AMENDMENT TO BRADLEY LAKE HYDROELECTRIC PROJECT (FERC No. 8221), BRADLEY LAKE EXPANSION PROJECT

Wetland Delineation Report

Prepared for:

Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, Alaska 99503-2495

Prepared by:

DOWL
5015 Business Park Blvd., Suite 4000
Anchorage, Alaska 99503

January 2026

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

A

ADF&G	Alaska Department of Fish and Game
AEA	Alaska Energy Authority

B

Bradley Lake Project	Bradley Lake Hydroelectric Project, FERC No. 8221
BLVD	Bradley Lake Vertical Datum

D

DOWL	DOWL, LLC
DSP	Draft Study Plan

F

FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FERC	Federal Energy Regulatory Commission

G

GIS	Geographic Information System
GHCN	Global Historical Climatology Network

H

HGM	hydrogeomorphic
HUC	Hydrologic Unit Code

I

ICD	Initial Consultation Document

M

MW	megawatt

N

N/A	not applicable
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory

O

OBL	Obligate
OHW	ordinary high water

P

PP	photo point
PWS	Professional Wetland Scientist

S

SP	sampling point

U

USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

1.1 Background

The Alaska Energy Authority (AEA), licensee and owner of the 120-megawatt Bradley Lake Hydroelectric Project (Federal Energy Regulatory Commission [FERC] No. 8221; Bradley Lake Project), is pursuing a FERC license amendment. The purpose of the proposed amendment is to gain authorization to divert storm and seasonal meltwater coming from Dixon Glacier at the headwaters of the Martin River to Bradley Lake and to raise the Bradley Lake dam/spillway to increase storage capacity and power production (AEA 2025).

AEA filed an Initial Consultation Document (ICD) (Kleinschmidt Associates 2022a) with FERC on April 27, 2022. The ICD describes existing facilities and current Bradley Lake Project operations; characterizes the affected environment; and describes two proposed project alternatives for producing energy from Dixon Glacier meltwater. Following the ICD filing, AEA hosted Joint Agency and Public Meetings in Homer, Alaska, on June 14, 2022, to discuss the ICD and receive stakeholder input. In November 2022, AEA filed a Draft Study Plan (DSP) (Kleinschmidt Associates 2022b) with FERC, based on the two alternatives, outlining 10 studies, including the Wetland Delineation Study. Stakeholders filed comments to the DSP in December 2022; no comments were made to the Wetland Delineation Study. AEA briefly paused the FERC amendment process while it conducted additional feasibility studies and narrowed down the proposed Project alternatives.

Based on further investigations, AEA decided to move forward with the proposed alternative diverting Dixon Glacier meltwater to Bradley Lake (Bradley Lake Expansion Project or Project). The proposed Project comprises two major elements, the Dixon Diversion and the Bradley Lake Pool Raise, and would include construction of: a diversion dam near the toe of the Dixon Glacier; an approximately 4.6-mile-long diversion tunnel bored through the mountain extending from Dixon Glacier to Bradley Lake, diverting water from the Martin River basin to Bradley Lake; approximately 1 mile of new, 16-foot-wide, gravel-surfaced access road from the existing Upper Battle Creek Diversion access road to the outlet of the proposed diversion tunnel; and modification of the existing Bradley Lake Dam to raise the maximum normal pool elevation currently at Elevation (El.) 1,180 feet Bradley Lake Vertical Datum (BLVD) by 16 feet (to El. 1,196 feet BLVD). The entire proposed Project is located on state-owned land.

AEA re-initiated the amendment process in 2024 by hosting public meetings in March and April 2024 to review the selected Project alternative, stakeholder comments to the DSP, and AEA's proposed modifications to the DSP. AEA also held a pre-application meeting with the U.S. Army Corps of Engineers (USACE) in May 2024. Consultation specific to this study can be found in Appendix A.

Wetland delineations were completed in 2024 and 2025 by DOWL, LLC (DOWL), in accordance with Part IV of the *Corps of Engineers Wetland Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (Version 2.0; USACE 2007). The 2024 surveys focused on the proposed Project footprint, while the 2025 effort was centered around potential construction impact areas. An interim report was prepared and filed with FERC describing the 2024 results (DOWL 2024). This final report describes the comprehensive results of both the 2024 and 2025 surveys which provide information for assessing potential impacts to wetlands and for future permitting with USACE for impacts to aquatic resources subject to jurisdiction under Section 404 of the Clean Water Act.

1.2 Modifications to the Draft Study Plan

The DSP for the Wetland Delineation Study included a goal for a wetland functional assessment, with specific objectives of analyzing wetland impacts, obtaining a USACE Section 404 permit for jurisdictional wetlands, and identifying avoidance and minimization measures and compensatory mitigation for jurisdictional wetlands. AEA will assess wetland impacts in the Draft License Amendment Application to be filed with FERC. Preliminary avoidance and minimization measures will be considered in the amendment application. These measures as well as compensatory mitigation, if required, would be finalized through consultation with USACE during the Section 404 permitting process, which would occur after submittal of the amendment application. Based on consultation with USACE, it was determined that the wetland functional assessment would also be completed at the time of Section 404 permitting (see Appendix A, Consultation Record). Accordingly, these goals and objectives were removed from the study.

2.0 GOALS AND OBJECTIVES

The goal of the Wetland Delineation Study is to identify wetlands and waterbody extents potentially impacted by the proposed Bradley Lake Expansion Project.

The specific objective of the study is as follows:

Delineate wetlands into distinct polygons based on Cowardin Classification (subclass designation) (Cowardin et al. 1979), Viereck Class IV vegetation types (Viereck et al. 1992), and hydrogeomorphic (HGM) classes to calculate the areas of each classification.

