

Alaska Department of Transportation and Public Facilities

Sitka Seawalk Phase II Project (DOT&PF Project No. SFHWY00312)

Tier 1 Eelgrass Delineation Report

Sitka, Alaska

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INTRODUCTION

Background

Alaska Department of Transportation and Public Facilities (DOT&PF) is proposing to construct Phase II of the Sitka Seawalk project in Sitka, Alaska (Figure 1). To support environmental permit compliance associated with this potential development, DOT&PF hired Solstice Alaska Consulting, Inc. (Solstice) and Alaska BioMap, Inc. to perform a survey of potentially affected eelgrass (*Zostera marina*) beds.

Previous Investigations

Photographs, video imagery, and biological mapping units acquired from the National Oceanic and Atmospheric Administration National Marine Fisheries Service's (NOAA Fisheries) *ShoreZone* website, show continuous eelgrass and marine algae in the project area (NOAA Fisheries 2022). In addition, Solstice conducted a preliminary low-tide survey in May 2022 for presence/absence of eelgrass in the project area and saw a continuous eelgrass bed at the head of the cove near the start of Section 2 of the seawalk. Because the preliminary survey was conducted outside of the June-October survey window recommended by the U.S. Army Corps of Engineers (USACE; 2018) and because it was not conducted during an extreme low tide, the extent of eelgrass in the area was unknown.

STUDY AREA

The study area encompassed the entire seawalk project area, totaling approximately 8,245 square meters (m²; 2.0 acres) along about 230 m (754 feet [ft]) of shoreline along Sitka Channel and adjacent to Harbor Drive in Sitka, Alaska (Figure 1). Two distinct habitat types characterize the area: a broad, shallow cove at the north end that is exposed at low tide and a narrow, steep shoreline of riprap and bedrock that remains submerged even at the lowest tides. The center point coordinates of the survey area are 57.047°, -135.338°, and the legal description is Copper River Meridian, Township 56S, Range 63E, Section 1 and 2.

METHODS

The eelgrass survey was conducted on August 12 and 13, 2022 by Darcie Neff and Emerald Hagy. Survey dates were selected based on the eelgrass growing season and optimal low tides. All survey activities occurred during daylight and within 4 hours of low tide (range +2.25 m to -2.68 m [7.4 ft to 8.4 ft] below mean lower low water [MLLW]).

Prior to the field survey, study area and possible transect locations were identified based on expected seawalk impacts and DOT&PF requests. In the field, all eelgrass in the survey area was delineated and mapped for areal extent following the "Eelgrass Delineation Method B" detailed in Components of a Complete Eelgrass Delineation Report (USACE 2018). Under this methodology, an eelgrass bed is defined as having a minimum of one or more shoots of eelgrass within a 1 m² quadrat within 1 m of another shoot. Beds of this density are considered continuous. In cases where an identified eelgrass bed is comprised of many individual patches that each meet the definition of an eelgrass bed and have a distance of 4.9 m (16 ft) or less between them, the eelgrass habitat can be identified as one patchy eelgrass bed following USACE (2018) guidance.

Beds were mapped by collecting global positioning system (GPS) data with Trimble Terrasync software on a Trimble Geo 7x handheld unit. The GPS data were collected real-time while following the edge of the bed as closely as possible. The GPS data were transferred to a desktop computer and differentially corrected to Sitka and Juneau base stations using Pathfinder Office. Corrected data were exported to shapefiles for further post-processing in ArcMap 10.8.

Intertidal beds were sampled at stations along transects placed perpendicular to the waterline (Figure 3). At each sampling station, a 0.5 m × 0.5 m quadrat was placed on the ground (Photo 1). Within the quadrat, eelgrass percent cover was determined as the percentage of the quadrat covered by eelgrass shoots to the nearest 5%; the field crew conferred to determine an estimate. Each station was photographed in a straight-down perspective, showing the substratum, vegetation, and fauna within the quadrat.



Photo 1. A sample station with a 0.5 m × 0.5 m quadrat.

Each station was marked in the center with a metal-staked flag. These flags were left in place for the duration of the day's survey, as allowed by the tide, to help maintain orientation within the bed and aid in determination of tidal elevations.

Habitat submerged during low tide was surveyed by boat. Subtidal beds were mapped from the water for areal extent and measured for water depth. Photographs and visual estimates of bed size were taken from shore.

