MARINE MAMMAL MONITORING FINAL REPORT
15 JULY 2008 THROUGH 14 JULY 2009

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

In Accordance with the 15 July 2008 National Marine Fisheries Service Incidental Harassment Authorization

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1.0 INTRODUCTION

On 15 July 2008, the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) issued a one-year Incidental Harassment Authorization (IHA) (Appendix A) to the Port of Anchorage Administration (POA) and the United States Department of Transportation, Maritime Administration (Maritime Administration) authorizing Level B harassment of marine mammals during in-water construction associated with the Port of Anchorage (Port) Marine Terminal Redevelopment (MTR) Project. The regulations governing the issuance of an IHA 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 216, Subpart I (Sections 216.101-216.108). This permit authorizes marine mammal takes for the period of 15 July 2008 through 14 July 2009. MTR Project construction is authorized under the 10 August 2007 U.S. Army Corps of Engineers (USACE) 404/10 Permit POA-2003-502, hereafter USACE 404/10 Permit. Special Condition (SC) IV of the USACE 404/10 Permit stipulates requirements to prevent and minimize adverse impacts to marine mammals (Appendix B). Where applicable, the IHA stipulations supersede the SC IV.

This Marine Mammal Monitoring Final Report satisfies the reporting requirements stipulated by Section 6 of the IHA permit. The final report provides cumulative construction and scientific marine mammal monitoring data and analysis for the period 15 July 2008 through14 July 2009, based upon monthly reports, including daily construction marine mammal sighting forms; detailed monthly sighting data tables; and the full scientific data reports provided to NMFS each month during the 12-month IHA period. This report provides a summary of the sighting data for one and one-half construction seasons. It also discusses the frequency in which marine mammals were present within the MTR Project footprint, characterizes the habitat use and behavior of marine mammals at the Port, provides information on the sound levels around the Port related to and in the absence of all construction activities, and discusses impacts (if any) of the construction related noise on marine mammal presence, behavior and habitat use.

1.1 MTR Project Location and Purpose

The Port, located within the Municipality of Anchorage on the Knik Arm of Cook Inlet in Southcentral Alaska (Figure 1), handles 90 percent of all consumer goods and cargo for 85 percent of the population of the state. It 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 Maritime Administration, under a memorandum of understanding with the Municipality of Anchorage, owner and operator of the Port, is overseeing the redevelopment. Integrated Concepts & Research Corporation (ICRC), prime contractor for the Maritime Administration, is managing MTR Project construction.

The MTR Project will expand the upland and waterfront areas of the Port, replace aging and deteriorating docks and waterfront facilities, and install new Port and waterfront infrastructure to meet the current and anticipated future operational needs of the Port. The MTR Project expands the available working area of the Port by reclaiming approximately 135 acres of tideland and installing a sheet pile bulkhead to provide approximately 7,700 feet of new berthing (Figure 2).

1.2 MTR Project Work July 2008 to July 2009

During the IHA period, work was conducted at two sites north of the existing Port, the North Extension and the Wet and Dry Barge Berths. Out-of-water construction activities authorized by the USACE Permit began in June 2008, and in-water pile driving began as soon as the IHA was issued.

1.2.1 North Extension

Construction activities at the North Extension area began in early June 2008 and involved the following:

- In-water construction dredging to remove seafloor sediments prior to pile driving (completed in 2008).
- Recovery and reuse of temporary liner rock (completed in 2008).
- In-water and out-of-water placement of fill material (continues in 2009 for completion in 2010).

1.2.2 Barge Berths

Construction activities at the Wet and Dry Barge Berth sites began in late July 2008; one week after the IHA was issued, and involved the following:

- In-water construction to complete the bulkhead structure for the Wet and Dry Barge Berths, including installation of steel sheet pile to provide the basic structure for the barge berths (completed at the beginning of the 2009 construction season).

- In-water installation of ship fendering systems and out-of-water construction of mooring appurtenances at the Dry Barge Berth (completed in 2009).
- Construction of the Wet Barge Berth continues in 2009.
- At both the Wet and Dry barge berths, land-based vibracompaction to densify the fill previously placed in water (continues in 2009).

2.0 PROTECTION OF MARINE MAMMALS DURING IN-WATER CONSTRUCTION ACTIVITIES

The pile-driving equipment used for in-water construction of the wharf generates sound waves within the water, which have the potential to disturb or present a physical hazard to marine mammals.

The IHA issued to the POA and the Maritime Administration by NMFS for the period 15 July 2008 through 14 July 2009 authorized incidental, but non-intentional Level B takes by harassment of marine mammals during in water construction activities. The Marine Mammal Protection Act defines Level B harassment as an act that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering. The IHA issued for the MTR Project permitted Level B non-intentional takes of the following marine mammals:

- 34 Cook Inlet beluga whales *(Delphinapterus leucas)*
- 20 harbor porpoises *(Phoncoena phocoena)*
- 20 killer whales *(Orcinus orca)*
- 20 harbor seals *(Phoca vitulina)*

The IHA specified that failure to shut down in-water construction activities before a marine mammal was sighted within the safety and harassment zones constituted a take. Conditions of the IHA were included as contract requirements of the construction subcontractor. A “soft start” was implemented at the beginning of each pile driving activity (or if pile driving had ceased for more than one hour). This included delaying the start up of pile driving if a marine mammal was sighted.

2.1 Safety and Harassment Zones

As required by the IHA and the USACE 404/10 Permit, the POA and the Maritime Administration established NMFS-approved safety and harassment zones at the MTR Project site, which were monitored for the presence of marine mammals before, during, and after in-water work activities. If the safety and harassment zones were not visible because of fog, poor light, darkness, sea state, or any other reason, in-water construction activities shut down until the area was once again visible. In compliance with the stipulations of the IHA, no in-water impact pile driving was conducted within two hours of published low tide occurrence.

2.1.1 Establishment of Safety Zones

Conservative safety zones were established by the USACE and the NMFS to prevent physical harm to marine mammals in the MTR Project area. When marine mammals were sighted either approaching the safety zones or surfacing within the safety zones, in-water construction activities were suspended until the marine mammal moved to a safe distance or was not sighted within the safety zone for at least 15 minutes. The enforced safety zones during the IHA authorization period were:

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

2.1.2 Establishment of Harassment Zones

In October 2007, an underwater noise survey was conducted at the Port to measure and evaluate construction noise levels during a pre-construction test pile-driving effort. The survey consisted of measuring underwater sounds of impact and vibratory driving of steel H-piles and sheet piles, in addition to measuring the ambient conditions and noise levels generated by dredging operations, the pile-driving barge, and a tug boat pulling the barge. Based on the requirements of the USACE 404/10 Permit and the NMFS, the objective of this underwater noise survey was to identify the 190-, 180-, and 160- decibel (dB)-level isopleths for each type of pile driving, identify a pile driving shut-down radius for each pile installation technique, and determine the 120 dB isopleth for vibratory pile driving.

Results of the underwater noise survey established the following harassment zones enforced during in-water construction activities to limit the number of takes occurring by Level B Harassment within the IHA period:

- **350** m from impact pile driving
- **800** m from vibratory pile driving

Under the stipulations of the IHA, suspension of in-water pile driving was encouraged, but not mandatory, when marine mammals approached or were sighted within these zones, *with the following exceptions*:

- No Level B takes of beluga whale calves were allowed when a beluga calf (or calves) was sighted approaching the harassment zones or 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 was sighted approaching the harassment zones, in-water pile driving was suspended.

In compliance with these conditions, in-water pile driving activities were suspended until a marine mammal(s) was sighted 1) outside of, and moving away from, the harassment zones or 2) was not sighted within a harassment zone for at least 15 minutes. An animal was considered taken if it entered the NMFS-determined harassment isopleths while in-water pile driving was ongoing. The IHA stipulated that once the allowable number of takes for a marine mammal species was reached, the harassment zones were to be treated as exclusion zones. During the IHA period none of the allowable takes was exceeded.

3.0 MARINE MAMMAL MONITORING PROGRAMS

The POA and the Maritime Administration are committed to ensuring the protection of Cook Inlet beluga whales and other marine mammals by avoiding or minimizing impacts during MTR Project construction activities at the Port. During the environmental assessment process for the MTR Project, NMFS met with the POA and the Maritime Administration to discuss what mitigation measures could be implemented to protect marine mammals. Prior to and during the 15 July 2008 to 14 July 2009 authorization period, in collaboration with the NMFS, the POA and the Maritime Administration implemented the following three NMFS-approved marine mammal monitoring programs designed to minimize the number of takes and to collect information on marine mammal behavior in the vicinity of the Port.

1) The Construction Marine Mammal Monitoring Program, which began in 2006, was established to protect marine mammals by enforcing shut-down criteria during in-water fill activities and pile driving. This program provided information on the behavior and locations of marine mammals.

2) The Scientific Marine Mammal Monitoring Program, which began in 2005, was specifically established at the request of NMFS to observe and assess whale movement, timing, group size, locations, and patterns one year prior to, during, and one year after MTR Project construction. This program is independent of the Construction Marine Mammal Monitoring Program. When on site, the scientific observers collaborate with the construction observers to verify sightings and distances from construction.

3) The POA Opportunistic Marine Mammal Sighting Program, which officially started in 2007, encourages POA staff, subcontractors, tenants, and Port visitors to voluntarily report sightings of beluga whales and other marine mammals. A sighting form is distributed at the Port security office; signs that provide information on this program are posted throughout the Port and at the Anchorage Small Boat Harbor. During each construction season, the POA keeps a log of all opportunistic marine mammal sightings and provides an annual report to the NMFS Alaska Regional Administrator.

The Maritime Administration and the POA were responsible for the implementation of Programs 1 and 2 for the MTR Project. ICRC provided an independent scientific marine mammal monitoring team and provided marine mammal observers at the construction site, as stipulated by the IHA and the USACE 404/10 permit. The POA administered Program 3 and prepared a submittal of an annual report, to the NMFS Alaska Regional Administrator.

The marine mammal monitoring area includes all water within the Knik Arm of Upper Cook Inlet visible from in-water construction activities near and offshore of the Port harbor. During marine mammal monitoring and data collection activities, emphasis is placed on documenting the frequency of beluga whale or other marine mammal presence within and near the construction area, and on evaluation of the responses of marine mammals to construction-related noise and habitat use. Providing real-time information to the construction crew so that mitigation measures could be swiftly implemented enhanced the shore-based protection program managed by the construction subcontractor.

3.1 Construction Marine Mammal Monitoring Program

In July 2008, at the start of in-water construction, one qualified marine mammal observer (MMO) was staged on site near the single location of in-water activity to document visual observations of marine mammals. The construction observer worked, on average, four hours per day and was then relieved by a new observer.

With the increase of in-water construction locations, additional observers were stationed near each construction crew and crane. The number of MMOs was increased to ensure full visibility of the harassment zones and provide early sighting of marine mammals. By the end of the IHA period, four MMOs were placed at the Port at the best vantage points practicable to monitor the waters of Knik Arm. MMOs were present at the MTR Project site at all times during in-water construction activities and also 30 minutes prior to the commencement of in-water pile driving.

All sightings of marine mammals were documented by the MMOs on a NMFS-approved marine mammal sighting form. If a marine mammal was sighted within a designated harassment zone during in-water pile driving, a take was recorded for each marine mammal present within the harassment zone. The MMOs are contractually required to keep an accurate take count of marine mammals sighted within the safety and harassment zones, notify ICRC, and document the take(s) on the sighting form. If a marine mammal was sighted approaching the construction zone radii, the MMOs implemented shut-down procedures, when applicable, for suspending in-water construction activity.

Each MMO received training in the detection, identification, and distance estimation of marine mammal species; was equipped with binoculars and other proper viewing materials; and stationed at a location that provided optimal sight range. The MMOs had no other construction-related task while monitoring. A comprehensive marine mammal monitoring plan (Plan) was prepared for NMFS review and approval prior to in-water work. The plan contains all the contractual and permit requirements and describes the procedures the construction subcontractor implemented to comply with the conditions of the IHA and the USACE 404/10 Permit.

Conformance with the Plan was discussed at weekly construction meetings to ensure the procedures were working and to identify and implement any revisions necessary to improve procedures in the Plan. The MMOs understood permit requirements and were diligent in ensuring that safety and harassment zones were monitored according to the conditions of the IHA. The MMOs implemented quality checks to ensure their communication with the construction subcontractors, POA personnel, ICRC, and other observers was clear and concise.

3.1.1 Marine Mammal Sighting Form – Construction Observers

The NMFS-approved sighting form used by the MMOs recorded the following information:

- Date of observation, observer and his location, sighting number for that day

- The number of takes (by species) of marine mammals (i.e., entered the impact [350 m] or vibratory [800 m] harassment zones; or entered the 200-m shut down zone for either pile driving method)
- Time of initial sighting to end of sighting, tidal stage, and weather condition (including Beaufort Sea State)
- Pile driving activities taking place at the time of sighting and if or why shut down was or was not implemented
- Species, number, group composition (i.e., age and color class), distance to pile driving hammer, and behavior (e.g., group cohesiveness, direction of travel, etc.) of animals throughout duration of sighting
- Any discrete behavioral reactions
- Observer location and initial and final sighting locations marked on a grid map

The MMOs documented what type of in-water work was being conducted at the time of each sighting. Whenever a marine mammal was sighted, the MMO immediately notified the construction personnel operating the pile-driving hammer (or other equipment) of the marine mammals' direction of travel and if a shut-down was necessary.