The results of this study provide AEA with information to assess potential impacts to wetlands, develop avoidance and minimization measures, identify USACE Section 404 jurisdictional wetlands and determine compensatory mitigation requirements consistent with Section 404(b)(1) guidelines, if necessary, and obtain a USACE permit. Based on direction provided by USACE during the May 7, 2024 pre-application meeting (see Appendix A), AEA will complete a functional assessment of the jurisdictional wetlands at the time of permitting.

3.0 STUDY AREA

The study area consists of the proposed Project footprint with buffers and potential construction impact areas as follows:

- Dixon Diversion Dam
- Dixon Diversion tunnel: 100-foot buffer around inlet and outlet;
- 1-mile-long new access road: 80-foot buffer around centerline;
- Bradley Lake Dam: 250-foot buffer around the dam site;
- Bradley Lake Pool Raise area: area between El. 1,180 and 1,196 feet around Bradley Lake;
- Six material sites, staging areas, and spoil deposition areas;
- Construction camp pad; and
- Expanded Bradley Lake Project boundary along existing road.

The total study area evaluated for wetlands and aquatic resources is 734 acres (Figure 3-1). The study area is within the township, range, and sections in the Seward Meridian listed in Table 3-1.

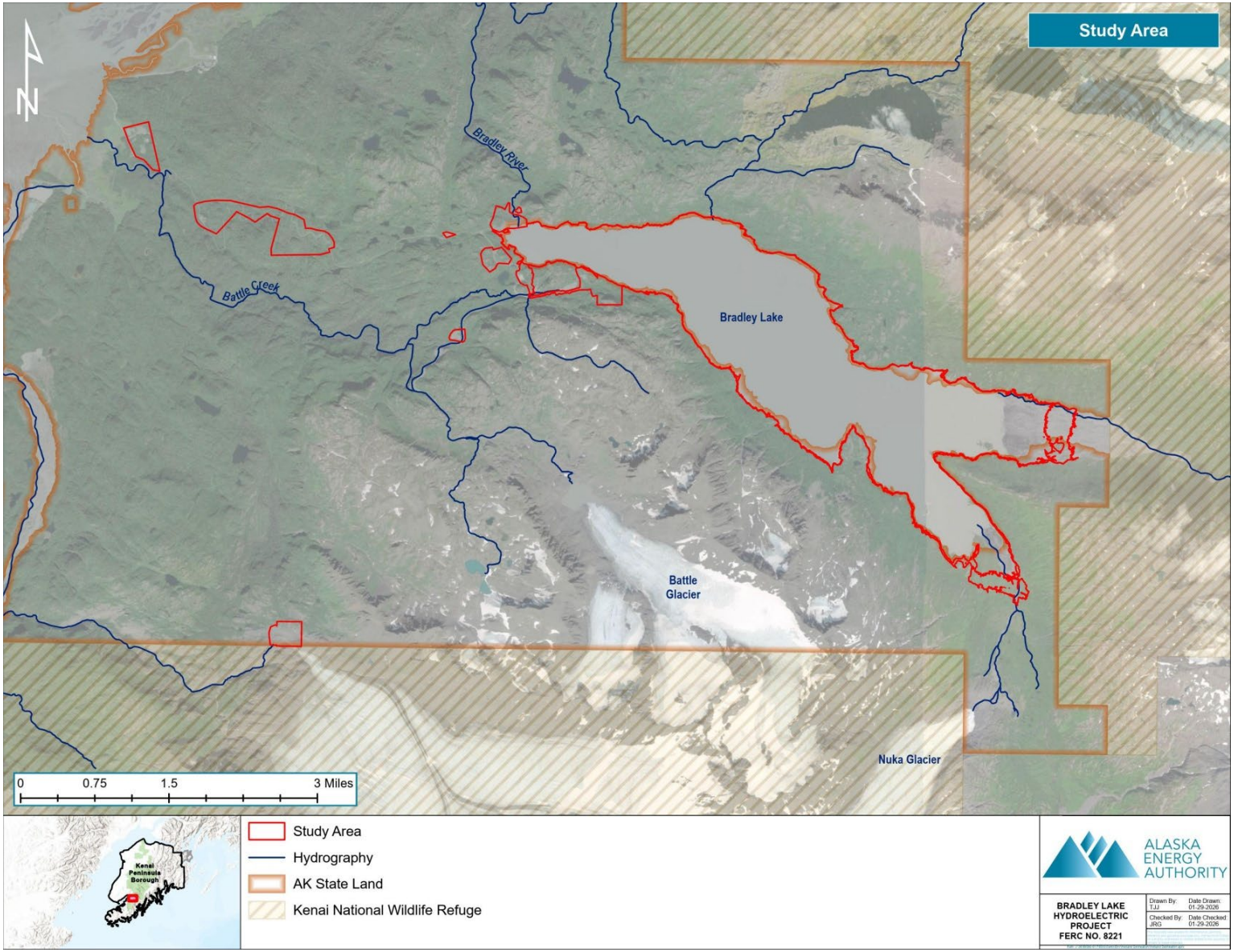


Figure 3-1 Bradley Lake Expansion Project wetland mapping study area

Table 3-1 Location Information

Township	Range	Sections
5 South	10 West	1, 3, 10, 11, 12, 35, 36
5 South	9 West	7, 8, 9, 10, 11, 14, 15, 16, 17,18, 22, 23, 24, 25, 26, 36
5 South	8 West	19, 20, 29, 30, 31

The study area is within the Alaska Pacific Coastal Mountains ecoregion. The Alaska Pacific Coastal Mountains ecoregion has steep terrain with most of the gradients exceeding 7 degrees. This ecoregion was heavily glaciated during the Pleistocene epoch, with active glaciers in higher elevations. The study area is near the southern boundary of the Cook Inlet ecoregion with similar characteristics. Dwarf and low scrub species dominate the region, as slopes are typically barren to sparsely vegetated, while lower elevations near drainage systems consist of needleleaf forests and dense thickets of low scrub communities (Gallant et al. 1995). The annual growing season spans from May 29 to September 27 (USACE 2007). Most of the soils in the ecoregion are covered by glaciers, ice fields, or rock outcrops with the developed soil formed in gravelly till and colluvium.