When possible and as time allowed, tidal elevations were determined alongshore, at sampling stations, and at the upper and lower bounds of eelgrass. Alongshore, tidal levels were collected while walking at the water's edge. At stations and eelgrass bounds, the time at which inundation occurred was recorded and later related to daily tide levels predicted for tide station 9451600 (NOAA 2022). Control points were also collected at four nearby USGS geodetic survey markers to help ensure accurate georeferencing.

RESULTS

Four continuous eelgrass beds (one large intertidal bed and three small subtidal beds) were identified, delineated, and mapped in the study area (Figure 2). GPS accuracy ranged from 0.05 m to 1.1 m across all point and line data, with more than 90% of the 4,300 corrected positions registering within 0.5 m (19.7 inches).



Photo 2. Study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel. Bed 1 (described below) is visible in this photo.

Intertidal Eelgrass Bed (Bed 1)

The intertidal eelgrass bed (Bed 1) filled the majority of the cove at the northern end of the study area (Photo 2), extending from +0.97 m to -1.0 m (-3.2 ft to -3.3 ft) relative to MLLW. The western edge of the bed was between 0 m and 3 m (0 ft to 9.8ft) from the riprap for about 85 m of shoreline (Figure 3). Total area of Bed 1 was 3,750 m² (0.93 acres), or roughly 40% of the study area.

Bed 1 was sampled at a total of 51 sampling stations along 7 transects set perpendicular to the waterline (Figure 3). Transects were named alphabetically in the order that they were surveyed (A to G; Figure 3), and sampling stations along each transect were named in descending order from the highest to the lowest elevation, starting with the number 1. Table 1 summarizes findings along each transect in Bed 1.

Table 1. Summary of Results by Transects in Sitka Seawalk Phase II Eelgrass Survey Bed 1

Transect	Length (m)	# Of Sampling Stations	Overall Eelgrass Characterization	Percent Cover		Photo Reference
				Station(s)	Cover	
A	48 m	8	Dense	1 to 2	<2%	4
				3 to 8	50% to 80%	
B	46 m	6	Dense	1	<1%	5
				2 to 6	50% to 75%	
C	39 m	7	Mixed	1, 4, and 5	<5%	6
				2, 3, 6, and 7	10 % to 40%	
D	16 m	5	Dense	1, 2, and 5	0% to 2%	7
				3 and 4	40% to 60%	
E	70 m	11	Dense	1 and 2	0%	8
				3	<1 %	
				4 to 10	40% to 80%	
				11	15%	
F	35 m	7	Mixed	1 to 3	0% to 2%	9
				4 and 6	10%	
				5 and 7	50% to 55%	
G	46m	7	Dense	1 and 4	1% to 10%	9 and 10
				2, 3, 5, 6, and 7	40% to 70%	

Five species of marine algae were identified in Bed 1. In Transect C, sugar kelp (*Saccharina latissima*), sea lettuce (*Ulva lactuca*), and a red alga were present. The red alga, tentatively identified by photo as an invasive species of the genus *Ahnfeltia* based on personal communication with Mandy Lindeberg¹, was located between station C3 and C4 (Photo 3; Figure 3). The epiphytic sea cauliflower (*Leathesia marina*) was found on a species of *Neorhodomela* algae in Sampling Station G5, and rockweed (*Fucus distichus*) dominated portions of Transect F (Photo 9).

¹ Mandy Lindeberg is a Fisheries Research Biologist with the National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratories, Ted Stevens Marine Research Institute in Juneau, Alaska. Mandy is also the lead author of the *Field guide to Seaweeds of Alaska* (2010) and one of two points of contact for the website www.seaweedsalaska.com.



Photo 3. Red alga, tentatively identified by photo as an invasive species of the genus *Ahnfeltia*, between Stations C3 and C4 in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey area in Sitka Channel.

Two humanmade structures were present in Bed 1. A presumably derelict metal pipe outfall was immediately north of Transect C. The end of Transect E also intersected the metal pipe with Sampling Station E11 on the pipe's south side (Photos 6 and 8). A manmade rock wall of unknown purpose or age was identified on the eastern side of Bed 1 and intersected Transects F and G (Photos 9 and 10).