As discussed in the May 2009 monthly report, a temporary modification of mitigation procedures went into effect by the Maritime Administration. This occurred during the consultation period with NMFS under the requirements of Section 7 of the Endangered Species Act due to the recent listing of the Cook Inlet beluga whale. As a precautionary action, the Maritime Administration directed ICRC that no discretionary Level B takes of beluga whales would be allowed until a decisional document was issued by the NMFS Alaska Regional Office. From 1 May through 14 July 2009, the MTR Project worked under a "no take" procedure whereby in-water construction was shut down in advance of any possibility of a take and marine mammal monitoring was extended beyond the harassment radii. The NMFS decisional document, the Biological Opinion, was obtained on 13 July 2009. The "no take" policy was removed on 14 July.

3.2 Scientific Marine Mammal Monitoring Program

In addition to the construction observers responsible for implementing shut-down procedures for in-water construction activities, an independent, scientific marine mammal monitoring team of graduate and undergraduate students from the Alaska Pacific University (APU) Environmental Science Program, Marine Biology Department, was subcontracted to implement scientific

marine mammal monitoring and reporting. This program satisfies IHA condition 5(e)(1). The scientific monitoring team documented 1) the frequency at which marine mammals, particularly beluga whales, were present in the MTR 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. The scientific monitoring team conducted their observations at Cairn Point (Cairn Point Station) on Elmendorf Air Force Base located directly above and north of the Port, an ideal vantage point for observing marine mammal activity.

During the construction seasons within the IHA period, APU observers monitored Knik Arm for beluga whales and other marine mammals eight hours per day/four days per week, during two tide cycles per observation day. 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). Each observer of a two-person team conducted beluga whale (and other marine mammal observations) using ten-minute scan samples which were recorded on a daily data log (Appendix C).

APU observers worked in collaboration with the construction MMOs to immediately communicate the presence of beluga whales or other marine mammals in the area. They were kept informed of anticipated construction schedules and any changes during construction observation shifts.

The scientific monitoring plan, including the data log used to record marine mammal sightings was approved by NMFS prior to implementation of their monitoring program. Monthly scientific marine mammal monitoring reports were prepared during the construction seasons within the IHA period and submitted to NMFS.

4.0 SUMMARY OF IN-WATER CONSTRUCTION ACTIVITIES AND CONSTRUCTION OBSERVER MARINE MAMMAL SIGHTING DATA: 15 JULY 2008 – 14 JULY 2009

The following sections summarize in-water and out-of-water construction activities and construction marine mammal monitoring activities during the IHA period. In-water work ceased over the winter between the 2008 and 2009 construction seasons due to frozen soils, ice formation in the Knik Arm and higher risk of safety issues.

4.1 Construction and Monitoring Activities During 2008

In-water construction and marine mammal monitoring for 2008 started 24 July and ended on 2 December, when ice formation and poor visibility made further in-water fill placement and pile driving activities unfeasible. During the 2008 field season, crews worked single shifts and completed 38 sheet-pile cells.

4.1.1 Documentation of 2008 Pile Driving Hours

In August, at the request of NMFS, ICRC began recording the number of hours per day of in-water construction activities. In September, again at the request of NMFS, ICRC began recording the number of hours per day for each method of in-water pile driving: impact hammer, vibratory hammer, and vibratory stabbing. During the 2008 field season, 602.55 hours of in-water pile-driving took place over 97 days (Table 1).

4.1.2 Comparison of 2008 Pile Driving Hours

Between 1 September and 30 November 2008, construction activities related to in-water pile driving with an impact hammer took place on 48 days, for a total of 220.30 hours and an average of 4.59 *intermittent* hours per day. In-water pile driving with a vibratory hammer took place on 32 days, for a total of 137.5 hours and an average of 4.29 *intermittent* hours per day. Stabbing took place on 26 days, for a total of 101 hours and an average of 3.88 *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 1-hour period for vibratory hammers, and from approximately 3 to 20 minutes within a 1-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).

4.1.3 Construction Pile-Driving Shutdowns 2008

In compliance with the IHA, a total of 14 construction shutdowns were initiated during August, October, and November 2008: 10 shutdowns were initiated because beluga whales either swam toward or surfaced within the Harassment Zones, and 4 shutdowns were initiated because the monitoring area was not clearly visible due to fog and falling snow. No shutdowns were initiated in July or September 2008.

4.1.4 Summary of Construction Monitoring 2008

The construction marine mammal observers monitored the waters within and surrounding the MTR Project footprint from 24 July through 2 December 2008 during in-water pile driving and fill placement activities. The observers recorded the location of the marine mammals on a grid map (pages 3 and 4 of the sighting form), according to the distance of the animals from the noise source. 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 submitted to NMFS from August through November 2008.

From July through November 2008, the construction observers recorded 60 marine mammal sightings, during which 1 harbor seal and 431 beluga whales were observed (Table 1). Of the 431 beluga whales sighted, 231 were adults, 101 were juveniles, and 43 were calves; 56 whales of unknown age were also sighted. The highest number of sightings (34) and number of marine mammals sighted (262) occurred in August. The fewest number of sightings for a 30-day period (3) were recorded in October, when only 10 beluga whales were sighted. Eight takes of beluga whales (of the 34-take maximum for permitted by the IHA) were recorded during the 2008 field season: three on October 1 (during one sighting) and five on November 7 (during one sighting).

Throughout the 2008 field season, the process for documentation and reporting of marine mammal sightings was continually evaluated and improved by ICRC and approved by the NMFS. In October, ICRC revised the original NMFS-approved sighting form to improve readability and incorporate additional information requested by NMFS. As pile driving progressed southward, the location of the marine mammal observation site shifted as necessary to provide the best vantage point for observation.

4.2 Construction and Monitoring Activities During 2009

In-water construction for the 2009 field season began 28 March and ended on 14 July for work authorized under the IHA. Crews often worked double shifts as conditions allowed. Fill placement and installation of sheet pile cells was continued on the north end of the MTR Project site.

4.2.1 Documentation of 2009 Pile-Driving Hours and Construction Shutdowns

From 28 March through 14 July 2009, a total of 913.6 hours of in-water pile driving took place on 74 days. Of the total pile-driving hours/days in 2009, in-water pile driving with an impact

hammer was conducted a total of 282.5 hours on 29 days, an average of 9.7 *intermittent* hours per 24-hour day (Table 2). No pile driving with an impact hammer was conducted in March-April (Table 1).

In-water pile driving with a vibratory hammer took place on 67 days, for a total of 531.85 hours and an average of 7.9 *intermittent* hours per 24-hour day (Table 2). Stabbing with a vibratory hammer took place on 29 days, for a total of 103.25 hours and an average of 3.6 *intermittent* hours per 24-hour day. In compliance with the IHA, 14 construction shutdowns were initiated from 28 March through 14 July 2009 (Table 1).

4.2.2 Summary of Construction Monitoring in 2009

The construction MMOs monitored the waters within and surrounding the MTR Project footprint during all in-water pile driving and fill placement activities, from 28 March through 14 July. The observers recorded the location of the marine mammals on two grid maps (pages 3 and 4 of the sighting form) as appropriate, according to the distance of the animals from the noise source. 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 from April through July 2009 were provided in monthly reports to NMFS.

During the 2009 IHA period, the MMOs documented 44 marine mammal sightings, in which 3 adult Steller sea lions (a rarity in Upper Cook Inlet; believed to be the same animal sighted three times), 17 harbor seals (16 adults and 1 pup), 5 adult harbor porpoises, 2 unidentified pinnipeds, and 127 beluga whales were observed. Of the 127 beluga whales, 88 were white (adults), 33 were gray (juveniles), and 6 were dark gray (calves). During the monitoring period 28 March through 14 July 2009, the highest number of sightings (23) occurred in June, and the highest number of marine mammals sighted (122) occurred in May.

The fewest number of sightings for a 30/31-day period (4) was recorded in April when only 8 beluga whales were sighted. There was only 1 sighting during the period 1 June through 14 June (one adult harbor porpoise) and only 1 sighting during the period 1 July through 14 July (one adult beluga whale). The low number of sightings during these two periods was attributable in part to the 7-day in-water construction shutdowns required by Special Condition V of the USACE 404/10 Permit to accommodate smolt releases during one week in June and one week in July. No construction MMOs were on site during shut down periods (Table 1).

4.2.2.1 Improvements to the Construction Marine Mammal Monitoring Program

ICRC made a number of improvements to increase the effectiveness of the Construction Marine Mammal Monitoring Program over the 12-month period of the IHA. Lessons learned were incorporated and resulted in field changes and reporting procedure modifications. The marine mammal sighting form was revised to improve readability, a new grid map (page 3 of sighting form) was developed to show the locations of the MMOs, and the northernmost sighting location (of four total monitoring stations) was moved further north on shore and around the Cairn Point bluff to allow observers to better view animals heading south. Another improvement was the addition of 30-foot-high scissor lifts located at three of the four Port observation stations; the increased elevation significantly improved the MMOs' line of sight. The northern site monitoring station, equipped with railings and a nonskid floor, is the top of a 20-foot-long empty conex. This monitoring station required elevation due to high tides, a sloughing hillside, and bear activity in the immediate area.

4.2.2.2 Stranding of Harbor Seal Pup (June 2009)

As previously reported, a harbor seal pup was sighted on the evening of 15 June 2009, outside the harassment zone resting on the shore at the northern end of the dry barge berth and moving uphill to avoid rising water. The construction MMO noted on the sighting form that "personnel and equipment were [then] excluded from the area to avoid disturbing the animal." By early the next morning, the MMO noted that the pup had not moved from above the waterline within 15 meters of the location where it had initially been sighted. No adult harbor seal was observed within the vicinity of the pup.

In-water construction was shut down while ICRC consulted NMFS Alaska Region and the Alaska SeaLife Center for guidance on how to best handle this situation. It was determined by NMFS that the pup was abandoned. ICRC staff worked quickly under the guidance of NMFS and the biologists from the SeaLife Center and carefully removed the pup to a safe location to transfer the animal to the rescue team from the Alaska SeaLife Center. The SeaLife Center's marine biologist estimated the pup to be only two weeks old and very undernourished. ICRC was asked to choose a name for the pup, based on the Center's naming theme for marine mammals rescued during 2009: sweets and candy. The name selected was "Jellybean."

Upon Jellybean's arrival at the SeaLife Center, staff members tube-fed him harbor seal formula (milk substitute, seal oil, and other ingredients). This method of feeding delivers the formula directly to the animal's stomach, enabling it to ingest the necessary nutrients with a minimum of

handling. Jellybean thrived in the care of the SeaLife Center, and graduated to a diet of herring. On 2 October, when Jellybean reached a weight of 50 pounds, the SeaLife Center released him into Lower Cook Inlet at Anchor Point, where he joined a group of harbor seals.

4.3 Summary of Construction Observer Monitoring Data for the IHA Period

MTR construction observers recorded a total of 104 marine mammal sightings and observed a total of 586 marine mammals during the IHA period. The greatest number of beluga whales documented in one month was in August 2008 (262 beluga whales). There were no killer whales observed (Table 1).

The cumulative totals for each species documented during the 12 month period are as follows:

- Harbor seal: 18 total (16 adults; 1 pup; 1 unknown age)
- Harbor porpoise: 5 adults
- Cook Inlet beluga whale: 558 total (319 white; 134 gray; and 49 dark gray; and 56 unknown age)
- Steller sea lion: 3 adults (determined to be the same adult seen several times in one day)
- Unidentified pinniped: 2

Pile driving activities during the IHA period totaled 77 days of impact pile driving; 99 days of vibratory pile driving, and 55 days of vibratory stabbing, for a total of 1,520.15 hours of pile driving. Over the construction seasons within the IHA period, an average of 6.53 *intermittent* hours of impact pile driving; 6.76 *intermittent* hours of vibratory pile driving, and 3.7 *intermittent* hours of vibratory stabbing were conducted within a 24 hour day (Table 2). There were 28 construction shutdowns and 13 Level B takes (12 beluga whales; one harbor seal) documented from 14 July 2008 through 14 July 2009 (Table 1).

Construction observers documented no apparent reaction to or behavior changes in marine mammals in response to in-water MTR construction activities, including pile driving; animals were sighted during and in the absence of in-water pile driving. Whale and other marine mammal sightings were documented throughout all tides, from low slack through high ebb. Sightings were rarely recorded at high flood tide. The beluga whales were most often documented swimming or traveling along either the eastern or western shorelines of the Port harbor area, with a trend toward use of the east side of Knik Arm. Observation data indicate

that the Cook Inlet beluga whales continue to use this portion of Knik Arm as a passage way between feeding areas to the north and south of the Port and for opportunistic feeding.