Bradley Lake is connected to Kachemak Bay, with its headwaters originating from the Kachemak and Nuka glaciers. Streams connected to Bradley Lake include many small, high-gradient streams and two major tributary streams. Meltwater from the Dixon Glacier terminus, where the tunnel intake would start, flows to the Martin River that is connected to Kachemak Bay southwest from where the Bradley River connects to the bay.

Uplands within the study area consist of a steep hillside surrounding Bradley Lake, areas of glacial outwash and stream deposits, and previously disturbed and filled access roads and infrastructure.

4.0 METHODS AND DATA SOURCES

4.1 Precipitation

The Antecedent Precipitation Tool Version 1.25 was used to determine precipitation conditions using the Nuka Glacier, Middle Fork Bradley, and Homer weather station data from the National Oceanic and Atmospheric Administration's Daily Global Historical Climatology Network (GHCN) (Figure 4-1 and Figure 4-2). Daily precipitation values over a 30-day rolling cycle were averaged for the 3-months preceding the field delineation activities to determine if observed surface hydrology or soil moisture conditions were expected to be drier than normal, normal, or wetter than normal. Fieldwork was conducted July 29 to August 2, 2024, during the dry season for the region, and June 18 to 20, 2025, during the wet season for the region.

For the 3 months preceding 2024 fieldwork, precipitation observations were considered normal within the study area (Figure 4-1). Wetland formation is driven by the frequency and duration of hydrology sources through precipitation, groundwater, stream/pond, or a combination of each. Based on the area receiving normal precipitation, it was anticipated wetlands formed with a dominant water source of groundwater and/or precipitation would have primary hydrologic indicators present during data collection activities. The amount of precipitation the week and days prior to fieldwork influences precipitation-driven wetlands (e.g., ponding). Field observations during the 2024 fieldwork were during the dry season where a dry season water table is between 12 and 24 inches for a mineral soil and between 12 and 40 inches for an organic soil.

The study area normally receives up to 5.3 inches of rainfall during the month of July. In July 2024, the study area received 4.5 inches of rainfall. June precipitation was drier than normal, while May precipitation was wetter than normal.

For the 3 months preceding 2025 fieldwork, precipitation observations were considered wetter than normal within the study area (Figure 4-2). Based on the area receiving greater than normal precipitation, it was anticipated wetlands formed with a dominant water source of groundwater and/or precipitation would have hydrologic indicators present during data collection activities.

The study area normally receives up to 6.4 inches of rainfall during the month of June. In June 2025, the study area received 7.7 inches of rainfall. April and May precipitation was normal.