Across all transects, percent cover as well as the width and length of eelgrass blades generally increased with decreasing elevation. A few flowering shoots were observed on Transect F. A diatom film was common on eelgrass blades at elevations less than -0.7 m (-2.3 ft) MLLW. Invertebrates recorded in Bed 1 include about two dozen *Littorina* and *Lacuna* snails, two *Lacuna* egg cases attached to eelgrass (Sampling Station D4), three ochre sea stars (*Pisaster ochraceus*), one burrowing green anemone (*Anthopleura artemisia*), two Christmas anemone (*Urticina crassicornis*), numerous purple shore crab (*Hemigrapsus nudus*), and one 9-inch long polychaete worm. Also seen were several schools of what looked to be young-of-the-year cod swimming through the eelgrass in about 6 inches of water at a falling tide. A great blue heron (*Ardea herodias*) remained in the eelgrass bed area for about 2 hours on one of the days.

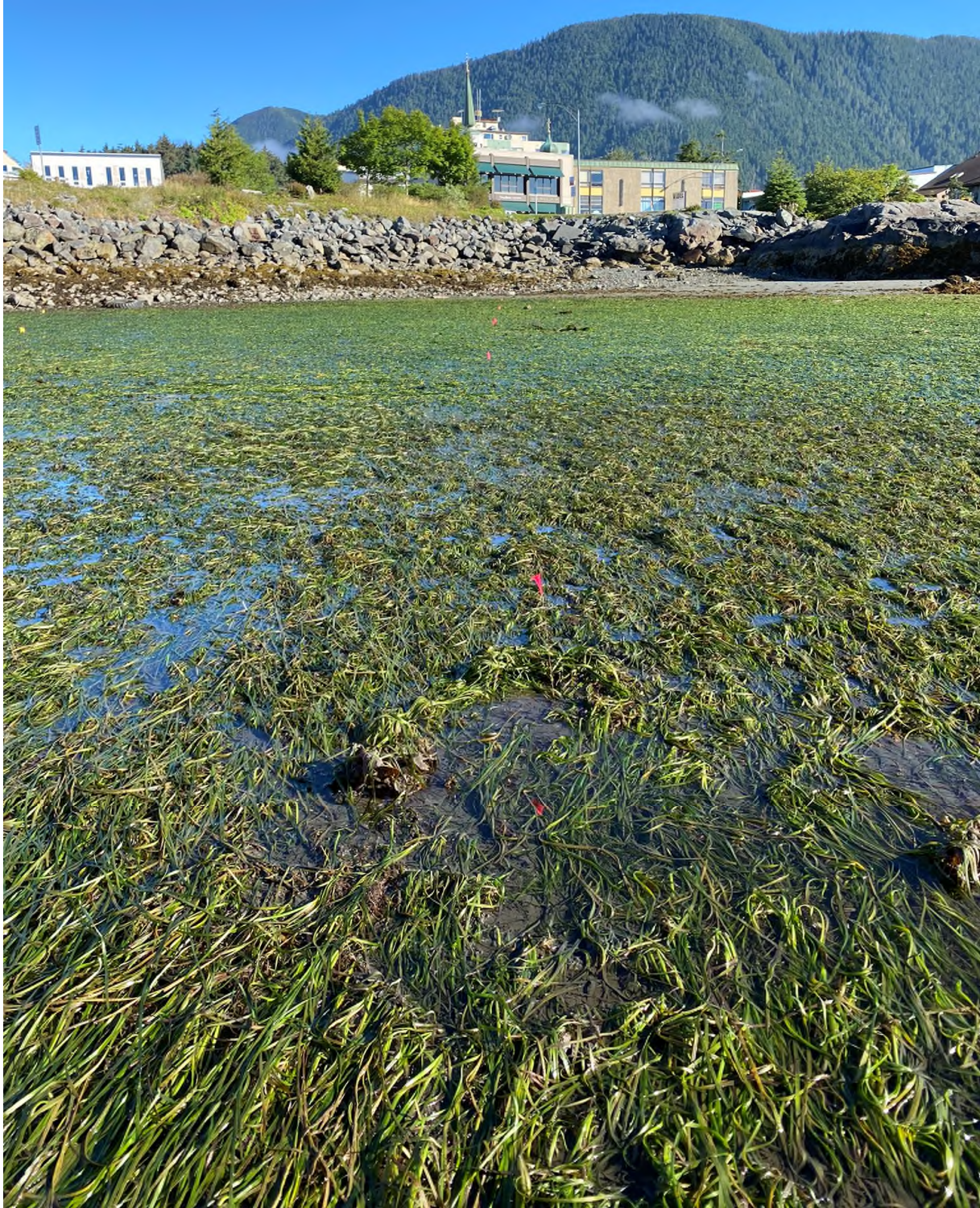


Photo 4. Pink flags mark Transect A in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel.