5.0 SUMMARY OF SCIENTIFIC MONITORING DATA

The Scientific Marine Mammal Monitoring Program, conducted from 14 July through 14 November 2008 and from 4 May through 14 July 2009, addressed the following objectives:

- Estimate of the frequency in which marine mammals were present within and adjacent to the MTR Project footprint
- Characterization of habitat use and behavior of marine mammals at and around the Port
- Analysis of the impacts of construction-related noise and other Port operational noise on marine mammal presence, behavior, and habitat use.

Graduate and undergraduate students from the APU marine biology department provided 816.16 total field hours across 86 days during the IHA Period. Scientific observers recorded a total of 90 sightings and a total of 320 marine mammals (318 beluga whales and 2 harbor seals). A total of 224 white, 58 gray, 26 dark gray beluga whales, and 10 beluga whales whose color could not be determined were sighted within and near the Port MTR Project footprint. Observers noted that whales moved north through the MTR Project footprint area during late summer and early fall, and then traveled south during late spring and fall. The largest total number of beluga whales, including groups, was seen in August 2008 around the Port area both during and in absence of in-water pile driving activities. Fifty-three percent of all whale observations occurred within or adjacent to the Port area during the IHA period. No behavior changes were documented as a result of in-water construction or other Port operational noise. APU's full scientific data report for the IHA period is provided as Appendix C.

6.0 ACOUSTIC MONITORING

To satisfy Section 5(e)(2) of the IHA, a one-time acoustic monitoring study was conducted in 2008. The purpose of the study was to identify or confirm harassment isopleths for the pile driving types used for MTR in-water construction.

During the period 19 September through 9 October 2008, an underwater noise survey was conducted at the Port in order to capture representative noise measurements during in-water pile driving and other Port operation activities. Over 14 hours (50,000 measurements) of data were collected focusing on each construction pile driving method in order to produce acoustic

ranges to the 190, 180, 160 and 120 dB re 1 micro Pascal root mean square isopleths from pile driving activities. Collection of most of the acoustic data was accomplished aboard a drifting boat to reduce the effect of flow noise. At the request of NMFS, all acoustical recordings were conducted 1 meter below the water surface and 1 meter above the sea floor.

The 2008 noise survey confirmed the findings of previous studies: the area around the Port is a noisy environment, with average ambient underwater sounds above 120 dB. Tides and wind are the most influential factors in creating high ambient noise levels, with vessel and air traffic increasing the underwater sounds. A number of background noise recordings (in the absence of pile driving) were made during the 2008 study; the recorded noise ranged from 120 to 150 dB. The conclusions of the study indicate that the background noise levels at the Port are typically at 125 dB.

Acoustic data was collected using empirical measurements made at various locations during different types of pile driving. From these estimated source levels, distances to the 180/190-, 160- and 125-dB isopleths were calculated assuming a transmission loss of 20 log.

A summary of worst case measurements and other supplementary data was provided to the NMFS in January 2009, which served as part of the Letter of Authorization application for in-water construction activities through 2014. Sound levels were measured and based upon a transmission loss of 20 log, and distances from the source level to the 160-dB and 125-dB isopleths were calculated. The worst-case measured sound levels were generated by impact pile driving during construction of the sheet pile face wall, with a calculated source level of 200 dB and calculated distance to 160 dB isopleth of 97 m. For vibratory pile driving, the average estimated source level of 187 dB was calculated and the calculated distance to the 125-dB isopleth was 1,300 m. Based upon additional data from other studies, NMFS elected to maintain a conservative 350-m Level B isopleth for impact pile driving and determined a 1,300-m isopleth for vibratory pile driving to be appropriate.

TABLES

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Table 1. Marine Mammal Sightings and In-Water Construction: 15 July 2008 through 14 July 2009
Incidental Harassment Authorization: Port of Anchorage Marine Terminal Redevelopment Project

Month/Year	Total Sightings	Marine Mammal Species, Number, and Group Composition	Number of Animals in Safety Zones[1]	Number of Animals in Harassment Zones[2]	Shutdowns[3]	Takes	Total Days: In-water Pile Driving[4]	Total Hours: In-water Pile Driving[5]	Total Hours: In-water Pile Driving *Impact Hammer*[6]	Total Hours: In-water Pile Driving *Vibratory Hammer*[7]	Total Hours: In-water *Stabbing (Vibratory)*[8]
July 2008[9]	1	7 beluga whales: adults	7	0	0	0	Unknown	Unknown	Unknown	Unknown	Unknown
August 2008	34	262 beluga whales: 151 adults; 46 juveniles; 27 calves;38 unknown age	10	96	6	0	25	143.75	Unknown	Unknown	Unknown
September 2008	12	1 harbor seal (unknown age); 50 beluga whales: 14 adults; 18 juveniles; 0 calves; 18 unknown age	7	19	0	0	22	125.75	32.75	70.5	22.5
October 2008	3	10 beluga whales: 6 adults; 2 juveniles; 2 calves	6	9	4	3 (beluga whale)	27	209	104	55	50
November 2008	10	102 beluga whales:[10] 53 adults; 35 juveniles; 14 calves	91	91	4	5 (beluga whale)	23	124.05	83.55	12	28.5
2008 Construction Season Totals	60	1 harbor seal (unknown age) 431 beluga whales: 231 adults; 101 juveniles; 43 calves; 56 unknown age	121	215	14	8	97	602.55	220.3	137.5	101
March-April 2009	4	8 beluga whales: 4 adults; 4 juveniles; 0 calves	7	7	2	0	19	125.5	0	70.75	54.75
May 2009	17	3 harbor seals (adults); 1 unidentified pinneped; 118 beluga whales: 83 adults; 29 juveniles; 6 calves	9	16	7	4 (beluga whale)	26	245.25	36	182.75	26.5
June 2009	23	5 harbor porpoise (adults); 3 Steller sea lions (adults)[11]; 13 harbor seals (1 pup; 12 adults) 1 unidentified pinniped; 1 beluga whale: adult	4	7	5	1 (harbor seal)	22	392.85	173.5	202.6	16.75
1 July – 14 July 2009	1	1 harbor seal (adult)	0	0	0	0	7	154	73	75.75	5.25
2009 Construction Season Totals: 28 March – 14 July	44	3 Steller sea lions (adults); 2 unidentified pinnipeds; 17 harbor seals (16 adults;1 pup); 5 harbor porpoise (adults) 127 beluga whales: 88 white; 33 gray; 6 dark gray[13]	20	30	14	5	74	917.6	282.5	531.85	103.25
CUMULATIVE TOTALS FOR IHA PERIOD: 15 JULY 2008 – 14 JULY 2009	104	18 harbor seals (16 adults; 1 pup; 1 unknown age) 3 Steller sea lions (adults); 5 harbor porpoise (adults); 2 unidentified pinnepeds; 558 beluga whales: 319 adults; 134 juveniles; 49 calves; 56 unknown age	141	245	28	13	171	1,520.15	502.8	669.35	204.25

1. These animals also recorded in the Harassment Zones.
2. Some of these animals also entered the Safety Zones.
3. Includes shutdowns initiated because of poor visibility of monitoring area [Stipulation 5(c)(3) of Incidental Harassment Authorization (IHA)].
4. Total days of in-water pile driving not tracked in July 2008; at the request of National Marine Fisheries Service (NMFS), tracking of total days of in-water pile driving began in August 2008.
5. Total hours of in-water pile driving not tracked in July 2008; at the request of NMFS, tracking of total hours of in-water pile driving began in August 2008.
6. Total hours of in-water pile driving with *impact hammer* not tracked in July 2008; at the request of NMFS, tracking of total hours of in-water pile driving with *impact hammer* began in August 2008.
7. Total hours of in-water pile driving with *vibratory hammer* not tracked in July 2008; at the request of NMFS, tracking of total hours of in-water pile driving with *vibratory hammer* began in August 2008.
8. Total hours of in-water *stabbing* not tracked in July 2008; at the request of NMFS, tracking of total hours of in-water *stabbing* began in September 2008. Stabbing totals for 2008 are for vibratory and non-vibratory stabbing; totals for 2009 are for vibratory stabbing only.
9. In-water construction began on 24 July 2008, nine days after IHA was issued; the only marine mammal sighting recorded for the month was on 24 July.
10. Total number of whales sighted in November 2008 includes averaged numbers for three sightings and respective group compositions recorded on November 7 (ref: *November 2008 Monthly Marine Mammal Monitoring Report* ;Table 2, footnotes 8-16).
11. Multiple sightings of this sea lion.
12. Multiple sightings of this harbor seal.
13. Age classification for beluga whales was changed to white (adult), gray (juvenile), and dark gray (calf).

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Table 2. In-Water Pile Driving During Permitting Period: 15 July 2008 through 14 July 2009
Incidental Harassment Authorization: Port of Anchorage Marine Terminal Redevelopment Project

Total days pile driving (all types):	171
Total (intermittent) pile driving hours:	1,520.15
Average daily pile driving hours*	8.86
Total days: vibratory pile driving	99
Daily average: vibratory pile-driving hours (intermittent)	6.76
Total days: impact pile driving	77
Daily average: impact pile-driving hours (intermittent)	6.53
Total days: stabbing (vibratory)	55
Daily average stabbing (vibratory) hours (intermittent)	3.7

*2008: one day = one 12-hour shift.
2009: one day = two 12-hour shifts.

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FIGURES

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Figure 1. Port of Anchorage

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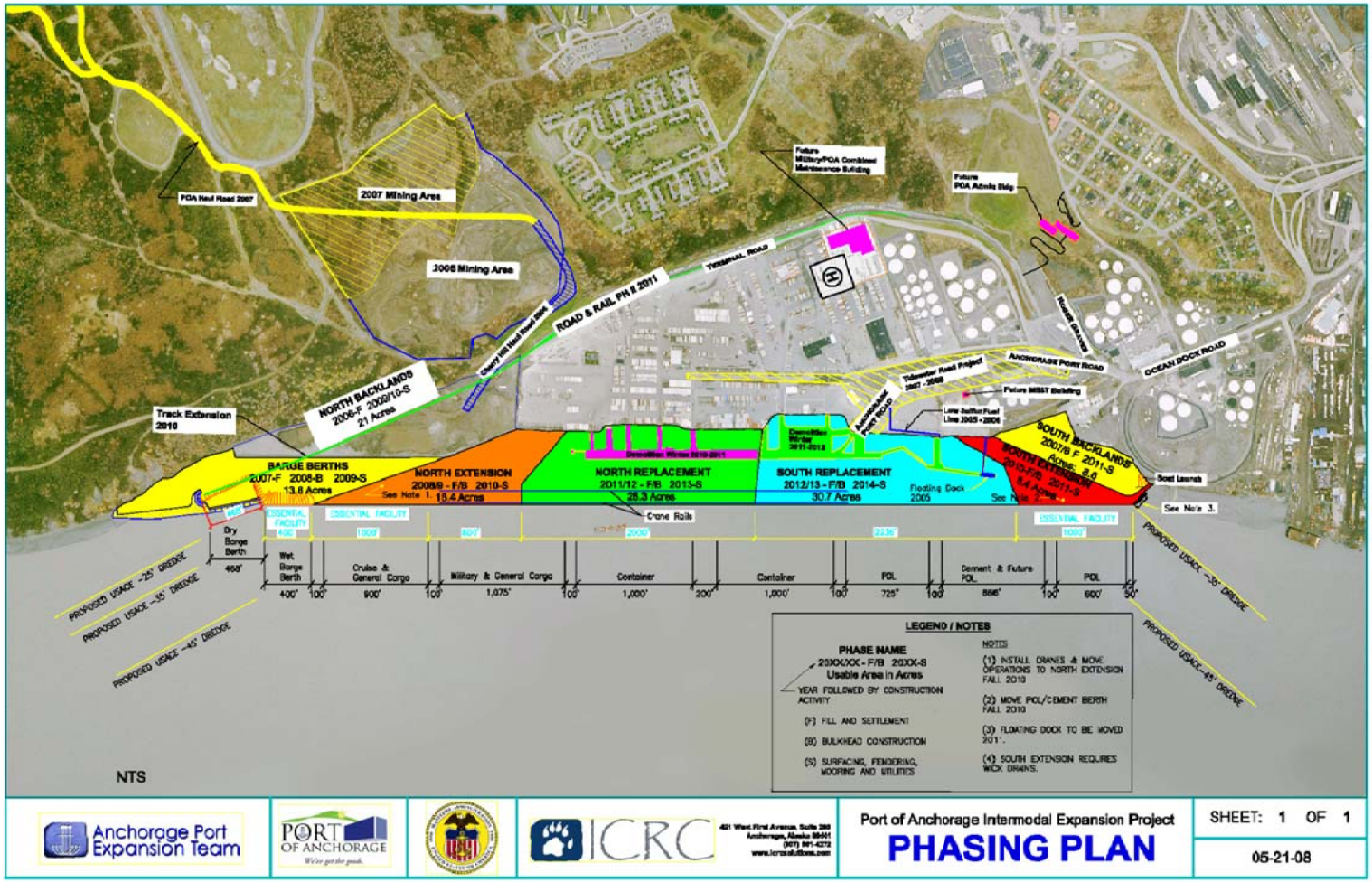

Figure 2. MTR Project Phasing Plan

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APPENDIX A

NOAA/NMFS 2008 Incidental Harassment Authorization

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RECEIVED
JUL 17 2008

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

JUL 15 2008

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

Dear Mr. Sheffield:

Enclosed is an Incidental Harassment Authorization (IHA) issued to the Port of Anchorage and U.S. Department Maritime Administration, under the authority of Section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C. 1361 et seq.). This Authorization allows for incidental take, 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*), incidental to the Port of Anchorage Marine Terminal Redevelopment Project.