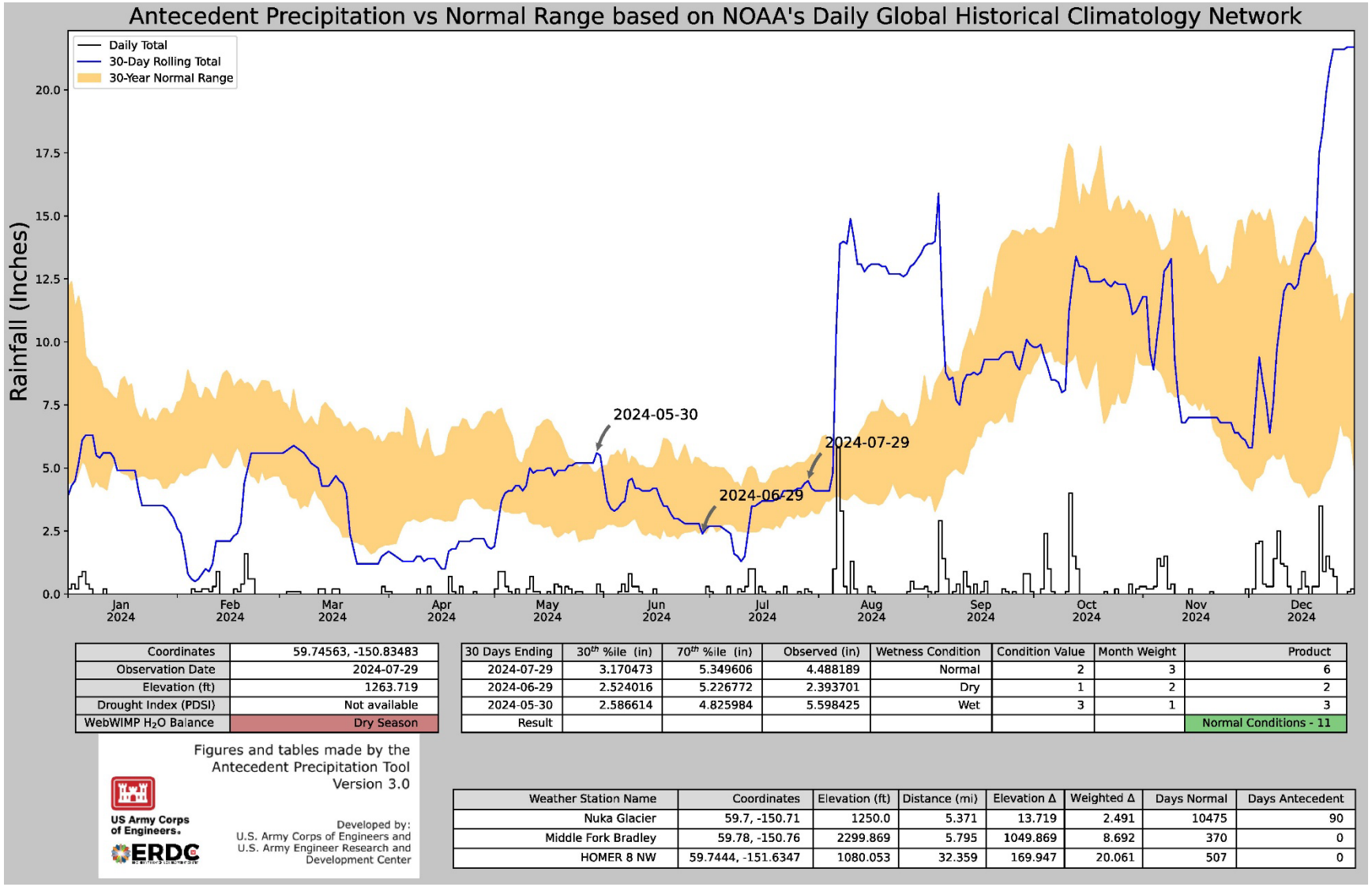
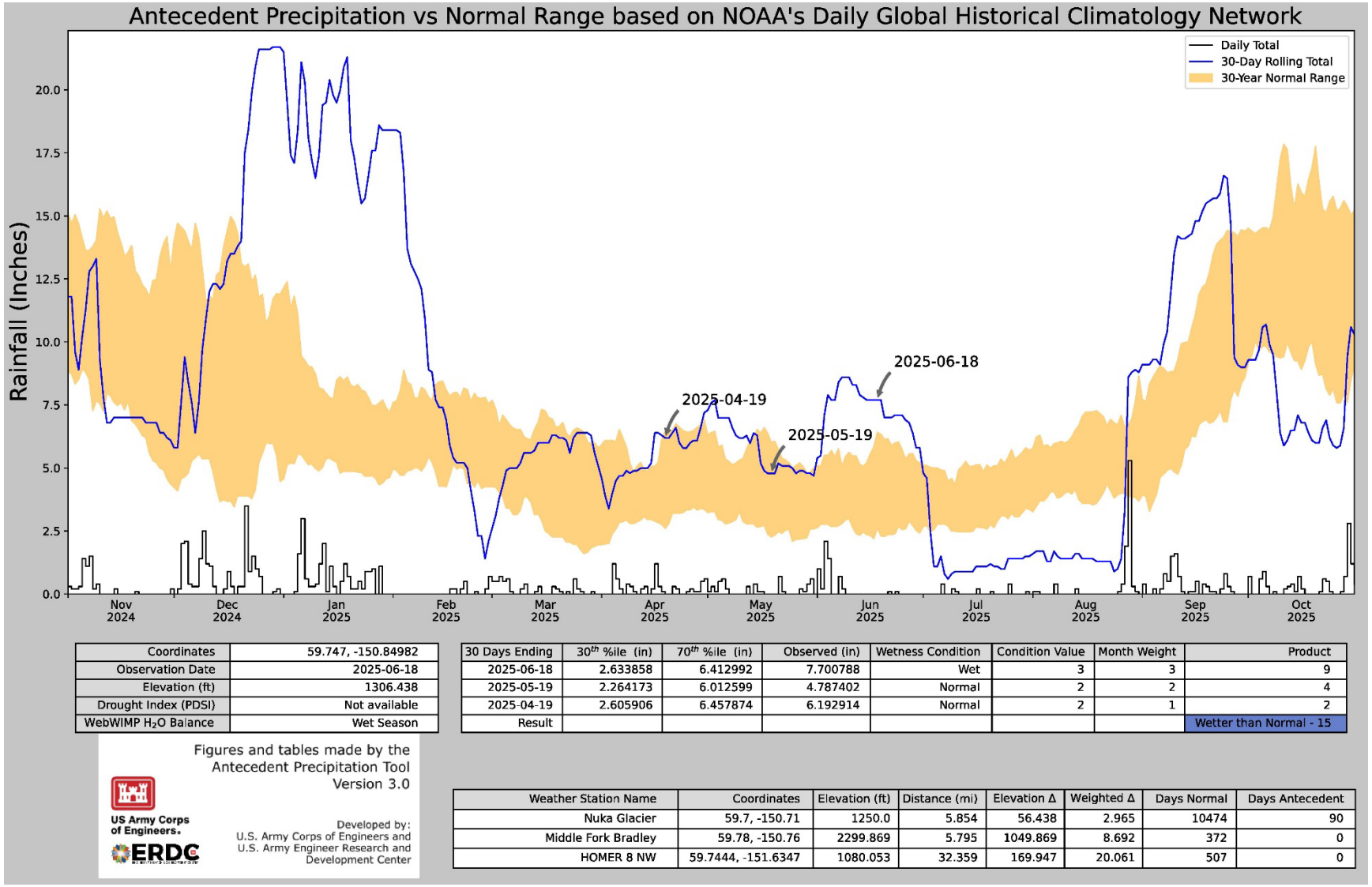


Figure 4-1 Nuka Glacier, Middle Fork Bradley, and Homer. National Oceanic and Atmospheric Administration Daily GHCN 2024 precipitation data.