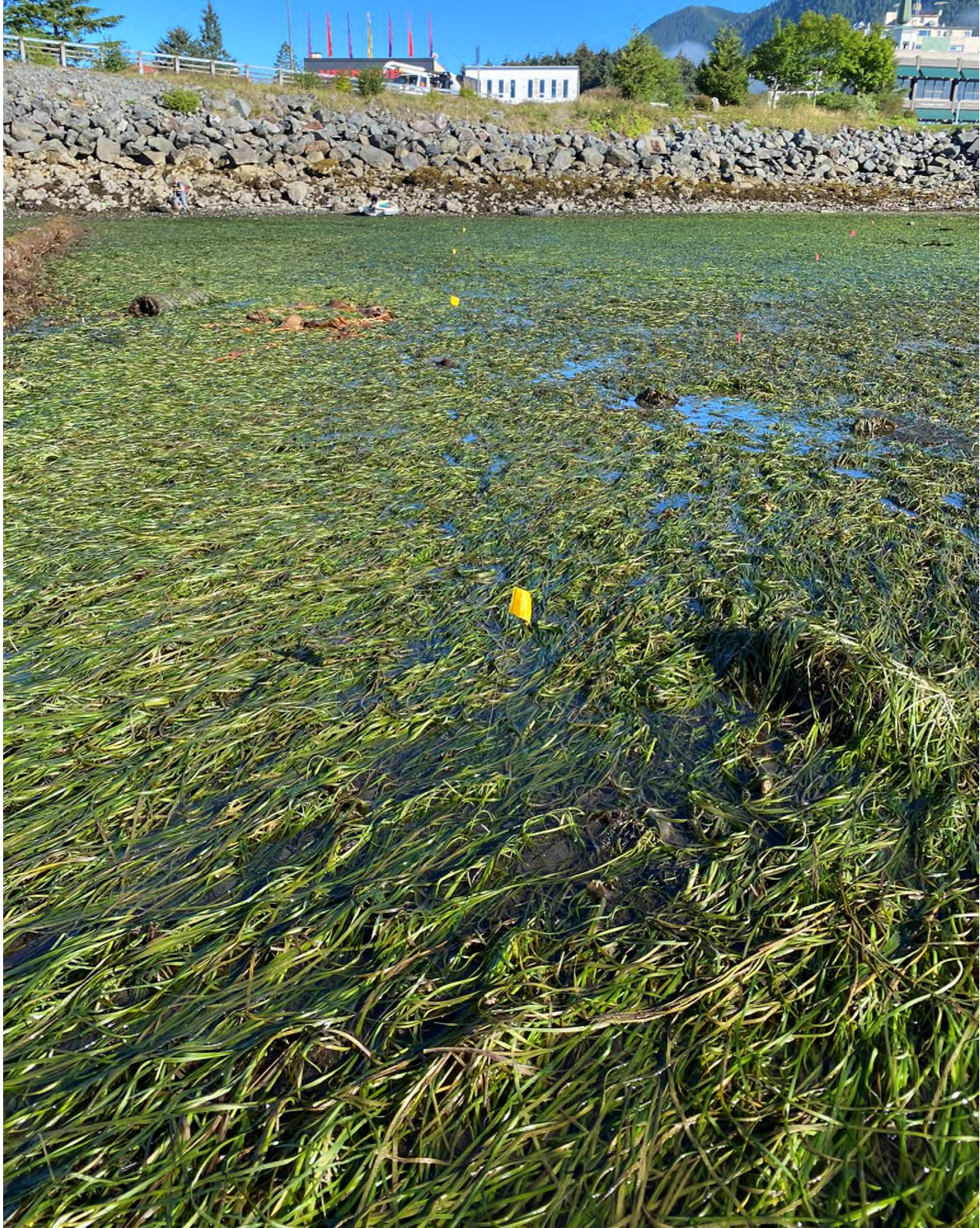


Photo 5. Yellow flags mark Transect B in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel.



