

**Request for Incidental Harassment  
Authorization**

Removal of Berth II Rock Pinnacle Project  
Ketchikan, Alaska

*for*  
**City of Ketchikan**

December 7, 2018



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**File No. 5850-002-00**

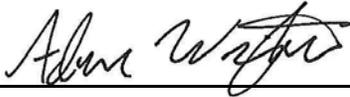
December 7, 2018

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## 1.0 DESCRIPTION OF THE ACTIVITY

### 1.1. Introduction

Ketchikan, the gateway to Alaska, is a major cruise ship destination with over 1 million visitors annually traveling to the area during the warmer months from May to September. The City proposes to remove an existing rock outcrop (commonly referred to as the rock pinnacle), in close proximity to Berth II to expand the area of safe navigation depths for cruise ships (ships) that presently visit Berths I and II. Removing the pinnacle will provide a more reliable ingress and egress for ships over a much wider range of wind and water level conditions. The project is presently scheduled to occur between September 16<sup>th</sup> of 2019 and April 30<sup>th</sup> of 2020. Work occurring within this timeframe includes equipment mobilization, rock pinnacle removal, transporting the material to an appropriate upland stockpile or placement site and equipment demobilization. Blasting will occur between November 15 and March 15 of the proposed work season. The purpose of this summary is to provide a complete project description of the proposed construction activities as related to potential impacts to marine mammals.

The project's timing and duration, and specific types of activity may result in the incidental injurious take (Level A) and incidental harassment (Level B take) of marine mammals. The take is related to construction noise introduced through in-water work from rock blasting. Through guidance provided under the Marine Mammal Protection Act (MMPA), the City is requesting Incidental Harassment Authorization (IHA) for Level A take of one marine mammal species: harbor seal (*Phoca vitulina*) and Level B take of nine marine mammal species: harbor seal, Steller sea lion (*Eumetopias jubatus*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), killer whale (*Orcinus orca*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), gray whale (*Eschrichtius robustus*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) that may occur in the vicinity of the project. The 14 specific items required for this application, as set out by 50 CFR 216.104, Submission of Requests, are provided in Sections 1 through 14 of this application.

### 1.2. Proposed Action

The proposed project includes removal of an offshore submerged rock pinnacle to target dredge depth of -42 feet Mean Lower Low Water (MLLW). Specific details of the Project Action are provided below.

### 1.3. Project Elements

The rock pinnacle is located approximately 1,000 feet west of Berth II and limits vessel navigation to Berths I, II and III during low tide and high wind conditions. An underwater rock pinnacle near the cruise ship docks must be removed to allow ship traffic proper access in and out of the berths. This pinnacle, roughly 320 feet by 150 feet, requires blasting for removal. Up to 7,500 cubic yards of material are expected to be removed through this effort (320 feet by 150 feet by approximately 4 feet).

Removal of the rock pinnacle will bring the entire area to the optimal depth allowing for improved access and berthing for existing vessels during high winds. The -42 feet MLLW target dredge depth for removing the rock pinnacle will result in an overall cut of 4-feet. The approximate total solid volume of rock removed, over the entire area of the pinnacle (about 0.76 acres), is less than 7,500 cubic yards. The removal of the rock pinnacle is important to maintain a safe, accessible, and commercially viable existing facility.

### **1.3.1. Blasting Activities and Noise**

Removal of the rock pinnacle is proposed to occur between September 16, 2019 to April 30, 2020, with blasting only occurring from November 15, 2019 to March 15, 2020. Work to occur within this timeframe includes equipment mobilization, rock pinnacle removal through blasting, dredging of blasted material and transport of the material to an appropriate upland stockpile or placement site, equipment demobilization). There will be up to 50 days of blasting (currently anticipating between 25 and 50 blasts) with up to one blast per day at a maximum weight of explosive of up to of 75 pounds (lbs) per delay. A blast consists of a detonation of up to 75 total pounds of explosive from a series of sequential delays at an interval of 8 milliseconds (ms). The proposed daily blast will consist of a grid of boreholes (total number may vary but typically it ranges between 30 to 60 holes), each loaded with product, then filled in the top section of the borehole with stone (this process is referred to as “rock stemming”). Rock stemming locks the product into the borehole to assure that most of the resulting energy enters the surrounding rock rather than the water column. This mitigates, or reduces, the blast energy released into the water. When the blast is detonated, each small borehole is triggered in a sequential manner to optimize rock fragmentation while minimizing underwater overpressure. This sequence is also important in reducing the amount of energy required to fracture the rock.

Our proposed project specifications stipulate that no more than 75 pounds of explosive per delay. The timing in the blast must assure that the maximum pounds per delay does not exceed 75 pounds. The entire single blast for the day (as proposed for this project), will typically detonate in about less than one second (one second = 1000 milliseconds). Therefore, when the daily blast is detonated, there are only milliseconds between each borehole, and the entire blast takes less than one second. The use of multiple boreholes, confinement of the blast (rock stemming), use of planned sequential delays, all help to direct the blast energy into the rock rather than the water column. Other BMPs include adherence to a winter in-water work window, proper barge set up, accurate drilling, shot duration, limiting the blasts to a maximum of one per day, and marine mammal monitoring. The project will adhere to all federal and state blasting regulations, which includes the development and adherence to blasting plans, monitoring, and reporting. All of the proposed BMPs support the reduction of potential adverse impacts on protected species from in-water noise and overpressure.

#### **1.3.1.1. Waterborne Noise**

As discussed, the proposed project includes underwater blasting of the rock pinnacle which involves noise production that may impact marine mammals.

The area of impacts of the rock pinnacle blasting encompasses the injury and behavioral disturbance zones for marine mammals exposed to waterborne sound pressure levels (SPLs) generated by rock pinnacle blasting (Figures 2 and 3). In 2016, the National Marine Fisheries Service (NMFS) released updated technical guidance for assessing underwater sound effects on marine mammals, establishing new thresholds for PTS, which are considered Level A take. Cetacean thresholds were split into three categories based on auditory frequency range (low, medium, and high) while pinnipeds were split into two groups based on family: phocid and otariid. These thresholds are shown on Table 1.

**TABLE 1 – LEVEL-A TAKE UNDERWATER AUDITORY THRESHOLDS ESTABLISHED BY NMFS (2016)<sup>1</sup>**

Hearing Group	Permanent Threshold Shift (PTS) dB	
	Impulsive	Non-Impulsive
Low-Frequency (LF) cetaceans	183	199
Mid-Frequency (MF) cetaceans	185	198
High-Frequency (HF) cetaceans	155	173
Phocid Pinnipeds	185	201
Otariid Pinnipeds	203	219

Notes:

<sup>1</sup> Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2016).

dB = decibel

Level B take (harassment) criteria were unchanged by NMFS 2016. Impulsive noise (e.g. blasting) will disturb marine mammals at and above 160 dB.

An assessment of underwater blasting source levels and impact areas was conducted by Alaska Seismic & Environmental, LLC. Blasting work will involve 25 to 50 blasts total, one per day, with a maximum explosive weight per delay of 75 lbs. National Oceanic and Atmospheric Administration (NOAA) Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS-OPR-59) was used for underwater acoustic thresholds for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS). Thresholds and distances were also calculated for mortality, gastrointestinal (GI) tract injury, and slight lung injury using disturbance thresholds suggested by Finneran and Jenkins (2012). Blasting threshold distances are included in Table 2 below.

A source level (single shot Sound Exposure Level [SEL]) of 228.42 dB re 1 uPa<sup>2</sup> was selected based on previously recorded underwater overpressure measurements (Carlson, et al. 2011). Site conditions and blasting parameters were similar for this project to the expected conditions for the Ketchikan Removal of Berth II Rock Pinnacle Project. SEL threshold distances were calculated using the NMFS Marine Mammal Acoustic Technical Guidance User Spreadsheet Tool. Threshold distances based on peak sound pressure levels were calculated using an underwater overpressure attenuation model developed by Kolden and Aimone-Martin (2014). The values listed in Table 2 are the more conservative, or larger threshold distance, of the two models.

Mortality and slight lung injury were calculated for harbor seals, as they are the smallest and most vulnerable species expected to be within the vicinity. Calculations were made assuming an 11-kilogram seal at a depth of 10 meters. Gastrointestinal (GI) tract injury is correlated with peak sound pressure levels independently of animal mass and water depth (Finneran and Jenkins 2012), thus only one threshold distance calculation is shown.

**TABLE 2. UNDERWATER BLASTING THRESHOLD DISTANCES**

Hearing Group	Sound Exposure Level (SEL)			
	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (TTS)	
	SEL Threshold (dB uPa <sup>2</sup> s)	Distance (meters [m])	SEL Threshold (dB uPa <sup>2</sup> s)	Distance (m)
Low-Frequency Cetaceans	183.0	1056.1	168.0	10561.1
Mid-Frequency Cetaceans	185.0	9.0	170.0	89.9
High-Frequency Cetaceans	155.0	246.4	140.0	2464.1
Phocid Pinnipeds	185.0	317.4	170.0	3173.6
Otariid Pinnipeds	203.0	23.4	188.0	234.3

Hearing Group	Peak Sound Pressure Level (SPLpk)			
	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (PTS)	
	SPLpk Threshold (dB ref 1uPa)	Distance (m)	SPLpk Threshold (dB ref 1uPa)	Distance (m)
Low-Frequency Cetaceans	219.0	78.3	213.0	152.1
Mid-Frequency Cetaceans	230.0	23.2	224.0	45.0
High-Frequency Cetaceans	202.0	514.0	196.0	998.7
Phocid Pinnipeds	218.0	87.4	121.0	169.9
Otariid Pinnipeds	232.0	18.6	226.0	36.1

Species	GI Tract Threshold SPLpk = 237 (dB ref 1uPa) Distance (m)	Slight Lung Injury Threshold I <sub>s</sub> =123.8 (dB ref 1uPa) Distance (m)	Mortality Threshold I <sub>M</sub> = 289.3 (dB ref 1uPa) (m)
All Marine Mammal Species	10.7	245.8	94.7

**1.3.1.2. Airborne Noise**

Underwater blasting has the potential to generate airborne noise that could impact marine mammals. NMFS has established pinniped in-air acoustic thresholds for Level B disturbance take. Pinniped injury (Level A) take thresholds or cetacean in-air noise thresholds have not been established.

Airborne noise is considered to be discountable and is not discussed in detail throughout this request for IHA because there is extremely limited potential for an airborne disturbance take to occur that would not already be tallied under an associated in-water take (either Level B or Level A). The airborne disturbance areas will be monitored, as discussed in the Marine Mammal Monitoring Plan (MMMP), and the reactions of hauled-out pinnipeds will be discussed in daily reports.

## **2.0 DATES, DURATION, AND SPECIFIED GEOGRAPHIC REGION**

### **2.1. Dates**

Removal of the rock pinnacle is proposed to occur between September 16, 2019 to April 30, 2020, with blasting only occurring from November 15, 2019 to March 15, 2020. Work to occur within this timeframe includes equipment mobilization, rock pinnacle removal through blasting, dredging of blasted material and transport of the material to an appropriate upland stockpile or placement site, equipment demobilization). Removal of the rock pinnacle is expected to require up to 50 days of blasting to complete.

### **2.2. Region of Activity**

The proposed activities will occur offshore from Berth II in Ketchikan, Alaska, on the Tongass Narrows water-body (Figure 1). Berth II is located in the southeastern portion of Ketchikan, opposite Pennock Island and near the mouth of Ketchikan Creek.

For the purpose of this IHA, the region of activity is defined as the Tongass Narrows and extending southeast into the Revillagigedo Channel (approximately 7 miles from Ketchikan). Impacts from the project are not expected to extend further than about three miles northeast of the City, where the noise will intersect landmasses.

## **3.0 SPECIES AND NUMBERS OF MARINE MAMMALS IN THE ACTIVITY AREA**

### **3.1. Species**

This request for IHA addresses nine marine mammal species with potential to occupy waters of the Tongass Narrows and Revillagigedo Channel (Dahlheim, et al. 2009; Allen and Angliss 2014; Muto, et al. 2017; C. Nick, Allen Marine Tours, personal communication; S. Corporon, City of Ketchikan, personal communication; Table 10). A recent IHA issued for the Ketchikan Dock Company's Berth IV upgrade project was also reviewed to assist with determining species occurrence/density estimates for the project impact area.

One of the species, harbor seal, is known to consistently occur near the Ketchikan urban harbors. Common seasonal observations of Steller sea lions are regularly made during the Chinook salmon run in May and June (personal communication, C. Nick, Allen Marine Tours). Humpback whales are known to transit the Tongass Narrows, most commonly between late May and early June. Killer whale, pacific white-sided dolphin, and harbor porpoise have also been observed within the Tongass Narrows most commonly during the summer months. Minke whales, Gray whales, and Dall's porpoise are not regularly seen in this area. Table 3 summarizes stock assessment information for species with potential presence in Southeast Alaska.

**TABLE 3 – MARINE MAMMAL SPECIES POTENTIALLY PRESENT IN REGION OF ACTIVITY**

Common Name	Scientific Name	Stock Abundance Estimate <sup>1</sup>	Endangered Species Act (ESA) Status	MMPA Status	Frequency of Occurrence <sup>2</sup>
Harbor seal	<i>Phoca vitulina</i>	31,634 (Clarence Strait)	Not listed	Not strategic, Non-depleted	Likely
Steller sea lion	<i>Eumetopias jubatus</i>	53,303 (Western distinct population segment [DPS])	Endangered	Strategic, Depleted	Infrequent
		41,638 (Eastern DPS; Southeast Alaska Region)	Not listed	Not strategic, Non-Depleted	Likely
Harbor porpoise	<i>Phocoena phocoena</i>	11,146 (Southeast Alaska)	Not listed	Strategic, Non-depleted	Infrequent
Humpback whale	<i>Megaptera novaeangliae</i>	3,264 (Mexico DPS) <sup>3</sup>	Threatened	Strategic, Depleted	Infrequent
		11,398 (Hawaii DPS) <sup>3</sup>	Not listed	Strategic, Depleted	Infrequent
Killer whale	<i>Orcinus orca</i>	2,347 (Alaska residents) 261 (Northern residents) 587 (Gulf, Aleutian, Bering transients) 243 (West Coast transients)	Not listed	Strategic, Non-depleted	Likely
Dall's porpoise	<i>Phocoenoides dalli</i>	83,400 (Southeast Alaska)	Not listed	Not strategic, Non-depleted	Rare
Minke whale	<i>Balaenoptera acutorostrata</i>	No current estimates	Not listed	Not Strategic	Rare
Gray whale	<i>Eschrichtius robustus</i>	20,990 (Eastern North Pacific Stock) 209 (Pacific Coast Feeding Group [PCFG])	Not listed	Not strategic, Non-depleted	Rare
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>	26,880 (North Pacific Stock)	Not listed	Not strategic, Non-depleted	Infrequent

Notes:

<sup>1</sup>. NMFS marine mammal stock assessment reports at: <http://www.nmfs.noaa.gov/pr/sars/species.htm>.