Coordinates	59.747, -150.84982
Observation Date	2025-06-18
Elevation (ft)	1306.438
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2025-06-18	2.633858	6.412992	7.700788	Wet	3	3	9
2025-05-19	2.264173	6.012599	4.787402	Normal	2	2	4
2025-04-19	2.605906	6.457874	6.192914	Normal	2	1	2
Result							Wetter than Normal - 15

Figures and tables made by the Antecedent Precipitation Tool Version 3.0

US Army Corps of Engineers
ERDC

Developed by:
U.S. Army Corps of Engineers and
U.S. Army Engineer Research and Development Center

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
Nuka Glacier	59.7, -150.71	1250.0	5.854	56.438	2.965	10474	90
Middle Fork Bradley	59.78, -150.76	2299.869	5.795	1049.869	8.692	372	0
HOMER 8 NW	59.7444, -151.6347	1080.053	32.359	169.947	20.061	507	0

Figure 4-2 Nuka Glacier, Middle Fork Bradley, and Homer. National Oceanic and Atmospheric Administration Daily GHCN 2025 precipitation data.

4.2 Surface Hydrology

The Project will modify wetlands in three adjacent Hydrologic Unit Code 12 (HUC12) watersheds: Martin River (190203011104), Battle Creek (190203011103), and Bradley Lake (190203011101) watersheds. These HUC12 watersheds make up about 25 percent of the larger Quiet Creek–Frontal Kachemak Bay HUC10 (1902030111) watershed at the headwaters of Kachemak Bay. The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) wetland mapper has shown that the study area drains into estuarine and marine wetlands (E2USN) on the coast of Kachemak Bay (USFWS 2024).

4.3 National Wetlands Inventory

USFWS NWI existing wetland mapping data (USFWS 2024) were reviewed to establish a coarse wetland mapping baseline. The USFWS NWI dataset describes the extent and type of wetlands and waters of the U.S. in the study area (scale 1:24,000). The mapped extents are shown in Appendix B: Figure B-1. Within the 734-acre study area, the NWI mapping identified 4.9 acres of lacustrine, 7.2 acres of palustrine, 60.7 acres of riverine, and 4.9 acres of estuarine wetlands (Table 4-1).

Table 4-1 National Wetlands Inventory acres in the study area by Cowardin Classification.

Cowardin Classification	Acres	Percent of Study Area
Lacustrine	4.9	0.7
Palustrine	7.2	1.0
Riverine	60.7	8.2
Estuarine	4.9	0.7
Total Wetlands	**77.7**	**10.6**
Uplands	656.3	89.4

Note: Numbers are rounded to one decimal place, so sums are not exact.

4.4 Soil Type Data

Natural Resources Conservation Service (NRCS) Web Soil Survey data (NRCS 2024) are listed below and described in Table 4-2 as a percentage of the study area. Nine soil types are mapped in the study area, with no hydric soil conditions (Appendix B: Figure B-2).

Table 4-2 Natural Resources Conservation Service soil types in study area.

Map Unit Name	Percent of Study Area
Chenega silt loam, 0 to 2 percent slopes	0.2
Lithic Haplocryands-Alic Haplocryands-Rock outcrop complex, 25 to 45 percent slopes	19.6
Lithic Haplocryands-Alic Haplocryands-Rock outcrop complex, 45 to 100 percent slopes	3.1
Southern Alaska Coastal Mountains-Maritime Alpine-Barren Mountains	2.3
Southern Alaska Coastal Mountains-Maritime Subalpine and Alpine-Mountains	50.4
Tutka-Kasitsna-Rock outcrop complex, very steep	0.8
Tutka-Portgraham complex, hilly to steep	14.5
Urban land	8.1
Water, fresh	0.9

Note: Percentages are rounded to one decimal place, so sums are not exact.

4.5 Other Data Sources

Data from the following sources were also reviewed:

- Aerial Imagery: Esri World Imagery (July 2022) and high-resolution 2022 aerial imagery was used for wetland mapping. Other available aerial imagery data from Google Earth taken in 2003, 2005, 2017, and 2021 were referenced for changes in vegetation signature.
- U.S. Geological Survey (USGS) Hydrography Datasets: The National Hydrography Dataset identified 7,033.9 linear feet of streams within the study area (Appendix B: Figure B-1) (USGS 2024).
- Alaska Department of Fish and Game (ADF&G) Anadromous Waters Catalog: No streams have been mapped as anadromous waters within the study area (ADF&G 2024).
- LiDAR: 2025 1-foot contour data was used for wetland and waters mapping.

4.6 Field Data Collection and Wetland Mapping

DOWL Environmental Specialists Josh Grabel, PWS #2638, and Emily Anderson conducted the wetland delineation fieldwork from July 29 through August 2, 2024, and Josh Grabel and Gretchen Dana conducted the wetland delineation fieldwork from June 18 through 20, 2025, in accordance with Part IV of the *Corps of Engineers Wetlands Delineation Manual*

(USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (Version 2.0; USACE 2007). Wetlands were classified and grouped according to guidelines outlined in the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) and *A Hydrogeomorphic Classification for Wetlands* (Brinson 1993).

Data were collected at sampling points using the three-parameter approach combining site-specific indicators of hydrophytic vegetation, hydric soils, and wetland hydrology. Field notes were taken to document landscape topography and general site characteristics. At each sampling point, soil pits were excavated to a depth of at least 24 inches, or to the presence of a restrictive digging layer. Soil and hydrology characteristics of texture, color, saturation, and depth to water table were recorded on USACE Routine Wetland Determination forms (Appendix C.1). Soil color was recorded using Munsell Soil-Color Charts (Munsell Color 2024). Data reported for sampling points are prefixed with "SP." Additionally, photo points were taken to document site conditions, confirm dominant plant species, extrapolate data to similar habitat areas, or to make a wetland/upland determination when soil excavation was not necessary (Appendix C.2). Photo point locations are prefixed with "PP."