Photo 6. Green flags mark Transect C in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel. This transect runs almost parallel to a derelict metal pipe.



Photo 7. Pink flags mark Transect D in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel.



Photo 8. Yellow flags mark Transect E in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel. This transect intersects a derelict metal pipe outfall.



Photo 9. Green and pink flags mark Transects F and G in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel. Both transects intersect remnants of a manmade rock wall.



Photo 10. A prominent section of a manmade rock wall on Transect G in Bed 1 of the study area for the Sitka Seawalk Phase II Eelgrass Survey area in Sitka Channel.

Subtidal Eelgrass Beds (Beds 2, 3, and 4)

A subtidal bed (Bed 2) was observed just south of the most southeastern point of Bed 1 at -1.1 m (-3.6 ft) MLLW (Photo 11). Total area of Bed 2 had an estimated area of 4.3 m² (46.3 ft²).



Photo 11. Yellow arrow marks the approximate location of Bed 2 in the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel marked with an arrow. The O'Connell Bridge Lightering Float is visible at the middle left area of the picture.

Roughly equidistant of Bed 2 and the gangway of the O'Connell lightering facility (Figure 1) were two subtidal beds (Bed 3 and 4) separated by about 10 m. Bed 3 was located at a depth of about -2.6 m (8.5 ft) MLLW and had an estimated area of 3.4 m² (36.6 ft²; Photo 12). Bed 4 was at a depth of about -1.9 m MLLW and was estimated at 0.7 m² (7.5 ft²; Photo 13). The blades of Beds 3 and 4 were fully submerged, and it was unable to verify whether these were eelgrass or surfgrass (*Phyllospadix scouleri*) beds. Surfgrass occurs in Sitka and is found in upper subtidal bedrock habitats with moderate to high wave exposure (Lindeberg and Lindstrom 2010)².

The shoreline between Bed 4 and the gangway of the O'Connell Bridge Lightering Dock was exposed at low tide (Photo 14). The area was scanned from the edge of the parking lot and characterized by a hard substrate of boulders and cobble covered with dense rockweed and some sea lettuce. No eelgrass or evidence of habitat conducive to eelgrass was visible.

² Both eelgrass and surfgrass are native to Alaskan waters and provide similar important structure and habitat in the nearshore environment. The possibility of surfgrass is called out due to the USACE eelgrass delineation guidelines (USACE 2018) being specifically for species of *Zostera* and requiring that native *Z. marina* and introduced *Z. japonica* be delineated as separate beds.



Photo 12. Bed 3 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel. Bed 3 is visible at the surface of the water near the bottom of the picture.



Photo 13. Bed 4 of the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel.



Photo 14. Shoreline immediately north of the O’Connell lightering facility in the study area for the Sitka Seawalk Phase II Eelgrass Survey in Sitka Channel.

CONCLUSIONS

Four continuous eelgrass beds, one intertidal and three subtidal, were identified in the Sitka Seawalk Phase II Project Tier 1 Eelgrass Survey area (Table 2). The majority of the eelgrass was located in the cove at the north end of the study area. Areal extent of eelgrass beds ranged from 3,750 m² (0.93 acres) in the cove to 0.7 m² (7.53 ft²) in near the O’Connell Bridge Lightering Dock. Total eelgrass area was 3,758.4 m² (0.93 acres) or roughly 46% of the 2 acres (8,245 m²) surveyed. Eelgrass depth distribution in the cove ranged from +0.97 m (3.18 ft) to -2.6 m (-8.5 ft). Subtidal beds were found in about 8.4 m (27.6 ft) of the survey area, and the beds extended to -1.9 m (4.6 ft) MLLW in the cove to -2.6 m (8.5 ft) MLLW in three small areas.

Table 2. Summary of Beds in the Sitka Seawalk Phase II Project Tier 1 Eelgrass Survey area.

Bed #	Bed Type	Area (m ²)
1	Continuous, intertidal	3,750.5
2	Continuous, subtidal	4.3
3	Continuous, subtidal	3.4
4	Continuous, subtidal	0.7
Total		3,758.4

REFERENCES

Lindeberg, M.R. and S.C. Lindstrom. 2010. Field guide to seaweeds of Alaska. Alaska Sea Grant College Program, University of Alaska Fairbanks, Fairbanks, Alaska. 188 pp.

