours before (-) or after (+) low tide (Figure 3.3).

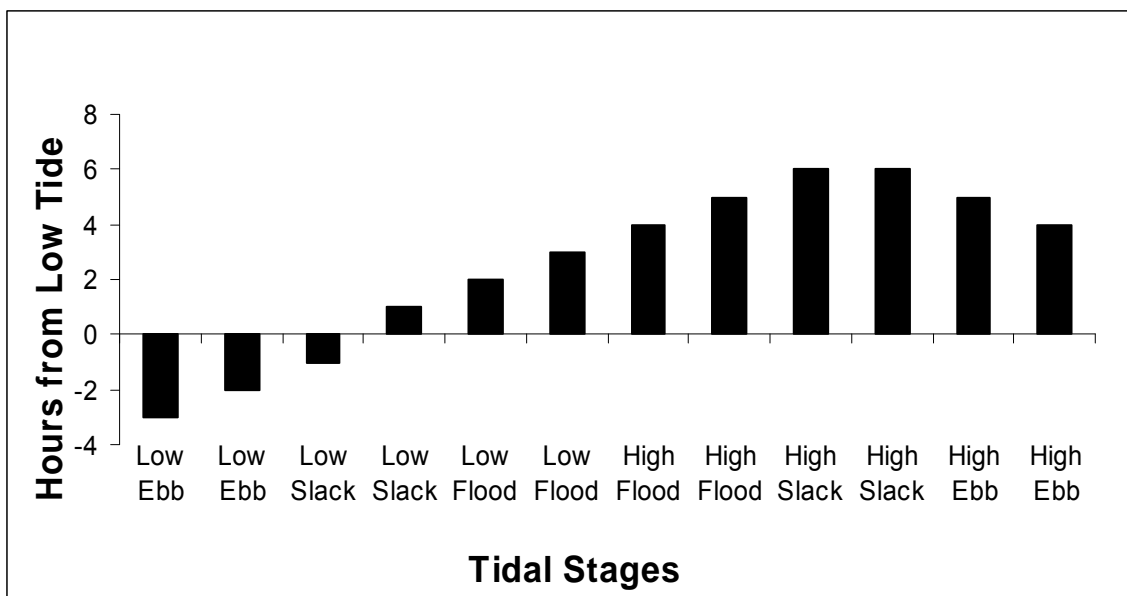


Figure 3.3 Classification of daily tidal cycles into six stages of two hours each. The stages are defined as hours before (-) or after (+) low tide. Repeats for each stage illustrate gradual transition from one stage to the next.

3.4.3 Spatial Distribution

Sightings were summed for all grid cell locations where beluga whales were sighted during the observation period and classified according to whether the whales were observed outside, adjacent to or within the MTR Project footprint. Habitat use of whales in each location was calculated as total number of whales, number of groups sighted and total observation time.

Habitat use and movement were mapped using ArcGIS ArcInfo 9.3 to display whale track lines obtained from theodolite fixes and translated in *Pythagoras*. Habitat use was determined by overlapping track lines with grid cells and summing the total number of whales per group within each grid cell. Beluga sightings during tidal stages were determined by overlapping track lines with grid cells and matching the time of day whales were observed with the correct tidal stage.

3.4.4 Group Size, Structure and Behavior

Mean group size and structure were analyzed for all sightings and according to whether the whales were observed outside, adjacent to or within the Project footprint. Behavioral states were summarized for all whale groups observed and unusual behaviors noted.

3.4.5 Other Marine Mammals

Sightings of other marine mammals were rare, and were summarized by month and location within the study area. Brief descriptions of behavior are provided as applicable.

4.0 Results

A total of 782.6 hours of observation was completed from 4 May – 18 November 2009 (Table 4.1). Monitoring shifts ranged from as early as 08:00 to as late as 19:00, with shifts scheduled as either morning (usually 08:00 to 12:00) or afternoon (either 12:00 – 16:00 or 14:00 – 19:00). Effort hours were largely evenly distributed across this time range, with some tapering of the earliest morning and latest afternoon hours in November 2009 as light levels decreased. The fewest effort hours occurred during the period of 12:00 – 13:00, which was the hour when shift changes were often occurring.

Table 4.1. Summary of observational effort by month

Month	Days	Hours
May-09	15	96.5
Jun-09	18	146.0
Jul-09	18	125.8
Aug-09	17	130.5
Sep-09	16	121.5
Oct-09	18	112.9
Nov-09	10	49.5
Total	86	782.6

4.1 Environmental Conditions

Overall sighting conditions during the entire study period were moderate to excellent (Table 4.2). Beaufort sea state was most often rated as a 1 or a 2¹. Glare sufficient to obstruct sightings was present during 57 days of observations. However, glare was most often reported in the months with the highest number of whale sightings (August – September), suggesting that glare did not substantially affect the results.

Table 4.2. Environmental conditions by month

Month	Overall Conditions	Primary Sea State	Wind Speed (km/hr)	Temperature (°C)	Visibility (km)	Cloud Coverage (%)
May '09	Excellent	1	4.6	13.4	10	32
June '09	Excellent	1	4.6	16.0	10	59
July '09	Excellent	2	2.7	19.0	10	52
Aug '09	Excellent	2	2.8	17.0	10	59
Sep '09	Excellent	2	3.5	16.0	10	37
Oct '09	Moderate	2	3.6	7.4	8.7	72
Nov '09	Moderate	2	2.7	-3.5	9.4	60

Overall conditions and primary sea state are reported as most frequently observed.

Wind speed, temperature, visibility and % cloud cover are reported as means.

4.2 Beluga Whales

A total of 166 beluga whales (120 white, 42 gray, 4 dark gray calves) were observed during the period 4 May – 18 November 2009 (Table 4.3). The following sections describe temporal and spatial distribution, group size and structure, and behavior of beluga whales across time of day, tidal stage, season and year.

¹ The Beaufort sea state scale is defined as: 0 = mirror-like; 1 = ripples without foam crest; 2 = small wavelets, crests do not break; 3 = large wavelets, scattered white caps; 4 = small waves, fairly frequent white caps.

Table 4.3. Beluga whale sighting summary

Date	Grid Cell ¹	Time	Duration of Observation (min)	Time within Footprint ² (min)	Group #	Group Composition			
						White	Grey	Calf/Dk. Grey	Total
04.05.09	G5, G4, F4, E4	14:50	30	0	1	4	1	0	5
04.05.09	I5	15:28	1	0	2	1	0	0	1
04.05.09	K5	15:30	1	0	3	2	0	0	2
04.05.09	G6	15:37	1	0	4	3	0	0	3
04.05.09	I5	15:40	1	0	5	1	0	0	1
04.05.09	H5	15:47	3	0	6	3	0	0	3
04.05.09	H5, G5, E4, D4	15:57	33	0	7	4	1	0	5
04.05.09	F4	16:00	1	0	8	1	0	0	1
04.05.09	F4	16:35	5	0	9	3	0	0	3
05.05.09	E3	15:33	17	0	1	1	1	0	2
05.05.09	F3	16:00	16	0	2	0	2	0	2
05.05.09	G3	16:20	1	0	3	1	1	0	2
05.05.09	J4, K4	16:30	10	0	4	1	0	0	1
05.05.09	F3	17:00	1	0	5	1	0	0	1
11.05.09	H5, H4, H3	8:46	5	0	1	1	0	0	1
19.08.09	C9, B8	8:00	10	0	1	3	2	0	5
19.08.09	H9, I9	11:53	7	7	2	5	0	1	6
19.08.09	D9, E9, F9, G9, H9, I9, J8, J9	14:50	18	16	3	4	4	0	8
19.08.09	E9, F9, G9, H9, I9, J9	15:30	20	19	4	4	3	0	7
20.08.09	I9, J9	9:55	10	10	1	1	2	0	3
20.08.09	I9	10:18	7	7	2	1	2	0	3
20.08.09	I9, H9	10:33	3	3	3	1	1	0	2
20.08.09	I9, H9	10:42	1	1	4	1	2	0	3
20.08.09	H9	10:54	1	1	5	1	0	0	1
20.08.09	I8	11:00	1	1	6	1	1	0	2
20.08.09	J9	11:16	1	0	7	2	1	0	3
24.08.09	D9, C9	13:09	4	3	1	1	0	0	1
24.08.09	G9	14:26	9	9	2	1	1	0	2
24.08.09	H9, J8, I8	14:44	15	5	3	1	1	0	2
24.08.09	E9, F9	15:12	7	0	4	0	1	0	1
24.08.09	C9	15:39	10	0	5	0	2	0	2
24.08.09	E9, D9	15:55	14	0	6	0	1	0	1
25.08.09	H9, G9, F9, E9, I9	11:58	19	18	1	4	0	0	4
25.08.09	I9	12:17	3	3	2	2	1	0	3
25.08.09	G7	12:26	1	0	3	3	0	0	3
26.08.09	J8, I9, H9, G9, F9, E9	13:25	19	10	1	1	0	1	2
26.08.09	G9, H9, I9	16:30	15	14	2	3	0	0	3
01.09.09	I4, J4, L3, M3	15:30	15	0	1	10	0	0	10
08.09.09	H9	12:06	1	1	1	1	0	0	1
08.09.09	J9, I9, H9	12:10	6	5	2	1	1	0	2
08.09.09	H9, I9	12:24	3	3	3	1	0	0	1
08.09.09	J9, I9	12:29	3	3	4	1	0	0	1
08.09.09	K8, K7	13:10	4	0	5	1	0	0	1
08.09.09	I4, J4	13:44	7	0	6	1	0	0	1
08.09.09	K4, K5, L4, L5	15:00	31	0	7	2	0	0	2
08.09.09	J5, K4, K5	16:40	59	0	8	2	0	0	2
08.09.09	J5, K5	18:26	25	0	9	2	0	0	2
10.09.09	D2, D3, E2, E3, E4, F3, F4, G4, H4, H5, I5	13:35	26	0	1	9	1	0	10
23.09.09	A8, B8, C8, D9	13:18	10	7	1	0	2	0	2
04.11.09	F9, G9, H9, I9, J9	15:17	18	17	1	6	5	1	12
07.11.09	E9, F9, G9, H8, I8, J8	10:49	29	29	1	4	1	1	6
07.11.09	B9, C9, D9, E9, F9, G9, H8, J8, K8, L7	12:40	61	22	2	8	1	0	9
07.11.09	K6	14:20	1	0	3	2	0	0	2
07.11.09	K6	15:18	1	0	4	2	0	0	2
Totals			621	214		120	42	4	166

¹Footprint Grid Cells D9-J9²Shaded cells indicate sightings within the MTR Project Footprint

4.2.1 Sightings by time of day

Beluga whale sightings occurred during all observation periods except during the 09:00 and 17:00 hours (Figure 4.1). There was a significant peak in the total number of groups and the total number of whales sighted in the late afternoon (15:00 – 17:00; $F_{8,45} = 2.91$, $p = .01$).