<sup>2</sup>. Rare: Few confirmed sightings, or the distribution of the species is near enough to the area that the species could occur there.

Infrequent: Confirmed, but irregular sightings. Likely: Confirmed and regular sightings of the species in the area at least seasonally.

<sup>3</sup> Wade, et al. 2016

Harbor seals are the most frequently observed marine mammal species near Ketchikan, within and around the existing harbor. Seals are known to haul out at Walden Rocks within Nichols Passage, approximately 5 miles southeast of the project area. There are no known formally documented haulouts within the Tongass Narrows. Seals are most abundant during the late spring to early summer salmon runs. (C. Nick, Allen Marine Tours, personal communication).

Steller sea lions are less common in the Tongass Narrows, but single individuals or pairs of seals are not uncommon during the summertime Chinook salmon run (Allen Marine Tours, personal communication).

The closest haulout is located on Grindall Island, approximately 20 miles to the west. Steller sea lions are expected to be infrequently present within the disturbance zone during the proposed duration of construction.

There are confirmed sightings of harbor porpoise, Dall's porpoise, humpback whale, gray whale, killer whale, and pacific white-sided dolphin within the Tongass Narrows and/or adjacent disturbance zones. Opportunistic sightings of marine mammals by charter boats operating out of Ketchikan provide the following estimates for each late fall/winter season:

- Harbor porpoise can be common but not abundant in the Tongass Narrows; approximately 30 animals total in groups of two or three, most common from spring through fall.
- Several killer whale pods have been observed in the Tongass Narrows, with highest numbers and frequency during the Chinook salmon run. Occasional winter sightings of smaller migratory groups (transients) with average residency of several days to 1 week.
- Humpback whale are present in the Tongass Narrows and adjacent Clarence strait, with occasional winter sightings some years. Peak densities reported during summertime.
- Dall's porpoise are occasional visitors to the Tongass Narrows; a few individuals have been sited during late fall and winter.
- Minke whales are considered relatively rare in this portion of Alaska with no recorded official observations in Tongass Narrows.
- No information was provided regarding dolphin or gray whale observations. Possible infrequent presence in the project area is conservatively assumed during project construction.

The following sections discuss the species from Table 3 and their numbers in Southeast Alaska, specifically the Tongass Narrows and Clarence Strait when possible.

#### **4.0 AFFECTED SPECIES STATUS AND DISTRIBUTION**

This section includes information on each species' stock status and distribution and includes seasonal information if available. This summary seeks to refine the estimate of animals that are within the region of the project and will serve as the basis for our project related take estimates. There are limitations to the regional knowledge base which we discuss below. No systematic marine mammal surveys have been conducted in the Tongass Narrows, but Dalheim, et al. (2009) conducted cetacean line transect surveys of most of the inland coastal waters of Southeast Alaska between 1991 and 2007. Spring, summer and fall surveys were conducted with a total of 484 survey days logged.

No systematic pinniped survey data were identified for the Tongass Narrows, but the National Marine Mammal Laboratory of National Oceanic and Atmospheric Administration (NOAA) Fisheries maintains a multi-year data base of Steller sea lion counts (Fritz, et al. 2015). This database contains annual survey counts for sea lion pups, juveniles and adults, and the movements of branded animals. Long term haulouts are not located within or closely adjacent to the impact or disturbance zones. Local observers have found sea lions in waters surrounding Ketchikan, mainly during the Chinook salmon run for a few months per year during May and June.

Similarly, no specific abundance data have been identified for harbor seals, but seals within the Tongass Narrows belong to the Clarence Strait stock. No known haulouts occur within Tongass Narrows, however individual or small groups of seals are observed around the harbor and City vicinity. The stock is genetically distinct and believed to be year-round residents, so it is possible to calculate animal densities within this geographical area.

#### **4.1.1. Harbor Seal**

##### **4.1.1.1. Hearing Ability**

NMFS classifies harbor seals as phocid pinnipeds with an approximate in-water hearing range of 50 hertz (Hz) to 86 kilohertz (kHz) (NMFS 2016).

##### **4.1.1.2. Status**

Harbor seals are not listed as depleted under the MMPA and they are not listed under the ESA. The Clarence Strait stock of harbor seals is not classified as a strategic stock (Muto, et al. 2017). Harbor seals occurring near Ketchikan belong to the Clarence Strait harbor seal stock. The current abundance estimate for this stock is 31,634 (Muto, et al. 2017), based on aerial survey data. The minimum population estimate is 29,093. The five-year trend for Clarence Strait harbor seals is estimated at an increase of 921 animals per year. Potential Biological Removal (PBR) calculated for this stock is 1,222 harbor seals.

##### **4.1.1.3. Distribution**

Harbor seals inhabit coastal and estuarine waters off Baja California; north along the western coasts of the United States, British Columbia, and Southeast Alaska; west through the Gulf of Alaska and Aleutian Islands; and in the Bering Sea north to Cape Newenham and the Pribilof Islands. They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed in marine, estuarine, and occasionally fresh waters (Muto, et al. 2017). There are no documented long-term haulout sites for harbor seals in Tongass Narrows; seasonal foraging is known to occur at the mouth of Ketchikan Creek, typically during late summer/early fall pink salmon runs (S. Corporon, City of Ketchikan, Ports and Harbors Director, personal communication).

Harbor seals within the Clarence Strait stock have maintained an increasing population over the past 5 years. The latest stock assessment analysis indicates that the Clarence Strait population trend is an increase of 921 seals per year, with a low probability (21 percent) that the stock is decreasing based on 5-year trend analysis (Muto, et al. 2017). The Clarence Strait stock (31,624 seals) covers approximately 10,677 square kilometers – a density of about three seals per square kilometer.

##### **4.1.1.4. Presence in Project Area**

Potential disturbance of harbor seals will occur within a maximum area of 3,174 meters from the pinnacle blast. Harbor seal are known to occupy the harbor directly adjacent to the planned pinnacle removal. Daily sightings of harbor seal within the disturbance zone, and occasionally within the injury zone, are expected.

#### **4.1.2. Steller Sea Lion**

##### **4.1.2.1. Hearing Ability**

Steller sea lion are classified by NMFS as otariid pinnipeds with a generalized in-water hearing range of 60 Hz to 39 kHz (NMFS 2016).

##### **4.1.2.2. Status**

The eastern DPS stock of Steller sea lion is currently not listed as “threatened” under the ESA. As a result, this stock is not classified as a strategic stock. The western DPS stock of Steller sea lion is currently listed

as “endangered” under the ESA, and therefore designated as “depleted” under the MMPA. Genetic data indicates that most sea lions in the project area are composed of the eastern stock; however, a percentage of the western stock resides in Southeast Alaska. Based on an input from NMFS, we are not factoring in the western DPS. Therefore, animals potentially affected by the project are assumed to be potentially part of the eastern stock.

The current total population estimate for the western stock in Alaska is estimated at 53,303 based on 2017 survey results. To get this estimate, pups were counted during the breeding season, and the number of births were estimated from the pup count. Because of uncertainties regarding the use of pup data, this estimate is also considered the minimum population estimate. During the 1980s, counts of the western stock declined approximately 15 percent per year, which prompted the listing under the ESA. Survey data in 2002 and subsequent surveys suggest that the overall decline stopped between 2000 and 2002. Trend data collected through 2015 suggest there is strong evidence that the population has increased between 2000 and 2015; however, there are also strong regional differences across the range in Alaska (Muto, et al. 2017).

The current total population estimate for the eastern stock is estimated at 71,562 (Johnson and Fritz 2014) with the U.S. portion of that stock totaling 41,638 and the southeast Alaska region supporting 28,594 eastern Steller sea lions (Muto, et al. 2017). Modeling reporting in the most recent stock assessment indicates population growth of 4.5 percent per year between 1989 and 2015.

We predict that all Steller sea lions observed would belong to the local, unlisted, eastern DPS.

#### **4.1.2.3. Distribution**

Steller sea lions range along the North Pacific Rim from northern Japan to California, with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands. Large numbers of individuals disperse widely outside of the breeding season (late May to early July), thus potentially intermixing with animals from other areas, probably to access seasonally important prey resources (Muto, et al. 2017).

There are several mapped and regularly monitored long-term Steller sea lion haulouts surrounding Ketchikan, such as Grindall island (approximately 20 miles), West Rocks (36 miles), or Nose Point (37 miles), none within in Tongass Narrows (Fritz, et al. 2015). Sea lions are rarely observed in the Tongass narrows during the winter (Nick, C. Allen Marine Tours, personal communication). Fritz, et al. (2015) reported adult counts at Grindall Island averaged about 190 between 2002 and 2015. No pups were recorded during this timeframe. West Rock averaged over 650 adults with 0 to 3 pups observed over the same timeframe. Both the long-term and seasonal haulouts would be considered critical habitat for the species but are outside of the construction impact zones.

Grindall Island is approximately 20 miles outside of the behavioral zone for the blasting, north and west of the Tongass Narrows, coinciding with the shorter range of the injury zone. Given that sea lion presence in Tongass Narrows mostly occurs during the Chinook run, during which no pinnacle blasting will occur, and the nearest haulout site is outside of the behavioral impact zone, it is expected that Steller sea lion exposure to pinnacle blasting will be low. This has been confirmed by local observers, who have reported one to three sea lions in the Tongass Narrows near Ketchikan during the Chinook run, and otherwise rarely observed.

#### **4.1.2.4. Presence in Project Area**

Steller sea lions are common throughout the inside waters of southeast Alaska and reside within the project vicinity, however are not commonly observed in Tongass Narrows outside of the Chinook run. However due to the proximity of the Grindall Island haulout, they are potentially present year-round within the potential disturbance zone.

#### **4.1.3. Harbor Porpoise**

##### **4.1.3.1. Hearing Ability**

Harbor porpoises are classified by NMFS as high-frequency cetaceans with a generalized hearing range of 275 Hz to 160 kHz (NMFS 2016).

##### **4.1.3.2. Status**

Harbor porpoise are not designated as “depleted” under the MMPA nor listed as “threatened” or “endangered” under the ESA (Muto, et al. 2017). Because the abundance estimates are 12 years old and the frequency of incidental mortality in commercial fisheries is not known, the Southeast Alaska stock of harbor porpoise is classified as a strategic stock.

There are three harbor porpoise stocks in Alaska including the Southeast Alaska stock, Gulf of Alaska stock, and the Bering Sea stock. Only the Southeast Alaska stock occurs in the project vicinity. A review of survey data collected from 2010 through 2012 calculated an abundance estimate of 975 harbor porpoises (Dahlheim, et al. 2015). This estimate was split into the northern and southern portion of the unit and only included inside waters of southeast Alaska. Harbor porpoise abundance in the southern portion, including Ketchikan, is estimated to be 577. However, this number may be biased low due to survey methodology (Muto, et al. 2017).

Older abundance surveys which included both coastal and inside waters of southeast Alaska resulted in an observed abundance estimate of 3,766 porpoise (Hobbs and Waite 2010). Correction factors for observer perception bias and porpoise availability at the surface were used to develop an estimated corrected abundance of 11,146 harbor porpoise in both the coastal and inside waters of Southeast Alaska.

##### **4.1.3.3. Distribution**

Harbor porpoise primarily frequent coastal waters, and in the Gulf of Alaska and Southeast Alaska, they occur most frequently in waters less than 100 meters (Dahlheim, et al. 2009). Within the inland waters of Southeast Alaska, the harbor porpoise distribution is clumped, with greatest densities observed in the Glacier Bay/Icy Strait region, and near Zarembo and Wrangell Islands and the adjacent waters of Sumner Strait (Muto, et al. 2017).

Harbor porpoise are spotted sporadically from marine tour ships around Ketchikan (Nick, C. Allen Marine Tours, personal communication). One sighting every three weeks was reported, typically north of the Tongass Narrows in Behm Canal. The duration of these animals remaining in the area is unknown. The mean group size of harbor porpoise in Southeast Alaska is estimated at two individuals (Dahlheim, et al. 2009).

##### **4.1.3.4. Presence in Project Area**

While less common within the Tongass Narrows, harbor porpoise could potentially pass through the area and/or occupy the Revillagigedo Channel year-round.

#### **4.1.4. Humpback Whale**

##### **4.1.4.1. Hearing Ability**

Humpback whales are classified by NMFS as low-frequency cetaceans with a generalized hearing range of 7 Hz to 35 kHz (NMFS 2016).

##### **4.1.4.2. Status**

Several humpback whale DPS are listed as “endangered” or “threatened” under the ESA, and therefore designated as “depleted” under the MMPA. One stock known to potentially occur in Southeast Alaska is the Mexico DPS, which is listed as threatened. The more commonly observed Hawaii DPS of humpback whale is not listed under the ESA.

In 2016 NMFS formally recognized distinct humpback whale populations, of which two are known to occupy Southeast Alaska (Wade, et al. 2016). This study found a strong majority of whales present in the area belong to the unlisted Hawaii DPS, while less than 10 percent of the whales expected within Southeast Alaska belong to the threatened Mexico DPS. Wade, et al. (2016) calculated stock estimates for the newly recognized DPS's: 11,398 for Hawaii and 3,264 for Mexico. Wade, et al. (2016) reports a distribution of 94 percent Hawaii DPS vs 6 percent Mexico DPS humpback whale observation percentage in Southeast Alaska. For the purpose of this assessment we assume 90 percent of humpback whale observations to be of the unlisted Hawaii DPS, while 10 percent belong to the threatened Mexico DPS.

##### **4.1.4.3. Distribution**

Humpback whales are the most commonly observed baleen whale in the area and surrounding Southeast Alaska, particularly during spring and summer months. Humpback whales in Alaska, although not limited to these areas, return to specific feeding locations such as Frederick Sound, Sitka Sound, Glacier Bay, Icy Strait, Lynn Canal, and Prince William Sound, as well as other similar coastal areas (Hendrix, et al. 2011).

Summertime observations of humpback whales commonly transit the Tongass Narrows, particularly in late May into June (Nick, C. Allen Marine Tours; Steve C. City of Ketchikan, personal communication). Wintertime observations are reported occasionally, though not annually.

##### **4.1.4.4. Presence in Project Area**

Humpback whales could be present within the disturbance zones at any point during the year. They are most likely to occur seasonally during periods of prey aggregation, typically during the late spring and summer months.

#### **4.1.5. Killer Whale**

##### **4.1.5.1. Hearing Ability**

Killer whales are classified by NMFS as mid-frequency cetaceans with a generalized hearing range of 150 Hz to 160 kHz (NMFS 2016).