The following references were used to assist with field identification of dominant vegetative species:

- *Alaska Trees and Shrubs* (Viereck 2007)
- *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska* (Pojar and MacKinnon 2016)
- *Alpine Plants of the Northwest: Wyoming to Alaska* (Pojar and MacKinnon 2013)
- *Field Guide to Alaskan Wildflowers* (Pratt 1990)
- *Wetland Sedges of Alaska* (Tande and Lipkin 2003)
- *Willows of Southcentral Alaska* (Collet 2002)
- *2022 National Wetland Plant List, Version 3.6-Alaska Region* (USACE 2023)

An Apple iPad tablet with Esri Arc Collector Global Positioning System with 15-foot accuracy was used to collect spatial location field data. Esri ArcMap was used to delineate wetland/upland boundaries and calculate acreages. Final mapping was based on interpretation of aerial and site photos, topographic data, and field observations.

5.0 RESULTS

5.1 Study Area Characteristics

The study area contains approximately 83.9 acres of wetlands and waters within the pool raise and 14.8 acres of wetlands and waters within the remaining study area. Approximately 635.3 acres (86.6 percent) were determined to be upland habitat. Results of the field investigation are discussed below. Data sheets for sampling points and photo points are in Appendix C.1.

All dominant plant species observed in the study area are listed in Table 5-1, and all plant species observed in the field are included in Appendix C.3.

Table 5-1 Dominant plant species observed in study area.

Scientific Name	Common Name	Indicator Status
Achillea millefolium	common yarrow	FACU
Alnus incana	speckled alder	FAC
Alnus viridis	Sitka alder	FAC
Andromeda polifolia	bog rosemary	FACW
Arabis lyrate	rockcress	FACU
Artemisia tilesii	Tilesius' wormwood	FACU
Calamagrostis canadensis	bluejoint	FAC
Carex bigeloeii	Bigelow's sedge	FAC
Chamaenerion angustifolium	narrow-leaf fireweed	FACU
Cornus alba	white dogwood	FAC
Dryopteris expansa	spreading wood fern	FACU
Empetrum nigrum	black crowberry	FAC
Epilobium palustre	marsh willowherb	OBL
Equisetum arvense	field horsetail	FAC
Eriophorum angustifolium	tall cotton-grass	OBL
Menziesia ferruginea	false azalea	FACU
Oplopanax horridus	devil's-club	FACU
Picea x lutzii	hybrid spruce	FACU
Populus balsamifera	balsam poplar	FACU
Ribes triste	redcurrant	FAC
Rubus pedatus	strawberry-leaf raspberry	FAC
Salix ovalifolia	oval-leaf willow	FAC
Salix pulchra	diamond-leaf willow	FACW
Sambucus racemosa	red elderberry	FACU
Sanguisorba canadensis	Canadian burnet	FACW

Scientific Name	Common Name	Indicator Status
Spiraea stevenii	Steven's meadowsweet	FACU
Trientalis europaea	Arctic starflower	FACU
Vaccinium uliginosum	alpine blueberry	FAC
Veratrum viride	American false hellebore	FAC

Notes: FAC = Facultative; FACU = Facultative Upland; FACW = Facultative Wetland; OBL = Obligate; UPL = Upland.

5.1.1 Wetlands

Study area wetlands consist of the following dominant vegetation: speckled alder (*Alnus incana*), Sitka alder (*A. viridis*), bluejoint (*Calamagrostis canadensis*), leafy tussock sedge (*Carex aquatilis*), Alaska long-awn sedge (*C. macrochaeta*), alpine-tundra sedge (*C. macrochaeta*), alpine blueberry (*Vaccinium uliginosum*), balsam poplar (*Populus balsamifera)*, Bigelow's sedge(*Carex bigeloeii*), narrow-leaf fireweed (*Chamaenerion angustifolium*), black crowberry (*Empetrum nigrum)*, marsh horsetail (*Equisetum palustre*), marsh willowherb (*Epilobium palustre*), tall cotton-grass (*Eriophorum angustifolium*), tussock cotton-grass (*E. vaginatum*), strawberry-leaf raspberry (*Rubus pedatus*), felt-leaf willow (*Salix alaxensis*), diamond-leaf willow (*S. pulchra*), Sitka willow (*S. barclayi*), oval-leaf willow (*Salix ovalifolia*), salmonberry (*Rubus spectabilis*), Canadian burnet (*Sanguisorba canadensis*), Arctic starflower (*Trientalis europaea*), alpine blueberry (*Vaccinium uliginosum*), and alpine-marsh violet (*Viola palustris*).

Hydrophytic vegetation met dominance and/or prevalence index indicators. Typical wetlands within the study area are shown in Photo 5-1.

Photo 5-1 Typical wetlands within the study area (SP17).

Hydrologic indicators consisted of high water table, soil saturation, dry season water table, algal mat, inundation visible on aerial imagery, water-stained leaves, drainage patterns, presence of reduced iron, geomorphic position, microtopographic relief, and passing the facultative (FAC)-neutral test. The most common primary indicators were high water table and soil saturation. Typical wetlands soil and hydrology (soil saturation, dry season water table) in the study area are shown in Photo 5-2.

Photo 5-2 Typical wetland soils within the study area (SP7).

In general, soils in wetlands had a thick organic layer and met Histosol or Histic Epipedon. Soils without a thick organic layer but considered hydric soil based on best professional judgment include SP5 and SP11. SP5 contained gravelly soils with low organic-carbon content. SP11 contained problematic hydric soils within a stream channel with drift deposits, geomorphic position, FAC-neutral, and hydrophytic vegetation. Table 5-2 lists soil characteristics observed at sampling points.