National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries). 2022. Alaska ShoreZone Mapping Website. Accessed on June 19, 2022 at https://alaskafisheries.noaa.gov/mapping/sz_js/

National Oceanic and Atmospheric Administration (NOAA). 2022. Tides and Currents Website. Accessed on August 8, 2022 at <https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9451600&units=standard&bdate=20220812&edate=20220813&timezone=LST/LDT&clock=12hour&datum=MLLW&interval=hilo&action=dailychart>.

U.S. Army Corps of Engineers (USACE) 2018. Components of a Complete Eelgrass Delineation Report. Prepared by Dr. Deborah Shafer Nelson, U.S. Army Engineer Research and Development Center at the request of the Seattle District and Headquarters, USACE, with funding provided through the Wetlands Regulatory Assistance Program.

APPENDIX A. Figures

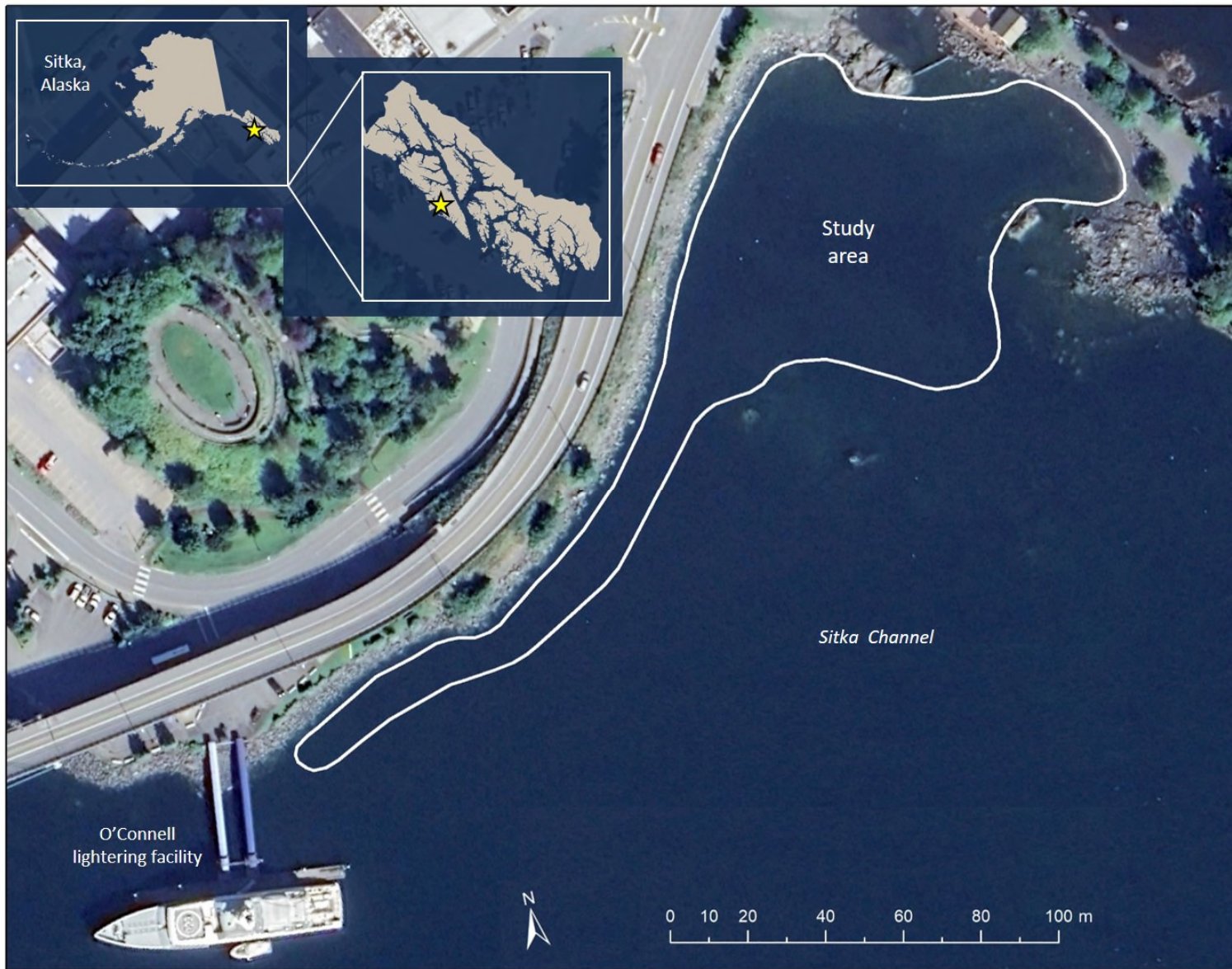


Figure 1. Vicinity map of Sitka Seawalk Phase II Eelgrass Survey area in Sitka Channel.