##### **4.1.5.2. Status**

Killer whales occurring near Ketchikan could belong to one of four different stocks: Eastern North Pacific Alaska residents (Alaska residents); Eastern North Pacific Northern resident stock (Northern residents); Gulf of Alaska, Aleutian Islands, and Bering Sea transient stock (Gulf of Alaska transients); or West Coast transient stock. These four stocks are not designated as “depleted” under the MMPA or listed as “threatened” or “endangered” under the ESA (Muto, et al. 2017). Therefore, all four stocks of killer whales are not classified as a strategic stock.

The Alaskan resident stock, including the waters of southeast Alaska, Prince William Sound, and western Alaska is considered to contain 2,347 resident whales (Muto, et al. 2017).

The Northern resident stock is a transboundary stock, and includes killer whales that frequent British Columbia, Canada, and southeastern Alaska (Muto, et al. 2017). Photo-identification studies since 1970 have catalogued every individual belonging to the Northern resident stock and in 2010 the population was composed of three clans representing a total of 261 whales. Because this population has been studied for such a long time, the estimated population size of 261 animals can serve as a minimum count of the population.

In recent years, a small number of the Gulf of Alaska transients (identified by genetics and association) have been seen in southeastern Alaska; previously only West Coast transients had been seen in southeastern Alaska (Muto, et al. 2017). Therefore, the Gulf of Alaska transient stock occupies a range that includes southeastern Alaska. Photo-identification studies have identified 587 individual whales in this stock.

The West Coast transient stock includes animals that occur in California, Oregon, Washington, British Columbia and southeastern Alaska. Analysis of photographic data identifies 243 individual transient killer whales (Muto, et al. 2017).

#### **4.1.5.3. Distribution**

Killer whales are found throughout the North Pacific. Along the west coast of North America killer whales occur along the entire Alaskan coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (Muto, et al. 2017). Seasonal and year-round occurrence has been noted for killer whales throughout Alaska and in the intracoastal waterways of British Columbia and Washington State, where whales have been labeled as “resident,” “transient,” and “offshore” type killer whales based on aspects of morphology, ecology, genetics and behavior.

Local citizens (Nick, C. Allen Marine Tours; Steve C. City of Ketchikan, personal communication) report that several killer whale pods frequent the area, culminating in a large group of 20 to 30 during the Chinook salmon run. Wintertime observations are less common, with a group of five whales reported transiting the narrows in winter 2016/2017, but none the following winter as of January 2018. Despite being rare in occurrence during the proposed time of construction (potentially less than one individual present on average), it must be acknowledged that killer whales often travel in pods and would occur as such if they were to occur at all in the project area. For the purposes of this request we estimate that a group of five whales (pod) may spend up to 10 days near the exposure zone.

#### **4.1.5.4. Presence in Project Area**

Due to the wide variety of life history strategies of the different killer whale populations, they could be present within the disturbance zones at any time throughout the year.

#### **4.1.6. Dall's Porpoise**

##### **4.1.6.1. Hearing Ability**

Dall's porpoises are classified by NMFS as high-frequency cetaceans with a generalized hearing range of 275 Hz to 160 kHz (NMFS 2016).

#### **4.1.6.2. Status**

Dall's porpoise are not designated as "depleted" under the MMPA nor listed as "threatened" or "endangered" under the ESA. The Alaska stock of Dall's porpoise is not classified as a strategic stock.

There are no reliable abundance data for the Alaska stock of Dall's porpoise. Surveys for the Alaska stock of Dall's porpoise were conducted in the late 1980s and early 1990s and identified a population of 83,400 (Muto, et al. 2017).

#### **4.1.6.3. Distribution**

Dall's porpoise are widely distributed across the entire North Pacific Ocean. Throughout most of the eastern North Pacific they are present during all months of the year, although there may be seasonal onshore-offshore movements along the west coast of the continental United States and winter movements of populations out of Prince William Sound and areas in the Gulf of Alaska and Bering Sea (Muto, et al. 2017).

Dahlheim, et al. (2009) found Dall's porpoise throughout Southeast Alaska, with concentrations of animals consistently found in Lynn Canal, Stephens Passage, Icy Strait, upper Chatham Strait, Frederick Sound, and Clarence Strait. Local observers do not report specific sightings of Dall's porpoise, which typically show a strong vessel attraction (Muto, et al. 2017) making observations easy for a keen eye. The mean group size of Dall's porpoise in Southeast Alaska is estimated at three individuals (Dahlheim, et al. 2009).

#### **4.1.6.4. Presence in Project Area**

Sightings of Dall's porpoise are infrequent though not rare near Ketchikan. They could be present on any given day during the construction period.

### **4.1.7. Minke Whale**

#### **4.1.7.1. Hearing Ability**

Minke whales are classified by NMFS as low-frequency cetaceans with a generalized hearing range of 7 Hz to 35 kHz (NMFS 2016).

#### **4.1.7.2. Status**

Minke whales are not designated as "depleted" under the MMPA nor listed as "threatened" or "endangered" under the ESA. Because minke whales are considered common in the waters off Alaska and because the number of human-related removals is currently thought to be minimal, this stock is presumed to not be a strategic stock (Muto, et al. 2017).

The Alaska stock of minke whales occurs in Southeast Alaska. At this time, it is not possible to produce a reliable estimate of minimum abundance for this wide-ranging stock. No estimates have been made for the number of minke whales in the entire North Pacific. Surveys in 2001-2003 of an area ranging from Kenai Fjords in the Gulf of Alaska to the central Aleutian Islands estimate 1,233 animals (Zerbini, et al. 2006). 2010 surveys on the eastern Bering Sea shelf included 1,638 kilometer of effort and provide a provisional estimate of 2,020 whales (Friday, et al. 2013). Neither of these estimates corrected for animals missed on the trackline and only surveyed a portion of the stock's range. Due to lacking abundance estimates the current minimum population number is considered unknown.

#### **4.1.7.3. Distribution**

In the North Pacific minke whales occur from the Bering and Chukchi Seas south to near the Equator (Muto, et al. 2017). Dahlheim, et al. (2009) observed minke whales during the spring and summer, with multiple

sightings near the north end of Clarence Strait and one observation near the Dixon entrance. Observations were concentrated near the entrance to Glacier Bay, far north of the work area. Local observers do not report observations of minke whales, and that they are considered rare in waters around Ketchikan.

#### **4.1.7.4. Presence in Project Area**

While considered rare within the vicinity, small groups of Minke whales could enter the disturbance zones at any time throughout the year.

### **4.1.8. Gray Whale**

#### **4.1.8.1. Hearing Ability**

Gray whales are classified by NMFS as low-frequency cetaceans with a generalized hearing range of 7 Hz to 35 kHz (NMFS 2016).

#### **4.1.8.2. Status**

The Eastern North Pacific (ENP) stock of gray whale was delisted from the ESA in 1994 (NMFS 1994). It is not listed as “depleted” under the MMPA. Crossover in range between the ESA-endangered Western North Pacific (WNP) stock is considered rare, though not unheard of. Various tagging, photo-identification, and genetic studies showed 27 whales identified in the WNP off Russia have been observed in the ENP, including the coastal waters of Canada, the U.S., and Mexico (Carretta, et al. 2017).

The ENP stock of Gray Whale features a relatively small number of whales, including the PCFG that spends summers and falls in the waters between Kodiak Island down to Northern California (Carretta, et al. 2017). Winter migration brings these animals to Baja California, Mexico. Population size is calculated based on migrating whales counted as they pass the central California coast; the most recent estimate of ENP abundance is 20,990 (Durban, et al. 2013). A photographic mark-recapture study (Calambokidis, et al. 2014) calculated an abundance estimate for the PCFG of 209 whales. The population size has been stable or increasing over the last several decades (Muto, et al. 2017).

#### **4.1.8.3. Distribution**

A study of gray whale abundance from Northern California to British Columbia (Calambokidis, et al. 2014) analyzed seasonal timing and abundance of ENP gray whales over 13 years (1998 through 2010). Whales were sighted every day, however very few during December through February when most whales are in or migrating to Mexico. During this study period, 25 whales were reported in the entire Southeast Alaska region, five of which occurred in November, within the proposed construction window (November to March).

Gray whales were not reported during conversations with Ketchikan residents. A gray whale entering the Tongass Narrows appears highly unlikely, however a gray whale could migrate through or near the Dixon Entrance during November, and possibly travel up the Nichols Channel into the marine mammal disturbance zone extending into the Revillagigedo Channel.

#### **4.1.8.4. Presence in Project Area**

A gray whale sighting within the disturbance zone would be considered extremely rare, however they could travel up the Revillagigedo Channel during the work period.

#### **4.1.9. Pacific White-Sided Dolphin**

##### **4.1.9.1. Hearing Ability**

Pacific white-sided dolphins are classified by NMFS as mid-frequency cetaceans with a generalized hearing range of 150 Hz to 160 kHz (NMFS 2016).

##### **4.1.9.2. Status**

Pacific white-sided dolphin are not designated as “depleted” under the MMPA nor listed as “threatened” or “endangered” under the ESA. Because Pacific white-sided dolphin are considered common in the waters of Alaska and because the number of human-related removals is currently thought to be minimal, this stock is presumed to not be a strategic stock (Muto, et al. 2017).

Pacific white-sided dolphins (North Pacific Stock) have an estimation of 26,880 in the most recent stock assessments (2017). Surveys for the Alaska stock of Pacific white-sided dolphin were conducted in the late 1980s and early 1990s (Buckland, et al. 1993) and more recently in 2005, 2006, 2014 and 2016. The abundance estimate is based on recently published report by NMFS 2018 (James, et al. 2018).

##### **4.1.9.3. Distribution**

Dalheim, et al. (2009) frequently encountered Pacific white-sided dolphin in Clarence Strait with significant differences in mean group size and rare enough encounters to limit the seasonality investigation to a qualitative note that spring featured the highest number of animals observed. These observations were noted most typically in open strait environments, near the open ocean. Mean group size was over 20, with no recorded winter observations nor observations made in the Nichols Passage or Behm Canal, located on either side of the Tongass Narrows.

##### **4.1.9.4. Presence in Project Area**

Though generally preferring more pelagic, open-water environments, Pacific white-sided dolphin could be present within the disturbance zone during the construction period.

## **5.0 TYPE OF INCIDENTAL TAKE REQUESTED**

This section summarizes potential incidental take of marine mammals during the pinnacle blasting activities described in Section 1.0 of this IHA application. Incidental take is estimated for each species by estimating the likelihood of a marine mammal being present within an injury or disturbance zone during pinnacle rock blasting activities.

The activities outlined in Section 1.0 have the potential to take marine mammals by exposure to underwater sound. Take will potentially result from waterborne noise from underwater rock blasting.

Only harbor seals and possibly Steller sea lions are expected to forage in the disturbance zone with any frequency and could be exposed multiple times during the project. Because of the habituated behavior of pinnipeds in the work area, there is also the potential for these two species to occupy areas within the injury zone. However, these animals will be protected from exposure to injury by implementation of the marine mammal monitoring program which will prevent blasting from occurring if they observe an animal entering or within the injury zone. Due to the small injury zone for Steller sea lions, no Level A take is requested for this species.

The exposure periods of each species of marine mammal to various noise inducing in-water activities are presented in Table 4.

**TABLE 4 – POTENTIAL EXPOSURE OF MARINE MAMMALS DURING IN-WATER WORK ACTIVITIES**

Species	Level A Injury	Level B Behavior Disturbance
Harbor Seal	Local population over 50 days	Local population over 50 days
Steller Sea Lion	No exposure because of small injury zones <sup>1</sup>	Local population over 50 days
Harbor Porpoise	None <sup>2</sup>	One group of five porpoise every 5 <sup>th</sup> day
Humpback Whale	None <sup>2</sup>	One pod of two whales every 3 <sup>rd</sup> day
Killer Whale	None <sup>2</sup>	One pod of five whales every 10 <sup>th</sup> day
Dall’s Porpoise	None <sup>2</sup>	One group of 10 porpoise every 10 <sup>th</sup> day
Pacific White-Sided Dolphin	None <sup>2</sup>	One group of 20 dolphins every 10 <sup>th</sup> day
Gray Whale	None <sup>2</sup>	One transient whale every 10 <sup>th</sup> day
Minke Whale	None <sup>2</sup>	One group of two whales every 10 <sup>th</sup> day

Notes:

<sup>1</sup> Minimal exposure to Level A injury and airborne disturbance will occur because small injury zones can be effectively monitored during marine mammal monitoring program

<sup>2</sup> Highly unlikely that these mammals will enter the small injury zone near existing facility

## 6.0 TAKE ESTIMATES FOR MARINE MAMMALS

This section summarizes potential incidental take of marine mammals during the project elements described in Section 1.0 of this LOA request. Incidental take is estimated for each species by estimating the likelihood of one or more marine mammals being present within an injury or disturbance zone during rock blasting activities.

Due to the expected sound levels from pinnacle blasting, this IHA application requests incidental take authorization by Level B acoustical harassment for all nine marine mammals considered in this application. Except for harbor seals and Steller sea lions, it is anticipated that all of the marine mammals that enter a Level B acoustical disturbance zone will be exposed to in-water noise only briefly as they are transiting the area. Only harbor seals and possibly Steller sea lions are expected to regularly forage in the Ketchikan project area and could be exposed multiple times during the project activities. Level A take is not expected to occur due to the small area of potential injury threshold and implementation of the MMMP, but a small allocation for harbor seals is requested given their occurrence near the harbor and frequent habituation to in-water construction projects.

### 6.1. Estimated Annual Duration of In-Water Work

The construction schedule is presented in Section 2. Blasting will require up to 50 days with one blast per day during the winter of 2019-2020.

## 6.2. Estimated Zones of Influence/Zones of Exclusion

The distances to the acoustic thresholds for Level B (harassment) and Level A (injury) take for pinnacle blasting are presented in Section 1.3. The zones of influence were calculated and are summarized in Table 2. These distances include in-air disturbance zones that will be limited to harbor seals and Steller sea lions.

## 6.3. Estimated Incidental Takes

Incidental take is estimated for each species by considering the likelihood of a marine mammal being present within the disturbance zone during a blasting event. Expected marine mammal presence is determined by past observations and general abundance near the Ketchikan waterfront during the construction window. The take requests for this IHA were estimated using local marine mammal data sets (e.g., National Marine Mammal Laboratory databases; Dahlheim, et al. 2009) and observations from local Ketchikan charter operators and residents. A recent IHA for nearby construction (Solstice 2018) was also reviewed to identify marine mammal group size and potential frequency of occurrence within the project vicinity. The calculation for marine mammal exposures is estimated by the following two equations:

Level B Exposure estimate = N (number of animals) × number of days animals are expected within disturbance zones from noise generating activities.

Level A Exposure estimate = N (number of animals) × number of days that an injury zone is estimated to occur for each activity.

Most species will be present only occasionally. It is assumed that take requests will include multiple harassments of the same individuals, particularly with harbor seals. Take requests are summarized in Table 5 and discussed for each individual species below.