Table 5-2 Soil observations at sampling points within the study area.

Sampling Point	Organic Mat Thickness (inches)	Hydric Soil
SP1	3	No
SP2	4	No
SP3	2	No
SP4	3	No
SP5	4	Yes, Problematic gravelly soils
SP6	3	No
SP7	18	Yes, Histosol
SP8	8	Yes, Histic Epipedon
SP9	5	No
SP10	1	No
SP11	0	Yes, problematic sandy soils in stream channel
SP12	5	No
SP13	5	No
SP14	4	No
SP15	20	Yes, Histosol
SP16	4	No
SP17	11	Yes, Histic Epipedon
SP18	6	No
SP19	4	No
SP20	1	No
SP21	2	No
SP101	2	No
SP102	2	No
SP103	2	No
SP104	2	Yes, problematic Alaska Alpine Swale indicator
SP105	14	Yes, Histic Epipedon
SP106	2	No
SP107	18	Yes, Histosol
SP108	2	No
SP109	2	No
SP110	1	No
SP111	5	No
SP112	1	No
SP113	6	Yes, Histic Epipedon
SP114	4	Yes, Hydrogen Sulfide
SP115	2	No

5.1.2 Streams

Two major tributary streams discharge into the eastern extent of Bradley Lake. Along the steep slopes of the Bradley Lake shoreline, several small, high-gradient streams flow to Bradley Lake. The West and East Forks of Upper Battle Creek, and the Middle Bradley River are diverted to Bradley Lake. Bradley Lake discharges to the Bradley Lake Project powerhouse located at tidewater; and required minimum flows are released from the dam to the Bradley River. Meltwater from the Dixon Glacier terminus flows to the Martin River. Both the Bradley River and the Martin River flow to Kachemak Bay, a traditional navigable water.

The major tributaries (Bradley River and Kachemak Creek) that naturally discharge into Bradley Lake are braided streams with multi-threaded channels consisting of vegetated or non-vegetated areas that seasonally flood during high water and have dynamic channels with large sediment movement. The Nuka glacier feeds the Bradley River headwaters, while the namesake Nuka River flows in the opposite direction and through the southeast side of the Kenai Peninsula. In braided streams, the outer channel banks and everything in between are considered the extent of the Riverine System (Federal Geographic Data Committee 2013). The ordinary high water (OHW) of the outermost channels in the braided streams were considered the base elevation for stream classification. One of the braided tributaries feeding Bradley Lake contained two islands with elevations above the OHW. Any vegetated areas below the OHW elevation within the stream braids were considered stream channel and not wetlands. No mineral or organic soils were present in these areas. Signs of hydrology flow through these areas included drift deposits and shrubs stripped of leaves from recent flow events. A typical stream within the study area is shown in Photo 5-3.

Photo 5-3 Upper Bradley River side channel within the study area (PP43).

The alpine and subalpine setting cumulates numerous smaller tributaries, with both intermittent and annual regimes. Many of the intermittent streams are supplemented by snowpack and precipitation, flowing only during spring break up and precipitation events. Annual streams are sourced from meadows, depressional wetlands, and alpine ponds. A typical annual stream was observed at PP146, as seen in Photo 5-4.

Photo 5-4 Example of annual stream within the study area (PP146).

In addition to naturally occurring tributaries, Bradley Lake sees input from the Battle Creek Diversion project on the southern shore near its western terminus (i.e., the dam) and the Middle Fork Bradley diversion through Marmot Creek to Bradley Lake (Figure 4-1). The West Fork Upper Battle Creek diversion surfaces approximately 0.5 miles south from the shoreline of Bradley Lake and joins the East Fork Battle Creek within a naturally constricted channel. Ponds have formed in shallow sloped areas with small deltas-braided sections that are visible during low flow.

5.1.3 Uplands

Study area uplands consist of the following dominant vegetation: common yarrow (*Achillea millefolium*), rockcress (*Arabis lyrate*), larkspur-leaf monkshood (*Aconitum delphiniifolium*), speckled alder, Sitka alder, Tilesius' wormwood (*Artemisia tilesii*), bluejoint, narrow-leaf fireweed, black crowberry, white dogwood (*Cornus alba*), Siberian wood-aster (*Eurybia sibirica*), spreading wood fern (*Dryopteris expansa*), Arctic lupine (*Lupinus arcticus*), two-leaf false Solomon's-seal (*Maianthemum dilatatum*), false azalea

(*Menziesia ferruginea*), devil's-club (*Oplopanax horridus*), Kentucky blue grass (*Poa pratensis*), pink wintergreen (*Pyrola asarifolia*), redcurrant (*Ribes triste*), northern blackberry (*Rubus arcticus*), strawberry-leaf raspberry (*R. pedatus*), hybrid spruce (*Picea x lutzii*), diamond-leaf willow, Sitka willow, red elderberry (*Sambucus racemosa*), spearleaf stonecrop (*Sedum lanceolatum*), Steven's meadowsweet (*Spiraea stevenii*), tufted leafless-bulrush (*Trichophorum caespitosum*), Arctic starflower, northern mountain-cranberry (*V. vitis-idaea*), and American false hellebore (*Veratrum viride*). Typical uplands within the study area are shown in Photo 5-5. Typical upland soil and lack of hydrologic indicators are shown in Photo 5-6.

Photo 5-5 Typical uplands within the study area (SP12).

Photo 5-6 Typical upland soil with lack of hydrologic indicators (SP9).

Uplands typically meet the dominance or prevalence index indicators of hydrophytic vegetation. However, usually no primary hydrologic indicators were observed, and no hydric soil indicators were met. Upland sampling points matched NRCS upland soil mapping.

