



Juneau Douglas North Crossing PEL Study Intertidal Habitat Survey Report

Prepared for
Alaska Department of Transportation and Public Facilities



December 2023

Parametrix

Citation

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Contents

| | |
|--|----|
| 1. Introduction..... | 3 |
| 2. Methods..... | 3 |
| 3. Results..... | 5 |
| 3.1 Salmon Creek..... | 5 |
| 3.2 Twin Lakes..... | 7 |
| 3.3 Vanderbilt..... | 7 |
| 3.4 Sunny Point East..... | 8 |
| 3.5 Sunny Point West..... | 9 |
| 3.6 Mendenhall Peninsula..... | 9 |
| 4. Recommendations/Additional Information Needs..... | 10 |
| 5. References..... | 11 |

TABLES

| | |
|---|---|
| Table 1. Intertidal Habitat Type Definitions and Comparison to Other Classification Systems..... | 4 |
| Table 2. Amount of Intertidal Habitat Type in Each Alternative Study Area, Rounded to the Nearest Tenth-Acre..... | 6 |

PHOTOGRAPHS

| | |
|---|----|
| Photograph 1. Intertidal Habitats in the Salmon Creek Study Area..... | 5 |
| Photograph 2. Intertidal Habitats in the Twin Lakes Study Area..... | 7 |
| Photograph 3. Intertidal Habitats in the Vanderbilt Study Area..... | 8 |
| Photograph 4. Intertidal Habitats in the Sunny Point East Study Area..... | 8 |
| Photograph 5. Intertidal Habitats in the Sunny Point West Study Area..... | 9 |
| Photograph 6. Intertidal Habitats in the Mendenhall Peninsula Study Area..... | 10 |

ATTACHMENTS

1. Intertidal Mapbook
2. Intertidal Habitat Profiles

Acronyms and Abbreviations

| | |
|--------|---|
| CBJ | City and Borough of Juneau |
| DOT&PF | Alaska Department of Transportation and Public Facilities |
| GIS | geographic information system |
| MHHW | mean higher high water |
| MLLW | mean lower low water |
| NEPA | National Environmental Policy Act |
| PEL | Planning and Environmental Linkages |

1. Introduction

The City and Borough of Juneau (CBJ) has partnered with Alaska Department of Transportation and Public Facilities (DOT&PF) to study a possible transportation corridor to connect Juneau with the northern end of Douglas Island. DOT&PF has chosen the Planning and Environmental Linkage (PEL) process to evaluate a purpose and need and recommend alternatives for such a connection. The PEL study considers potential crossing locations between Douglas Island and mainland Juneau in the channel area north of the existing Douglas Island Bridge. The analyses conducted for the PEL may be incorporated into a future National Environmental Policy Act (NEPA) review.

In April 2023, DOT&PF identified six alternatives to advance for detailed development in the Juneau Douglas North Crossing PEL Study (see Attachment 1, Page 1). To support further evaluation of these alternatives, the project team performed field surveys to expand our understanding of environmental resources potentially affected by each alternative. This report identifies the goals and objectives of the field survey effort for intertidal habitats, describes the methodology employed, summarizes the findings of the field surveys, and provides recommendations for refining the data that will support future evaluations.

The goal of the intertidal habitat survey was to develop detailed mapping that would serve as the basis for evaluating the potential impacts of each alternative on intertidal habitats. The following objectives were defined:

- Prepare a preliminary version of the intertidal habitat map using existing data.
- Perform field-based habitat surveys in the intertidal zone of the study area.
- Verify or refine the intertidal habitat map and calculate the area of each habitat type in the survey area.

2. Methods

Existing data that were identified and reviewed before beginning fieldwork included the following:

- Google Earth imagery.
- Multispectral Landsat Imaging (<https://earthexplorer.usgs.gov/>).
- USGS Topographic Data (<https://apps.nationalmap.gov/viewer/>).
- The Alaska ShoreZone mapping system (<https://alaskafisheries.noaa.gov/mapping/sz/>).
- USFWS National Wetlands Inventory (<https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>).
- Maps and documents developed for prior studies of the Juneau Douglas North Crossing (e.g., Parametrix 2022; HDR 2005) as well as other relevant reports (e.g., FAA and CBJ 2007).

Pertinent data from these resources were incorporated into a geographic information system (GIS) geodatabase and used to develop a preliminary map of intertidal habitat types. Data was made accessible in an ESRI ArcGIS Online webmap developed specifically for the project.

Habitat type classifications for this study were developed based in part on the existing national schema (Cowardin et al. 1979) as well as on categories developed for the Juneau International Airport Environmental Impact Statement (FAA and CBJ 2007). A crosswalk of these classifications is

provided in Table 1. Some degree of modification and refinement of these classifications was necessary based on observed field conditions.

Table 1. Intertidal Habitat Type Definitions and Comparison to Other Classification Systems

| Habitat Type | NWI (Cowardin et al. 1979) | Juneau Airport EIS (FAA & CBJ 2007, Table 3-29) | Description |
|---------------------------------|----------------------------------|---|--|
| Subtidal | M1, E1, R1 | Open Water | These are areas that remain inundated at extreme low tides (approximately -4 feet relative to MLLW). Submerged aquatic vegetation may or may not be present. |
| Lower intertidal mudflat | E2 AB/SB/US | Unvegetated | These areas are exposed at low tide and are unvegetated. They may include mud, sand, algal mats, and sparse vegetation. |
| Lower intertidal emergent marsh | E2 EM | Low Marsh | These areas are exposed at low tide and are vegetated. They may include Pacific alkali grass, goosetongue, and Lyngbye's sedge communities. |
| Intertidal rocky | E2 RS, M2 RS | N/A | These are areas of rocky or hard substrate anywhere in the intertidal zone. |
| Upper intertidal natural | E2 SS/FO | High Marsh, Supratidal, Shrub-scrub, Forest | These are areas in the upper portion of the intertidal zone that have established vegetation communities. They may include beach rye, coastal grass meadow, coastal forb meadow, reed canarygrass, deciduous shrub-scrub, deciduous forest, mixed woodland, spruce forest. |
| Upper intertidal developed | Special modifiers r,s,e | Disturbed, Seeded Grassland | These are areas in the upper portion of the intertidal zone that have been modified from the natural state. They may include human-created grassy areas, spoils, roadways, etc. |

Notes: Sources include Cowardin et al. 1979; HDR Inc. 2005; FAA and CBJ 2007; Parametrix 2022. MLLW = mean lower low water

The study area for each alternative was defined as all intertidal areas¹ within the anticipated construction footprint for that alternative, plus a 150-foot buffer in all directions. Biologists performing field surveys gained access to the study areas via public lands (typically Mendenhall Wetland State Game Refuge access points and CBJ- or State-owned parcels). Surveys were conducted between September 28 and October 1, 2023, when low tides (ideally less than -1 foot relative to mean lower low water [MLLW]) occurred during daylight hours.