**TABLE 5. ESTIMATED SPECIES OCCURRENCE AND TAKE CALCULATIONS FOR 50 DAYS OF BLASTING**

Species	Estimated Sighting Frequency	Estimated Group Size Range	Estimated Max Group Size	Level A take Calculation	Level B take Calculation
Harbor Seal	Daily	1-3	3	Two animals x 50 days of construction = 100	Three animals per group x three groups per day x 50 days of work = 450
Steller Sea Lion	Daily	1-10	50+	--	10 animals per group x 50 days of work = 500
Harbor Porpoise	One sighting every 5 <sup>th</sup> day	1-5	10+	--	Five animals per group x 50 days of work x (1/5) = 50
Humpback Whale	One sighting every 3 <sup>rd</sup> day	1-2	5	--	Two animals per group x 50 days of work x (1/3) = 33
Killer Whale	One sighting every 5 <sup>th</sup> day	1-5	10	--	Five animals per group x 50 days of work x (1/5) = 50
Dall's Porpoise	One sighting every 10 <sup>th</sup> day	5-15	20	--	10 animals per group x 50 days of work x (1/10) = 50

Minke Whale	One sighting every 10 <sup>th</sup> day	1-3	100+	--	Two animals per group x 50 days of work x (1/10) = 10
Gray Whale	One sighting every 10 <sup>th</sup> day	1-2	3	--	One animal per group x 50 days of work x (1/10) = 5
Pacific White-Sided Dolphin	One sighting every 10 <sup>th</sup> day	20-50	100+	--	20 animals per group x 50 days of work x (1/10) = 100

### 6.3.1. Harbor Seal

Harbor seals are a common observation around the Ketchikan waterfront, and likely utilize other, less developed nearshore habitats within and adjacent to the disturbance zones. Harbor seals can occur in the project area year-round with an estimated maximum group size of three animals (Solstice 2018). We conservatively estimate that three groups of three harbor seals could be present within the disturbance (Level B) area on each day of construction and two harbor seals could be present within the Level A zone on each day of construction. Potential airborne disturbance would be accounted for by the disturbance zone, which covers a wider distance and is assumed to be active each day of construction. Using these estimates the following number of Harbor seals are estimated to be present through the construction period.

#### 6.3.1.1. Level B

- Blasting: three groups of animals x three animals per group x 50 days of construction = 450

The City is requesting authorization for 450 Level B acoustical harassment takes of harbor seals.

In addition to the Level B take request above, the nature of the construction leaves the potential for Level A take (injurious) of harbor seal. Blasting PTS onset occurs within 317.4 meters of the blast. While the MMMP's goal is to minimize this take, several harbor seals are known to occupy the nearby harbor and utilize the downtown Ketchikan waterfront. Due to the size of this area it is unlikely that all potential Level A take of harbor seals be prevented. To be conservative, we expect that an average of two harbor seals per day may approach and enter the PTS zone during pinnacle blasting activities.

#### 6.3.1.2. Level A

- Blasting: two animals x 50 days of construction = 100

The City is requesting authorization for 100 Level A acoustical injury takes of harbor seals for the duration of the project.

### 6.3.2. Steller Sea Lion

Known haulouts are well outside of the pinnacle blasting disturbance zone. However, Steller sea lions are residents of the wider vicinity and could be present within the disturbance area on any given day of construction. Steller sea lion observations in the project area typically include groups composed of up to 10 animals (Solstice 2018). We conservatively estimate that a group of 10 sea lions could be present within the disturbance zones on any given day of construction.

No exposure to the blasting injury zone is expected based on the small size of these zones. The injury disturbance zones can be effectively monitored during the marine mammal monitoring program and prevent exposure and take. Using these estimates the following number of Steller sea lions are estimated to be present in the Level B disturbance zones:

- Blasting: 10 animals daily over 50 days of work = 500 Level B disturbance takes

The City is requesting authorization for 500 Level B acoustical harassment takes (assumed all eastern DPS). Given the low numbers of sea lions estimated to be present near Ketchikan during construction, it is expected that the great majority of the exposures will be to the same individual animals.

### **6.3.3. Harbor Porpoise**

Based on observations of local boat charter captains and watershed stewards, transient populations of harbor porpoise are infrequently encountered in small numbers in the Tongass Narrows, and more frequently in the nearby larger inlets and Clarence Strait. Therefore, they could potentially transit through both the disturbance zone during a blasting event. They would not be expected to occupy the Ketchikan waterfront and be exposed to the injury zone, except on a transitory basis. Harbor porpoises observed in the project vicinity typically occur in groups of one to five animals with an estimated maximum group size of eight animals (Solstice 2018). The frequency of harbor porpoise occurrences in the project vicinity is estimated to be one group passing through the area per month (Solstice 2018). For this analysis we use a conservative estimate and assume that a group of five harbor porpoise could be sighted in the disturbance zone every 5<sup>th</sup> day, or approximately once per week.

Using this number, the following number of harbor porpoise are estimated to be present in the disturbance zone:

- Blasting: five animals x 50 days of work divided by 5 (frequency of occurrence) = 50

The City is requesting authorization for 50 Level B acoustical harassment takes of harbor porpoise. Observers implementing the MMMP are expected to prevent potential Level A take, which is not requested for this species.

### **6.3.4. Humpback Whale**

Based on observations of local boat charter captains and watershed stewards, humpback whales regularly utilize the surrounding waters and are occasionally observed near Ketchikan, most often on a seasonal basis. Most observations occur during the summer with sporadic occurrences during other periods. The typical humpback whale group size in the project vicinity is between one and two animals observed at a frequency of up to three times per month (Solstice 2018). For the purpose of this assessment it is conservatively estimated that a group of two humpback whales will be sighted within the disturbance zones every 3<sup>rd</sup> day.

Using this number, the following number of humpback whales is estimated to be present in the disturbance zone:

- Blasting: two animals x 50 days of work divided by 3 (frequency of occurrence) = 33

The City is requesting authorization for 33 Level B acoustical harassment takes of humpback whales. Of this number, we estimate 30 humpback whales will belong to the unlisted Hawaii DPS while three will belong to the ESA-Threatened Mexico DPS.

#### **6.3.5. Killer Whale**

Killer whales could occur within the action area year-round. Typical pod sizes observed within the project vicinity range from 1 to 10 animals and the frequency of killer whales passing through the action area is estimated to be once per month (Solstice 2018). For the purposes of this request we estimate that a group of 5 whales may be sighted within the disturbance zone once every 5<sup>th</sup> day, or about once per week. Using this number, the following number of killer whales are estimated to be present within disturbance zones:

- Blasting: five animals x 50 days of work divided by 5 (frequency of occurrence) = 50

The City is requesting authorization for 50 Level B acoustical harassment takes of killer whales. This take could come from any of the Alaska Resident, Northern Resident, Gulf of Alaska transients, or West Coast Transient subpopulations.

#### **6.3.6. Dall's Porpoise**

Based on local observations and regional studies, transient populations of Dall's porpoise are infrequently encountered in small numbers in the waters surrounding Ketchikan. Therefore, they could potentially transit through the continuous noise disturbance zone during construction. Typical Dall's porpoise group sizes in the project vicinity range from 10 to 15 animals observed roughly once per month (Solstice 2018). For this analysis we use a conservative estimate and assume that a group of 10 Dall's porpoise could be sighted within the disturbance zone every tenth day, or about every other week. Using this assumption, the following number of Dall's porpoise are estimated to be present in the disturbance zone:

- Blasting: 10 animals x 50 days of work divided by 10 (frequency of occurrence) = 50

The City is requesting authorization for 50 Level B acoustical harassment takes of Dall's porpoise.

#### **6.3.7. Minke Whale**

Based on observations of local marine mammal specialists, the possibility of minke whales occurring in the Tongass Narrows is rare. Minke whales are generally observed individually or in groups of up to three animals. This, along with scientific survey data showing that this species has not been documented within the vicinity, indicates that there is little risk of exposure to waterborne noise from the project. However, the accessible habitat in the Revillagigedo Channel leaves the potential that minke whale could enter the disturbance zone. We conservatively estimate that two minke whales may be sighted within the disturbance zone every tenth day, or about once every two weeks.

- Blasting: two animal x 50 days work divided by 10 (frequency of occurrence) = 10

The City is requesting authorization for 10 level B acoustical harassment takes of minke whale.

#### **6.3.8. Gray Whale**

A small feeding aggregation of gray whale are known to utilize the broader Pacific Northwest, roughly between Kodiak Island and northern California. Their presence is highly seasonal, however occasional

observations during late fall/early winter have been reported. No gray whales were observed during surveys of the inland waters of southeast Alaska conducted between 1991 and 2007 (Dahlheim, et al. 2009). It is possible that a migrating whale may venture up Nichols Passage and enter the underwater disturbance zone. We conservatively estimate that one whale may be sighted within the disturbance zone every tenth day, or about every 2 weeks.

- Blasting: one animal x 50 days work divided by 10 (frequency of occurrence) = 5

The City is requesting authorization for five Level B acoustical harassment takes of gray whale. Their potential to enter the Tongass Narrows and approach the Level A injury zone undetected by observers is considered extremely minimal, so no Level A injury take is requested.

#### **6.3.9. Pacific White-Sided Dolphin**

Dolphins are regularly seen within Clarence Strait but have been reported to prefer larger channel areas near open ocean. Their presence within the Tongass Narrows has not been reported. Pacific white-sided dolphin group sizes generally range from between 20 and 164 animals. For the purposes of this assessment we assume one group of 20 dolphins may be sighted within the disturbance zone every tenth day, or about every other week. They are not expected to enter the Tongass Narrows toward their relatively small injury zone, so no Level A take is requested. Based on this assumption, the following number of Pacific white-sided dolphin are estimated to be present within the disturbance zone:

- Blasting: 20 animals x 50 days of work divided by 10 (frequency of occurrence) = 100

The City is requesting authorization for 100 Level B acoustical harassment takes of Pacific white-sided dolphin.

#### **6.3.10. Take Request Summary**

The total number of takes for which Level A Injury and Level B acoustical harassment authorization is requested is presented in Table 6 below.

**TABLE 6 – SUMMARY OF ACOUSTICAL INJURY AND HARASSMENT TAKE REQUESTS FROM BLASTING**

Species	Level A Injury Takes	Level B Harassment Takes	Abundance of Stock	Percentage of Stock Taken
Harbor Seal	100	450	31,634	1.7 <sup>1</sup>
Steller sea lion (eastern DPS)	0	375	41,638	1.7
Steller sea lion (western DPS)	0	125	53,303	0.23
Harbor porpoise	0	50	11,146	0.45
Humpback whale (Hawaii DPS)	0	30	11,398	0.26
Humpback whale (Mexico DPS)	0	3	3,264	0.09
Killer whale	0	50 <sup>2</sup>	Alaska Resident 2,347	2.1
			Northern Resident 261	19.2
			Gulf of Alaska Transient 587	8.5
			West Coast Transient 243	20.6
Dall's porpoise	0	50	83,400	0.06
Minke whale	0	10	Unknown	--
Gray whale	0	5	20,990 (ENP)	0.02 (ENP)
			209 (PCFG)	2.4 (PCFG) <sup>3</sup>
Pacific white-sided dolphin	0	100	26,880	0.37

Notes:

1. Likely will be the same animal over multiple days.
2. Assumes 50 takes from each of the following stocks: the Alaska Resident, Northern Resident, Gulf of Alaska Transient, and West Coast Transient subpopulations.
3. The Pacific Coast Feeding Group (PCFG) is not a formal DPS, however the population utilizing SE Alaska down through the continental US west coast is well studied, with a population estimate calculated, so the more specific numbers are included.

**7.0 ANTICIPATED IMPACT OF THE ACTIVITY**

Level A injury and Level B harassment take requests, and the percentage of each stock that may be temporarily disturbed, are summarized in Table 6 above. Take requests are assumed to include multiple harassments of the same individual(s), resulting in likely overestimates of Take Request Percent of Stock compared to actual take that will occur.

If incidental takes occur, it is most often expected to result in short-term changes in behavior and potential temporary hearing threshold shifts. These takes would be unlikely to have any impact on stock recruitment or survival, and therefore would have a negligible impact on the stocks of these species. Only limited injury (Level A take) to harbor seals is expected to occur as a result of project activities.

The Tongass Narrows does not include any major pinniped haulouts or breeding grounds and is not known as an important feeding ground for cetaceans. Impacts to habitat over existing conditions are negligible and will only occur adjacent to the developed City waterfront. The MMMP will minimize injurious takes to harbor seals and eliminate injurious take on Steller sea lions that may habituate to areas of human activity along the Ketchikan waterfront. The proposed construction window of September 16, 2019 through April 30, 2020 will avoid the salmon and Eulachon spawning runs where the abundance of seal, sea lion, killer whales and humpback whales are highest in the area. This will minimize the number of takes by conducting work when few marine mammals are present and greatly limit the amount of potential take from either injury or behavioral modification.

## **8.0 ANTICIPATED IMPACTS ON SUBSISTENCE USES**

Subsistence harvest of harbor seals and Steller sea lions by Alaska Natives is authorized under the MMPA. Harbor seals and Steller sea lions are available for subsistence harvest in this area (Wolfe, et al. 2013). There are no harvest quotas for other non-listed marine mammals found there. The Alaska Department of Fish and Game (Wolfe, et al. 2013) has regularly conducted surveys of harbor seal and sea lion subsistence harvest in Alaska.

However, as of August 2018, we contacted the Alaska Harbor Seal Commission, the Alaska Sea Otter and Steller Sea Lion Commission, and the Ketchikan Indian Community (KIC, federal-recognized Tribe) to discuss this project. The Alaska Harbor Seal Commission is currently not in operation and was not able to be reached to discuss this project. The Alaska Sea Otter and Steller Sea Lion Commission was reached and said they had no comment regarding this project and recommended we contact Ketchikan Indian Community regarding impacts on subsistence in the project area. Tony Gallegos, the Cultural and Natural Resources Director for the Ketchikan Indian Community, was contacted with no response as of August 30, 2018.

Muto, et al. (2017) reports an average annual harvest of 40 harbor seals in 2011 or 2012, a decline from an average annual harvest of 164 from 2004 to 2008. Given the small amount of harvest compared to the Clarence Strait stock (31,634 seals) and to the minimal amount of Level A take requested (100 seals), we anticipate no impacts to subsistence harvest of harbor seals in the region.

Level A take of Steller sea lions is not requested as their presence within the project area is considered unlikely during the project. We anticipate no impacts to subsistence harvest of Steller sea lions in the region.