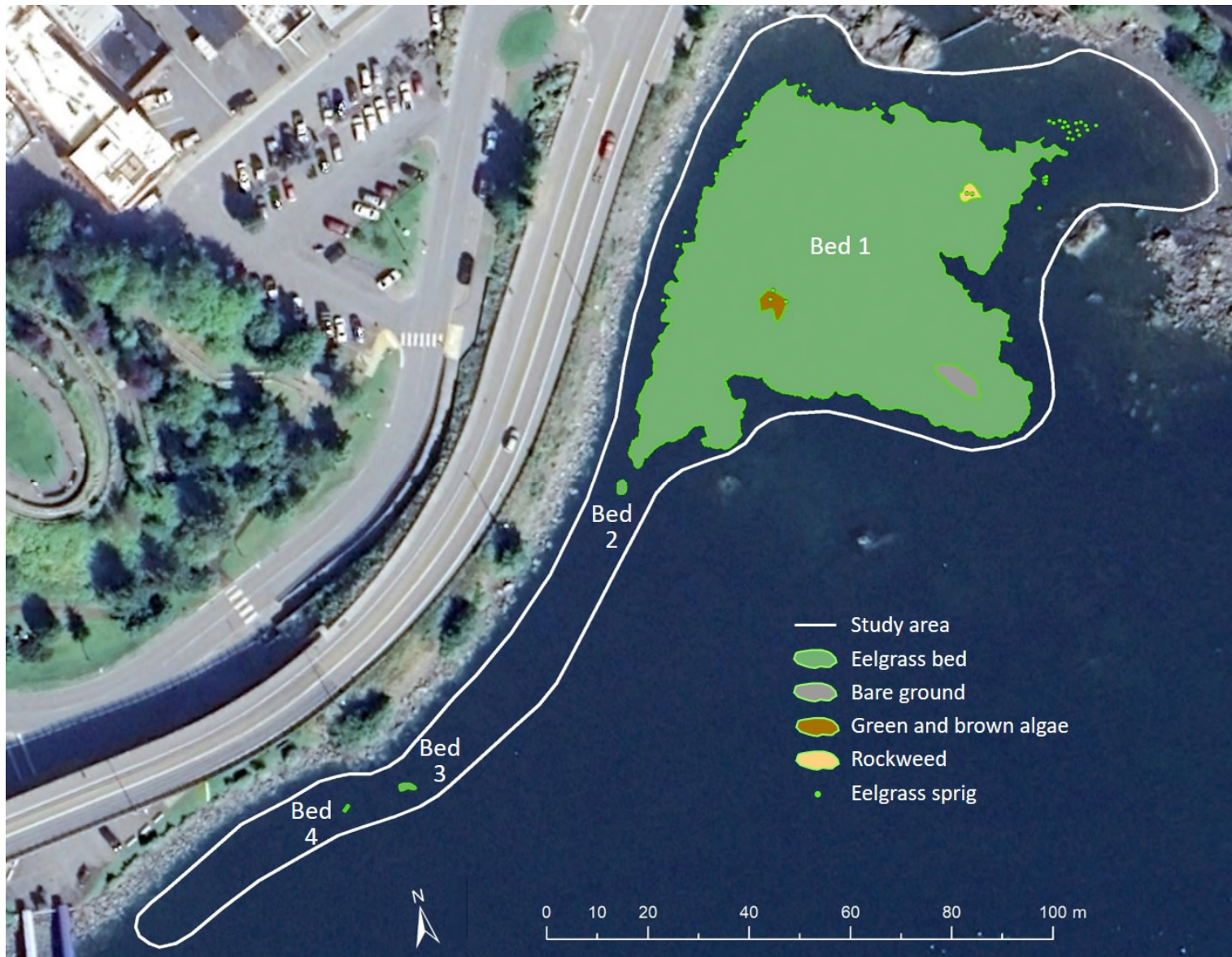


Figure 2. Eelgrass beds delineated in the Sitka Seawalk Phase II Eelgrass Survey area in Sitka Channel.