You are required to comply with the conditions contained in the IHA. In addition, you must cooperate with any Federal, state or local agency monitoring the impacts of your activities. Please note the reporting requirements outlined in Condition 6. All reports must be submitted to the NMFS Alaska Regional Office and Office of Protected Resources, Headquarters, before any future requests for an incidental take authorization, under section 101(a)(5), can be processed. The IHA requires monitoring by individuals trained in marine mammal observation during all times in-water pile driving is taking place. Reports, sighting sheets, and methodologies employed during marine mammal monitoring and acoustic surveys must be in the form of those approved by NMFS prior to issuance of this Authorization. All marine mammal observers must complete the NMFS approved sighting forms to the maximum extent practicable.

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

Sincerely,

James H. Lecky
Director
Office of Protected Resources

Enclosure

Printed on Recycled Paper

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Incidental Harassment Authorization

The Port of Anchorage (Port) and the Department of Transportation Maritime Administration (MARAD) are hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C. 1371(a)(5)(D)) and 50 CFR 216.107, to harass marine mammals incidental to Port of Anchorage Marine Terminal Redevelopment Project.

1. This Authorization is valid from July 15, 2008, through July 14, 2009.

2. This Authorization is valid only for the Port of Anchorage Marine Terminal Redevelopment Project as described in the IHA application.

3. The holder of this Authorization is restricted to the following number and manner of take:

(a) The taking, by Level B harassment only, is limited to no more than 34 Cook Inlet beluga whales (*Delphinapterus leucas*), 20 harbor porpoises (*Phocoena phocoena*), 20 killer whales (*Orcinus orca*), and 20 harbor seals (*Phoca vitulina*). An animal should be considered taken if it enters the NMFS determined harassment isopleths (i.e., 350m for impact pile driving and 800m for vibratory pile driving).

(b) The taking by injury or death of the species listed in (a), or the taking by Level B 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.

(c) The taking of any marine mammal in a manner prohibited under this Authorization must be reported immediately to the NMFS Alaska Regional Office at (907) 271-5006, and the Office of Protected Resources (NMFS), Headquarters, at (301) 713-2289.

4. 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 2 weeks prior to the seasonal commencement of in-water pile driving.

5. Mitigation and Monitoring

The holder of this Authorization is required to comply with the following mitigation measures:

(a) Scheduling of construction activities during low use period of beluga whales around the Port

In-water impact pile driving shall not occur two hours either side of low tide meaning two hours before low tide until two hours after low tide. For example, if low tide is at 1pm, impact pile driving will not occur from 11am to 3pm. These tidal restrictions are not applicable to vibratory pile driving.

(b) Establishment of safety zones and shut-down requirements

NMFS acknowledges that shut-down of reduced energy vibratory pile driving during the "stabbing" phase of sheet pile installation may preclude shut-down from occurring due to safety concerns as the sheet pile by break free if it is not installed to a proper depth which could result in a safety and navigational hazard. Therefore, the following shut-down requirements apply to all in-water pile driving activities except those during the "stabbing" phase of the installation process.

(1) Safety Zones

No in-water pile driving (impact or vibratory) shall occur if any marine mammal is located within 200m of the pile hammer in any direction. If any marine mammal is sighted within this 200m safety zone prior to pile-driving, the hammer operator (or other authorized individual) will delay pile-driving until the animal has moved outside the safety zone or the animal is not resighted within 15 minutes.

(2) Shut-Down for Large Groups

To reduce the chance of the Port reaching or exceeding authorized take and to minimize harassment to beluga whales, if a group of more than 5 beluga whales is sighted within the Level B harassment isopleths, in-water pile driving shut down is required.

(3) Shut-down for Beluga Whale Calves

If a beluga whale calf is sighted within or approaching a harassment zone, any type of in-water pile driving shall cease and shall not be resumed until the calf is confirmed to be outside of the harassment zone and on a path away from such zone. If the calf or group with a calf is not re-sighted within 15 minutes, pile driving may resume.

(4) If maximum authorized take is reached or exceeded, any marine mammal entering into the harassment isopleths will trigger mandatory in-water pile driving shut down.

(5) For Port operated in-water heavy machinery work other than pile driving (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, operations will cease and vessels will slow to a reduced speed while still maintaining control of the vessel and safe working conditions.

(c) "Soft start" and delays to in-water pile driving activities

(1) 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. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by 1-minute waiting period. The procedure will be repeated two additional times. If an impact hammer is used, contractors will be required to provide 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.

(2) If marine mammals are sighted within or approaching the safety or harassment zones prior to commencement of pile driving, operations shall be delayed until the animals move outside the zones in order to avoid take exceedence.

(3) Pile driving shall not occur when weather 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.

(d) Public Outreach

(1) The Port of Anchorage shall continue to employ use of a long-term, formalized marine-mammal sighting and notification procedures 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 Port shall forward documentation of all reported marine mammal sightings to the NMFS.

(2) The Port of Anchorage shall continue to post whale-notification signage at the port and 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.

(e) Monitoring

(1) Marine Mammal Monitoring

Prior to the start of seasonal pile driving activities, the Port of Anchorage shall require construction supervisors and crews, the marine mammal monitoring team, the acoustical monitoring team, and all project managers to attend a briefing on responsibilities of each party, defining chains of command, discussing communication procedures, providing overview of monitoring purposes, and reviewing operational procedures regarding beluga whales.

Monitoring for marine mammals will take place concurrent with all pile driving activities and 30 minutes prior to pile driving commencement. One to two trained observer(s) will be placed at the Port at the best advantage point(s) practicable to monitor for marine mammals and will implement shut-down/delay procedures when applicable. The observer(s) will have no other construction related tasks while conducting monitoring. Each observer will be properly trained in marine mammal species detection, identification and distance estimation and will be equipped with binoculars. At time of each sighting, the pile hammer operator must be immediately notified that there are beluga whales in the area, their location and direction of travel, and if shut-down is necessary.

In addition, the Port shall employ a marine mammal monitoring team separate from the construction contractor observer activities, for the duration of all construction activities. This monitoring team; however, is not required to be present during all in-water pile driving operations. The Port and separate marine mammal monitoring team shall remain in contact to alert each other to marine mammal presence.

Marine mammal monitoring at the Port shall commence 30 minutes prior to and during all times in-water pile driving is taking place. Marine mammal sightings and all associated information will be logged on NMFS approved data sighting sheets. The following data must be collected during a marine mammal sighting on the NMFS approved marine mammal sighting data sheets:

- Date, time of initial sighting to end of sighting, tidal stage, and weather condition (including Beaufort Sea State);
- Species, number, group composition (i.e., age class), distance to pile driving hammer, and behavior (e.g., group cohesiveness, direction of travel, etc) of animals throughout duration of sighting;
- Any discrete behavioral reactions as well as how close marine mammal(s) approach pile driving hammer;

- The number (by species) of marine mammals that have been taken (i.e., entered the impact (350m) or vibratory (800m) harassment zones) or enter the 200 m shut down zone; and

- Pile driving activities occurring at the time of sighting and if and why shut down was or was not implemented.

(2) Acoustic Monitoring

(a) The Port shall carry out a one-time acoustic monitoring study upon commencement of in-water pile driving. The study will confirm or identify harassment isopleths for all types of piles used, including open-cell sheet piles and 36-inch steel piles, and the "stabbing" process. The acoustic study proposal shall be approved by NMFS prior to the start of seasonal in-water pile driving.

(b) The Port will also install hydrophones (or employ other effective methodologies) necessary to detect and localize, to the maximum extent practicable, passing whales and to determine the proportion of beluga whales missed from visual surveys. This study shall characterize sound levels around the Port related to and in absence of all construction activities.

6. Reporting

The holder of this authorization is required to submit a series of acoustic and marine mammal monitoring reports to the Office of Protected Resources and the Alaska Regional Administrator, NMFS. A monthly marine mammal report containing all sighting data sheets shall be submitted the 10th day of each month to NMFS OPR and NMFS AKR for the previous months sightings. Included with the reports will be the schedule of pile driving hours, by type (i.e., impact or vibratory), for that month. A final report summarizing all sighting data must be submitted to NMFS no later than 90 days after expiration of this IHA. This final report shall estimate the frequency in which marine mammals were present within the project footprint, characterize habitat use and behavior of marine mammals at and around the Port of Anchorage, characterize sound levels around the Port related to and in absence of all construction activities; and address and analyze impacts of construction related noise on marine mammal presence, behavior, and habitat use. The acoustic study report (as required in Condition 5(e)(2)(a)) identifying sound propagation and harassment isopleths for impact and vibratory pile driving will be due to NMFS 45 days after completion of the survey.

7. In the unanticipated event that any cases of marine mammal injury or mortality are judged to have possibly resulted from the Marine Terminal Redevelopment Project, the holder of this IHA is required to cease all activities immediately and report the incident to NMFS (see 3(c) above) and the local stranding network. Project activities shall then be postponed until NMFS is able to review the circumstances and work with the Port of Anchorage and MARAD to determine whether modifications to the activities are appropriate and necessary.

8. A copy of this Authorization must be in the possession of all contractors and marine mammal monitors operating under the authority of this Incidental Harassment Authorization.

JUL 15 2008

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

Date

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APPENDIX B

Special Condition IV

U.S. Army Corps of Engineers 404/10 Permit

POA-2003-502

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Special Condition 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/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 µPa 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 µPa 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 during and after construction. 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.

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APPENDIX C

Scientific Marine Mammal Monitoring Report

15 July 2008 through 14 July 2009

Alaska Pacific University

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Distribution, Habitat Use and Behavior of Cook Inlet Beluga Whales and Other Marine Mammals at the Port of Anchorage Marine Terminal Redevelopment Project July 15, 2008 – July 14, 2009

IHA Report 2008 – 2009

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 and Research Corporation
421 West First Avenue, Suite 200
Anchorage, Alaska 99501

Prepared by

Leslie A. Cornick, Ph.D.,
Lindsey Saxon Kendall
Leigh Pinney

October 2009

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Appendix

1.0 Introduction

This report summarizes the Scientific Marine Mammal Monitoring 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 Marine Mammal Monitoring Program (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 Administration (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 graduate and undergraduate students in the Alaska Pacific University (APU) Marine Biology program during the one-year period (15 July 2008 through 14 July 2009) under the Incidental Harassment Authorization (IHA) issued to the POA and the Maritime Administration by NOAA/NMFS. *The Scientific Marine Mammal Monitoring IHA Report 2008-2009* presents information on the 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, as required by Condition 6 of the IHA.

In addition to marine mammal monitoring and data collection efforts, APU observers provided real-time information of Anchorage Port facility (Port) marine mammal sightings and proximity of animals to the construction site to the Construction Marine Mammal Observers (MMOs) working with the construction crew. During APU 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 in-water construction activities. Providing real-time information to construction crews so that mitigation measures could be swiftly implemented enhanced the marine mammal monitoring program managed by the construction contractor.

A total of 816.16 hours of observational effort was completed across 86 days from 15 July 2008 through 14 July 2009. Overall sighting conditions during the entire study period were moderate to excellent. A total of 318 beluga whales (224 white, 58 gray, 26 dark gray (calves) and 10 whales whose color could not be definitively determined) were observed during the IHA period. Mean group size was 3.53 ± .50 individuals. Only nine groups contained identified calves. All but two groups containing calves were sighted within or adjacent to the MTR Project footprint.

Whales were observed moving north through the study area during the late summer and early fall, and traveling south during the late spring and fall. Two large groups (n = 57) were observed moving south through the study area in mid-November 2008. No unusual behavioral events (e.g., abrupt directional changes, rapid descents) or other indicators of response to pile driving or other in-water construction were observed during the study period.

2.0 Program Objectives

The Scientific Marine Mammal Monitoring Program addressed 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.

During the IHA period, 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, from 15 July through 14 November 2008, and from 4 May through 14 July 2009. 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 800 m for in-water vibratory pile driving.

3.0 Methods

The Scientific Marine Mammal Monitoring Team (Scientific Team) received training in marine mammal identification and behavior, shore-based observational methodologies, and 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 above mean low low water [MLLW]).