## **9.0 ANTICIPATED IMPACTS ON HABITAT**

### **9.1. Introduction**

Blasting will permanently impact habitat directly offshore from the Ketchikan waterfront. Construction activities will have temporary impacts on marine mammal habitat through increases in in-water and in-air sound from underwater blasting. Other potential temporary impacts are on water quality (increases in turbidity levels) and on prey species distribution. BMPs and minimization practices used by the City to minimize potential environmental effects from project activities are outlined in Section 10.0 Mitigation Measures.

## 9.2. Direct Habitat Alterations

The offshore rock pinnacle removal will enhance turning and navigation capacity. This area is roughly 320 feet by 150 feet square with an average of 4 feet in height. Sheet 3 of the attached plan set details the configuration of this feature. Vertical benthic structure provides habitat for a variety of fish and prey species that would be removed during this portion of the project. The surrounding area is heavily trafficked by large and small ships and is not a significant foraging ground. Removal of this pinnacle would not impact growth and/or survival of marine mammal populations.

## 9.3. In-air Noise Disturbance to Haulouts

In-air noise from pinnacle blasting is considered discountable since it will be attenuated by the water column. Noise from construction activities (e.g. crane) are expected to be low and not significant. No documented haulout sites are within the in-air disturbance threshold distances for harbor seals. There is no critical habitat designated within the action area, the nearest Steller sea lion haulout is at Grindall Island, approximately 20 miles northwest from the disturbance area (C. Nick, Allen Marine Tours, personal communication). Therefore, disturbance to hauled out pinnipeds is not anticipated during these construction activities, except when individual animals surface during swimming within the threshold distances. This is already taken into account by underwater take of those animals.

## 9.4. Underwater Noise Disturbance

Ambient underwater background noise levels at Berths I and II have not been collected, but Laughlin (2014) has collected underwater background noise levels at several ferry terminals in Puget Sound, Washington. These levels ranged from 107 to 141 dB<sub>RMS</sub> and have been used to predict a waterborne background level of 120 dB<sub>RMS</sub> at the Ketchikan facility. This level is consistent with waterborne background levels collected at developed facilities within Puget Sound, and was a consistent threshold value used by a review of previously-submitted Alaskan IHAs and LOAs.

There are several short-term and long-term effects noise exposure may have on marine mammals, including impaired foraging efficiency and potential effects of noise on movements of prey, harmful physiological conditions, energetic expenditures, and temporary or permanent hearing threshold shifts due to chronic stress from noise (Southall, et al. 2007). A small injury zone is predicted for cetaceans exposed to underwater noise from pinnacle blasting. This zone ranges from 23.3 to 1,056 meters from the project area; however, it is unlikely that cetaceans will approach undetected by marine mammal observers during construction.

Underwater noise exceeding disturbance thresholds for all marine mammals is estimated to extend for 10,561 meters southeast, beyond the Tongass Narrows. This calculation appears extremely conservative, increasing the quantity of Level B take for several species. Effects from waterborne noise on marine mammals are expected to be short-term considering the impulse-type noise produced and limited to the construction period discussed in Section 1.

Construction activities that increase in-water noise, have the potential to adversely affect forage fish and juvenile salmonids in the project area. Forage fish species are part of the prey base for many marine mammals including seals, sea lions and baleen whales. Adult salmon are a part of the prey base for Steller sea lions, harbor seals, and killer whales. Forage fish and salmonids may alter their normal behavior during pinnacle blasting activities. In-water construction timing has been planned to avoid major spawning and

migration times. After pinnacle blasting is completed habitat use and function will return to pre-construction levels.

### **9.5. Water and Sediment Quality**

Short-term turbidity is a water quality effect of most in-water work including blasting and removal of blasting material through dredging. The project must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area. Turbidity may be increased above background levels within the immediate vicinity of construction activities and could exceed turbidity criteria for state water quality standards (18 AAC 70). Because of local currents and tidal action as well as BMPs, potential water quality exceedances are expected to be temporary and highly localized. The local currents will disperse suspended sediments from dredging of blasted rock material at a moderate to rapid rate depending on tidal stage.

Short-term effects on marine mammal species may occur if petroleum or other contaminants accidentally spill into the Tongass Narrows from machinery or vessels during blasting activities. Assuming normal construction and vessel activities, discharges of petroleum hydrocarbons are expected to be small and are not expected to result in high concentrations of contamination within the surface waters. Management measures will be implemented to minimize the risk of fuel spills and other potential sources of contamination. An approved spill response plan including provisions for on-site containment equipment (including a boom) will be developed prior to any construction activities. Spill prevention and spill response procedures will be maintained throughout construction activities (18 AAC 70). Therefore, short-term adverse effects on marine mammals from accidental spill are expected to be unlikely, and biologically of limited significance and duration if they should occur.

Construction activities, in the form of increased turbidity, have the potential to adversely affect forage fish and juvenile salmonid migratory routes in the project area. Both herring and salmon form a significant prey base for Steller sea lions, and herring is a primary prey of humpback whales. Increased turbidity is expected to occur in the immediate vicinity (on the order of 10 feet or less) of construction activities. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle. Given the limited area affected and high tidal dilution rates, effects on forage fish and salmon are expected to be minor or negligible.

### **9.6. Passage Obstructions**

Pinnacle blasting and removal of rock material through dredging at the project area are not likely to obstruct movements of marine mammals. These activities are occurring for a limited duration and over a limited areal extent, leaving the majority of the Tongass Narrows for marine mammals to pass. A construction barge will be used during the project. Construction vessels maneuvering in the construction area will be limited to a speed of five knots or less.

### **9.7. Conclusions Regarding Impacts on Habitat**

The most likely effects on marine mammal habitat from the proposed project will be a minor alteration of benthic habitat and temporary, short-duration noise, and water and sediment quality effects. The direct loss of habitat available to marine mammals during construction due to noise, water quality impacts, sediment quality impacts, and construction activity is expected to be minimal.

For the most part, adverse effects on prey species during project construction will be short-term. Given the numbers of fish and other prey species in the vicinity, the short-term nature of effects on fish species and the mitigation measures to protect fish during construction, the proposed project is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species.

## **10.0 ANTICIPATED EFFECTS OF HABITAT IMPACTS ON MARINE MAMMALS**

The proposed project will occur within the vicinity of the rock pinnacle footprint and is not expected to result in a significant permanent loss or modification of habitat for marine mammals or their food sources. The most likely effects on marine mammal habitat for the proposed project will be temporary, short duration in-air and in-water noise, temporary prey (fish) disturbance, and localized, temporary water quality effects. The direct loss of habitat available to marine mammals during construction due to noise, water quality impacts and construction activity is expected to be minimal. These temporary impacts have been discussed in detail in Section 9.0, Anticipated Impacts on Habitat.

## **11.0 MITIGATION MEASURES**

The exposures outlined in Section 6.0 represent a conservative maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level A and Level B harassment levels. The project proposes to employ a number of mitigation measures, discussed below, in an effort to minimize the number of marine mammals potentially affected. Marine mammal monitoring and mitigation measures are summarized below and presented in detail in the Removal of Berth II Rock Pinnacle Project Marine Mammal Monitoring Plan (Appendix A).

### **11.1. Mitigation for Rock Blasting Activities**

Removing the underwater rock pinnacle offshore of Berths I and II is a critical action to accommodating existing and proposed cruise ships. Impacts for this activity have been minimized where possible as described below:

- Small diameter holes and tight drill patterns will be used for shallow cuts to properly break rock for blast holes.
- Blast size will vary based on drilling results.
- A minimum of one test blast will be performed to confirm vibration and overpressure compliance.
- Only one blast will be performed per day.

During pinnacle blasting activities, the monitoring zone will include all areas where the underwater SPLs are anticipated to approach the Level A injury zone for all species. The combined pinnacle blasting monitoring zone for marine mammals is predicted to extend 10,561 meters from the pinnacle. This includes a length of underwater sound above background levels extending into the Revillagigedo Channel but intersects various land masses before reaching that distance. Further detail on the observation locations for monitoring this zone is described in the attached MMMP. A monitoring plan will be followed that avoids Level A injury take. The max Level A threshold distance is 1,056 meters, and no blasting will occur when no marine mammals are observed within this area. Further detail regarding the mitigation monitoring for marine mammals is described below:

- Monitoring will start 30 minutes prior to noise-generating activities and extend through 30 minutes after completion of the activity.
- Daily work plans will be discussed with the contractor to identify the appropriate monitoring zone based on location and timing of the blast that day.
- If cetaceans or pinnipeds are observed approaching or are in the pinnacle blasting disturbance zone (Figure 3), blasting will be allowed to continue and a take will be tallied against the allowed behavioral take authorized by the IHA. Data will be taken on the location, behavior, and disposition of the mammal as long as the mammal is within the harassment zone.
- If any cetaceans or pinnipeds are observed approaching the injury zone, blasting contractor would be notified and no blast would be allowed to occur until the animals are observed voluntarily leaving the injury zone or 15 minutes have passed without re-sighting the animal in the disturbance zone.
- During the 30 minutes post blasting, we will confirm extrapolated take through counting individual animals observed) and note any exceedances beyond extrapolated take. This will be assessed on daily basis.

#### **11.1.1. Visual Monitoring Requirements and Protocol**

Monitoring will be conducted by qualified, trained marine mammal observers. An observer is a biologist with prior training and experience in conducting marine mammal monitoring or surveys. This person must have the ability to identify marine mammal species and describe relevant behaviors that may occur in proximity to in-water construction activities. A trained observer will be placed at the best vantage point(s) practicable to monitor for marine mammals and to implement shutdown/delay procedures, when applicable, by calling for the shutdown to the blasting operator.

- Monitoring will begin 30 minutes prior to the pinnacle blast and will continue through completion of these activities, and for 30 minutes after completion. This will help ensure that all marine mammals in the monitoring zone are documented and that no marine mammals are present in the injury zone. Blasting will only commence once observers have declared the shutdown zone (i.e., the injury zone and the disturbance zone[s]) clear of marine mammals. The behavior of marine mammals observed in the project area will be monitored and documented to the extent practicable.
- If a marine mammal approaches/enters the shutdown (injury) zone during pinnacle blasting prior to triggering of the blast, the activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, or after 15 minutes have passed without detection of the animal.

#### **11.1.2. Timing and Daylight Restrictions**

All in-water blasting work will be limited to November 15, 2019 to March 15, 2020. Pinnacle blasting will be conducted during daylight hours (sunrise to sunset) to help ensure that marine mammal observers have acceptable surveying conditions to prevent Level A take.

## 12.0 ARCTIC PLAN OF COOPERATION

Not applicable. The proposed activity will take place in the waters adjacent to Ketchikan in Southeast Alaska. Ketchikan is located south of 60° N, the latitude NMFS regulations consider Arctic waters. No activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, there are no relevant subsistence uses of marine mammals implicated by this action.

## 13.0 MONITORING AND REPORTING

### 13.1. Monitoring Plan

A detailed MMMP has been prepared for this project. The monitoring plan is summarized in Section 11 and provided in Appendix A. The MMMP will be implemented during all in-water blasting activities.

### 13.2. Reporting

A monitoring report of observations and analyses will be prepared to document general compliance and the number of takes as compared to those authorized by NOAA Fisheries/NMFS through this application process.

Observers will collect marine mammal and other observations 30 minutes before, during, and 30 minutes after pinnacle blasting activities, including, at minimum:

- General data.
  - Date and time of activity.
  - Water conditions (e.g., sea state).
  - Weather conditions (e.g., precipitation, percent glare, visibility).
- Specific pinnacle blasting data.
  - Description of the pinnacle blasting activity including the location on the pinnacle.
- Pre-activity and during activity observational data.
  - Date and time survey is initiated and terminated.
  - Description of observable marine mammal behavior within monitoring zones or in the immediate area surrounding the monitoring zones, including the following:
    - Distance from animal to pinnacle blast sound source.
    - Reason why shutdown implemented.
    - If a shutdown was implemented, behavioral reactions noted and if they occurred before or after implementation of the shutdown.
    - If a shutdown is implemented, the distance from animal to sound source at the time of the shutdown.
  - Times when pinnacle blasting is delayed due to weather conditions, presence of marine mammals within shutdown zones, etc.
  - Actions performed to minimize impacts to marine mammals.
- Post-activity processing of data.

- Results, which include the detections of marine mammals, the species and numbers observed, sighting rates and distances, behavioral reactions within and outside of safety zones.
  - Refined exposure estimate based on the number of marine mammals observed during the course of construction.
- Reporting
- Collected data will be compiled into one monitoring report and submitted to NMFS within 90 days of completion of work. The report will contain the information listed above as well as an extrapolated total take estimate based on the number of marine mammals observed during the construction monitoring period. A final report will be submitted with 30 days of resolution of comments on the draft report.

## 14.0 SUGGESTED MEANS OF COORDINATION

In-water and in-air noise generated by blasting are the primary issue of concern to local marine mammals during this project. Potential impacts on marine mammals have been studied, with the results used to establish the noise criteria for evaluating take.

Project planning includes coordination with NMFS and whale-watching charters (when appropriate) to gather information on the location of marine mammals prior to initiating pinnacle blasting. Marine mammal monitoring will be conducted to collect information on the presence of marine mammals within the disturbance and injury zones for this project. A final report documenting minimization measures and monitoring results will be shared with NMFS after the conclusion of the project.