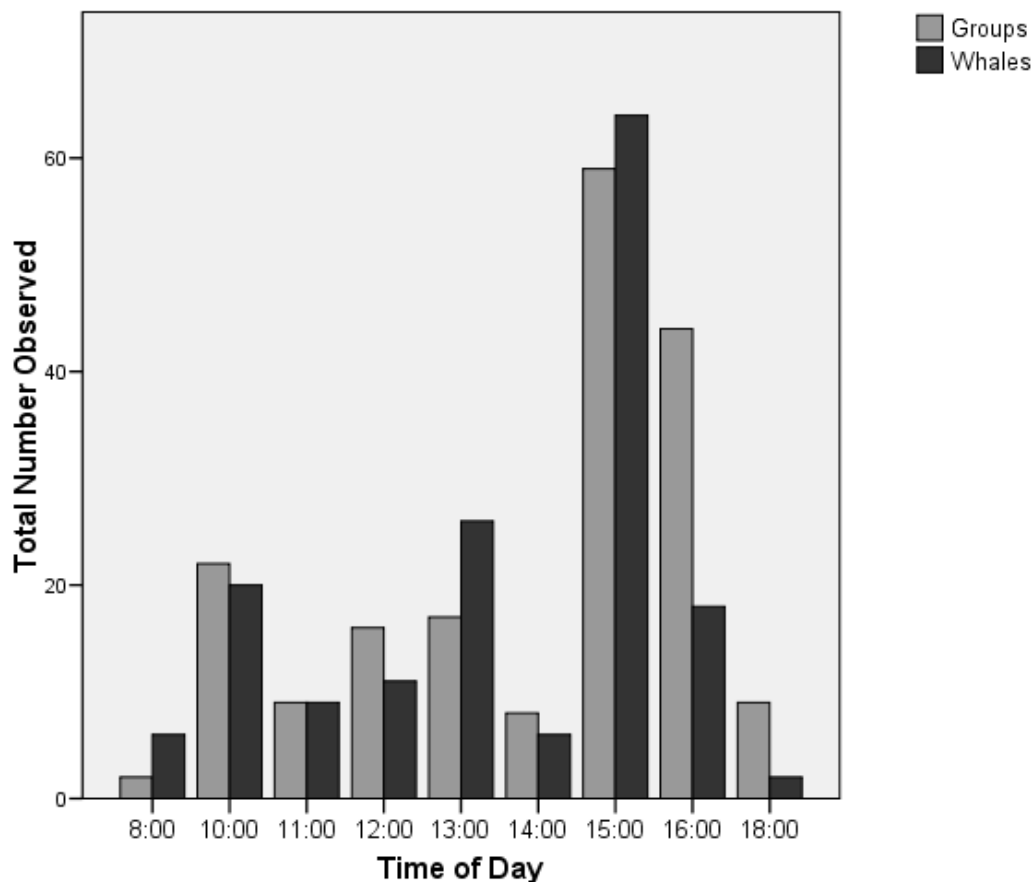


Figure 4.1. Beluga whale observations by time of day. Each hour period represents one full hour of observations (e.g., 15:00 represents the period from 15:00 – 16:00).

4.2.2 Sightings by tidal stage

There were significant differences in the number of whales observed across tidal stages ($F_{8,45} = 2.94$, $p = .02$). There were significant peaks during low ($p = .01$) and high ($p = .03$) flood tides and during high ebb tides ($p = .03$; Figure 4.2).

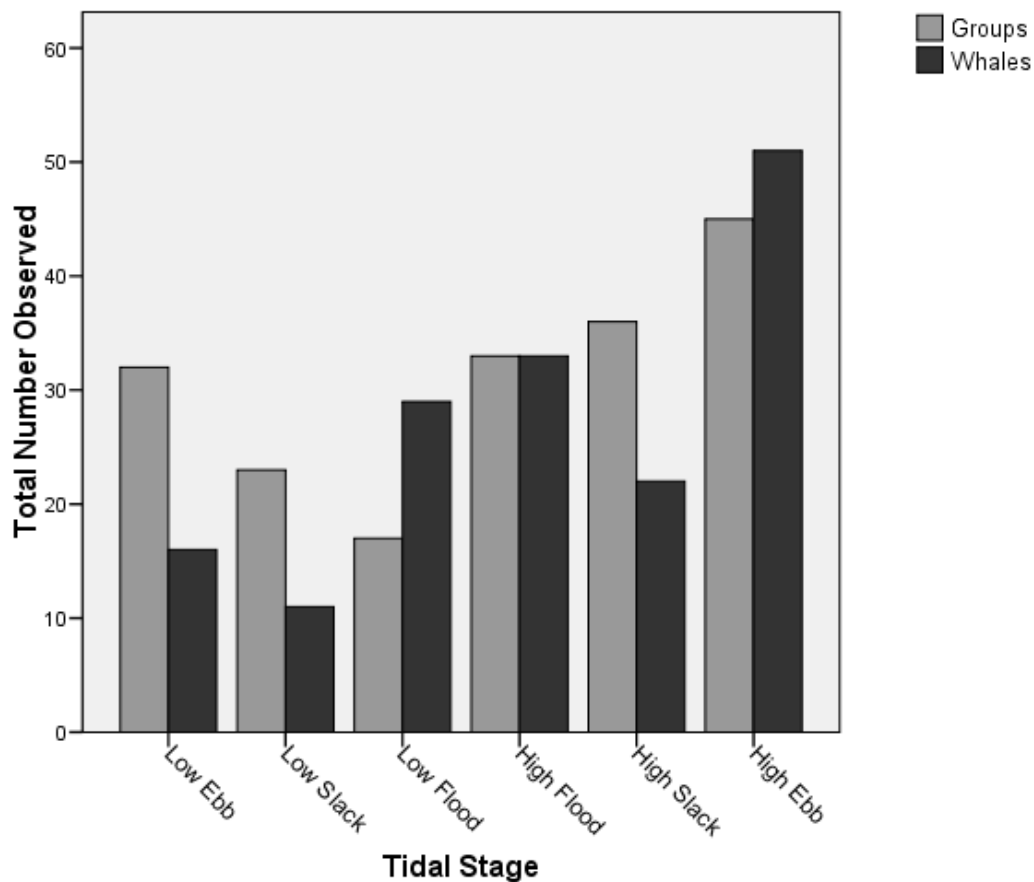


Figure 4.2. Beluga whale sightings by tidal stage. The stages are defined as hours before (-) or after (+) low tide; each stage is two hours in duration.

4.2.3 Sightings by season

There was a significant peak in the number of whales observed during the summer ($F_{2,51} = 5.03$, $p = .01$) compared to the spring and fall (Figure 4.3). Summer sightings peaked sharply in August; no whales were observed in July.

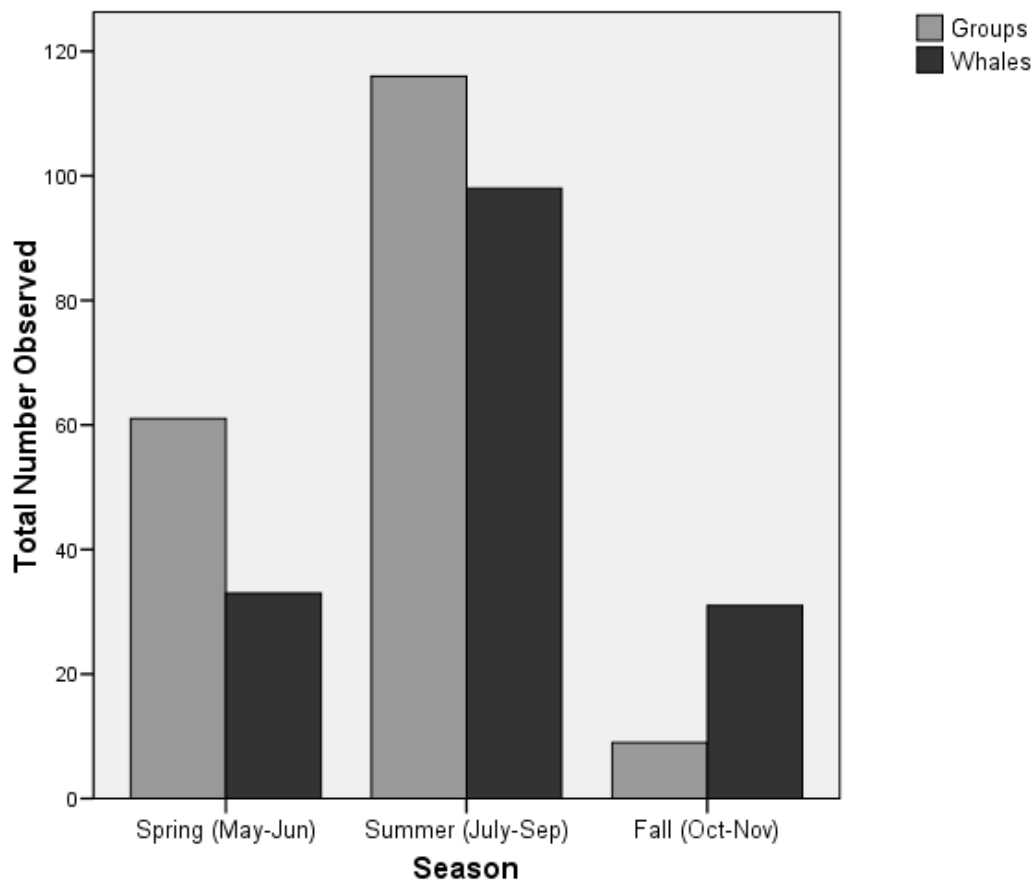


Figure 4.3. Beluga whale observations by season.