Biologists walked the accessible portions of the intertidal study areas and ground-truthed the preliminary field maps with a Trimble DA2 Catalyst Global Navigation Satellite System GPS receiver with submeter accuracy and iPad controller running an ArcGIS Field Map application. Where the preliminary map appeared outdated or inaccurate compared to existing conditions, biologists delineated the boundaries of defined habitat types and uploaded data to the webmap. Other observations, such as relative tide level, submerged aquatic vegetation communities, plant species, sediment grain sizes, visible benthic epifauna, wildlife use, and other habitat features were documented with notes and photographs.

¹ For this study, the intertidal zone was considered elevations between the shallow subtidal (approximately -10 feet MLLW) and the upper limit of tidal influence on community structure (in some places up to +25 feet MLLW).

Three additional habitat types were added as options to reflect field conditions. The first type, called Channel, included areas that were within intertidal elevations (i.e., higher than -4 feet relative to MLLW) but that remained submerged at low tides due to freshwater drainage from local creeks. This habitat type was used to distinguish creek mouths from lower intertidal mudflat. All other non-intertidal land covers within the study areas were considered Upland. In this report, Upland is a catch-all term that may include developed areas, forested areas, freshwater wetlands, and streams. This term may be defined and used differently in the wetland report. Finally, a habitat type was added to capture the unique characteristics of Twin Lakes study area, where water is impounded year-round by human-made control structures. These lake areas are neither upland nor intertidal; they were dubbed Impounded.

3. Results

The observed distribution of intertidal habitat types in the study area for each alternative is illustrated in Attachment 1 and summarized in Table 2. The total number of acres of each study area varied considerably, as did the nature of intertidal habitats. These differences are described for each alternative below. A descriptive profile of each habitat type is provided in Attachment 2.

3.1 Salmon Creek

The Salmon Creek study area covers a total of 79.5 acres, of which 28.2 acres are intertidal (Attachment 1, Page 2). The Salmon Creek alternative is the shortest alternative alignment, with an intertidal crossing distance² of approximately 2,100 feet. The study area includes the mouth of Salmon Creek where it flows under a bridge (Egan Drive) and an area of impounded water on the northeast side of Egan Drive where water levels are managed as part of Twin Lakes (Photograph 1A). It also includes the mouth of Falls Creek on Douglas Island. This alternative is one of only two that contain subtidal habitats due to its position at the head of Gastineau Channel, which is deeper to the southeast. The extensive unvegetated intertidal areas were characterized by mud and sand substrates, with scattered cobble and boulders. Proximity to the creek mouths resulted in other organic and inorganic debris across the beach and extensive mussel beds that have formed where hard attachment points exist (Photograph 1B).



Photograph 1. Intertidal Habitats in the Salmon Creek Study Area

1A (left): Mouth of Salmon Creek flowing under Egan Drive and across intertidal mudflat (upper right corner). Photo: NOAA ShoreZone
1B (right): Intertidal mudflat with patchy coverage of blue mussels (*Mytilus edulis*) and rockweed (*Fucus* spp.). Photo facing northeast.

² Intertidal crossing distance is measured along the length of the alignment from MHHW on the Juneau side to MHHW on the Douglas Island side.

Table 2. Amount of Intertidal Habitat Type in Each Alternative Study Area, Rounded to the Nearest 10th Acre

| Alignment | Intertidal Habitat Type | | | | | | | Other Type | | Study Area Total |
|----------------------|-------------------------|---------|--------------------------|---------------------------------|------------------|--------------------------|----------------------------|------------|--------|------------------|
| | Subtidal | Channel | Lower Intertidal Mudflat | Lower Intertidal Emergent Marsh | Rocky Intertidal | Upper Intertidal Natural | Upper Intertidal Developed | Impounded | Upland | |
| Salmon Creek | 5.6 | 0.7 | 16.3 | 3.0 | - | 1.1 | 1.5 | 4.2 | 47.1 | 79.5 |
| Twin Lakes | - | 3.5 | 54.8 | 1.7 | - | 0.4 | 3.8 | 15.8 | 29.6 | 109.4 |
| Vanderbilt | - | 5.5 | 33.0 | 24.1 | - | 13.3 | 2.8 | 13.6 | 36.5 | 128.7 |
| Sunny Point East | - | 2.0 | 3.7 | 21.5 | - | 17.9 | - | - | 35.0 | 80.1 |
| Sunny Point West | - | 2.6 | 1.8 | 17.4 | - | 16.1 | - | - | 109.2 | 147.1 |
| Mendenhall Peninsula | 36.6 | - | 29.2 | 0.9 | 0.1 | 0.8 | - | - | 155.3 | 222.8 |

3.2 Twin Lakes

The Twin Lakes study area covers a total of 109.4 acres, of which 64.1 acres are intertidal (Attachment 1, Page 3). Twenty-five percent of the intertidal area is northeast of Egan Drive, where water levels are controlled to maintain the Twin Lakes. The intertidal crossing distance of the Twin Lakes alignment is approximately 2,600 feet, but the study area also includes intertidal areas parallel and adjacent to Egan Drive for approximately 0.5 mile in either direction from where a crossing would connect. Within the study area, lower intertidal mudflat is the dominant habitat type (Photograph 2A), with a fringe of lower intertidal emergent marsh backed by and upper intertidal natural and developed. Channel areas correspond with culverts under Egan Drive, the mouth of Neilson Creek on Douglas Island, and the primary tidal channel(s) between Juneau and Douglas Island (Photograph 2B).



Photograph 2. Intertidal Habitats in the Twin Lakes Study Area

2A (left) Aerial view of the Twin Lakes alignment looking from Douglas Island across to Juneau. Photo: NOAA ShoreZone
2B (right) Intertidal mudflat with sandbars and channels of standing water. Photo facing west.