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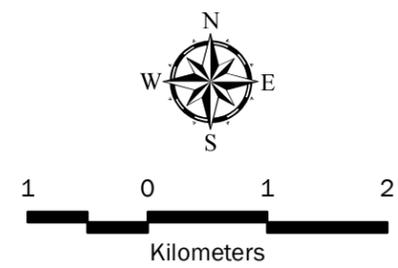
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**Legend**

- Project Area
- Action Area

Data Source:

Projection: NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet



<b>Project Vicinity and Action Area Map</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 1</b>

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Source

East Passage

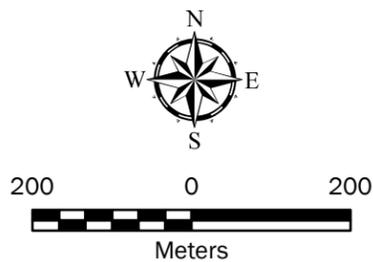
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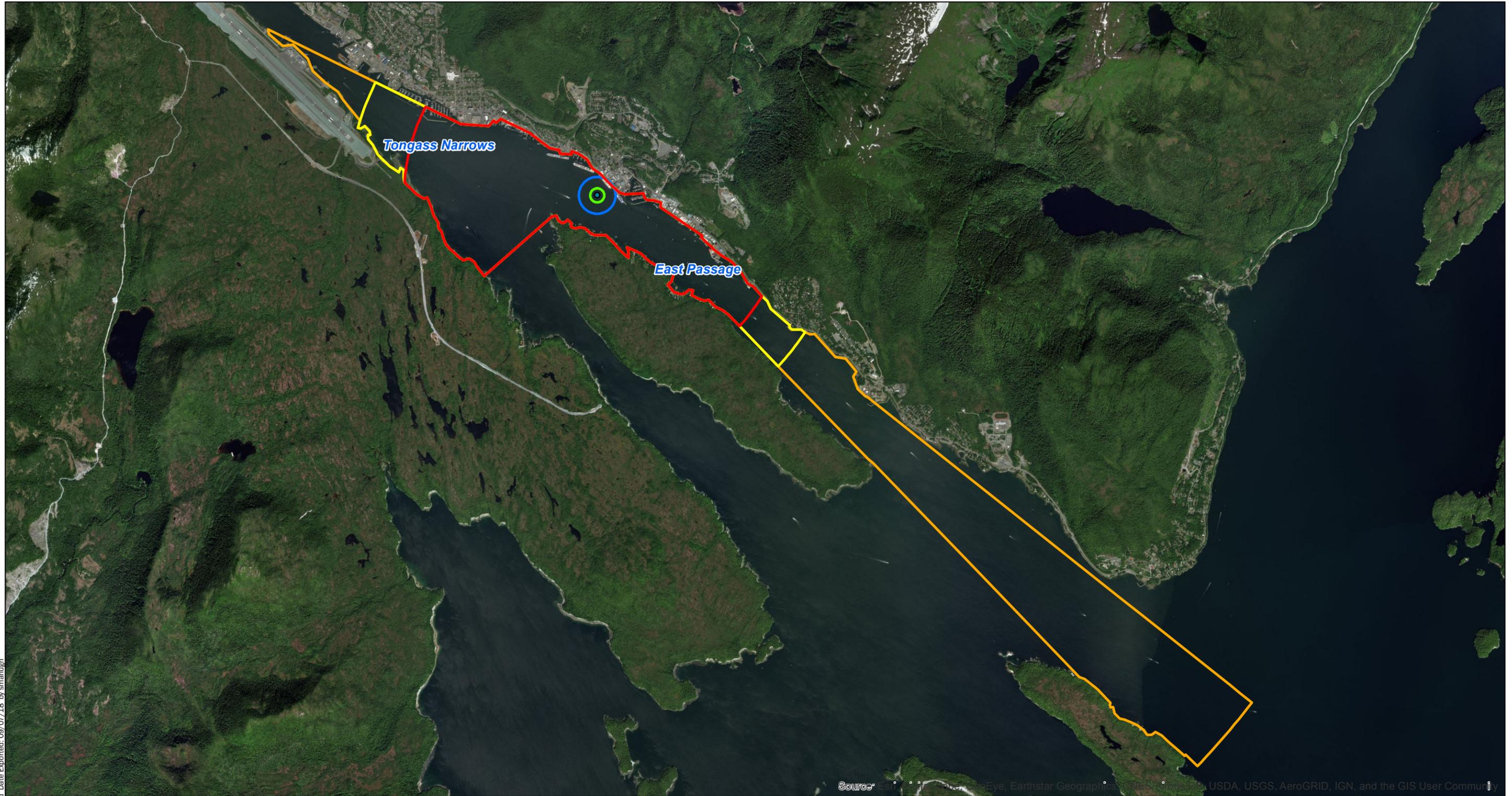
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**Legend**

- MF Cetacean (23.3m)
- Otariid Pinniped (23.4m)
- Phocid Pinniped (317.4m)
- HF Cetacean (514.0m)
- LF Cetacean (1,056.1m)



<b>Pinnacle Blasting Level A Thresholds</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 2</b>



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Source: Esri, DeLorme, GeoEye, Earthstar Geographics, CNES/Airbus, DigitalGlobe, GeoEye, IGN, GeoEye, USDA, USGS, AeroGRID, IGN, and the GIS User Community

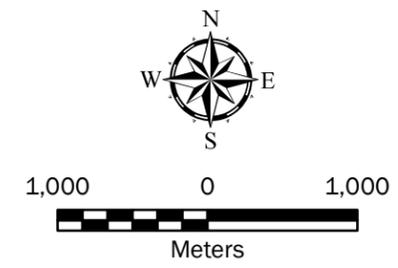
**Notes:**  
 1. The locations of all features shown are approximate.  
 2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

**Legend**

- MF Cetacean (89.9m)
- Otariid Pinniped (234.3m)
- HF Cetacean (2,464.1m)
- Phocid Pinniped (3,173.6m)
- LF Cetacean (10,561.1m)



<b>Pinnacle Blasting Level B Thresholds</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 3</b>



**APPENDIX A**  
**Marine Mammal Monitoring Plan,**  
**Removal of Berth II Rock Pinnacle Project**

## **Marine Mammal Monitoring Plan**

Removal of Berth II Rock Pinnacle Project  
Ketchikan, Alaska

*for*  
**City of Ketchikan**

December 7, 2018



## **Marine Mammal Monitoring Plan**

Removal of Berth II Rock Pinnacle Project  
Ketchikan, Alaska

*for*

**City of Ketchikan**

December 7, 2018



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**Marine Mammal Monitoring Plan**  
**Removal of Berth II Rock Pinnacle Project**  
**Ketchikan, Alaska**

**File No. 05850-002-00**

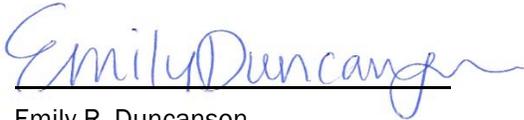
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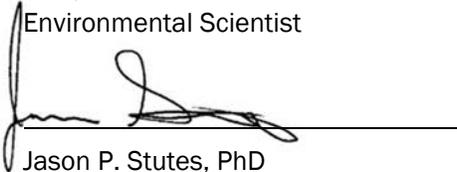
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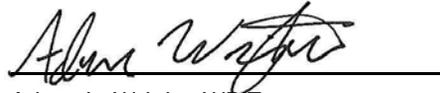
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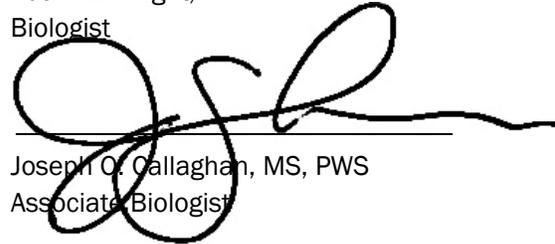
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- Appendix A. Marine Mammal Observation Record Form

## 1.0 INTRODUCTION

The City of Ketchikan (City) proposes to improve access to city-owned cruise ship berths in Ketchikan, Alaska to accommodate larger cruise ship classes that service Southeast Alaska. To support navigation and turning radius limitations of larger cruise ships, the offshore rock pinnacle is planned to be removed. Removal of the pinnacle is proposed to occur between September 16, 2019 and April 30, 2020. Work occurring within this timeframe includes equipment mobilization rock pinnacle removal, transporting the material to an appropriate upland stockpile, and equipment demobilization. All blasting will occur between November 15, 2019 and March 15, 2020.

The purpose of this summary is to provide a complete project description of the proposed construction activities as related to potential impacts to marine mammals.

GeoEngineers, Inc. (GeoEngineers) has prepared an Incidental Harassment Authorization (IHA) (GeoEngineers 2018a) for the City to assess the potential effects of the pinnacle removal on marine mammals in the project area. The IHA concluded with the employment of this marine mammal monitoring plan that waterborne noise from blasting activities is only likely to cause limited injury or adverse behavioral effects to marine mammal species. This marine mammal monitoring plan (MMMP) has been prepared to fulfill National Marine Fisheries Service (NMFS) and US Fish and Wildlife (USFWS) requirements through the Marine Mammal Protection Act to monitor for marine mammals in the defined area of potential waterborne sound effects and to document/minimize take and track it against approved take authorizations.

The proposed Project has the potential to impact marine mammal species protected under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) that occur in nearshore areas of Tongass Narrows (Table 1).

**TABLE 1 – MARINE MAMMAL SPECIES LIKELY TO OCCUR NEAR THE PROJECT AREA**

Common Name	Scientific Name
Humpback whale	<i>Megaptera novaeangliae</i>
Killer whale	<i>Orcinus orca</i>
Minke whale	<i>Balaenoptera acutorostrata</i>
Dall's porpoise	<i>Phocoenoides dalli</i>
Harbor porpoise	<i>Phocoena phocoena</i>
Harbor seal	<i>Phoca vitulina</i>
Steller sea lion	<i>Eumetopias jubatus</i>
Gray whale	<i>Eschrichtius robustus</i>
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>
Northern sea otter	<i>Enhydra lutris kenyoni</i>

## **2.0 PROJECT DESCRIPTION**

### **2.1. Project Location**

The project site is located in Ketchikan, Alaska, within the Ketchikan Gateway Borough on Revillagigedo Island in the Tongass Narrows at Section 30, Township 07, Range 91 East, Copper River Meridian; Latitude 55.3422 degrees North (N), Longitude 131.6461 degrees West (W) (Figure 1).

### **2.2. Project Description**

Project components that may affect ESA- and MMPA-protected marine mammals include waterborne and airborne noise generated by blasting and dredging. A complete summary of the project activities is described in the IHA (GeoEngineers 2018a) and Biological Assessment (GeoEngineers 2018b).

An underwater rock pinnacle near the cruise ship berths must be removed to increase safety for existing ships that presently visit Berths I and II. Removing the pinnacle will provide a more reliable ingress and egress for ships over a much wider range of wind and water level conditions and is important for improving conditions contributing to a safe, accessible and commercially viable existing navigation facility. This pinnacle, roughly 320 feet by approximately 150 feet at its widest point, requires blasting for removal. Up to 7,500 cubic yards of material are expected to be removed through this effort (320 feet by 150 feet by approximately 4 feet).

Removal of the rock pinnacle will bring the entire area to the optimal depth allowing for improved access and berthing for existing vessels during high winds. The -42 feet Mean Lower Low Water (MLLW) target dredge depth for removing the rock pinnacle will result in an overall 4-foot cut. The approximate total solid volume of rock removed, over the entire area of the pinnacle (about 0.76 acres), is less than 7,500 cubic yards. The removal of the rock pinnacle is important to maintain a safe, accessible, and commercially viable existing facility.

### **2.3. Construction Schedule**

The project is scheduled to begin construction on September 16, 2019 and conclude in April 30, 2020. Work to occur within this timeframe includes equipment mobilization, rock pinnacle removal, dredging, transport of the material to an appropriate upland stockpile or placement site, equipment demobilization). All blasting will occur between November 15, 2019 and March 15, 2020. Removal of the rock pinnacle is expected to require up to 50 days of blasting to complete.

## **3.0 PREDICTED WATERBORNE AND AIRBORNE NOISE**

### **3.1. Waterborne Noise**

As discussed, the proposed project includes underwater blasting of the rock pinnacle which involves noise production that may impact marine mammals.

The area of impacts of the rock pinnacle blasting encompasses the injury and behavioral disturbance zones for marine mammals exposed to waterborne sound pressure levels (SPLs) generated by rock pinnacle blasting (Figures 2 and 3). In 2016, the NMFS released updated technical guidance for assessing underwater sound effects on marine mammals, establishing new thresholds for permanent threshold shifts (PTS), which are considered Level A take. Cetacean thresholds were split into three categories based on

auditory frequency range (low, medium, and high) while pinnipeds were split into two groups based on family: phocid and otariid. These thresholds are shown on Table 2.

**TABLE 2 – LEVEL-A TAKE UNDERWATER AUDITORY THRESHOLDS ESTABLISHED BY NMFS (2016)<sup>1</sup>**

Hearing Group	Permanent Threshold Shift (PTS) dB	
	Impulsive	Non-Impulsive
Low-Frequency (LF) cetaceans	183	199
Mid-Frequency (MF) cetaceans	185	198
High-Frequency (HF) cetaceans	155	173
Phocid Pinnipeds	185	201
Otariid Pinnipeds	203	219

Notes:

<sup>1</sup> Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2016).

Level B take (harassment) criteria were unchanged by NMFS (2016). Impulsive noise (e.g. blasting) will disturb marine mammals at and above 160 dB measurement range. NMFS staff were consulted to establish suggested source SPL values for the project.

An assessment of underwater blasting source levels and impact areas was conducted by Alaska Seismic & Environmental, LLC. Blasting work will involve 25 to 50 blasts total, one per day, with a maximum explosive weight per delay of 75 pounds. A blast consists of a detonation of up to 75 total pounds of explosive from a series of sequential delays at an interval of 8 milliseconds (ms). The proposed daily blast will consist of a grid of boreholes (total number may vary but typically it ranges between 30 to 60 holes), each loaded with product, then filled in the top section of the borehole with stone (this process is referred to as “rock stemming”). The entire single blast for the day (as proposed for this project), will typically detonate in about less than 1 second (1 second = 1000 ms). Therefore, when the daily blast is detonated, there are only milliseconds between each borehole, and the entire blast takes less than one second.

National Oceanic and Atmospheric Administration (NOAA) Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS-OPR-59) was used for underwater acoustic thresholds for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS). Thresholds and distances were also calculated for mortality, gastrointestinal (GI) tract injury, and slight lung injury using disturbance thresholds suggested by Finneran and Jenkins (2012). Blasting threshold distances are included in Table 3 below.

A source level (single shot Sound Exposure Level [SEL]) of 228.42 dB re 1 uPa<sup>2</sup> was selected based on previously recorded underwater overpressure measurements (Carlson, et al 2011). Site conditions and blasting parameters were similar for this project to the expected conditions for the Ketchikan Removal of Berth II Pinnacle Project. SEL threshold distances were calculated using the NMFS Marine Mammal Acoustic Technical Guidance User Spreadsheet Tool. Threshold distances based on peak sound pressure levels were calculated using an underwater overpressure attenuation model developed by Kolden and Aimone-Martin (2014). The values listed in Table 3 are the more conservative, or larger threshold distance, of the two models.

Mortality and slight lung injury were calculated for harbor seals, as they are the smallest and most vulnerable species expected to be within the vicinity. Calculations were made assuming an 11-kilogram

seal at a depth of 10 meters. GI tract injury is correlated with peak sound pressure levels independently of animal mass and water depth (Finneran and Jenkins 2012), thus only one threshold distance calculation is shown.