4.2.4 Spatial distribution relative to the MTR Project footprint

Twenty-five of the sightings, approximately 46% of the total sightings ($n = 54$), occurred within the MTR Project footprint, and three additional sightings occurred adjacent to the MTR Project footprint (Figure 4.4). The total time belugas spent within or adjacent to the MTR Project footprint was approximately 3.93 hours (236 minutes), ~ 38 % of the total observation time. The greatest concentration of whale observations (89 out of 166 whales sighted, 54%) occurred within or adjacent to the MTR Project footprint.

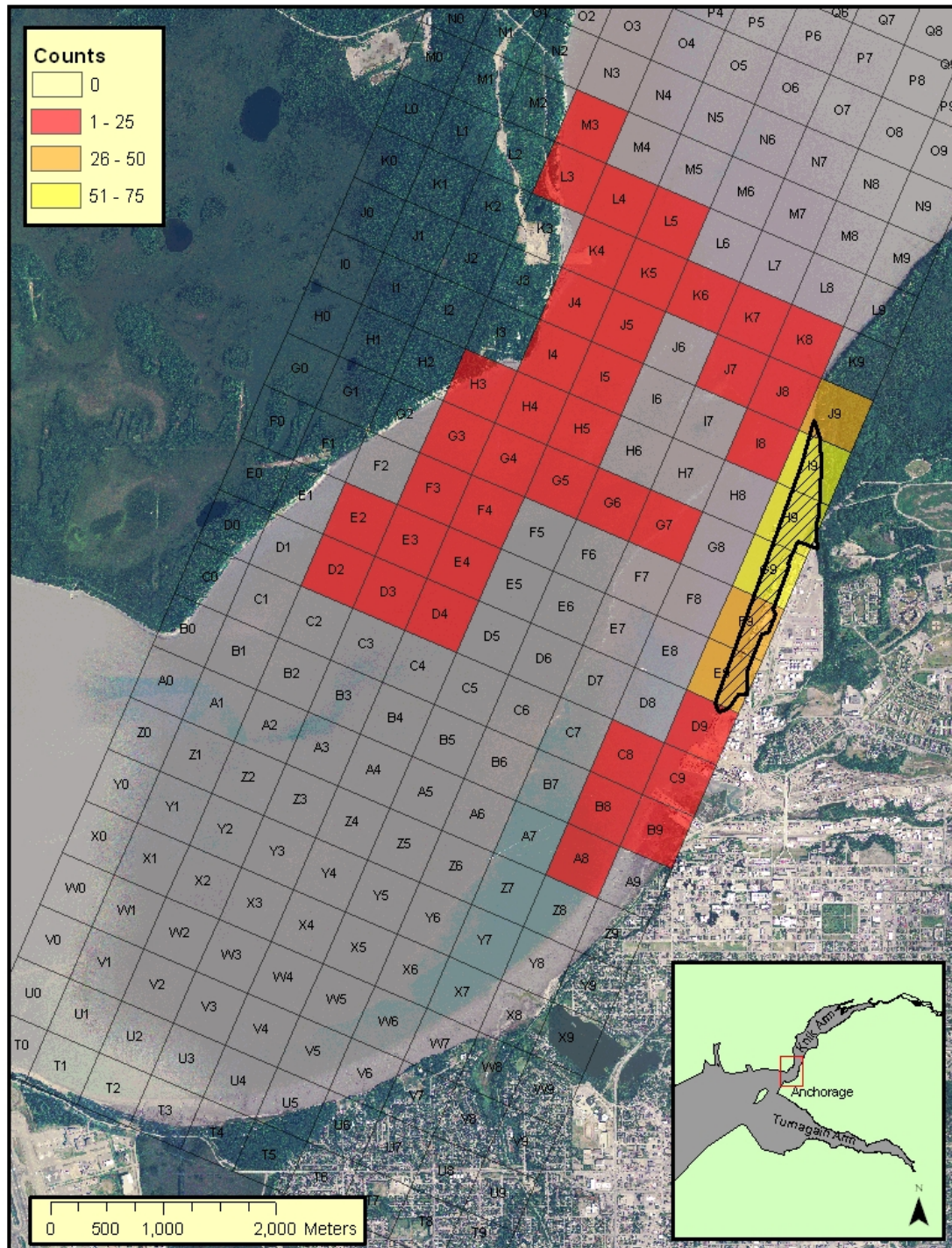


Figure 4.4. Spatial distribution of beluga whales. MTR Project footprint is outlined in black and crosshatched within grid cells E9 – J9. Cells are color coded by the total number of whales observed during the entire reporting period 4 May – 18 November 2009.

4.2.5 Spatial distribution by tidal stage

Spatial distribution by tidal cycle was primarily along the shore (Figures 4.5 – 4.6).

Beluga whales were fairly evenly distributed across Knik Arm during low tides, with increased presence on the eastern shoreline during low ebb tides (Figure 4.5a). During high flood tides, whales were concentrated on the western shoreline between Port MacKenzie and Point MacKenzie (Figure 4.6a). High slack tide observations were concentrated primarily on the eastern shore (Figure 4.6b). High flood tide observations were evenly distributed along both shorelines (Figure 4.6c).

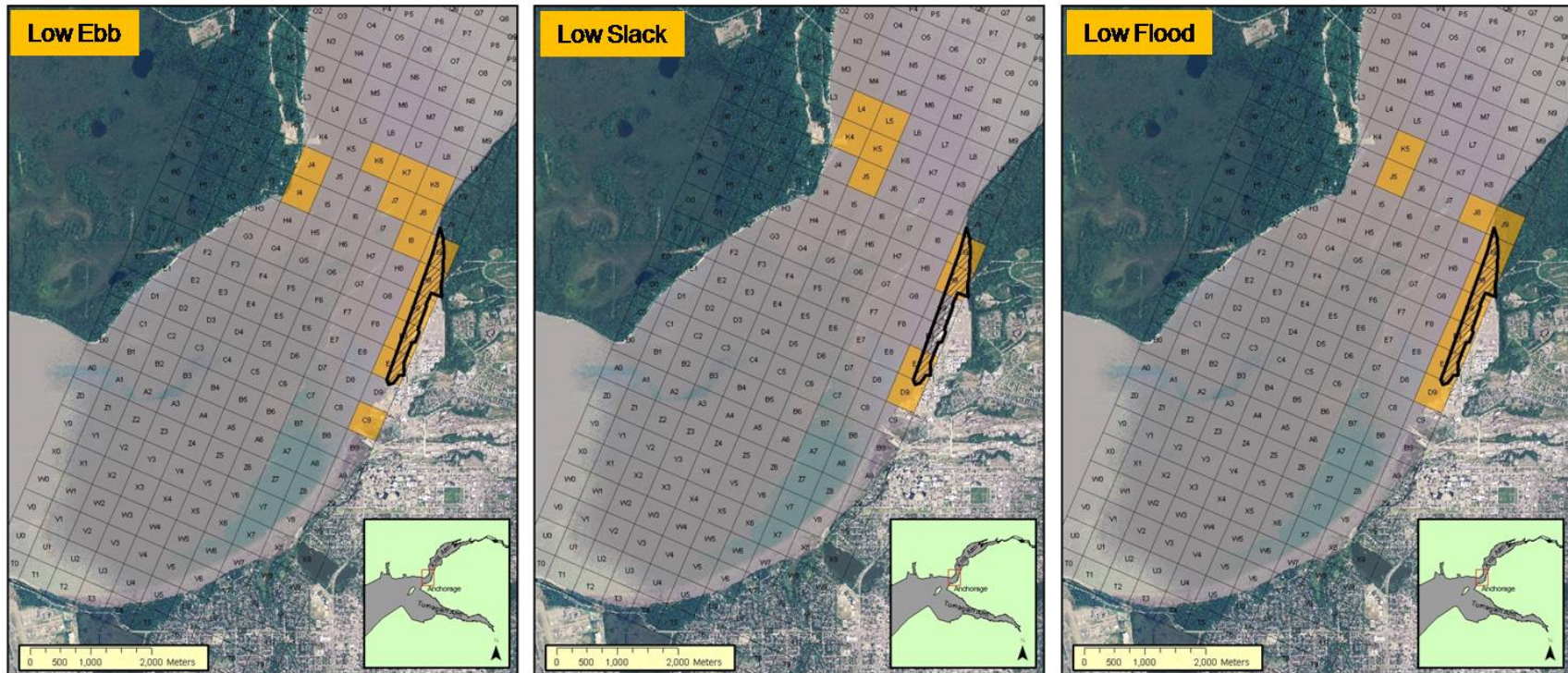


Figure 4.5. Spatial distribution of beluga whale sightings during low tides. MTR Project footprint is outlined in black and crosshatched. Panels are ordered according to daily tidal cycles (see Figure 3.3).