3.3 Vanderbilt

The Vanderbilt study area covers a total of 128.7 acres, of which 78.6 acres are intertidal (Attachment 1, Page 4). Thirty-nine percent of the intertidal area is northeast of Egan Drive. The intertidal crossing distance of the Vanderbilt alignment is approximately 3,600 feet, but the study area also includes approximately 1.2 miles of the intertidal zone parallel and adjacent to Egan Drive, some of which overlaps the Twin Lakes study area. A mix of intertidal mudflat and emergent marsh are found in this study area between Juneau and Douglas Island (Photograph 3A). Channels are associated with culverts under Egan Drive, the outlet of Lemon Creek (Photograph 3B), and the primary tidal channel(s).



Photograph 3. Intertidal Habitats in the Vanderbilt Study Area

3A (left) Douglas Island intertidal zone with unvegetated mudflat in the foreground and lower emergent marsh and upper intertidal natural habitat types in the background. Photo facing northwest.
3B (right) Mouth of Lemon Creek with Egan Drive on the left side of the frame. Photo facing southeast.

3.4 Sunny Point East

The Sunny Point East study area covers a total of 80.1 acres, of which 45.1 acres are intertidal (Attachment 1, Page 5). All of the intertidal area is south of Egan Drive. The intertidal crossing distance of the Sunny Point East alignment is approximately 5,200 feet with roughly half of this length shared with the Sunny Point West alignment. In this study area, the intertidal zone is predominantly emergent and upper marsh, with a network of tidal channels and mudflat edges (Photographs 4A and 4B). On the north end, the border of the intertidal zone is subtle as the marsh vegetation communities transition from freshwater wetland to estuarine plant communities. The study area runs through an isolated upland area halfway across the marsh and then continues south along the same alignment as the Sunny Point West alternative.



Photograph 4. Intertidal Habitats in the Sunny Point East Study Area

4A (left) Aerial view of emergent marsh and tidal channel network. Photo: NOAA ShoreZone
4B (right) Small tidal channel fringed by Lyngbye's sedge. Photo facing east

3.5 Sunny Point West

The Sunny Point West study area covers a total of 147.1 acres, of which 37.9 acres are intertidal (Attachment 1, Page 6). All of the intertidal area is south of Egan Drive. The intertidal crossing distance of the Sunny Point West alignment is approximately 4,000 feet with roughly half of this length shared with the Sunny Point East alignment; therefore, the mosaic of habitat types is similar to those described above (Photographs 5A, 5B).

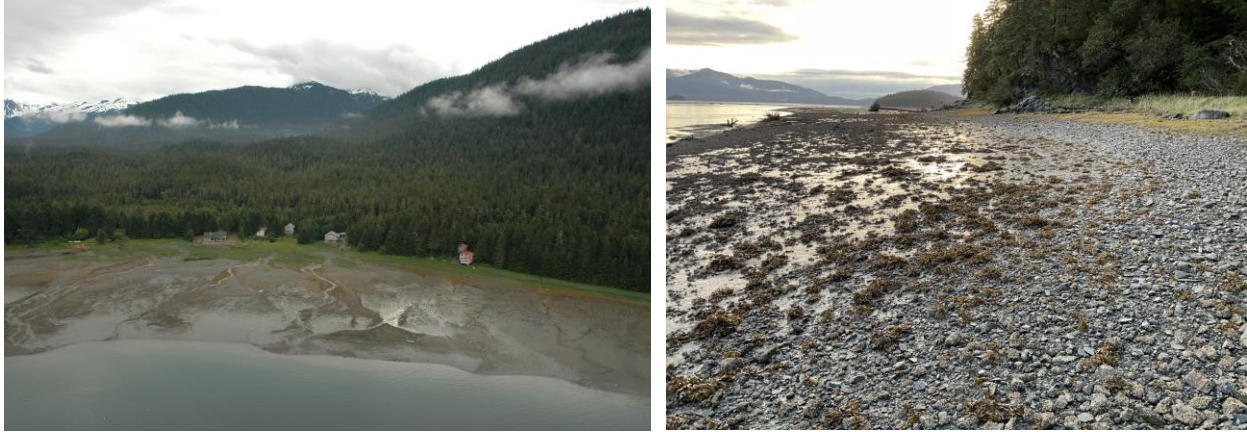


Photograph 5. Intertidal Habitats in the Sunny Point West Study Area

5A (left) Small tidal channel with mudflat and emergent marsh. Photo facing south.
5B (right) Large tidal channel through the marsh. Photo facing west.

3.6 Mendenhall Peninsula

The Mendenhall Peninsula study area covers a total of 222.8 acres, of which 67.5 acres are intertidal (Attachment 1, Pages 7 and 8). The intertidal crossing distance of the Mendenhall Peninsula alignment is approximately 7,500 feet. This alternative contains the most subtidal habitat, spanning the head of Fritz Cove at the mouth of the Mendenhall River, and it also contains the only intertidal rocky habitat that was identified during the survey. The glacier-fed Mendenhall River supplies a large volume of freshwater and silt to this area; additionally, the mouth of Fish Creek on Douglas Island is east of the study area and contributes freshwater to the estuarine mixing zone (Photograph 6A). The upper portion of the unvegetated intertidal consisted of large gravels with barnacles, evidence of a higher-energy environment, and exposure to wave action, particularly on the north end of the study area (Photograph 6B).



Photograph 6. Intertidal Habitats in the Mendenhall Peninsula Study Area

6A (left) Aerial view of the south end of the study area, with the mouth Fish Creek to the left (out of frame) and alternative alignment on the right side of frame. Photo: NOAA ShoreZone

6B (right) Mudflat on Mendenhall Peninsula with rockweed attached to cobble (left), transitioning to a gravel beach with barnacles (right). Photo facing west

4. Recommendations/Additional Information Needs

The results of this survey largely confirm information from prior efforts to map intertidal and other types of habitat. Similar to previous studies, this survey effort documents a vertical gradient of habitats based on frequency and duration of inundation, along with a mosaic across the landscape based on proximity to deeper marine water and freshwater sources. Biologists performing the field surveys identified discrepancies between the previously mapped boundaries of these habitat types and those observed in the field. Those differences likely arise both from the application of different methodologies and from the dynamic nature of the intertidal environment, where conditions may change over time and maps must be frequently updated.