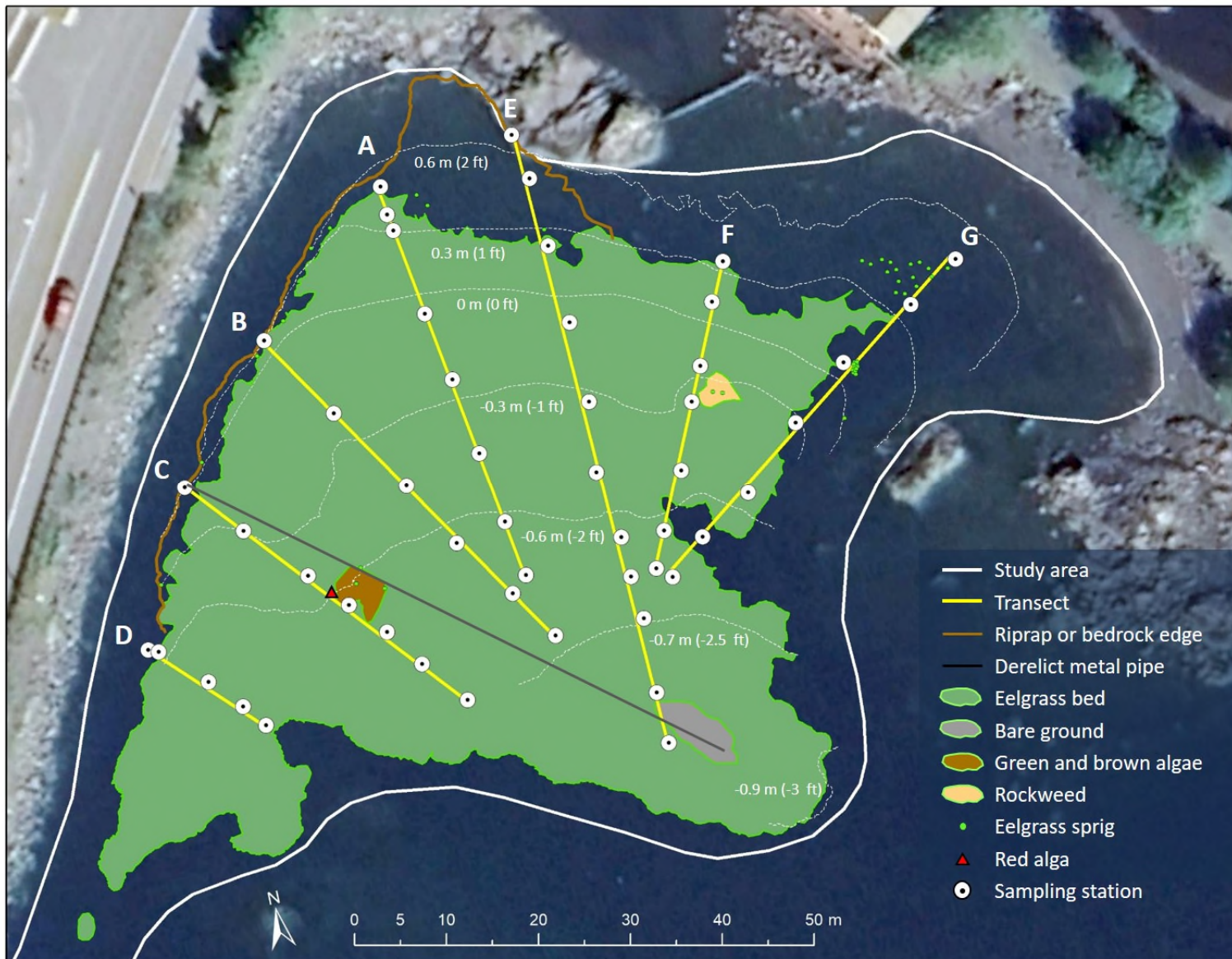


Figure 3. Bed 1 of the Sitka Seawalk Phase II Eelgrass Survey area in Sitka Channel.