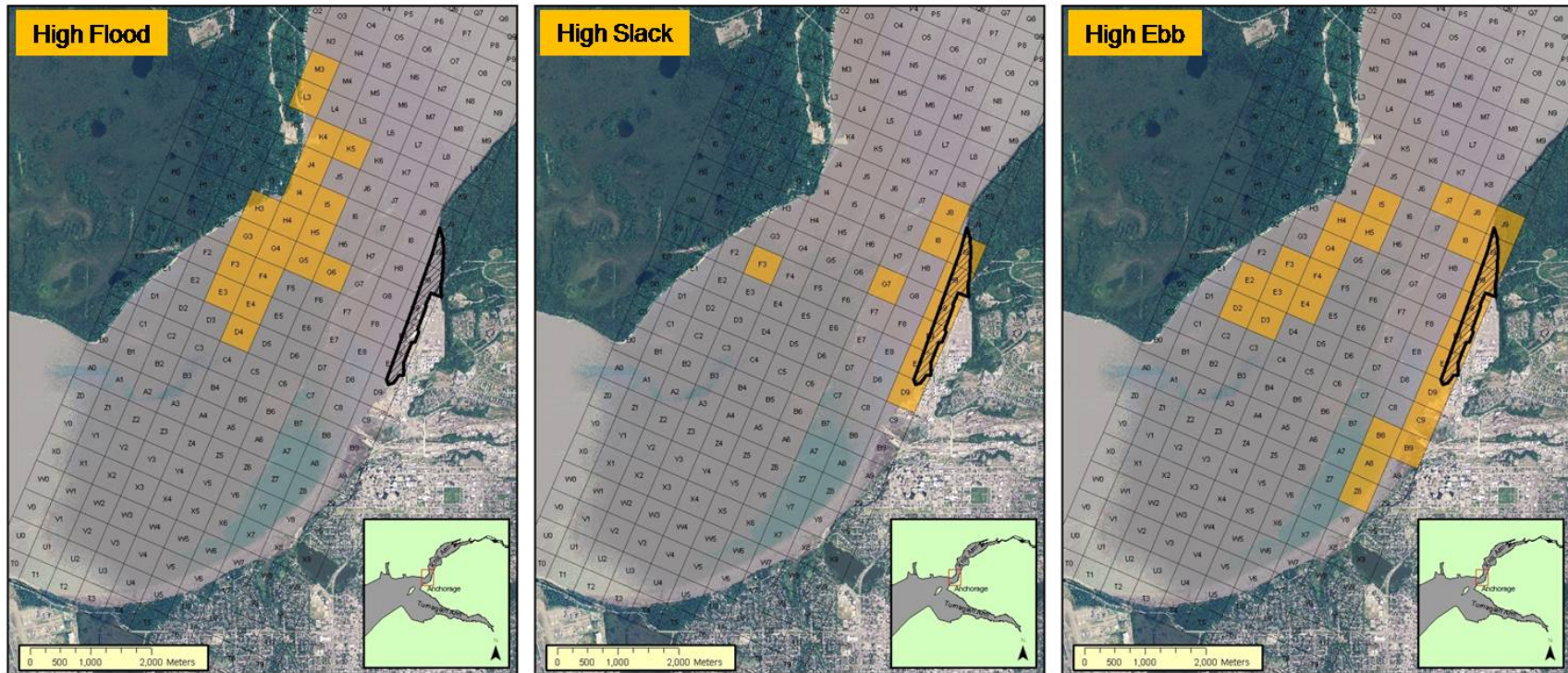


Figure 4.6. Spatial distribution of beluga whale sightings during high tides. MTR Project footprint is outlined in black and crosshatched. Panels are ordered according to daily tidal cycles (see Figure 3.3).

4.2.6 Group Size and Structure

Mean group size was $3.0 \pm .36$ individuals. Only four groups contained identified calves, and groups with calves were larger on average (5.4 ± 1.9 individuals) than those without. All four groups containing calves were sighted within or adjacent to the MTR Project footprint.

4.2.7 Movements and Behavior

Whales were primarily observed moving south through the study area during the spring, late summer and early fall, and traveling north during the late fall. The mean duration of sightings was 11.4 ± 1.8 minutes. There were no significant differences in the mean duration of sightings ($F_{8,45} = 1.01$, $p = .45$) across time of day. Confirmed diving was observed occasionally ($n = 4$), and feeding was suspected on one occasion but never confirmed. No unusual behavioral events (e.g., abrupt directional changes, rapid descents) were observed during the study period. Milling was the only other observed behavior ($n = 10$).

Twenty-three of the 38 groups with more than one individual were tightly packed and moving in a unified pattern. The remainder were either traveling in a loosely packed group ($n = 5$) or were milling in dense ($n = 8$) or dispersed ($n = 1$) groups. All but one group with calves were traveling in densely packed groups ($n = 4$). The remaining group with calves was milling in a dispersed group. One group was not assigned a group formation.

4.2.8 Responses to pile driving

There were no observed behavioral changes (e.g., abrupt change of direction, rapid descents) or other indicators of response to pile driving or other in-water construction.

4.3 *Interannual Comparisons*

The following sections examine differences in beluga whale sightings from 2007 – 2009. Differences in the number of whales observed, their spatial distributions and behaviors are compared. During 2007, observations were conducted only during October and November, so comparisons including 2007 will be limited to mean group sizes, seasonal comparisons for the fall season and broad patterns of habitat use.

4.3.1 Interannual differences in beluga whale sightings

There were substantially greater numbers of beluga whale groups and individuals observed during 2008 than 2009, but these differences were not significant (Figure 4.7). Sampling effort did not differ significantly between 2008 and 2009. There were no significant differences in mean group size for groups with or without calves (Figure 4.8); however, mean group size for groups with calves was smaller in 2009 (5.4 ± 1.9) than in 2007 (8.3 ± 2.0) or 2008 (12.9 ± 3.4) (Figure 4.9).

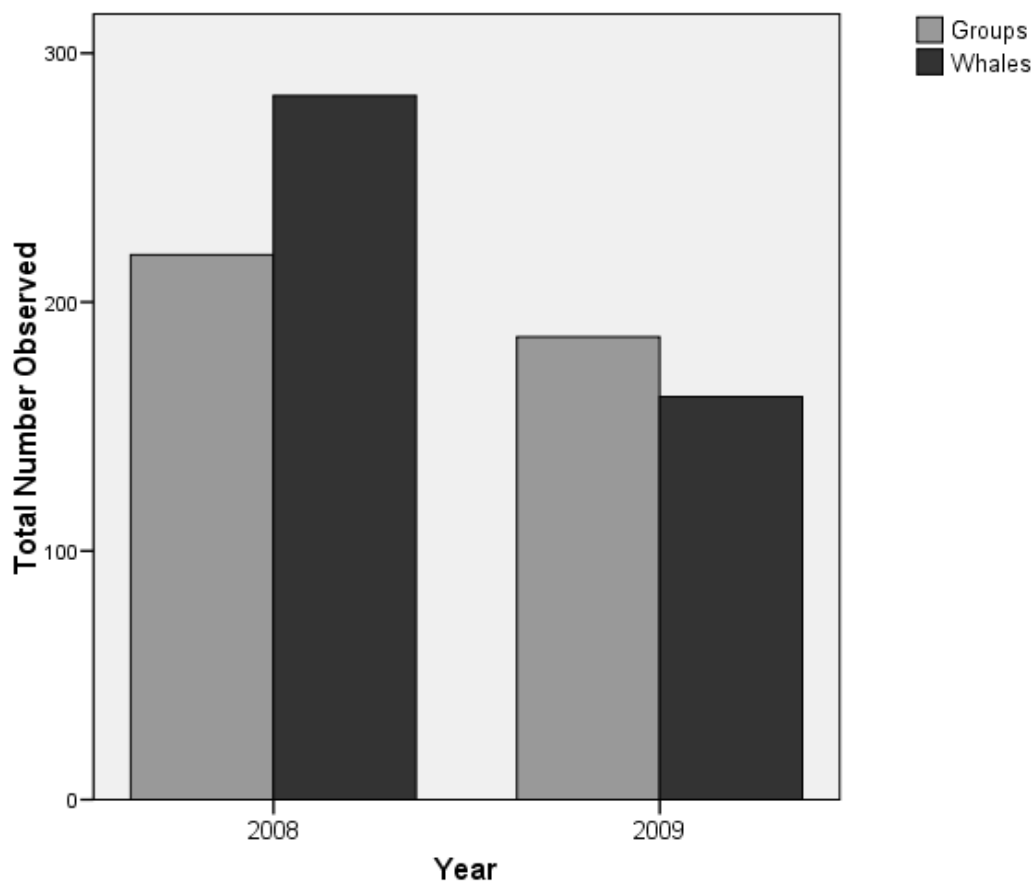


Figure 4.7. Total number of beluga whale groups and individuals observed each year from 2007 – 2009. Observations during 2007 were conducted only during October and November and are, therefore, not included in this comparison.