Further refinement of the habitat types into more specific categories may be possible. For example, it may be possible to denote differences in substrates or benthic infauna communities. However, this increased precision may not be useful for decision-making at the landscape level. Any proposed refinement of these habitat types should consider which specific attributes would be useful in distinguishing the potential impacts of the alternatives. Mapping refinements may also be necessary based on changes to the alternative alignments during the design process, consideration of construction methods, and the size of the buffer needed to incorporate all potential impacts.

This memo does not provide an analysis of the potential effects on intertidal habitats, nor is it intended to rank or prioritize the alternatives. Such assessments would be performed during the NEPA process, as part of a comprehensive review of the project.

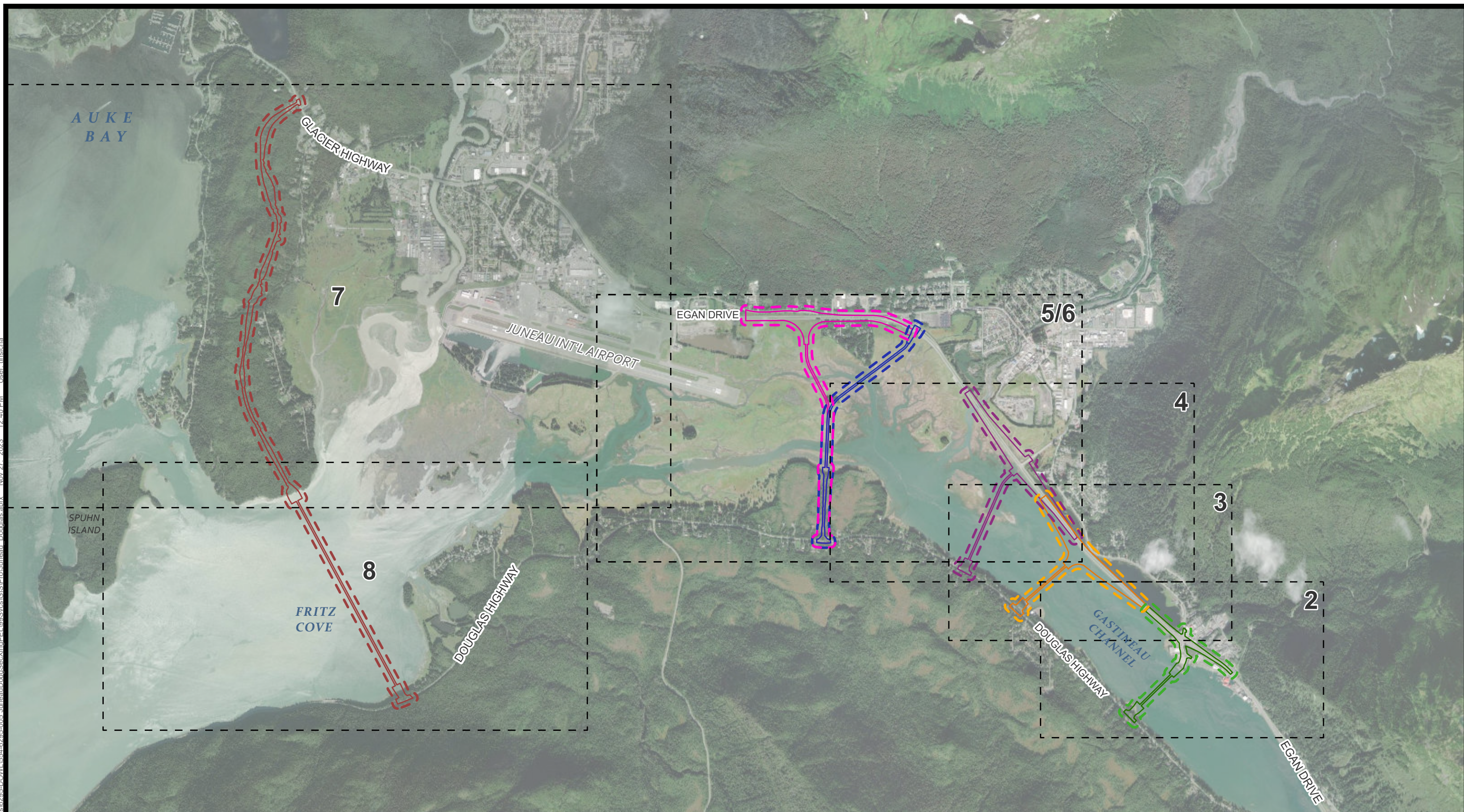
5. References

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- Federal Aviation Administration and City and Borough of Juneau, Alaska (FAA and CBJ). 2007. Juneau International Airport. Final EIS and Section 4(f) Evaluation.
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Attachment 1

Intertidal Mapbook

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ALTERNATIVE FOOTPRINTS / STUDY AREAS

| | | | |
|--|------------------------|--|--------------|
| | Salmon Creek Footprint | | PAGE EXTENTS |
| | Twin Lakes Footprint | | |
| | Vanderbilt | | |
| | Sunny Point East | | |
| | Sunny Point West | | |
| | Mendenhall Peninsula | | |

0 0.5 1 Miles

Sources:
 1: NATIONAL WETLAND INVENTORY, TOPOGRAPHY DERIVED FROM LIDAR (2013 AND 2021), FIELD VERIFICATION ON SEPTEMBER 27-29, 2023.
 2: GOOGLE AERIAL IMAGERY

NOTE: "UPLAND" INCLUDES ALL NON-INTERTIDAL LAND COVERS (E.G., FORESTED, FRESHWATER WETLAND, DEVELOPED, ETC.)