The added height of the platform maximized the probability of detecting beluga whales in and around the Port. Based on the results of marine mammal monitoring conducted since 2005, the Cairn Point Station is the best location for sighting marine mammals in and near the construction area and the associated Level B Harassment Zones. The POA holds a Right-Of-Entry Permit from EAFB to access Cairn Point for the purpose of conducting marine mammal monitoring activities.

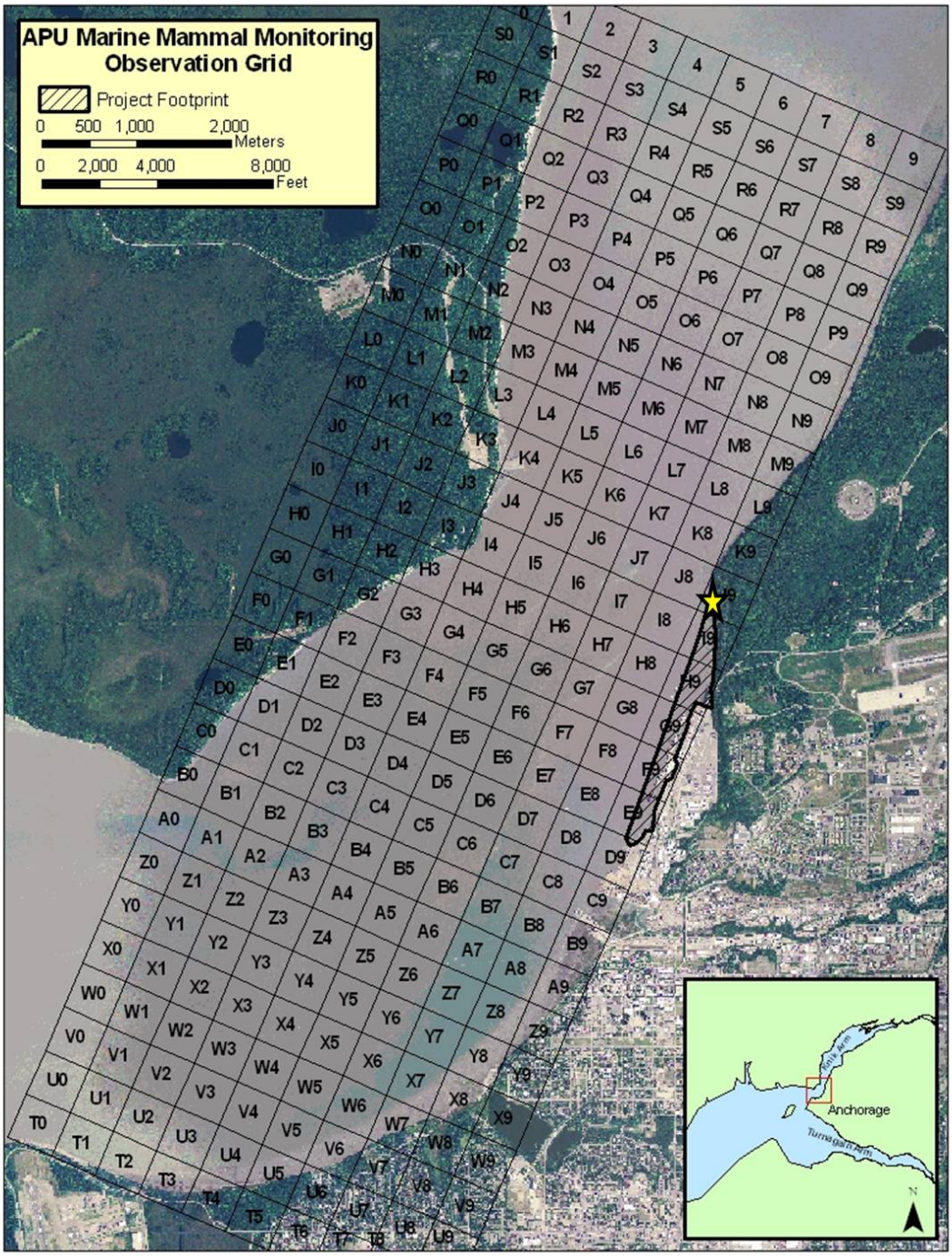


Figure 3.1. Map of study area with 500 x 500 m grid overlay. Grid cells encompassing the project footprint are D9 – J9 and are outlined and cross hatched. The Cairn Point Marine Mammal Observation Station is in grid cell J9, denoted by the yellow star.

Figure 3.2. Cairn Point Station at Elmendorf Air Force Base, theodolite facing west.

3.2 Sampling Effort

Marine mammal monitoring was conducted in 4 hour shifts up to 32 hours per week, covering the full range of tidal cycles as practicable during hours of access to the Cairn Point Station. 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 taking place, this activity was further categorized as soft start, impact pile driving or vibratory pile driving. 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 APU *Scientific Marine Mammal Monitoring Plan*.

During the majority of the IHA Period, (15 July 2008 – 14 November 2008) whales were classified by age (adult, juvenile, and calf, unknown). After consultation with NMFS and based upon the best available data on field classification of beluga whales, in early July 2009 the method of classification was changed from age to color (white, gray, dark gray). 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 I). 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 marine mammal most frequently observed, and 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/mmrp/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.

Geographic Information Systems (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 I9 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 I). 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.

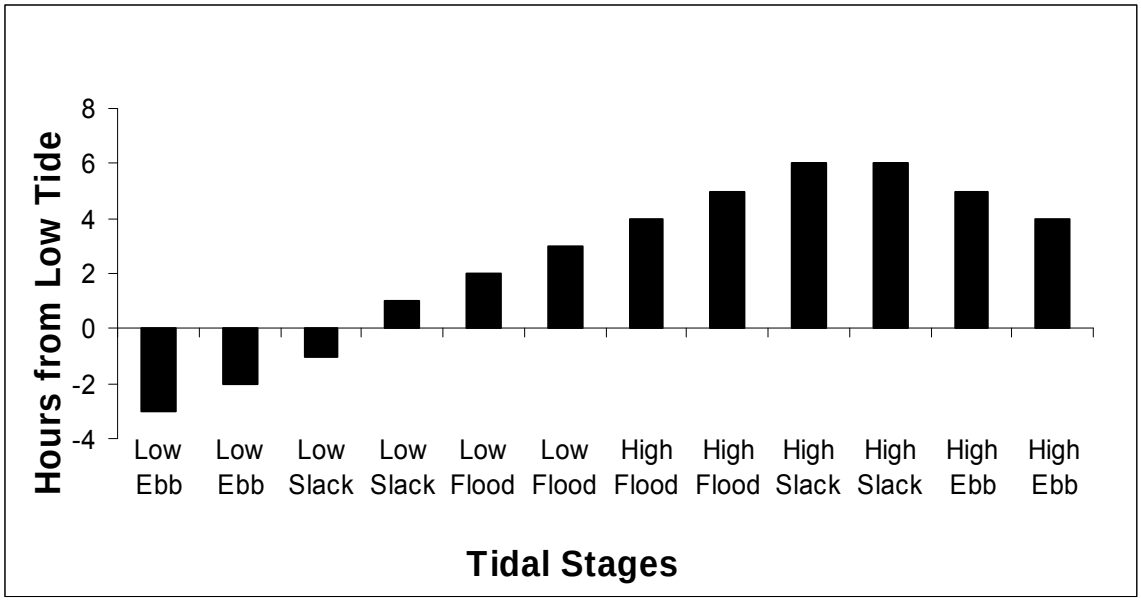
3.4.1 Environmental Conditions

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 by time of day, month, tidal stage and season (summer and fall). 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. Alpha levels were set at $p < .05$. All values are reported as mean ± 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.

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 and Structure; 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

Results of data analyses are presented here for total observational effort, environmental conditions, and beluga whale habitat use, movement and behavior. A summary of other marine mammal sightings is also presented.

4.1 Observational Effort

A total of 816.16 hours of observational effort was completed across 86 days from 15 July 2008 through 14 July 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 2008 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
Jul-08	11	87.00
Aug-08	17	120.50
Sep-08	14	133.83
Oct-08	22	128.00
Nov-08	10	51.33
May-09	15	96.00
Jun-09	18	144.00
Jul-09	8	55.50
Total	86	816.16
July 2008 effort from Jul 15-30		
July 2009 effort from Jul 1-14		

4.2 Environmental Conditions

Monthly environmental conditions are summarized in Table 4.2. Overall sighting conditions during the entire study period were moderate to excellent. Beaufort Sea State was most often rated as a 1 or a 2 [1]. Glare sufficient to obstruct sightings was present during 49 days of observations. However, glare was most often reported in the months with the highest number of whale sightings (Aug '08 – Sep '08), 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 (%)
July '08	Excellent	1	3.3	15.2	10	84
August '08	Excellent	1	2.1	15.9	10	75
September '08	Excellent	2	2.7	11.3	10	77
October '08	Excellent	2	3.3	2.1	10	59
November '08	Moderate	2	3.1	-2.0	8	83
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

Overall conditions and primary sea state are reported as most frequently observed.
Wind speed, temperature, visibility and % cloud cover are reported as means.

[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.

4.3 Temporal Distribution of Beluga Whales

4.3.1 Beluga whale sightings by time of day

Beluga whale sightings by time of day are shown in Figure 4.1. Sightings occurred during all observation periods except during the 18:00 hour, with peaks in the total number of whales sighted in the late morning (10:00 – 12:00) and late afternoon (15:00 – 17:00). The greatest number of groups was also seen in the late morning (11:00 – 12:00). The lack of sightings during the 12:00 and 13:00 hours is likely an artifact of reduced effort during that period due to observer shift changes. There was a significant peak in the duration of sightings during the 14:00 period ($F_{9,80} = 3.50$, $p = .001$).

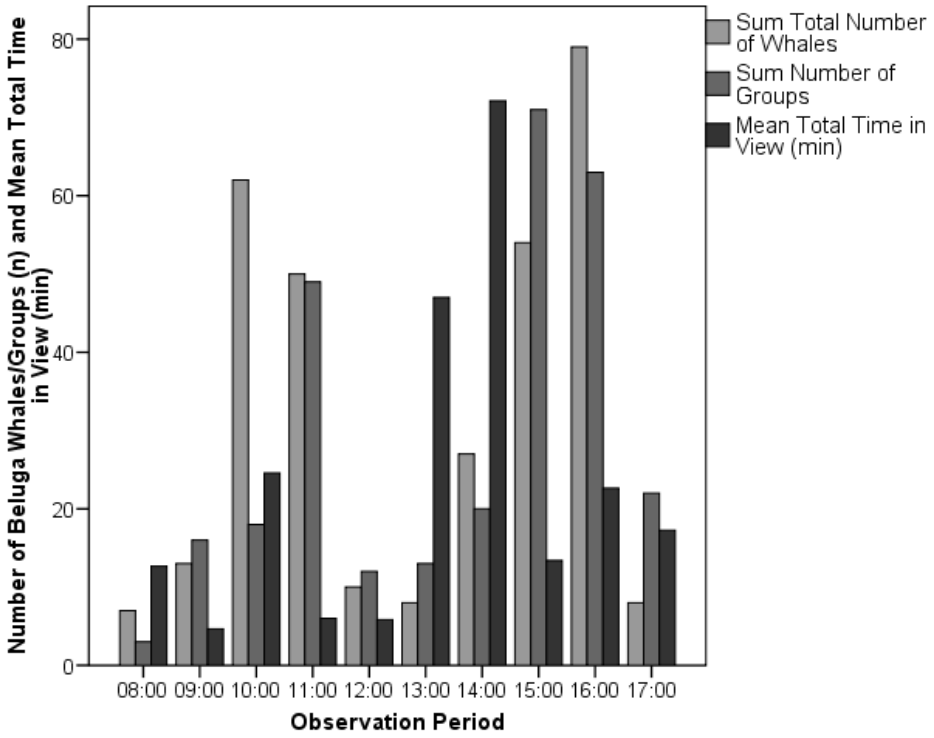


Figure 4.1. Beluga whale observations by time of day. Each hour period represents one full hour of observations (e.g., 15:00 represents the period from 15:00 – 16:00).

4.3.2 Beluga whale sightings by month and season

The largest total number of beluga whales and the largest number of groups were observed during August 2008 (Figure 4.2), with another peak in November 2008 due to two large groups that were observed near the end of the season. The fewest number of whales and groups were observed during October 2008. No whales were observed during June or July 2008 or 2009. Whales spent the longest time in view of observers

during August and September 2008, but these differences were not statistically significant (ANOVA, $p > .05$) across months.

This translates to a seasonal trend of a significant increase in beluga whale sightings from spring to summer (ANOVA, $F_{2,87} = 3.24$, $p = .04$; Figure 4.3). There was a subsequent drop off in sightings from summer to fall; however, this difference was not statistically significant (ANOVA, $p > .05$). There was a significant decrease in the mean duration whales were in view from summer to fall (ANOVA, $F_{2,87} = 4.88$, $p = .02$).