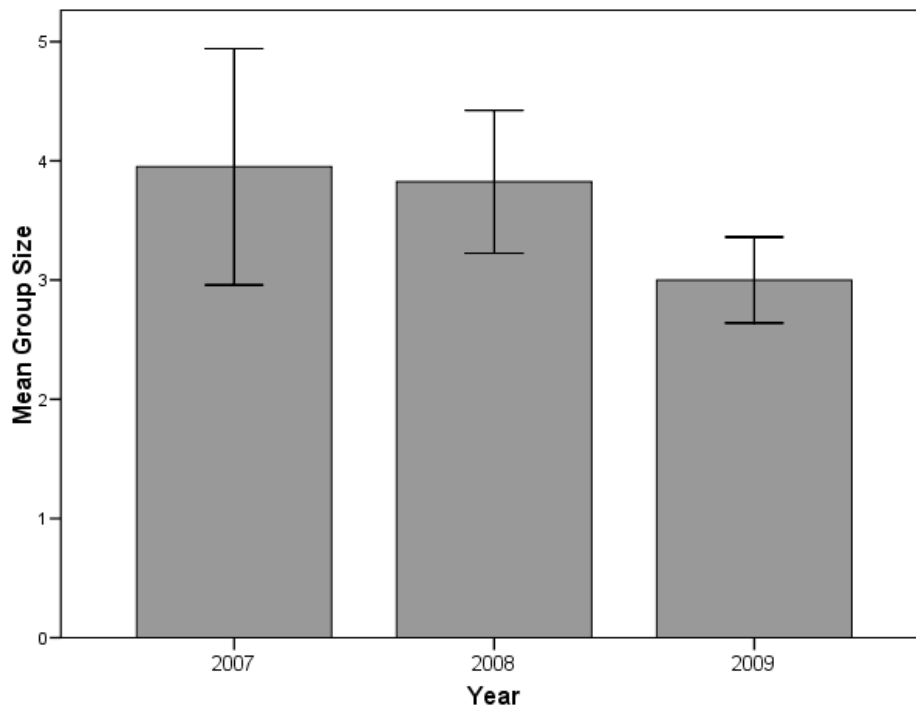


Figure 4.8. Mean group size for all groups across three sample years.

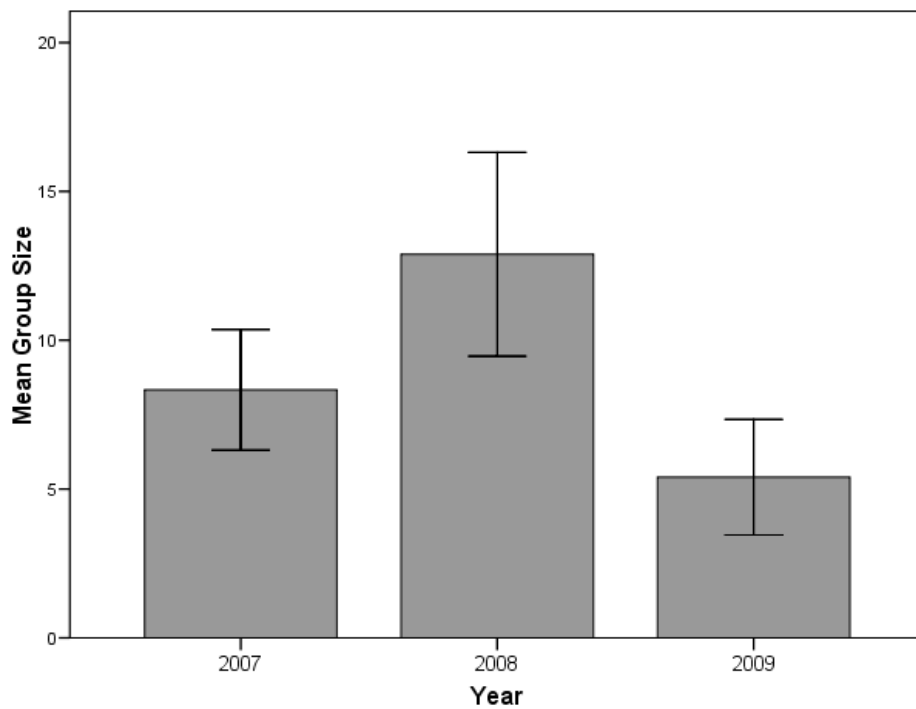


Figure 4.9. Mean group size for groups with calves across three sample years.

4.3.2 Interannual Differences in Spatial Distribution

There were no notable changes in overall or seasonal spatial distribution across years (Figure 4.10 – 4.12). Whales were distributed throughout the survey area in all three years, with some increased use of the mid-channel area during summer 2008 (Figure 4.10 – 4.11). There were no sightings on the western shoreline during fall 2009 (Figure 4.12). Beluga whale sightings were concentrated within and adjacent to the MTR Project footprint in all three years and across seasons. There are no interannual comparisons for spring data, because beluga whales were only observed during spring 2009.

Similar distribution patterns are reflected across tidal cycles from 2007 – 2009 with a few notable exceptions (Figures 4.13 – 4.18). Observations were concentrated on opposite shorelines during low flood tides between 2008 (western shore) and 2009 (eastern shore; Figure 4.15). Observations were concentrated only along the western shoreline during high flood tides in 2008 and 2009 (Figure 4.16). There were no sightings during low or high flood tides during 2007.

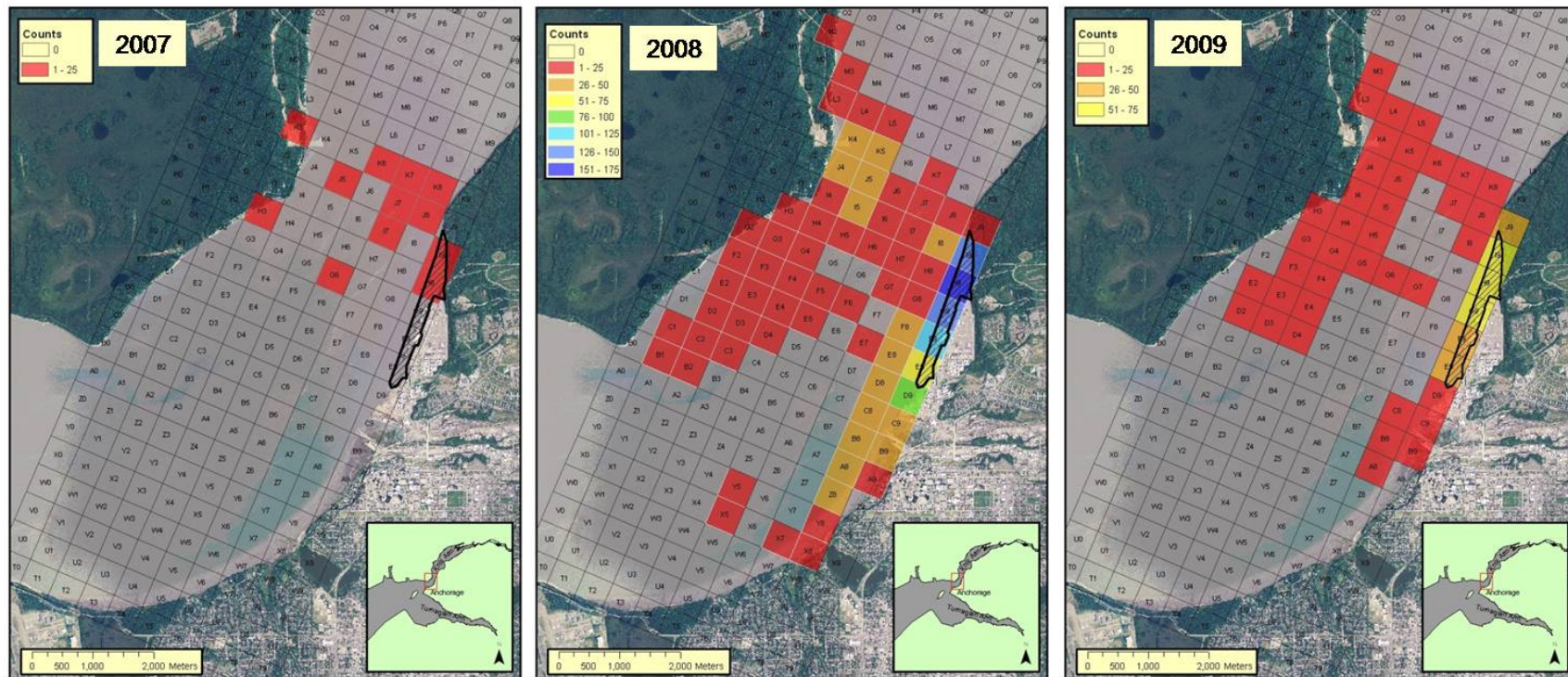


Figure 4.10. Spatial distribution of beluga whale sightings from 2007 – 2009. MTR Project footprint is outlined in black and crosshatched. Observations during 2007 were conducted only during October and November.