**INTERTIDAL HABITAT TYPES
 JUNEAU DOUGLAS SECOND
 CROSSING ALTERNATIVES
 PAGE 1 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



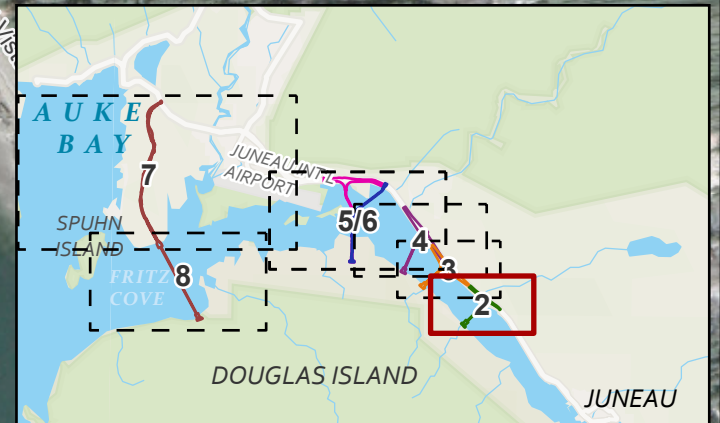
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 JUNEAU DOUGLAS SECOND CROSSING PEL STUDY

CITY AND BOROUGH OF JUNEAU, ALASKA

NOVEMBER 27, 2023 ATTACHMENT A

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- SALMON CREEK STUDY AREA**
- ALTERNATIVE FOOTPRINTS**
- Salmon Creek Footprint
 - Twin Lakes Footprint
 - Vanderbilt
 - Sunny Point East
 - Sunny Point West
 - Mendenhall Peninsula

- INTERTIDAL HABITAT¹**
- Subtidal
 - Channel
 - Lower Intertidal Mudflat
 - Lower Intertidal Emergent Marsh
 - Intertidal Rocky
 - Upper Intertidal Natural
 - Upper Intertidal Developed
 - Impounded
 - Upland

Sources:
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**INTERTIDAL HABITAT TYPES
 SALMON CREEK
 PAGE 2 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



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NOVEMBER 27, 2023 ATTACHMENT A

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| <p>TWIN LAKES STUDY AREA</p> <p>ALTERNATIVE FOOTPRINTS</p> <ul style="list-style-type: none"> Salmon Creek Footprint Twin Lakes Footprint Vanderbilt Sunny Point East Sunny Point West Mendenhall Peninsula | <p>INTERTIDAL HABITAT¹</p> <ul style="list-style-type: none"> Subtidal Channel Lower Intertidal Mudflat Lower Intertidal Emergent Marsh Intertidal Rocky Upper Intertidal Natural Upper Intertidal Developed Impounded Upland |
|---|--|

Feet

0 500 1,000

Sources:
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**INTERTIDAL HABITAT TYPES
TWIN LAKES
PAGE 3 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA

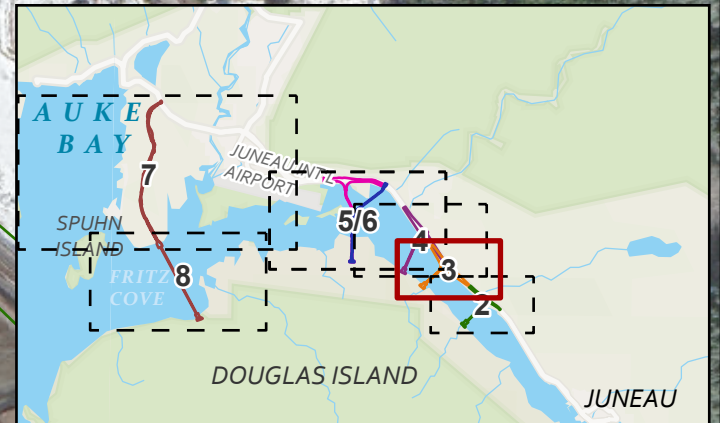


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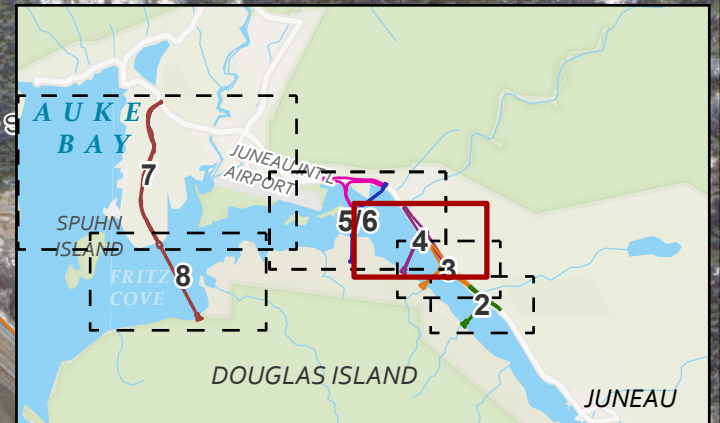
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CITY AND BOROUGH OF JUNEAU, ALASKA

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| NOVEMBER 27, 2023 | ATTACHMENT A |
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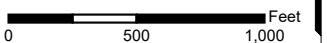


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- VANDERBILT STUDY AREA**
- ALTERNATIVE FOOTPRINTS**
- Salmon Creek Footprint
 - Twin Lakes Footprint
 - Vanderbilt
 - Sunny Point East
 - Sunny Point West
 - Mendenhall Peninsula

- INTERTIDAL HABITAT¹**
- Subtidal
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 - Lower Intertidal Mudflat
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**INTERTIDAL HABITAT TYPES
VANDERBILT
PAGE 4 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
SEC 1 - 12, 15 - 17, T 41S, R 66E;
SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



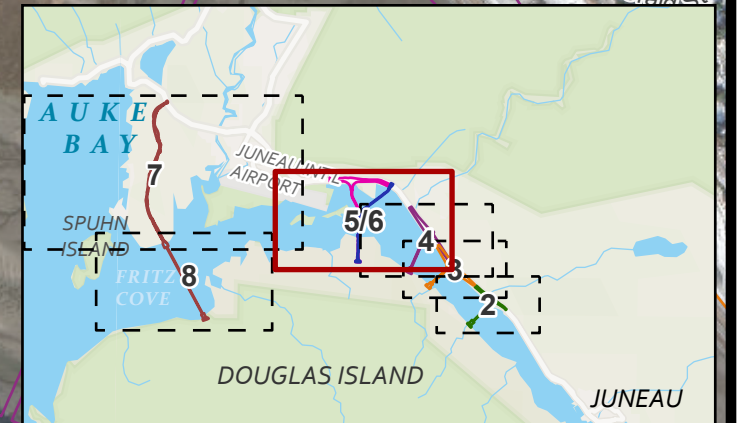
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NOVEMBER 27, 2023 ATTACHMENT A