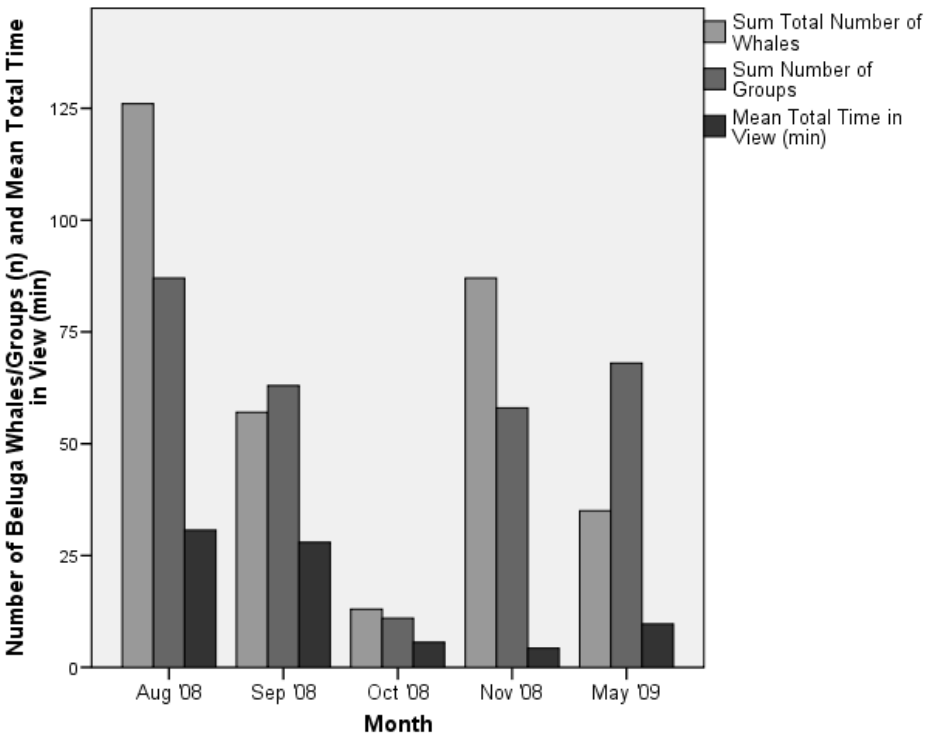


Figure 4.2. Beluga whale observations by month. No whales were observed during June-July 2008 or June-July 2009.

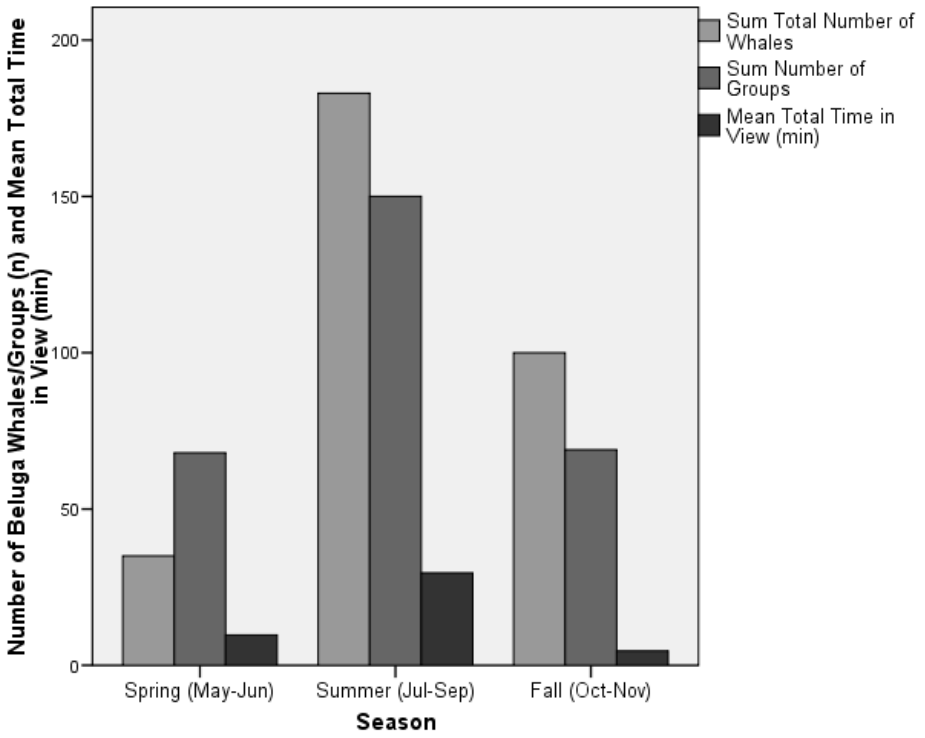


Figure 4.3. Beluga whale observations by season.

4.3.3 Beluga whale sightings by tidal stage

Whale sightings (total number of whales and number of groups) were evenly distributed across ebb and slack tidal stages, with two notable exceptions (Figure 4.4). There was a significantly greater total number of whales observed during high ebb tides (ANOVA, $F_{5,84} = 4.43$, $p = .00$); however 72 of the 111 whales observed during this tidal stage were in November 2008, including two large groups (n = 57) traveling south on November 7. There were significantly fewer groups of whales observed during low ebb tides (ANOVA, $F_{5, 84} = 2.77$, $p = .01$). There were no significant differences in the mean time whales were in view across any of the tidal stages (ANOVA, $p > .05$).

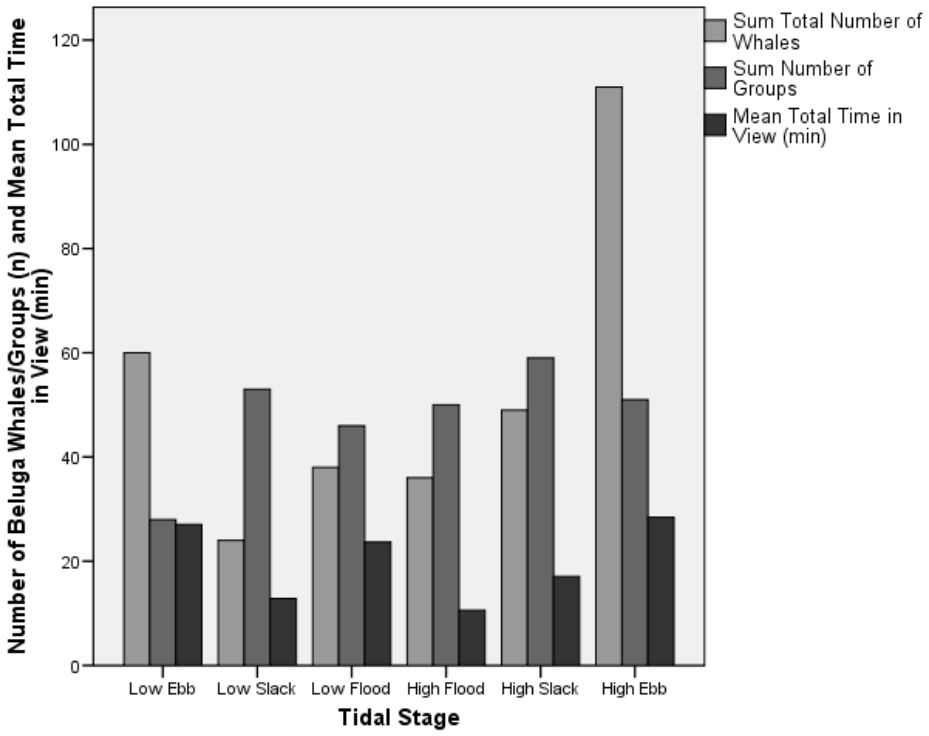


Figure 4.4. Beluga whale sightings by tidal stage. The stages are defined as hours before (-) or after (+) low tide; each stage is two hours in duration.

4.4 Spatial Distribution of Beluga Whales

4.4.1 Spatial distribution relative to the MTR Project footprint

Twenty-eight of the 90 total sightings, approximately 31%, were observed in grid cells within the MTR Project footprint, and another single sighting was adjacent to the Project footprint (Figure 4.5). The total time belugas spent within or adjacent to the MTR Project footprint was approximately 4.93 hours (296 minutes), ~ .006 % of the total observation time. However, the greatest concentration of whale observations (168 out of 318 individual whales, 53%) occurred within or adjacent to the MTR Project footprint.

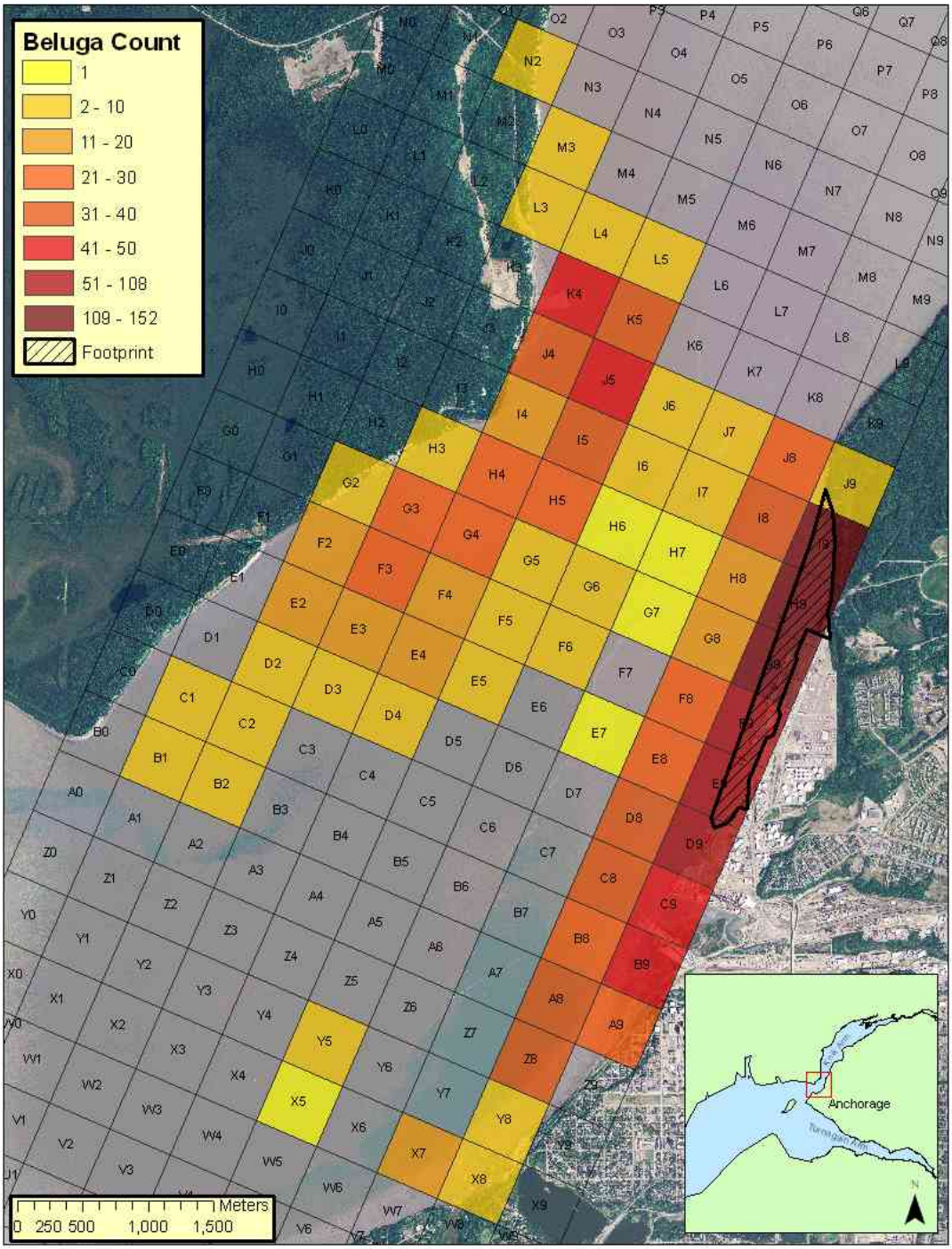


Figure 4.5. Spatial distribution of beluga whales. MTR Project footprint is outlined in black within grid cells E9 – J9. Cells are color coded by the total number of whales observed during the entire reporting period 15 July 2008 – 14 July 2009.

4.4.2 Spatial distribution and movements by month

Overall track lines indicate beluga whales moved through the study area adjacent to the shorelines (Figures 4.6 – 4.7). In August 2008, beluga whales were observed near both shores of Knik Arm, but more frequently on the eastern shoreline, within or adjacent to the MTR Project footprint (Figure 4.6a). September 2008 track lines indicate whales traveled more frequently on the west side of Knik Arm near Port MacKenzie (Figure 4.6b). In October and November 2008, beluga whales traveled on the east side of Knik Arm, within or adjacent to the MTR Project footprint (Figure 4.7a-b). Track lines were not obtained in May 2009, because whales did not surface multiple times during the sightings; however, whales were observed more frequently on the western side of Knik Arm, between Port MacKenzie and Point MacKenzie.