**TABLE 3. UNDERWATER BLASTING THRESHOLD DISTANCES**

Hearing Group	Sound Exposure Level (SEL)			
	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (TTS)	
	SEL Threshold (dB uPa <sup>2</sup> s)	Distance (meters [m])	SEL Threshold (dB uPa <sup>2</sup> s)	Distance (m)
Low-Frequency Cetaceans	183.0	1056.1	168.0	10561.1
Mid-Frequency Cetaceans	185.0	9.0	170.0	89.9
High-Frequency Cetaceans	155.0	246.4	140.0	2464.1
Phocid Pinnipeds	185.0	317.4	170.0	3173.6
Otariid Pinnipeds	203.0	23.4	188.0	234.3

Hearing Group	Peak Sound Pressure Level (SPLpk)			
	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (PTS)	
	SPLpk Threshold (dB ref 1uPa)	Distance (m)	SPLpk Threshold (dB ref 1uPa)	Distance (m)
Low-Frequency Cetaceans	219.0	78.3	213.0	152.1
Mid-Frequency Cetaceans	230.0	23.2	224.0	45.0
High-Frequency Cetaceans	202.0	514.0	196.0	998.7
Phocid Pinnipeds	218.0	87.4	121.0	169.9
Otariid Pinnipeds	232.0	18.6	226.0	36.1

Species	GI Tract Threshold SPLpk = 237 (dB ref 1uPa) Distance (m)	Slight Lung Injury Threshold I <sub>s</sub> =123.8 (dB ref 1uPa) Distance (m)	Mortality Threshold I <sub>M</sub> = 289.3 (dB ref 1uPa) (m)
All Marine Mammal Species	10.7	245.8	94.7

The NOAA species mapper lists sea otters, which are managed by USFWS, as a species that can occur in the action area. However, otters are not commonly observed in the waters around Ketchikan. If a sea otter is observed during the in-water blasting work, the USFWS draft protocols to avoid harm from noise from pile driving will be adapted and used as a surrogate for blasting (USFWS 2012). These USFWS (2012) guidelines use thresholds established by NMFS for pinnipeds. For the current pinnacle blasting scenario, the phocid pinniped threshold will be used as a proxy for Level A shutdown zone for northern sea otters. Table 4 presents the shutdown zone for this species.

**TABLE 4. NORTHERN SEA OTTER PINNACLE SHUTDOWN ZONE**

Source	Shutdown Zone (m)
Blasting	317.4 <sup>1</sup>

Notes:

<sup>1</sup> Blasting zone not established by USFWS (2012). Conservatively assumed to equal the largest zone for phocid pinnipeds.

### 3.2. Airborne Noise

Underwater blasting has the potential to generate airborne noise that could impact marine mammals. NMFS has established pinniped in-air acoustic thresholds for Level B disturbance take. Harbor seals are disturbed at sound levels over 90 dB, while other pinnipeds are disturbed at 100 dB. Pinniped injury (Level A) take thresholds or cetacean in-air noise thresholds have not been established.

Airborne noise is considered to be discountable and is not discussed in detail throughout this MMMP because there is extremely limited potential for an airborne disturbance take to occur that would not already be tallied under an associated in-water take (either Level B or Level A). The airborne disturbance areas will be monitored and the reactions of hauled-out pinnipeds will be discussed in daily reports.

## 4.0 MONITORING PROTOCOL

The following section provides the protocol for marine mammal observers at the project site and procedures to minimize impacts to marine mammals that approach or enter the potential permanent threshold shifts (PTS) (Figures 2 and 3). Figure 3 includes the shutdown zone for northern sea otters. The intent of the monitoring protocol is to:

- Comply with the requirements of the ESA Section 7 consultation and the requirements of the MMPA consultation.
- Avoid injury to marine mammals from elevated underwater sound pressure associated with rock pinnacle blasting.

We are not anticipating strictly monitoring disturbance zones as shown on Figure 3 and 4 and will make daily assumptions on take based on anticipated marine mammal occurrence and documented activity near the Level A and within the Level B monitoring zones.

### 4.1. Impulse Noise (Blasting) Protocol

During impulse noise generating activities, the monitoring zone will include all areas where the underwater sound pressure levels are anticipated to equal the largest marine mammal injury zone (PTS zone). The largest zone is 1,056.1 meters for low-frequency cetaceans. Disturbance will occur at a maximum 10,561 meters (low-frequency cetaceans) from the blast point.

Qualified observers will monitor the PTS zones. Marine mammal monitoring during blasting activities will include two land-based observers and one observer on the barge. The following survey methods will be implemented during blasting operations:

- Monitoring will begin 30 minutes prior to underwater noise generating activities. This will ensure that all marine mammals in the disturbance zone are documented and that no marine mammals are

present within the injury zone. Hauled out marine mammals within the injury and disturbance zones will be tallied and monitored closely.

- When a marine mammal is observed, its location will be identified using a rangefinder to verify distance and a global positioning system (GPS) or compass to verify heading.
- If any cetaceans or pinnipeds are observed approaching or within the disturbance zone, blasting activities will be allowed to continue and a take will be tallied against the allowed take authorized by the IHA.
- If marine mammals are observed approaching the injury zone, blasting contractor would be notified and no blast would be allowed to occur until the animals are observed voluntarily leaving the injury zone or 15 minutes have passed without re-sighting the animal in the disturbance zone.
- The NOAA Species Mapper lists sea otters, managed by the USFWS, as a species that can occur in the action area (NOAA 2017). Sea otters are not known to occur near Ketchikan and are not expected to occur in the action area during blasting. If a sea otter were to occur in the action area during blasting, the USFWS's recommended draft protocols for avoiding harm to sea otters from noise during pile driving (USFWS 2012). We are using the phocid pinniped Level A zone for blasting as a proxy for northern sea otters.
- All observations of marine mammals, including sea otters, will be documented on the Marine Mammal Observation Record Form (Appendix A) or an approved, digitized version.
- Observers will search continuously for marine mammals with the naked eye and with the aid of rangefinder binoculars and/or spotting scopes.
- Monitoring will continue for 30 minutes after impulse noise generating activities are completed for the day.
- During the 30 minutes post-blasting, we will confirm extrapolated take through counting individual animals observed and note exceedances beyond extrapolated take. This will be assessed on daily basis.

In the event of weather conditions that make it difficult to accurately spot marine mammals, impulse noise generating activities will cease and will not resume until conditions in the monitoring zone return to acceptable levels.

#### **4.2. Marine Mammal Observer Locations**

In order to effectively monitor the injury zone, the marine mammal observers will be positioned at the best practical vantage points. Two shore-based observers and one observer on the barge will be used during blasting.

Establishing a monitoring station on the barge will provide the observer with an unobstructed view of the injury zone during blasting and direct communication with the operator. The land-based observers will be positioned with a clear view of the remaining portion of the injury zone and will monitor the zone with binoculars and a spotting scope. The land-based observers will communicate via radio to the lead monitor positioned on the barge.

Specific locations of the observers will be based on blasting activities and the locations of equipment. Shore-based observers will be stationed along the outer margins of the largest injury zone.

The monitoring position of the observers will be identified with the following characteristics:

1. Unobstructed view of blasting area;
2. Unobstructed view of all water within the injury zone;
3. Clear view of operator or construction foreman in the event of radio failure (lead biologist); and
4. Safe distance from activities in the construction area.

#### **4.3. Qualifications for Marine Mammal Observers**

The following list includes minimum qualifications for Marine Mammal Observers.

1. Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance. Use of spotting scopes, binoculars, and a rangefinder may be necessary to correctly identify the target and its location relative to the monitoring zones.
2. Advanced education in biological science, wildlife management, mammalogy, or related fields (Bachelor's degree or higher is preferred).
3. Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
4. Experience or training in the field identification of marine mammals (cetaceans and pinnipeds).
5. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
6. Writing skills sufficient to prepare a report of observations that would include such information as the number and type of marine mammals observed; the behavior of marine mammals in the project area during construction; dates and times when observations were conducted; dates and times when in-water construction activities were conducted; dates and times when marine mammals were present at or within the defined disturbance or injury zones; dates and times when in-water construction activities were suspended to avoid incidental harassment by disturbance or injury from construction noise; etc.
7. Ability to communicate orally, by radio, or in person with project personnel to provide real-time information on marine mammals observed in the area as necessary.

#### **4.4. Equipment for Marine Mammal Observers**

The following equipment will be available to ensure adequate coverage of the blasting injury area:

- Hearing protection, steel-toed shoes, personal flotation device (PFD), and hardhat for observers (other protective gear may be required at the discretion of the construction contractor's health and safety plan);
- Portable radio to communicate with the contractor;
- Cellular phone with contact information for NMFS and the blasting contractor;
- Red and green signal flags to use as a back-up to radio communication;
- Daily tide and current tables for the action area;
- Stopwatch or time-keeping device;

- Binoculars;
- Spotting Scope;
- Rangefinder;
- GPS and compass;
- NMFS-approved Marine Mammal Observation Record Form (Appendix A) on non-bleeding, waterproof paper, and/or a digitized version;
- Copy of this Marine Mammal Monitoring Plan; and
- Clipboard and pencils.

## **5.0 INTERAGENCY NOTIFICATION**

### **5.1. Marine Mammal Notifications**

If observers find an injured, sick, or dead marine mammal, they shall notify NMFS immediately at 1.877.925.7773 with a description of the animal, location, date, time, photo (if possible), and any observed behaviors (if alive).

## **6.0 MONITORING SUMMARY REPORT**

A monitoring report of observations and analysis will be prepared for submission to NMFS. The report should include, at minimum, such information as the number, type, and location of marine mammals observed; the behavior of marine mammals in the area of potential sound effects during construction; dates and times when observations and in-water construction activities were conducted; dates and times when in-water construction activities were suspended because of marine mammals; and total number of takes with comparison to authorized take per the IHA. A similar report will be prepared and provided to USFWS if any northern sea otters are observed.

## **7.0 LIMITATIONS**

GeoEngineers has prepared this monitoring plan in general accordance with the scope and limitations of our proposal dated November 13, 2017. No warranty or other conditions, express or implied, should be understood. This report has been prepared for the exclusive use of the City of Ketchikan, its authorized agents, and regulatory agencies following the described methods and information available at the time of the work. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. The information contained herein should not be applied for any purpose or project except the one originally contemplated.

## **8.0 REFERENCES**

GeoEngineers 2018a. Request for Incidental Harassment Authorization, Removal of Berth II Rock Pinnacle Project. Prepared for the City of Ketchikan. Draft in progress.

GeoEngineers 2018b. Biological Assessment, Removal of Berth II Rock Pinnacle Project. Prepared for the City of Ketchikan. Draft in progress.

U.S. Fish and Wildlife Service (USFWS). 2012. Anchorage Fish and Wildlife Field Office. Observer Protocols for Pile Driving, Dredging and Placement of Fill. Draft August 7, 2012.





C:\Users\smahugh\Documents\Projects\Ketchikan Port\GIS\WXD\Pinnacle\_Fig1\_BA.mxd Date Exported: 11/09/18 by smahugh

**Notes:**

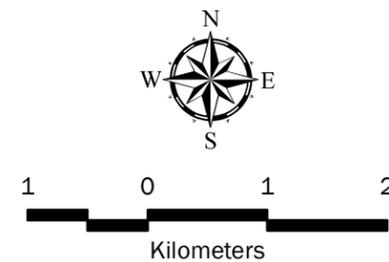
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

**Legend**

- Project Area
- Action Area



<b>Project Vicinity and Action Area Map</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 1</b>

WS



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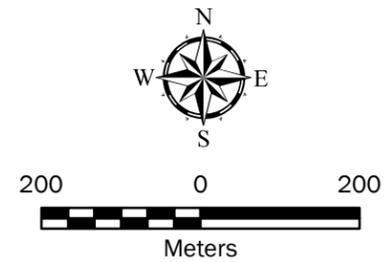
**Notes:**  
 1. The locations of all features shown are approximate.  
 2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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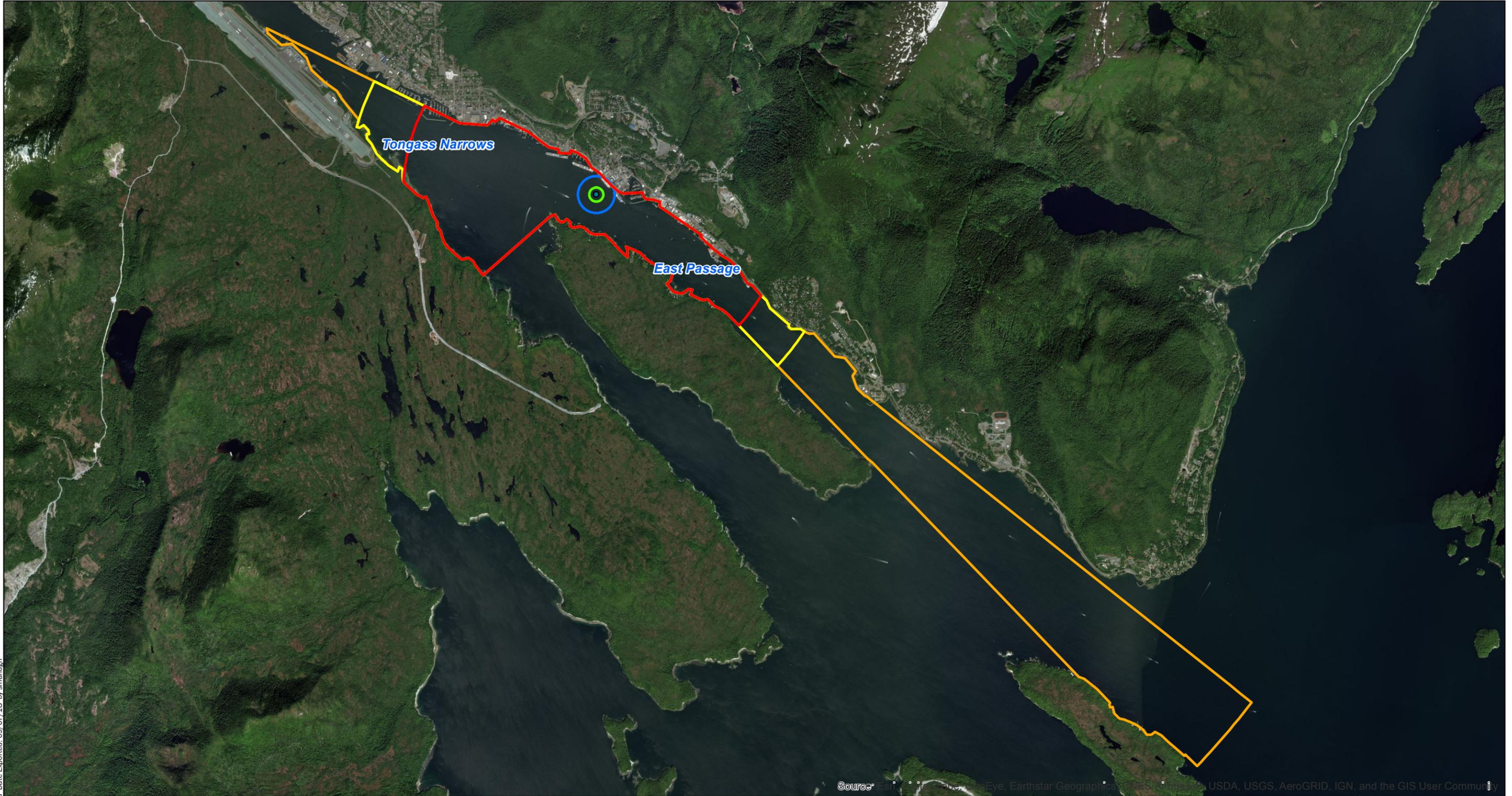
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**Legend**