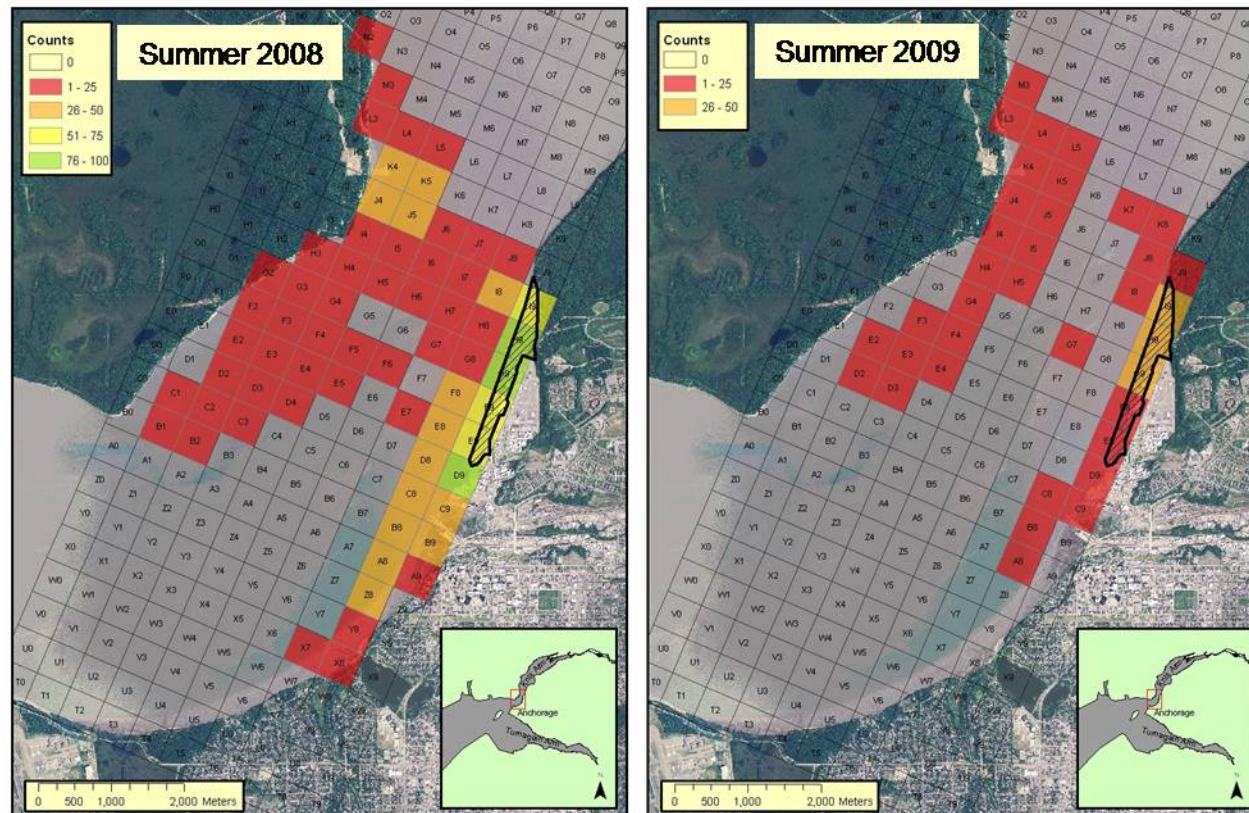


Figure 4.11. Spatial distribution of beluga whale sightings during the summer (Jul – Sep) in 2008 and 2009. MTR Project footprint is outlined in black and crosshatched. Observations during 2007 were conducted only during October and November and so are not included.

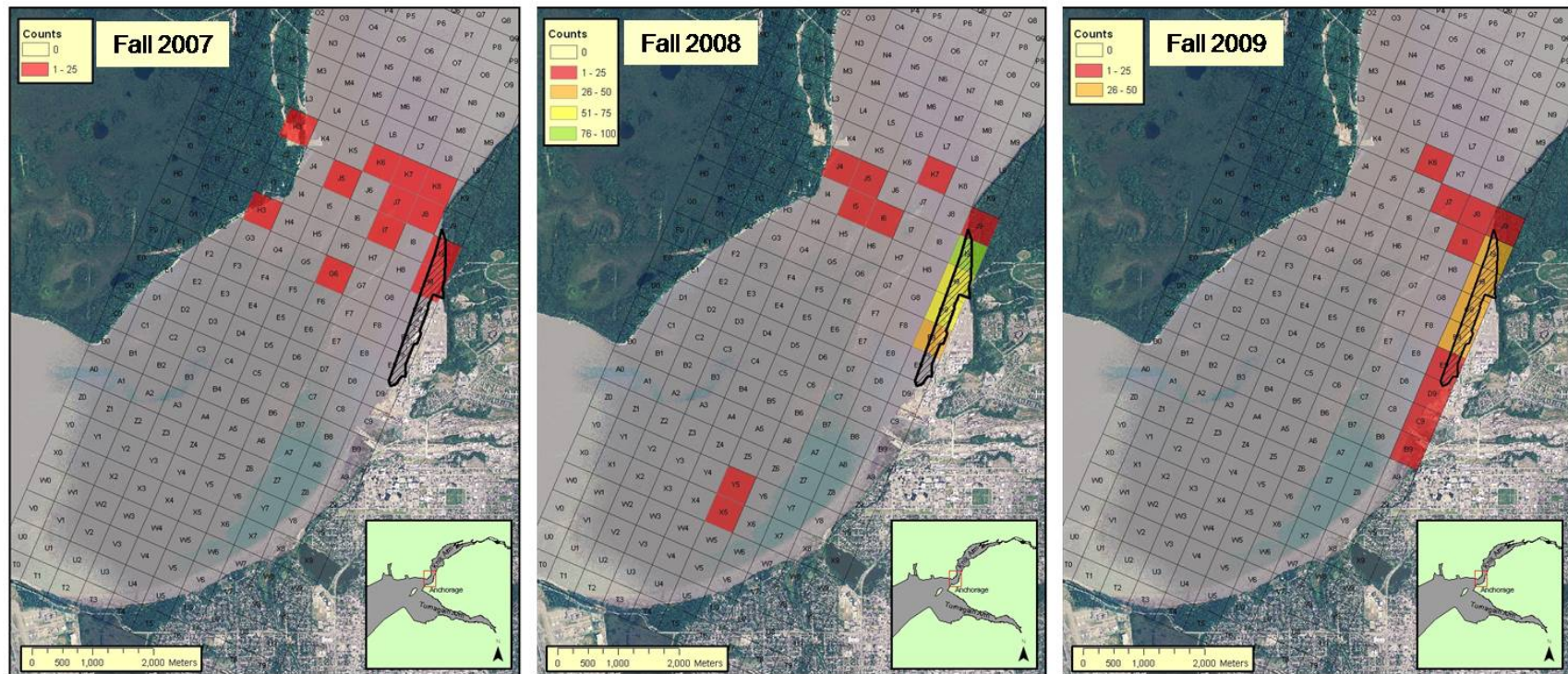


Figure 4.12. Distribution of beluga whale sightings during the fall (Jul – Sep) 2007 – 2009. MTR Project footprint is outlined in black and crosshatched.

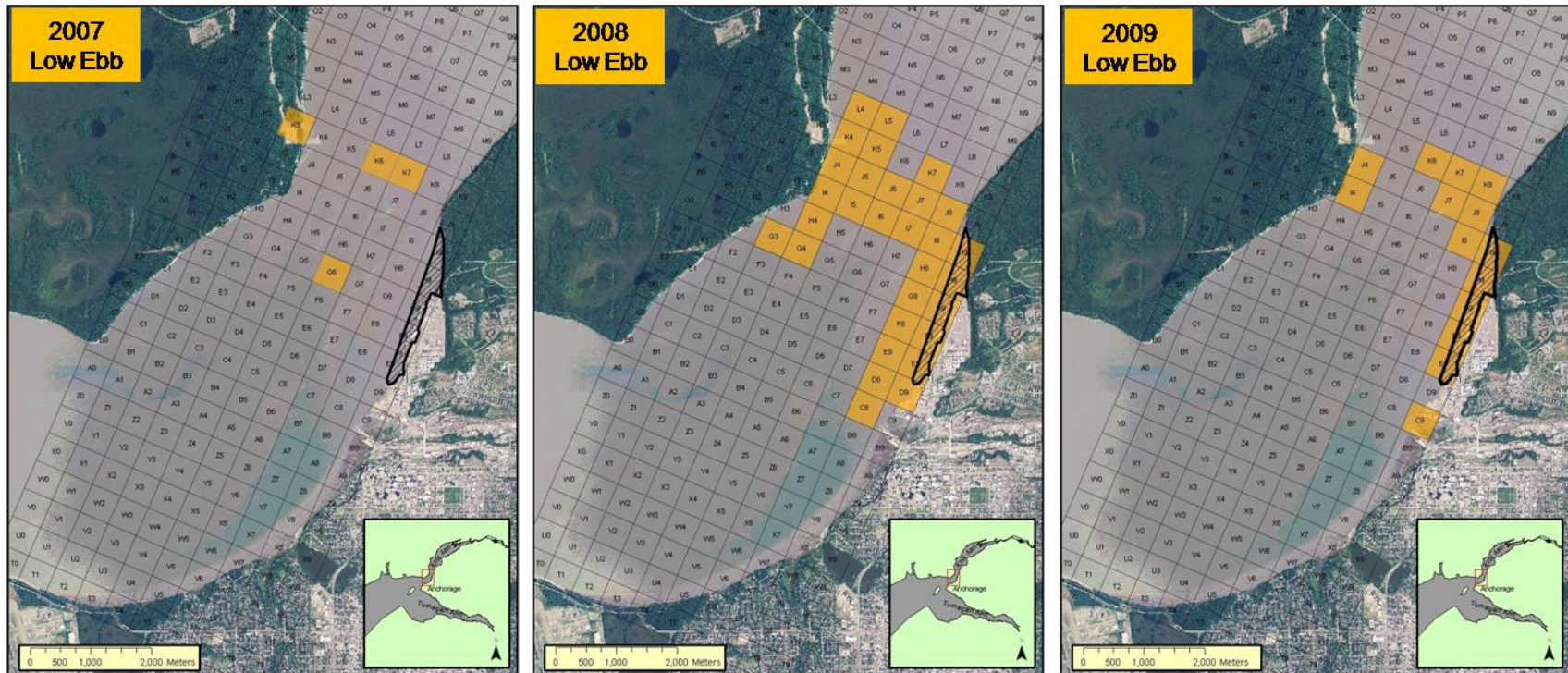


Figure 4.13. Spatial distribution of beluga whale sightings during low ebb tides from 2007 – 2009. MTR Project footprint is outlined in black and crosshatched.