4.4.3 Spatial distribution by tidal stage

Spatial distribution by tidal cycle was primarily along the shore (Figures 4.8 – 4.9). During low ebb and slack tides, beluga whales were fairly evenly distributed across the mouth of Knik Arm, with increased presence on the eastern shoreline during low ebb tides, and on the western shoreline during low slack tides. They were heavily concentrated on the western shoreline during low flood tides. During high flood tides, whales were concentrated on the western shoreline between Port MacKenzie and Point MacKenzie. High slack-tide observations were also few and were split between both eastern and western shores. The majority of sightings during high ebb tides occurred in November, when substantial numbers of whales (n = 72) were observed traveling south along the eastern shoreline within and adjacent to the MTR Project footprint.

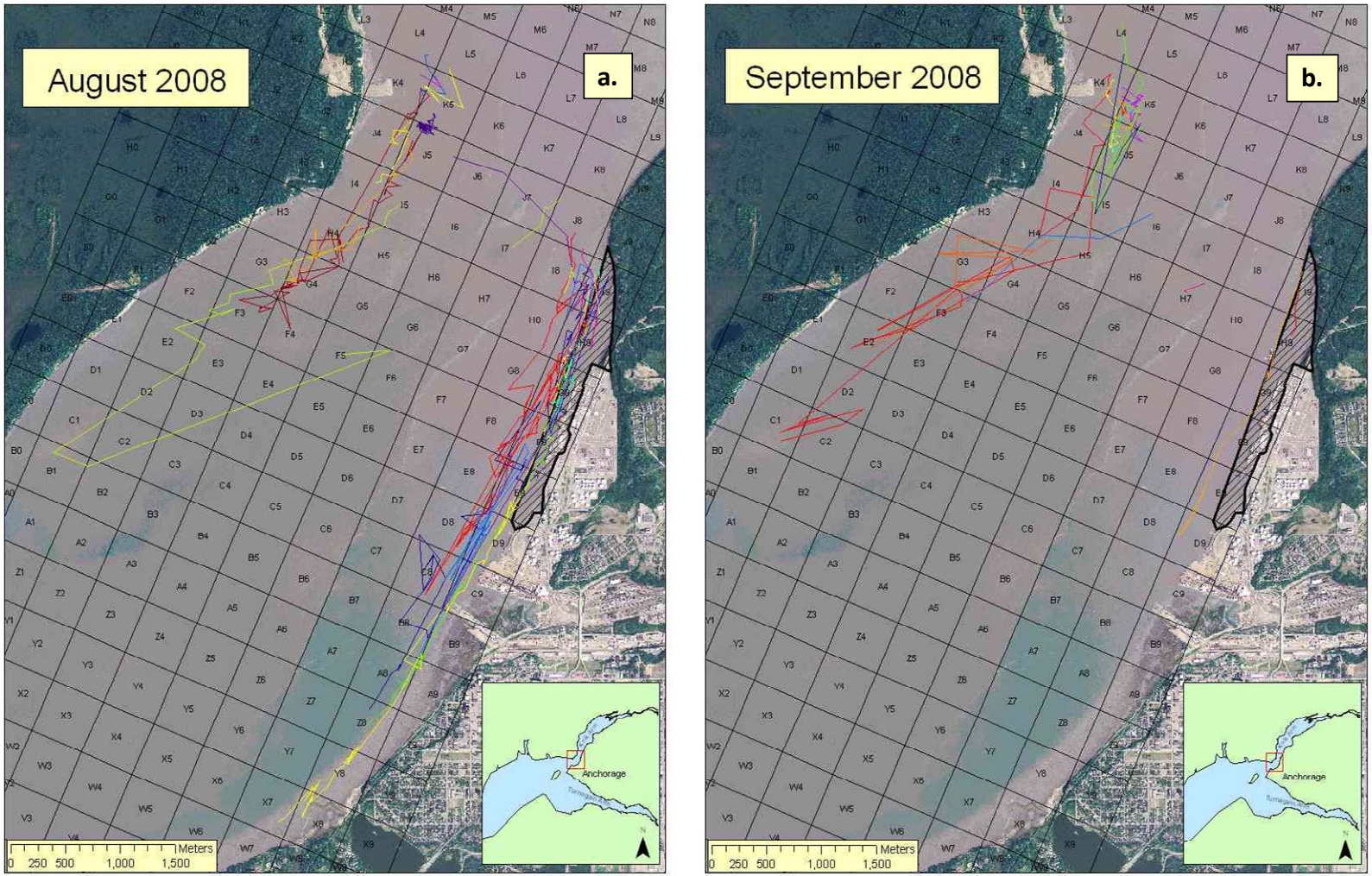


Figure 4.6. Movement of beluga whale groups by month for August and September 2008. Each colored track line represents one beluga whale group, and does not reflect group size or composition. MTR Project footprint is outlined in black and cross hatched.

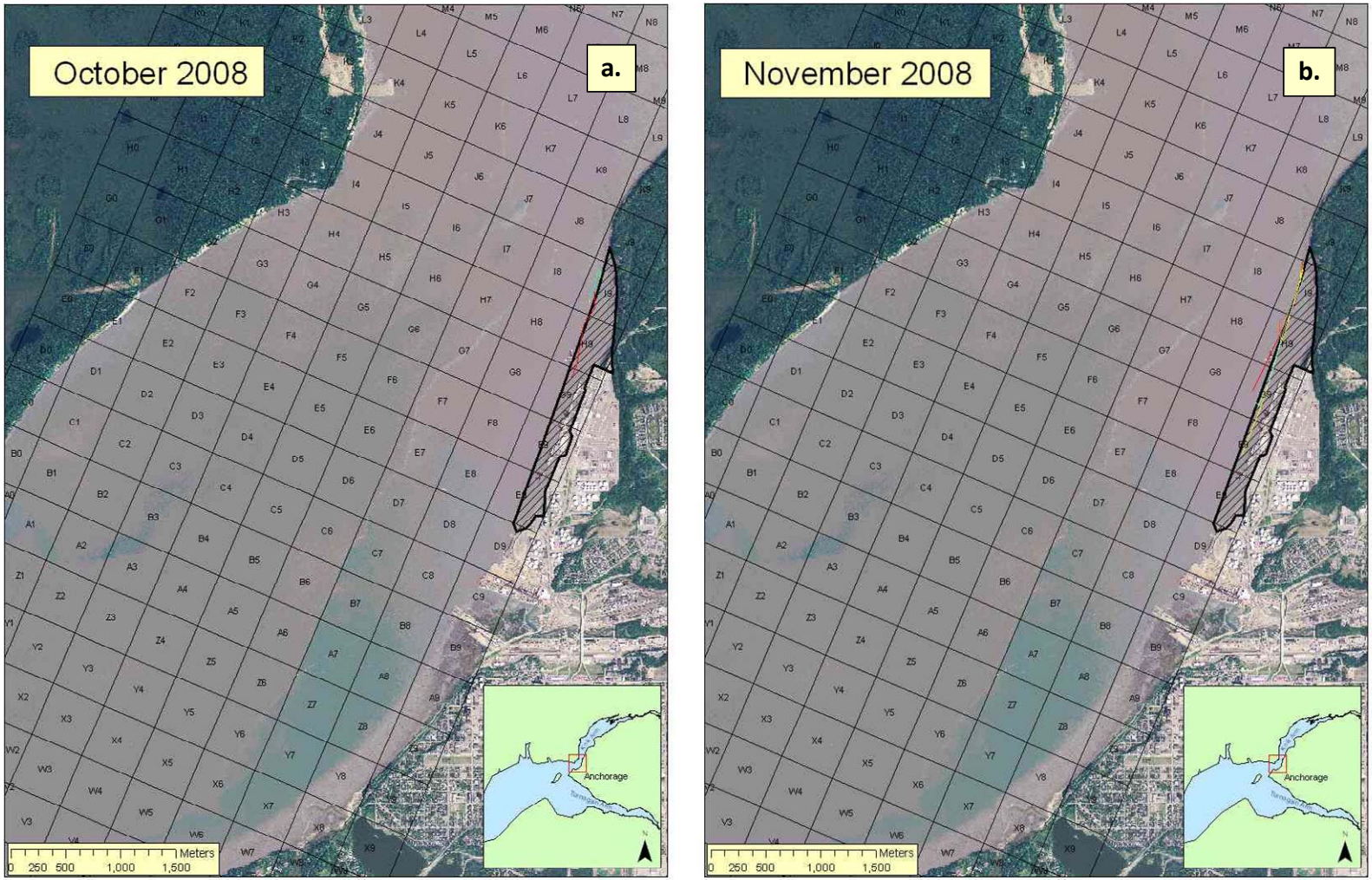


Figure 4.7. Movement of beluga whale groups by month for October and November 2008. Each colored track line represents one beluga whale group, and does not reflect group size or composition. MTR Project footprint is outlined in black and cross hatched.

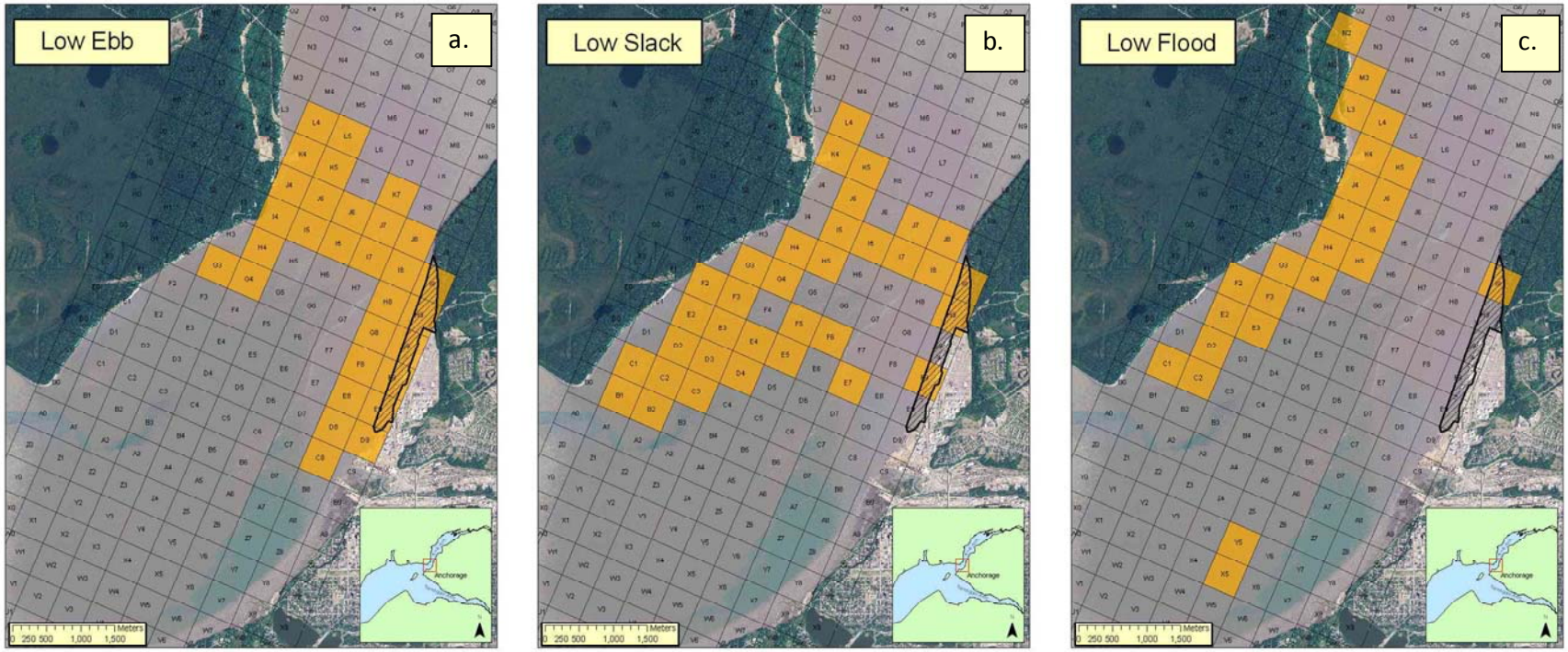


Figure 4.8. Spatial distribution of beluga whales across tidal stages during low tides. MTR Project footprint is outlined in black and cross hatched.