- MF Cetacean (23.3m)
- Otariid Pinniped (23.4m)
- Phocid Pinniped and Northern Sea Otter (317.4m)
- HF Cetacean (514.0m)
- LF Cetacean (1,056.1m)



<b>Pinnacle Blasting Level A Thresholds</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 2</b>



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Source: Esri, DeLorme, GeoEye, Earthstar Geographics, CNES/Airbus, DigitalGlobe, GeoEye, USDA, USGS, AeroGRID, IGN, and the GIS User Community

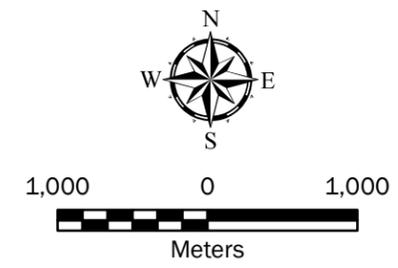
**Notes:**  
 1. The locations of all features shown are approximate.  
 2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 2011 StatePlane Alaska 1 FIPS 5001 Feet

**Legend**

- MF Cetacean (89.9m)
- Otariid Pinniped (234.3m)
- HF Cetacean (2,464.1m)
- Phocid Pinniped (3,173.6m)
- LF Cetacean (10,561.1m)



<b>Pinnacle Blasting Level B Thresholds</b>	
Removal of Berth II Rock Pinnacle Project Ketchikan, Alaska	
	<b>Figure 3</b>



**APPENDIX A**  
**Marine Mammal Observation Record Form**



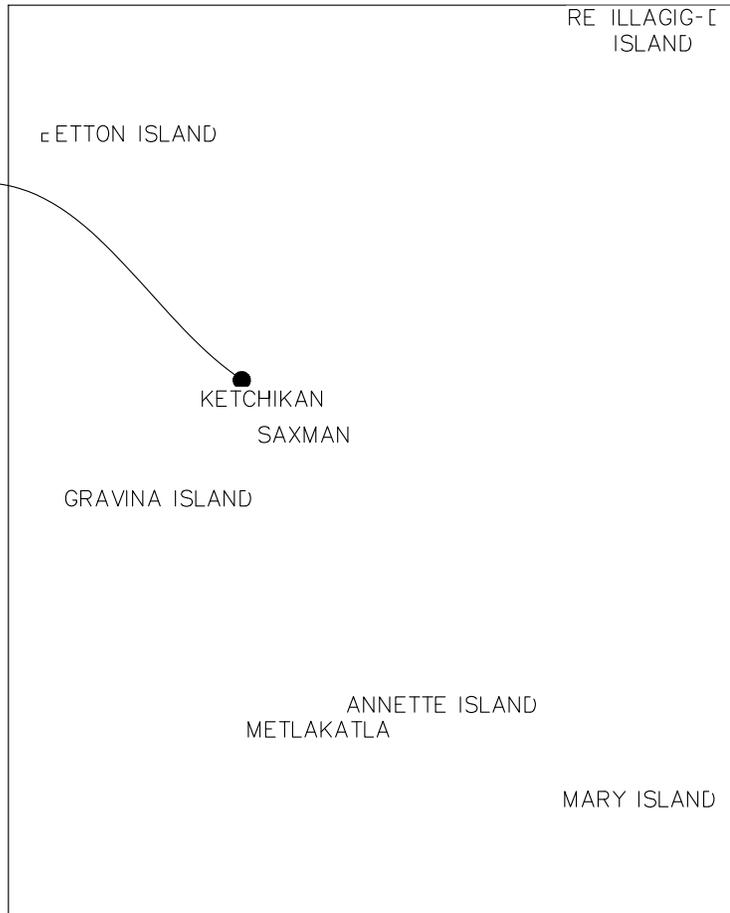


**APPENDIX B**  
**Design Sheets Provided by Moffit & Nichol**

TID-L D-TUM  
 HAT = 19.72  
 MHHW = 15.45  
 MHW = 14.55  
 MTL = 8.06  
 MLW = 1.57  
 MLLW = 0.00  
 LAT = -4.55



PROJECT LOCATION  
 LATITUDE 55.3422 N  
 LONGITUDE 131.6461 W



File: Q:\AK\9779\CADD\Active\Permit\9333\_1; Plotted: 11/5/2018 2:22 PM

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 KETCHIKAN, AK 99901

PROPOSED PROJECT: REMOVAL OF BERTH II  
 ROCK PINNACLE

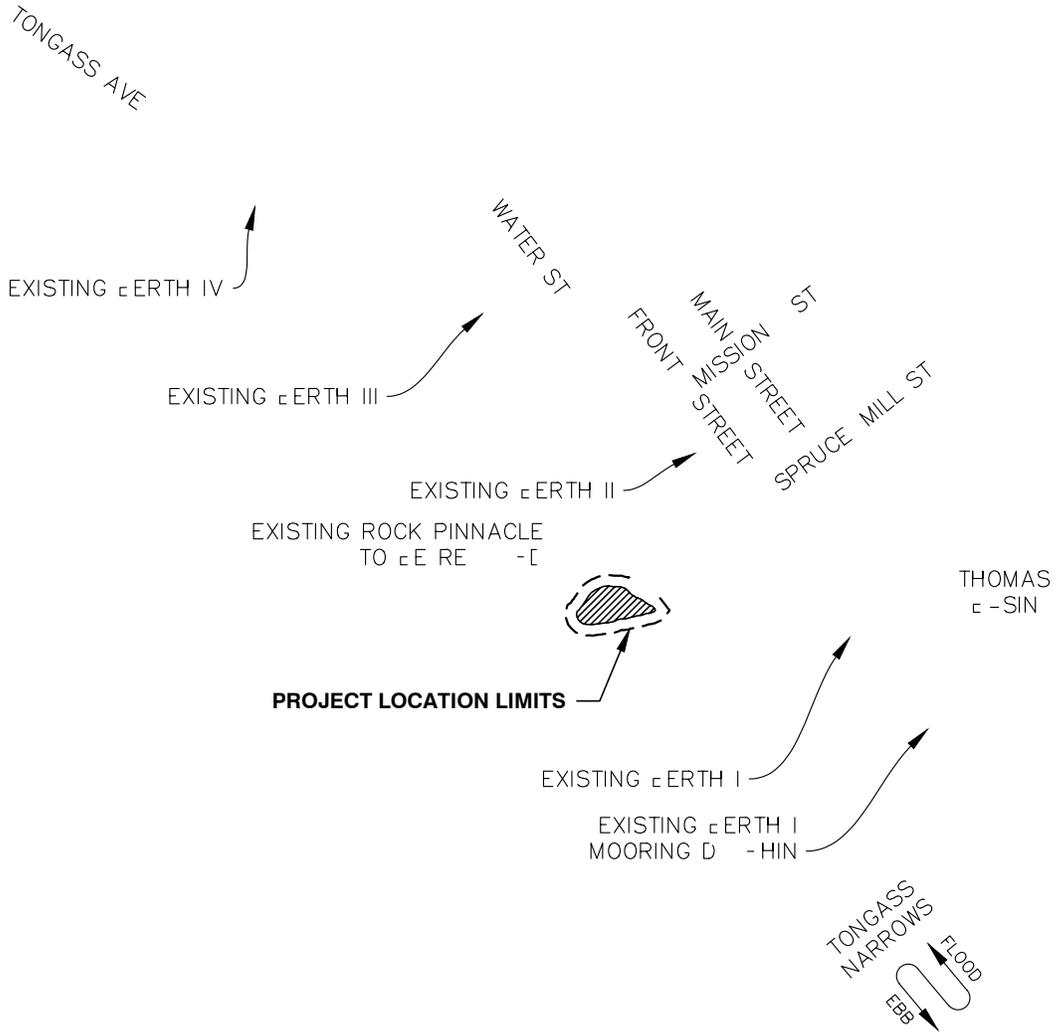
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 ADJACENT PROPERTY OWNERS:  
 1. TONGASS TRADING COMPANY  
 2. KETCHIKAN OUTLET STORE  
 3. SLMP LLC

LAT/LONG: 55.3422 N / 131.6461 W

PURPOSE: IMPROVED VESSEL ACCESS  
 IN: TONGASS NARROWS  
 NEAR/AT: KETCHIKAN  
 BOROUGH: KETCHIKAN GATEWAY

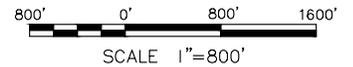
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STATE: AK



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 MHHW = 15.45  
 MHW = 14.55  
 MTL = 8.06  
 MLW = 1.57  
 MLLW = 0.00  
 LAT = -4.55

**PROJECT LOCATION LIMITS**  
 SCALE 1"=800'



REFERENCE NO: TBD BY USACE

LOCATION ADDRESS: 334 FRONT STREET  
 KETCHIKAN, AK 99901

PROPOSED PROJECT: REMOVAL OF BERTH II  
 ROCK PINNACLE

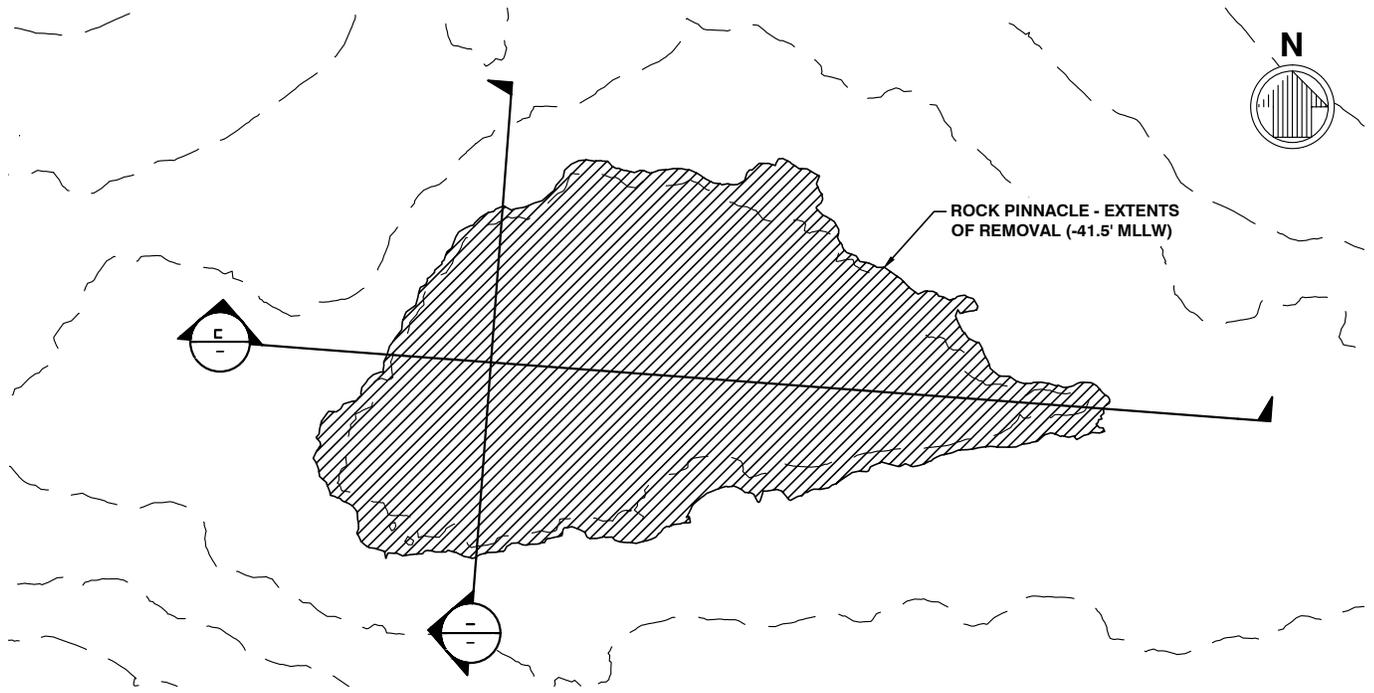
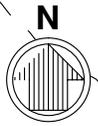
APPLICANT: CITY OF KETCHIKAN  
 ADJACENT PROPERTY OWNERS:  
 1. TONGASS TRADING COMPANY  
 2. KETCHIKAN OUTLET STORE  
 3. SLMP LLC

LAT/LONG: 55.3422 N / 131.6461 W

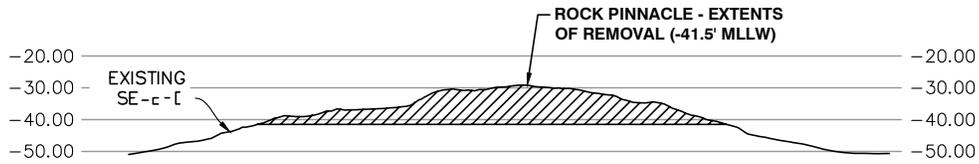
PURPOSE: IMPROVED VESSEL ACCESS  
 IN: TONGASS NARROWS  
 NEAR/AT: KETCHIKAN  
 BOROUGH: KETCHIKAN GATEWAY

SHEET: OF 3 DATE: NOVEMBER 5, 2018

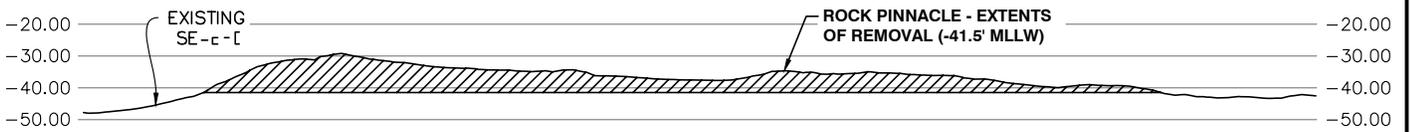
STATE: AK



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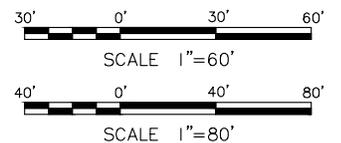
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SE TION  
SC E 1"=60'-0"

TID-L D-TUM  
HAT = 19.72  
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MTL = 8.06  
MLW = 1.57  
MLLW = 0.00  
LAT = -4.55

NOTE  
TRUCTION - TIVITI- -R-  
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REFERENCE NO: TBD BY USACE

LOCATION ADDRESS: 334 FRONT STREET  
KETCHIKAN, AK 99901

PROPOSED PROJECT: REMOVAL OF BERTH II  
ROCK PINNACLE

APPLICANT: CITY OF KETCHIKAN  
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PURPOSE: IMPROVED VESSEL ACCESS  
IN: TONGASS NARROWS  
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SHEET: 3 OF 3

DATE: NOVEMBER 5, 2018

STATE: AK