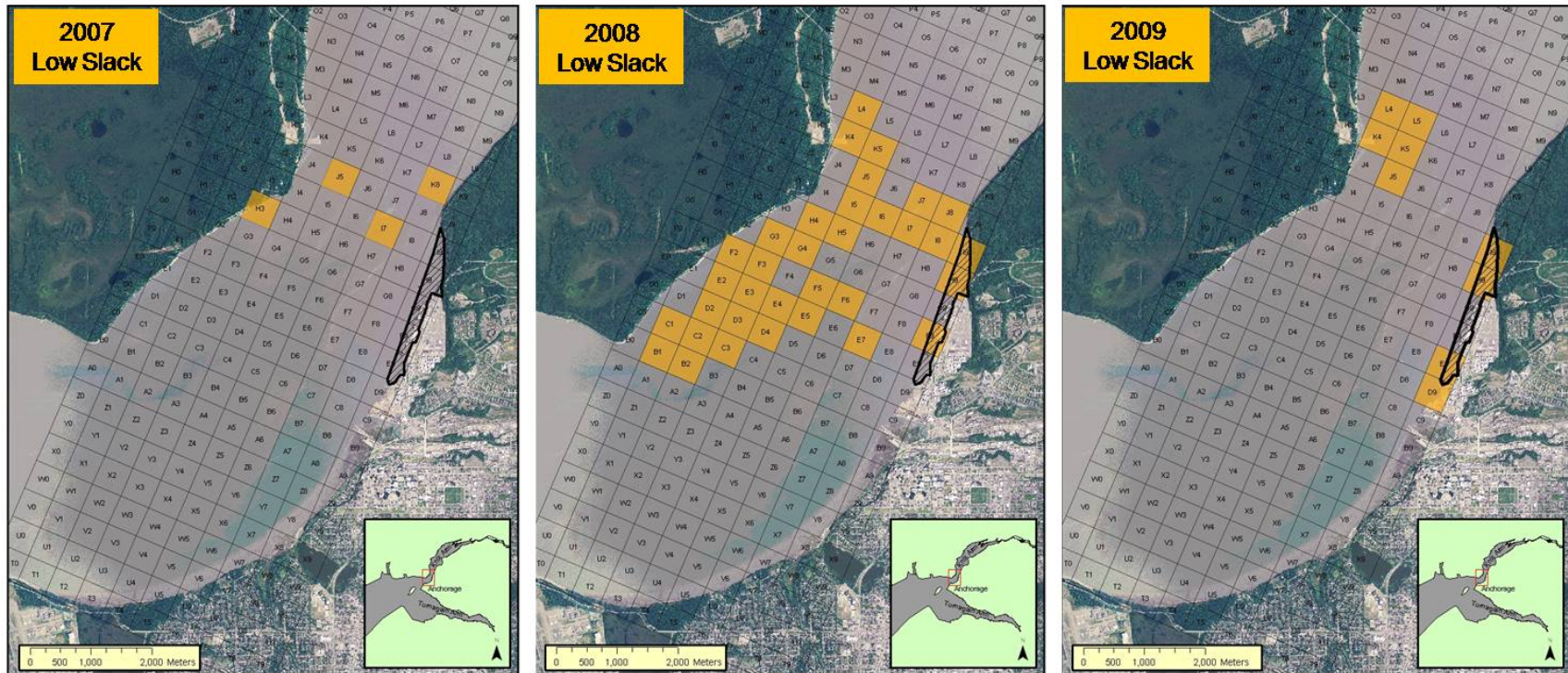


Figure 4.14. Spatial distribution of beluga whale sightings during low slack tides from 2007 – 2009. MTR Project footprint is outlined in black and crosshatched.



Figure 4.15. Spatial distribution of beluga whale sightings during low flood tides from 2008 – 2009. There were no sightings in flood tides during 2007. MTR Project footprint is outlined in black and crosshatched.



Figure 4.16. Spatial distribution of beluga whale sightings during high flood tides from 2008 – 2009. There were no sightings in flood tides during 2007. MTR Project footprint is outlined in black and crosshatched.

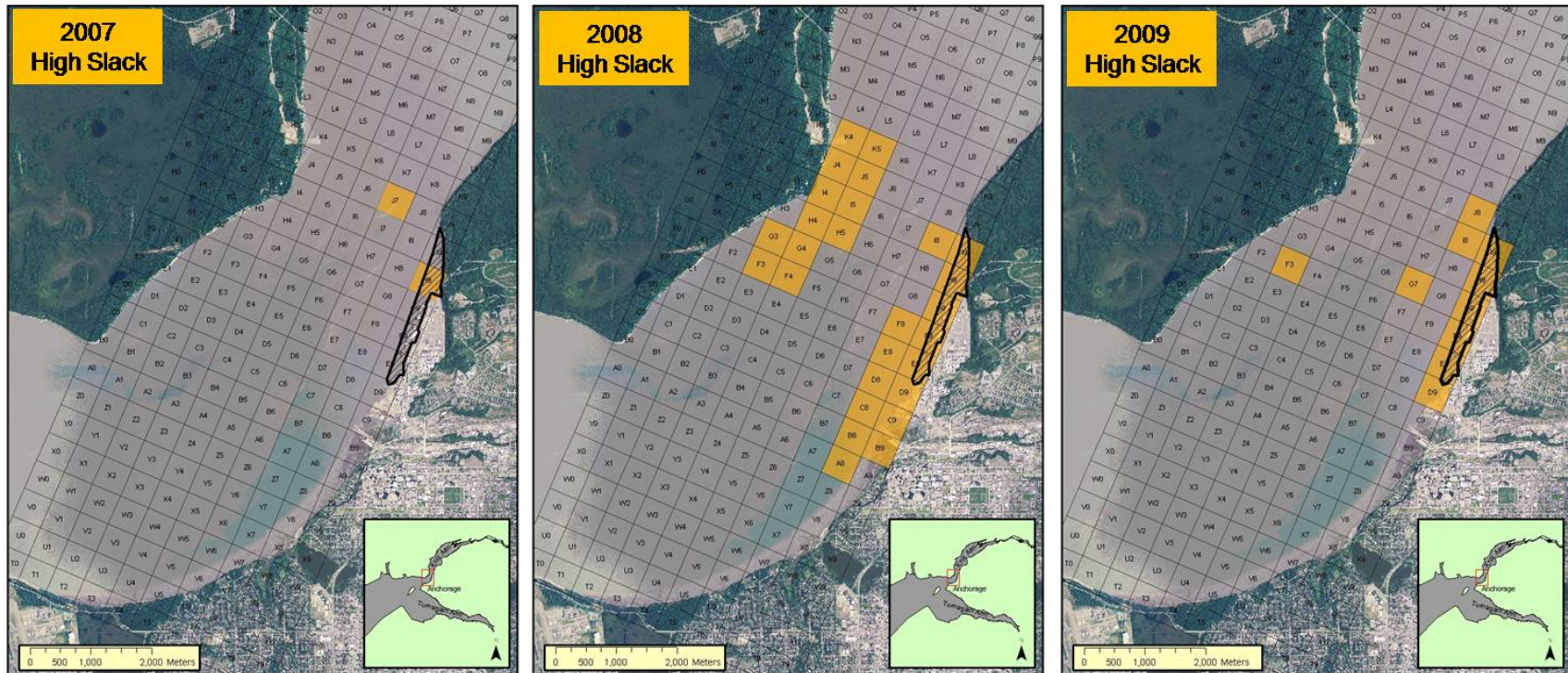


Figure 4.17. Spatial distribution of beluga whale sightings during high slack tides from 2007 – 2009. MTR Project footprint is outlined in black and crosshatched.

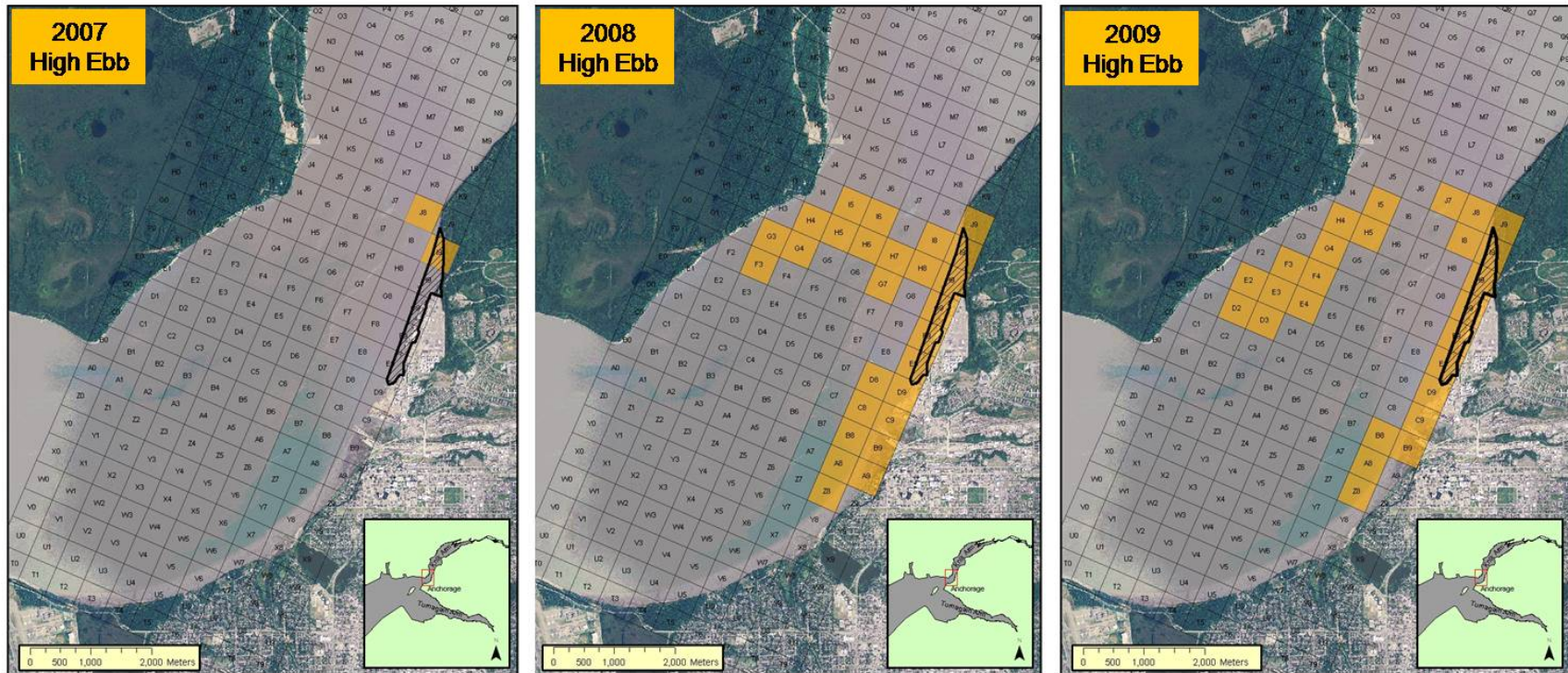


Figure 4.18. Spatial distribution of beluga whale sightings during high ebb tides from 2007 – 2009. MTR Project footprint is outlined in black and crosshatched.