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|--|--|--|--|
| <p>SUNNY POINT EAST STUDY AREA</p> <p>ALTERNATIVE FOOTPRINTS</p> <ul style="list-style-type: none"> Salmon Creek Footprint Twin Lakes Footprint Vanderbilt Sunny Point East Sunny Point West Mendenhall Peninsula | | <p>INTERTIDAL HABITAT*</p> <ul style="list-style-type: none"> Subtidal Channel Lower Intertidal Mudflat Lower Intertidal Emergent Marsh Intertidal Rocky Upper Intertidal Natural Upper Intertidal Developed Impounded Upland | |
| <p>0 500 1,000 Feet</p> | | <p>Sources:</p> <p>1: NATIONAL WETLAND INVENTORY, TOPOGRAPHY DERIVED FROM LIDAR (2013 AND 2021), FIELD VERIFICATION ON SEPTEMBER 27-29, 2023.</p> <p>2: GOOGLE AERIAL IMAGERY</p> <p>NOTE: "UPLAND" INCLUDES ALL NON-INTERTIDAL LAND COVERS (E.G., FORESTED, FRESHWATER WETLAND, DEVELOPED, ETC.)</p> | |

INTERTIDAL HABITAT TYPES
SUNNY POINT EAST
PAGE 5 OF 8

SEC 25 - 27, 34 - 36, T 40S, R 66E; SEC 30 - 34, T 40S, R 66E
SEC 1 - 12, 15 - 17, T 41S, R 66E;
SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



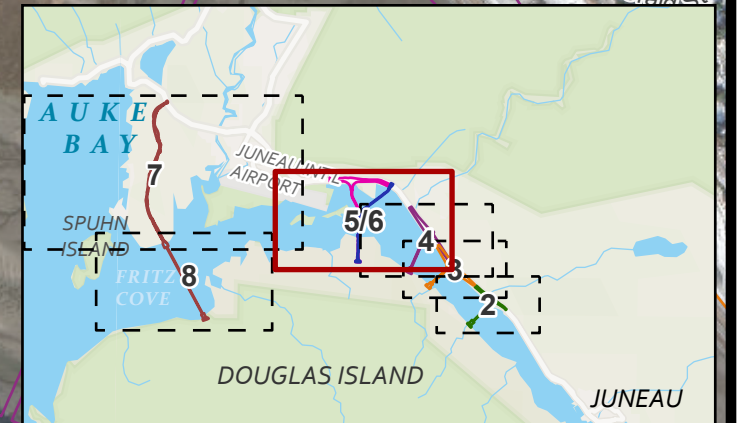
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

DOT&PF PROJECT NO. SFHWY00299/0003259
JUNEAU DOUGLAS SECOND CROSSING PEL STUDY

CITY AND BOROUGH OF JUNEAU, ALASKA

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| NOVEMBER 27, 2023 | ATTACHMENT A |
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| <p>SUNNY POINT WEST STUDY AREA</p> <p>ALTERNATIVE FOOTPRINTS</p> <ul style="list-style-type: none"> Salmon Creek Footprint Twin Lakes Footprint Vanderbilt Sunny Point East Sunny Point West Mendenhall Peninsula | | <p>INTERTIDAL HABITAT¹</p> <ul style="list-style-type: none"> Subtidal Channel Lower Intertidal Mudflat Lower Intertidal Emergent Marsh Intertidal Rocky Upper Intertidal Natural Upper Intertidal Developed Impounded Upland | |
| | | <p>0 500 1,000 Feet</p> | |

Sources:
 1: NATIONAL WETLAND INVENTORY, TOPOGRAPHY DERIVED FROM LIDAR (2013 AND 2021), FIELD VERIFICATION ON SEPTEMBER 27-29, 2023.
 2: GOOGLE AERIAL IMAGERY

NOTE: "UPLAND" INCLUDES ALL NON-INTERTIDAL LAND COVERS (E.G., FORESTED, FRESHWATER WETLAND, DEVELOPED, ETC.)

INTERTIDAL HABITAT TYPES
SUNNY POINT WEST
PAGE 6 OF 8

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



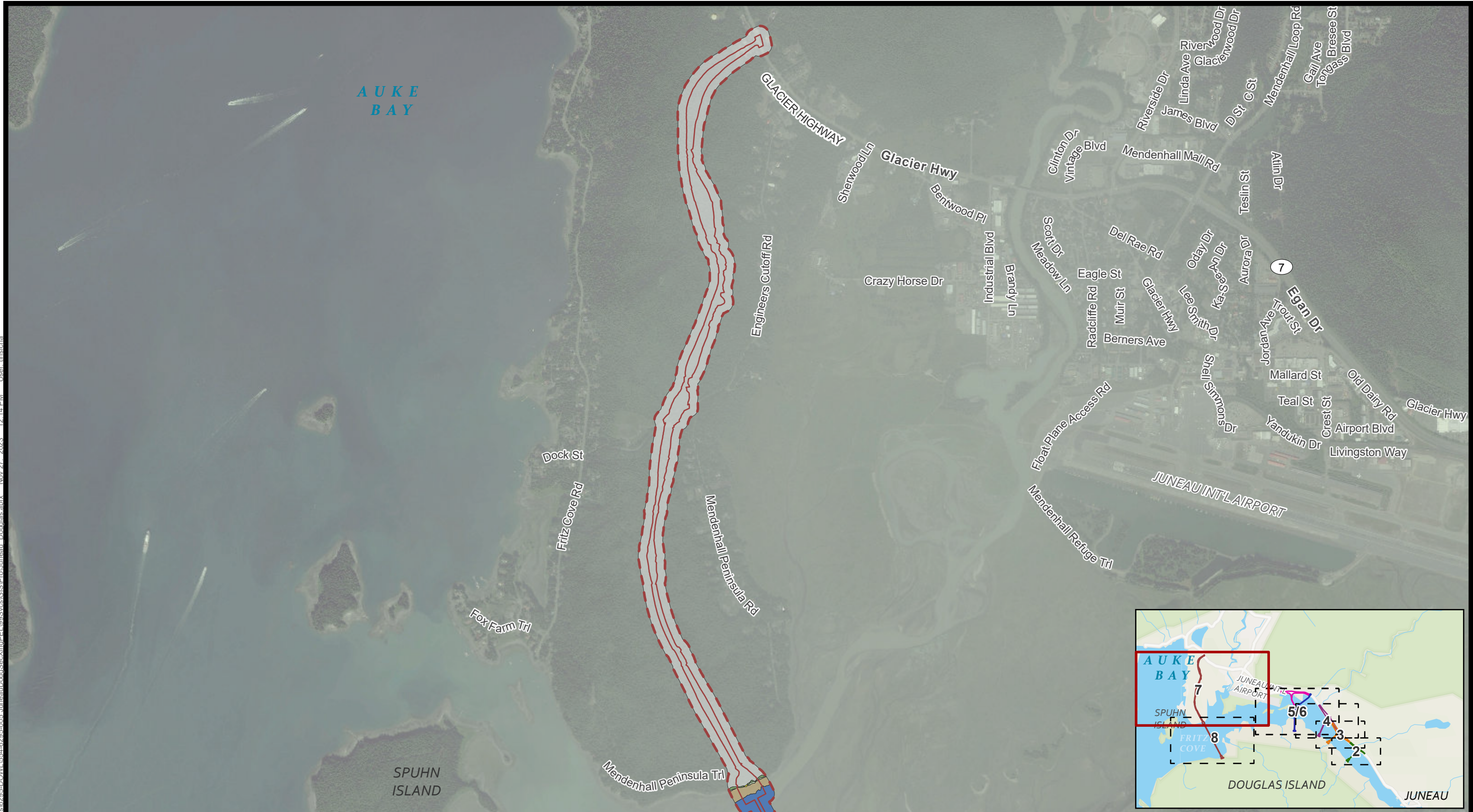
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CITY AND BOROUGH OF JUNEAU, ALASKA