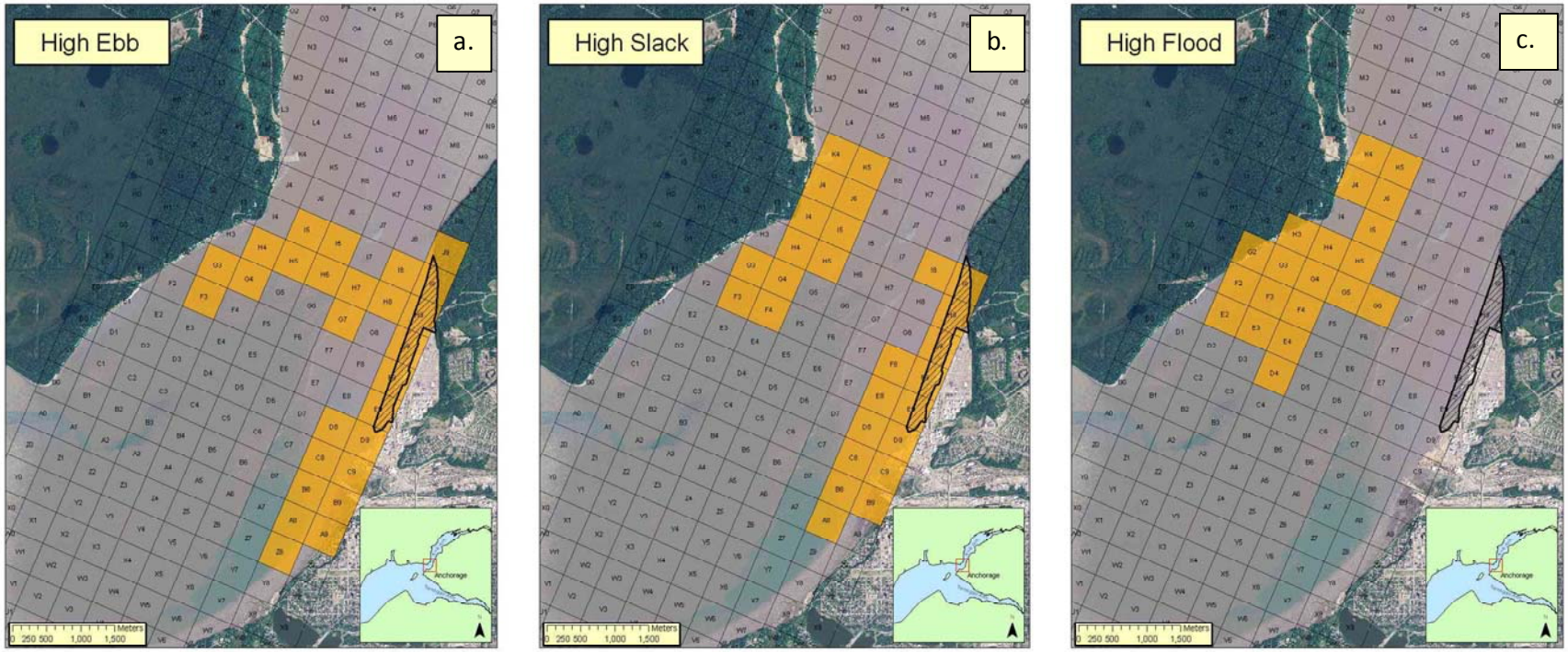


Figure 4.9. Spatial distribution of beluga whales across tidal stages during high tides. MTR Project footprint is outlined in black and cross hatched.

4.5 Group Size and Structure of Beluga Whales

A total of 224 white, 58 gray, 26 dark gray (calves) and 10 whales whose color could not be definitively determined were observed during the period July 15, 2008 – July 14, 2009 (Figure 4.9). Mean group size was 3.53 ± .50 individuals. Only nine groups contained identified calves, and groups with calves were larger on average (12.89 ± 3.43 individuals) than those without. All but two groups containing calves were sighted within or adjacent to the MTR Project footprint.

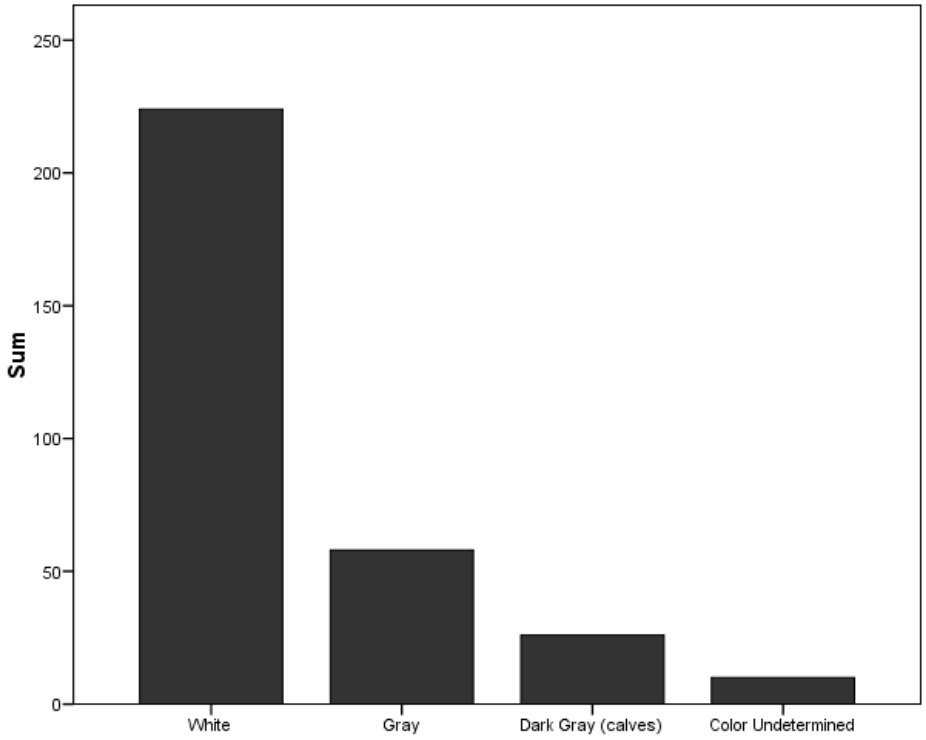


Figure 4.10. Number of beluga whales in each color class during the period 15 July 2008 through 14 July 14 2009.

4.6 Movements and Behavior of Beluga Whales

Whales were observed moving north through the study area during the late summer and early fall, and traveling south during the late spring and fall. Two large groups (n = 57) were observed moving south through the study area in mid-November 2008. Whales were primarily engaged in milling (n = 112) and diving (n = 40) behaviors. On several occasions where diving was observed, feeding was suspected but never confirmed (n = 21). No unusual behavioral events (e.g., abrupt directional changes, rapid descents) were observed during the study period.

Seventy-four of the 90 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 = 15) or were milling in dense (n = 15) or dispersed (n = 20) groups. Six groups with calves were travelling in densely packed groups and 2 were travelling in dispersed groups. One group with calves was observed milling in a dispersed group.

4.6.1 Responses to pile driving

There were no observed behavioral changes (e.g., abrupt behavioral changes, rapid descents) or other indicators of response to pile driving or other in-water construction. This is consistent with previous years' observations.

4.7 Other Marine Mammals

Two harbor seals (*Phoca vitulina*) were observed during the entire period from 15 July 2008 – 14 July 2009. The first seal was observed on 2 September 2008 at 16:25 in Grid Cell J9. The seal surfaced briefly and was not observed again. On 15 June 2009 between 11:34 and 12:00, a second harbor seal was observed within the MTR Project footprint in grid cells H8 and I9 in an area near where dredging operations and vibratory hammer pile driving were being conducted. The harbor seal's primary activity was diving and the secondary activity was suspected feeding. No other marine mammals (except beluga whales) were sighted by APU observers during the study period.

5.0 Discussion – Beluga Whales

Beluga whale habitat use, distribution and movements, and behavior were similar during the period 15 July 15 2008 – 14 July 2009 as in previously reported seasons. No surface behavioral responses to construction activities were observed.

5.1 Temporal Distribution

Peaks in beluga whale sightings in August and September are consistent with previous observations (Hobbs et al. 2005, Markowitz and McGuire 2007), indicating that beluga whales continue to move through Knik Arm in response to movements of their primary prey. The peak in November is consistent with an increase in late fall observations in 2007 (Cornick and Saxon-Kendall 2008). This second year of consistent November observations suggests that ice-free conditions in Knik Arm continue to persist beyond those of previous years, and beluga whales appear to be remaining in the study area until forced to move into the lower Cook Inlet by the intrusion of ice. Ice-free conditions

could provide increased foraging opportunity before winter, increased protection for calves from predation, or both.

5.2 Spatial Distribution

Spatial use patterns are consistent with those reported by Markowitz and McGuire (2007), specifically a high degree of use of the area within and adjacent to the MTR Project footprint. However, Markowitz and McGuire's (2007) observational effort was focused primarily around the Port and the construction zone, so their observations did not capture the whales' substantial habitat use along the western shoreline of Knik Arm. This section of the study area would include known foraging areas around the Little Susitna River and other potential foraging areas on the side of Knik Arm opposite the MTR Project footprint.

5.3 Group Size, Structure and Behavior

Mean group size during 2008-2009 (~4 whales) was comparable to 2007 (~ 4 whales) and 2006 (~ 3 whales; Markowitz and McGuire 2007). However, the mean size of groups with calves was larger in 2008-2009 than in 2006 (13 and 10 whales, respectively). Group dispersion during 2008-2009 was comparable to 2006 and 2007, with the majority of groups of greater than one individual being tightly spaced.

Observed beluga whale behavior was also consistent with previous observations, with whales primarily traveling through the study area to and from likely foraging areas further up Knik Arm (e.g., Fish Creek, Eagle River, and Eklutna). As in previous years, whales were observed following tidal cycles through the study area, moving into Knik Arm on the rising tide and back out on the falling tide, putting them primarily in the study area during slack tides (Figure 4.4). Of the 111 whales that were observed during the high ebb tide, 57 (51%) were the two large groups of whales that were observed during November, 2008. Therefore the peak in number of whales during this tidal cycle is not typical.

5.4 Responses to pile driving

No unusual behavioral changes or abrupt changes of direction or patterns of movement were observed during the study period, during pile driving, or during any other in-water construction activities.

6.0 Summary

Overall, beluga whale habitat use, movement and behavior during the 15 July 2008 – 14 July 2009 study period were all consistent with observations by LGL in 2006 (Markowitz and McGuire 2007) and APU in 2007 (Cornick and Saxon-Kendall 2008). 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 for the second year. 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 second year performing marine mammal monitoring for the MTR Project. Laurie Butler, Sam Cunard and everyone at ICRC provided APU with excellent logistical support. Nearly a dozen APU students worked as observers during 2008 and 2009 and also assisted with data entry. The opportunity provided by ICRC, the Port of Anchorage and the Maritime Administration is a significant enhancement to their education and training in the APU Marine Biology Program.

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APPENDIX

APU Sighting Log

POA Land-Based Surveys of Marine Mammals: Beluga whales (*Delphinapterus leucas*)

Alaska Pacific University

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

Verified_________
Entered by_______
Sheet #_______________

Sampling Round	Best Sample □	Time (hh:mm)	Count				Harbor Seal	Harbor Porpoise	Steller Sea Lion	Killer Whale	Other	Magnetic Compass Bearing 001-360°	Grid Cell	Group #	Group Code	Activity		Direction	Previously Counted Y/N/U		In-water Construction Activity		Start/End/Arrive/Leave (S/E/A/L)		Comments	Comments on the Reverse □
			Adults	Sub-Adults	Calves	Unk										1	2		You	Other	1	2	CON 1	CON 2	Write additional comments on the reverse side of this sheet. Be sure to identify which record additional comments are associated with.	
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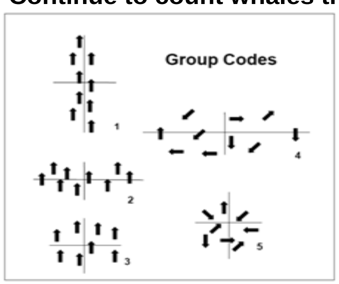
Note the time at the first and last sighting of each whale/group. Identify EACH grid cell the whales move through and note the time they enter each cell!!
Continue to count whales throughout the time the whales are in the area, until you get an accurate count (Best Sample)



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	Startled 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
							☐	☐				☐					☐
							☐	☐				☐					☐
							☐	☐				☐					☐
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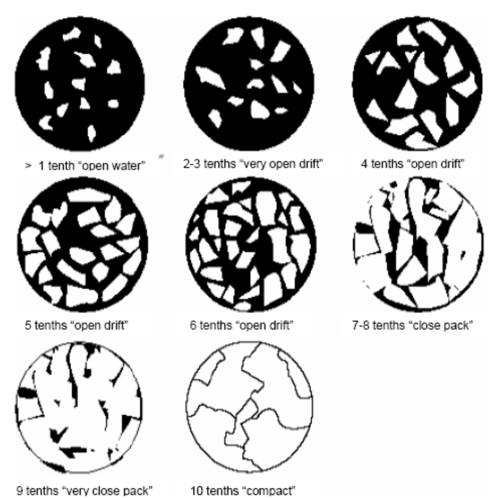
Sea State	Description
0	Sea like mirror
1	Ripples but without foam crests
2	Small wavelets
3	Large wavelets, perhaps scattered white horses
4	Small wavelets, fairly frequent white horses

Sea Ice Concentration (tenths 00-10)



Types of Vessels	
Ship	Skiff
Tug boat	Dredge
Barge	Coast Guard
Tug & barge	Other
Dredge	

Overall Conditions	
1	Poor
2	Moderate
3	Excellent