4.4 Other Marine Mammals

One harbor seal was observed during the entire period from 4 May – 18 November 2009 on June 15 in grid cell I9. The seal was tracked briefly, and surfaced four times between short submersions. No other behaviors were observed. No other marine mammals (except beluga whales) were sighted by APU observers during the study period.

5.0 Discussion

This section summarizes the results of marine mammal monitoring performed by the Scientific Program during 2009. Responses to construction activity are also discussed.

5.1 Beluga Whales

Beluga whale habitat use, distribution and movements, and behavior were similar in 2009 as in previous years, both prior to and after in-water construction activities commenced.

5.1.1 Temporal Distribution

Peaks in beluga whale sightings continue to occur in the summer as beluga whales move into Knik Arm in response to movements of their primary prey. Sightings have continued into November for the third consecutive year, although November sightings were fewer in 2009. Continued later use of Knik Arm by beluga whales is consistent with recent survey data that indicate a significant range contraction of Cook Inlet beluga whales into the furthest reaches of the upper inlet (Hobbs *et al.* 2008). This pattern is expected to persist as long as ice-free conditions are adequate for movement of whales.

5.1.2 Spatial Distribution

Spatial use patterns also remain consistent from year to year, with the majority of sightings concentrated along the shorelines, and within and adjacent to the MTR Project footprint in particular. During 2008 there was increased use of the mid-channel areas, but this may be a reflection of the greater number of whales sighted during that year, as the pattern persists across all seasons and most tidal cycles. Beluga whale habitat use, as characterized by shore-based observation, has not changed since observations were initiated in 2005 (Markowitz and McGuire 2007).

5.1.3 Group Size, Structure and Behavior

There were fewer groups and individuals observed during 2009 than 2008 for comparable levels of sampling effort, although this difference was not statistically significant. Mean group size during 2009 (~3 whales) was comparable to 2008 (~4 whales) and 2007 (~4 whales). However, the mean size of groups with calves was notably smaller in 2009 (~5 whales) than in all three previous years (12 in 2006 reported by LGL, 8 in 2007 reported by APU, 13 in 2008 reported by APU). While this reduction is not statistically significant, it is consistent with the reduction in total sightings, as well as the most recent population survey, which indicates a continued decline in the population (NMFS unpublished data). Group dispersion during 2009 was comparable to previous years, with the majority of groups of greater than one individual being tightly spaced.

Observed beluga whale behavior in 2009 was also consistent with previous years, with whales primarily traveling through the study area on the incoming and outgoing tides to and from likely foraging areas further up Knik Arm (e.g., Fish Creek, Eagle River, Eklutna). Beluga whales have been observed during all tidal stages, with the exception of flood tides during 2007. However, this is likely a seasonal effect, as observations during that year were only conducted in the fall (October – November).

5.1.4 Responses to pile driving

No unusual behavioral changes or abrupt changes of direction or pattern of movements were observed during 2009 or in any of the previous two years, during pile driving or any other in-water construction activities. However, shore-based observations are not able to capture any responses that may occur beneath the surface, particularly vocal responses, and so we cannot definitively state that there were no responses.

6.0 Summary

Overall, beluga whale habitat use, movement and behavior have remained consistent since the inception of the Scientific Program in 2007, as well as with those reported by LGL in 2006 (Markowitz and McGuire 2007). Beluga whales move into Knik Arm during the late summer and early fall, following their primary prey and providing increased predation protection for calves. Beluga whales appear to be responding to later ice-free conditions in the area, remaining well into November in all three years. Reduced numbers of whales observed in 2009 are consistent with recent survey data, but may

also be related to other factors, including timing of observations, environmental conditions, and the difficulty of sighting small dark calves from a shore-based station. Thus far, no obvious behavioral, habitat use or movement changes have been observed that can be attributed to in-water construction activities at the Port.

7.0 Acknowledgements

We would like to acknowledge the contributions of several people to the successful completion of APU's third year performing marine mammal monitoring for the MTR Project. Laurie Butler, Sam Cunard, and everyone at ICRC provided APU with excellent logistical support. Eight APU students worked as observers during 2009 and also assisted with data entry. The opportunity provided by ICRC and the Maritime Administration is a significant enhancement to their training in the APU Marine Biology Program.

8.0 Literature Cited

- Cornick LA and Saxon-Kendall, L. 2008. Distribution, Habitat Use and Behavior of Cook Inlet Beluga Whales in Knik Arm, Fall 2007. Alaska Pacific University, Anchorage, AK, for Integrated Concepts and Research Corporation, the Port of Anchorage, and the U.S. Department of Transportation Maritime Administration.
- Funk DW, TM Markowitz, R Rodrigues. 2005. Baseline studies of beluga whale habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005. Rep. from LGL Alaska Research Associates, Inc., Anchorage, AK, in association with HDR Alaska, Inc., Anchorage, AK, for the Knik Arm Bridge and Toll Authority, Anchorage, AK, the Department of Transportation and Public Facilities, Anchorage, AK, and the Federal Highway Administration, Juneau, AK.
- Hobbs, R. C., K. E. W. Sheldon, D. J. Rugh and S. A. Norman. 2008. 2008 status review and extinction risk assessment of Cook Inlet belugas (*Delphinapterus leucas*). in N. Alaska Fish. Sci. Cent., Natl. Mar. Fish. Serv. ed. *AFSC Processed Rep. 2008-02*. Sand Point Way NE, Seattle WA 98115.
- Mann, J. 2000. Unraveling the dynamics of social life: long-term studies and observational methods. in Mann *et al.* (eds.) *Cetacean Societies: Field Studies of Dolphins and Whales*. University of Chicago Press, Chicago, IL. pp 45-64.
- Markowitz, TM, McGuire TL. 2007. Temporal-spatial distribution, movements and behavior of beluga whales near the Port of Anchorage, Alaska. LGL Alaska Research Associates, Inc., Anchorage, AK, for Integrated Concepts and Research

Corporation, the Port of Anchorage, and the U.S. Department of Transportation Maritime Administration.

Martin, P, Bateson P. 1986. Measuring Behaviour. Cambridge University Press, Cambridge, MA. 222 pages.

Prevel Ramos AP, TM Markowitz, DW Funk, MR Link. 2006. Monitoring beluga whales at the Port of Anchorage: Pre-expansion observations, August-November, 2005. Rep. from LGL Alaska Research Associates, Inc., Anchorage, AK, for Integrated Concepts and Research Corporation, the Port of Anchorage, and the U.S. Department of Transportation Maritime Administration.

APPENDIX

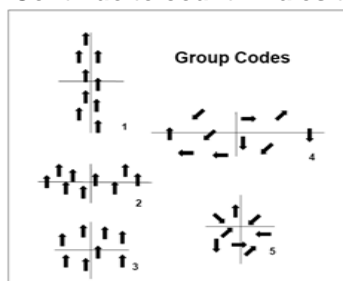
APU Marine Mammal and Environmental Data Sheets

This page intentionally blank

Station:	Date (dd/mm/yy):	Observer(s):	Pg __ of __
Shift Start Time (hh:mm):	Shift End Time (hh:mm):	Optic:	

[illegible]

Continue to count whales throughout the time the whales are in the area, until you get an accurate count (Best Sample)



Activity Code	
1	Traveling/Moving
2	Diving
3	Motionless on surface
4	Spyhopping
5	Breaching
6	Feeding Observed
7	Feeding Suspected
8	Milling

Activity Code	
9	Started effect
10	Approaches then leaves
11	Change in swimming speed
12	Abrupt change in direction
13	Abrupt dives
14	Disperse
99	Other

In-water Construction Activities	
0	No construction
1	Soft-start
2	Impact sheet pile driving (PD)
3	Vibratory sheet PD
4	Impact pipe PD
5	Vibratory pipe PD
6	Dredging
7	In-water fill
99	Other

POA Land-Based Surveys of Marine Mammals: Environmental Conditions

Alaska Pacific University

Station:	Date (dd/mm/yy):	Observer(s):	Pg__ of __
----------	------------------	--------------	------------

Verified _____
Entered by _____
Sheet # _____

Time (hh:mm)	Air Temp. (°C)	Precip Code 00-none 01-fog 02-rain 03-snow	Wind Dir. (99 if null)	Wind Speed (km/hr, nearest whole number)	Cloud Cover (%)	Vis. Dis. (km)	See Far Shore	Glare	Central Glare Bearing 001-360°	Swell (ht in m)	Sea State (Beaufort)	White Caps	Sea Ice Concentration (tenths 00-10)	Overall Conditions	# of vessels (hourly)	Comments	Comments on Reverse
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>									