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|---|---|
| <p>MENDENHALL PENINSULA STUDY AREA</p> <p>ALTERNATIVE FOOTPRINTS</p> <ul style="list-style-type: none"> Salmon Creek Footprint Twin Lakes Footprint Vanderbilt Sunny Point East Sunny Point West Mendenhall Peninsula | <p>INTERTIDAL HABITAT¹</p> <ul style="list-style-type: none"> Subtidal Channel Lower Intertidal Mudflat Lower Intertidal Emergent Marsh Intertidal Rocky Upper Intertidal Natural Upper Intertidal Developed Impounded Upland |
| <p>0 500 1,000 Feet</p> | |

Sources:
 1: NATIONAL WETLAND INVENTORY, TOPOGRAPHY DERIVED FROM LIDAR (2013 AND 2021), FIELD VERIFICATION ON SEPTEMBER 27-29, 2023.
 2: GOOGLE AERIAL IMAGERY

NOTE: "UPLAND" INCLUDES ALL NON-INTERTIDAL LAND COVERS (E.G., FORESTED, FRESHWATER WETLAND, DEVELOPED, ETC.)

**INTERTIDAL HABITAT TYPES
MENDENHALL PENINSULA (NORTH)
PAGE 7 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



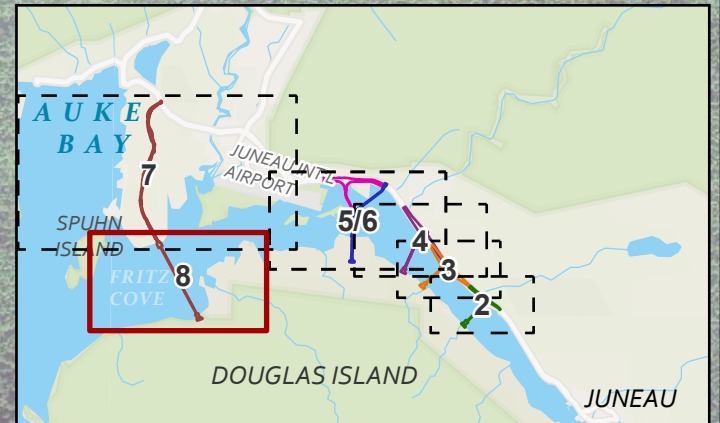
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CITY AND BOROUGH OF JUNEAU, ALASKA

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| <p>MENDENHALL PENINSULA STUDY AREA</p> <p>ALTERNATIVE FOOTPRINTS</p> <ul style="list-style-type: none"> Salmon Creek Footprint Twin Lakes Footprint Vanderbilt Sunny Point East Sunny Point West Mendenhall Peninsula | | <p>INTERTIDAL HABITAT¹</p> <ul style="list-style-type: none"> Subtidal Channel Lower Intertidal Mudflat Lower Intertidal Emergent Marsh Intertidal Rocky Upper Intertidal Natural Upper Intertidal Developed Impounded Upland | |
| | | <p>0 500 1,000 Feet</p> | |

Sources:
 1: NATIONAL WETLAND INVENTORY, TOPOGRAPHY DERIVED FROM LIDAR (2013 AND 2021), FIELD VERIFICATION ON SEPTEMBER 27-29, 2023.
 2: GOOGLE AERIAL IMAGERY

NOTE: "UPLAND" INCLUDES ALL NON-INTERTIDAL LAND COVERS (E.G., FORESTED, FRESHWATER WETLAND, DEVELOPED, ETC.)

**INTERTIDAL HABITAT TYPES
 MENDENHALL PENINSULA (SOUTH)
 PAGE 8 OF 8**

SEC 25 - 27, 34 - 36, T 40S, R 65E; SEC 30 - 34, T 40S, R 66E
 SEC 1 - 12, 15 - 17, T 41S, R 66E;
 SEC 4 - 10, 15 - 17, 21 - 23, 27 T 41S, R 67E

COPPER RIVER MERIDIAN, ALASKA



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CITY AND BOROUGH OF JUNEAU, ALASKA

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| NOVEMBER 27, 2023 | ATTACHMENT A |
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Attachment 2

Intertidal Habitat Profiles

Habitat Type Profile: Subtidal



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| <p>Description</p> | <p>Subtidal areas remain inundated at extreme low tides (approximately -4 feet relative to mean lower low water [MLLW]). The substrate may be mud, sand, gravel, or rocky. Submerged aquatic vegetation (such as eelgrass) may or may not be present.</p> <p>In most cases, the boundary of this habitat type was estimated based on aerial photographs and field-verified at the lowest tide available.</p> |
| <p>Characteristic Flora</p> | <p>Submerged aquatic vegetation (e.g., eelgrass, macroalgae)</p> |
| <p>Characteristic Fauna</p> | <p>Birds: American wigeon, bufflehead, Canada goose, common merganser, greater scaup, green-winged teal, hooded merganser, lesser scaup, mallard, northern pintail, northern shoveler, ring-necked duck, surf scoter</p> <p>Fish: Pacific herring, Pacific staghorn sculpin, starry flounder, rock sole, Pacific sand lance, salmonids</p> <p>Mammals: harbor seal, river otter, Steller sea lion</p> <p>Invertebrates: crabs, shrimp, sessile benthic marine invertebrates, Pacific giant octopus</p> |
| <p>Other Comments</p> | <p>The only subtidal habitat identified was in the Salmon Creek and Mendenhall Peninsula study areas. Other areas that remained submerged at low tide were characterized as Channel.</p> |

Habitat Type Profile: Channel



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| Description | Channel areas are above MLLW but remain inundated at low tides due to delayed drainage from tidal or freshwater sources. The substrate may be unvegetated mud, sand, or gravel. |
| Characteristic Flora | Unvegetated; occasional filamentous algae |
| Characteristic Fauna | <p>Birds: American crow, American wigeon, bald eagle, Bonaparte's gull, bufflehead, Canada goose, California gull, glaucous-winged gull, green-winged teal, herring gull, mallard, northern pintail, northern shoveler, ring-necked duck, short-billed gull</p> <p>Fish: juvenile flatfish, starry flounder, Pacific sand lance, Pacific staghorn sculpin, snake prickleback, yellowfin sole, salmonids</p> <p>Mammals: river otter</p> <p>Invertebrates: crabs, shrimp, benthic infauna</p> |
| Other Comments | Channels are found at the mouths of local creeks, where they have been formed by freshwater runoff across the tide flats as well as by depressions within the salt marsh that retain water even at low tide, when most tidal channels or sloughs are dry. |

Habitat Type Profile: Lower Intertidal Mudflat/Unvegetated



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| Description | Lower intertidal mudflat includes all areas that are exposed at low tide that are unvegetated; typically from the subtidal zone up to +10 ft MLLW. May include mud, sand, algal mats, brown and green algae, and sparse vegetation. Cobble and boulders may be present, which allow for colonization by blue mussels, barnacles, and other invertebrates. |
| Characteristic Flora | Brown algae (i.e., <i>Fucus</i> spp.) Green algae spp. |
| Characteristic Fauna | Birds: American crow, American pipit, American wigeon, bald eagle, Bonaparte's gull, California gull, glaucous-winged gull, greater yellowlegs, green-winged teal, herring gull, least sandpiper, lesser yellowlegs, mallard, short-billed gull, pectoral sandpiper, semipalmated plover, western sandpiper Mammals: river otter, mink Invertebrates: amphipods, isopods, snails, clams, polychaete worms, mussels, barnacles |
| Other Comments | This unvegetated intertidal habitat type includes a wide range of substrates, from silt, mud, sand, gravel to intermittent cobble/boulder. Additionally, mussel beds and macroalgae are common in higher-energy locations. |

Habitat Type Profile: Lower Intertidal Emergent Marsh



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|------------------------------------|--|
| <p>Description</p> | <p>These are areas that are frequently inundated but exposed at low tide and are vegetated with vascular plants. Communities may include Pacific alkali grass, goosetongue, and Lyngbye's sedge.</p> <p>These are typically found between approximately +10 ft MLLW to +16 ft MLLW (the mean higher high water [MHHW] elevation is 16.3 ft).</p> |
| <p>Characteristic Flora</p> | <p>Lyngbye's sedge (<i>Carex lyngbyei</i>) arrowgrass (<i>Triglochin maritimum</i>) beach rye (<i>Leymus mollis</i>) Canadian sandspurry (<i>Spergularia canadensis</i>) Gmelin's saltweed (<i>Atriplex gmelinii</i>) goosetongue (<i>Plantago maritima</i>) low chickweed (<i>Stellaria humifusa</i>) Pacific alkali grass (<i>Puccinellia nutkaensis</i>) sea milkwort (<i>Glaux maritima</i>) seabeach sandwort (<i>Honckenya peploides</i>) seablite (<i>Suaeda calceoliformis</i>) silverweed (<i>Potentilla anserina</i>)</p> |
| <p>Characteristic Fauna</p> | <p>Birds: American pipit, Canada goose, dabbling ducks (e.g., mallard, green-winged teal), dunlin, great blue heron, greater white-fronted goose, gulls, merlin, northern harrier, swans, whimbrel Fish: salmonids, sculpins, sticklebacks Mammals: black bear, river otter, mink</p> |
| <p>Other Comments</p> | <p>The upper extent of Lyngbye's sedge typically denotes the break between low and high marsh.</p> |

Habitat Type Profile: Intertidal Rocky



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|-----------------------------|---|
| Description | These are areas of rocky or hard substrate anywhere within the intertidal zone. |
| Characteristic Flora | Lyngbye's sedge (<i>Carex lyngbyei</i>) beach rye (<i>Leymus mollis</i>) mosses lichens |
| Characteristic Fauna | Birds: American crow, black oystercatcher, common raven, great blue heron, plovers, ruddy turnstone, sandpipers, surfbird Invertebrates: barnacles, chitons, isopods, limpets, sea stars, snails |
| Other Comments | This habitat type was only observed in the Mendenhall Peninsula study area, although isolated boulders within the mudflats and riprap can function similarly in other study areas. |

Habitat Type Profile: Upper Intertidal Natural



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| Description | These are areas in the upper portion of the intertidal zone that have established vegetation communities. They may include beach rye, coastal grass meadow, coastal forb meadow, reed canarygrass. They are typically found above MHHW elevation. |
| Characteristic Flora | beach rye beach pea cow parsnip fireweed foxtail barley hemlock parsley kneeling angelica Lyngbye's sedge Nootka lupine red fescue tufted hairgrass yarrow |
| Characteristic Fauna | Birds: American crow, American kestrel, American pipit, greater white-fronted goose, Lapland longspur, merlin, northern harrier, short-eared owl, snow goose Mammals: black bear, long-tailed vole, mink, river otter, Sitka black-tailed deer |
| Other Comments | This habitat type begins immediately above the Lyngbye's sedge community and extends to the upper limits of tidal influence. |

Habitat Type Profile: Upper Intertidal Developed



| | |
|-----------------------------|---|
| Description | These are areas in the upper portion of the intertidal zone that have been modified from the natural state. They may include human-created grassy areas, spoils, roadways, riprap, etc. |
| Characteristic Flora | Sitka willow saplings Sitka spruce saplings pasture grasses fireweed beach rye mosses |
| Characteristic Fauna | Birds: American crow, bald eagle, European starling, gulls |
| Other Comments | A developed shoreline was found predominantly on the Juneau side of the Gastineau Channel, with the riprap-protected roadway prism along Egan Drive. |