5.2 Study Area Summary

The study area was evaluated for Cowardin Classification at 172 photo points and 36 sampling points, as summarized in Table 5-3, Figure 5-1, and Appendix B: Figure B-3.1 through Figure B-3.13.

Table 5-3 Study area results by Cowardin Classification.

Cowardin Classification	Wildlife Habitat[a]	Viereck Class IV[a]	Sampling Points	Photo Points
PEM1B	Riverine and Depressional, Graminoid and Herbaceous Cover	Wet Graminoid and Herbaceous	105, 107, 113, 114	183
PEM1C	Riverine Low and Tall Willow, Subalpine and Alpine Dwarf Ericaceous Scrub, Upland and Subalpine Tall Alder Scrub	Dwarf Ericaceous Shrub Tundra, Low Open Willow Shrub, Tall Closed Alder Shrub	104	11, 62, 77, 132, 181
PSS1/EM1C	Riverine Low and Tall Willow	Low Closed Willow Shrub	15	53, 55, 57, 127
PSS1B	Subalpine and Alpine Dwarf Ericaceous Scrub, Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex	Dwarf Ericaceous Shrub Tundra	8, 17	35
PSS1C	Riverine Low and Tall Willow, Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex	Low Open Willow Shrub	5, 7	27, 32, 33, 70
PUB3H	Ponds	Water	N/A	N/A
PUBH	Ponds	Water	N/A	23, 26, 40, 135, 140, 186
PUB1C	Ponds	Seasonal Water	N/A	126
R2UBH	Lower Perennial, Open Floodplains, Graminoid and Open Scrub-shrub	Wet Graminoid and Herbaceous	N/A	182
R3UBC	Riverine Barrens, Riverine Low and Tall Willow	Low Open Willow Shrub	11	36, 37, 39, 41, 42, 44, 45, 48, 66, 69, 80, 82
R3UBH	Riverine Barrens, Riverine Low and Tall Willow, Upland and Subalpine Tall Alder Scrub, Rivers and Streams (high gradient-high flow)	Low Open Willow Shrub, Tall Closed Alder Shrub	N/A	43, 46, 47, 49-52, 74, 79, 116, 146, 149, 155, 162

Cowardin Classification	Wildlife Habitat[a]	Viereck Class IV[a]	Sampling Points	Photo Points
R3UBJ	Riverine Barrens, Gravel Bars, Sediment Accretion Zones	Bare	N/A	15
R4SBC	Riverine Low and Tall Willow	Low Open Willow Shrub	N/A	22, 24, 78, 8, 124, 137,138, 148, 167–169, 171, 178
L1UBH	Lake	Water	N/A	20, 21
L2UBH	Lake	Water	N/A	21
U	Artificial Fill, Riverine Low and Tall Willow, Rocky Cliffs, Rocky Shore and Cobble Beach, Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex Subalpine and Alpine Barrens, Subalpine and Alpine Dwarf Ericaceous Scrub, Upland and Subalpine Tall Alder Scrub	Barrens, Dwarf Ericaceous Shrub Tundra, Low Open Willow Shrub, Tall Closed Alder Shrub	1-4, 6, 9, 10, 12-14, 16, 18-21, 101-103, 106, 108-112, 115	1-10, 14, 16-20, 22-25, 28-38, 56, 58, 60, 61, 63, 65, 67, 68, 71-76, 83, 85, 101-115,117-123, 125, 128–131, 133, 134, 136, 141-145, 147, 150-154, 156-161, 162b, 164-166, 170, 172-177, 179-180, 184, 185, 187

[a]ABR Habitat and Viereck Classification Data 2024. Vegetation mapping conducted at 1:5,000 scale with wetlands as a subset of the habitats listed.

NWI mapping identified 59.2 acres of riverine, palustrine, and lacustrine wetlands within the pool raise portion of the study area, and 18.5 acres of riverine, palustrine, estuarine, and lacustrine wetlands in the remaining study area. Kenai Watershed Forum mapping is not present in the study area (Table 5-4). DOWL mapping identified 83.9 acres of wetlands and surface water within the pool raise study area and 14.8 acres within the remaining study area (Figure 5-1).

Table 5-4 Study area results comparison.

Cowardin Classification	DOWL Mapping Data		NWI Data	
	Pool Raise (acres)	Remaining Study Area (acres)	Pool Raise (acres)	Remaining Study Area (acres)
E2EM1P	0	0	0.0	4.9
L1UBH	0.0	0.2	0.0	4.9
L2UBH	0.0	5.4	0.0	0.0
PEM1B	0.0	1.0	0.0	0.0
PEM1C	0.1	0.2	0.0	0.0
PEM1E	0.0	0.1	0.0	0.0
PSS1A	0.0	0.0	0.2	0.0
PSS1/EM1C	0.7	0.0	0.0	0.0
PSS1B	0.6	0.2	0.0	0.0
PSS1C	0.1	1.0	0.0	5.1
PUB1C	0.0	0.0	0.0	0.0
PUBH	0.0	3.4	0.0	1.8
R2UBH	0.0	0.1	0.0	0.0
R3UBC	15.2	0.4	0.0	0.0
R3UBH	66.8	2.6	1.6	0.3
R3UBJ	0.0	0.0	0.0	0.0
R3USC	0.0	0.0	57.2	0.0
R4SBC	0.4	0.3	0.0	0.0
R5UBH	0.0	0.0	0.1	1.5
Total*	**83.9**	**14.8**	**59.2**	**18.5**

Note: Numbers have been rounded to one decimal place, so sums are not exact; "-" = not applicable.

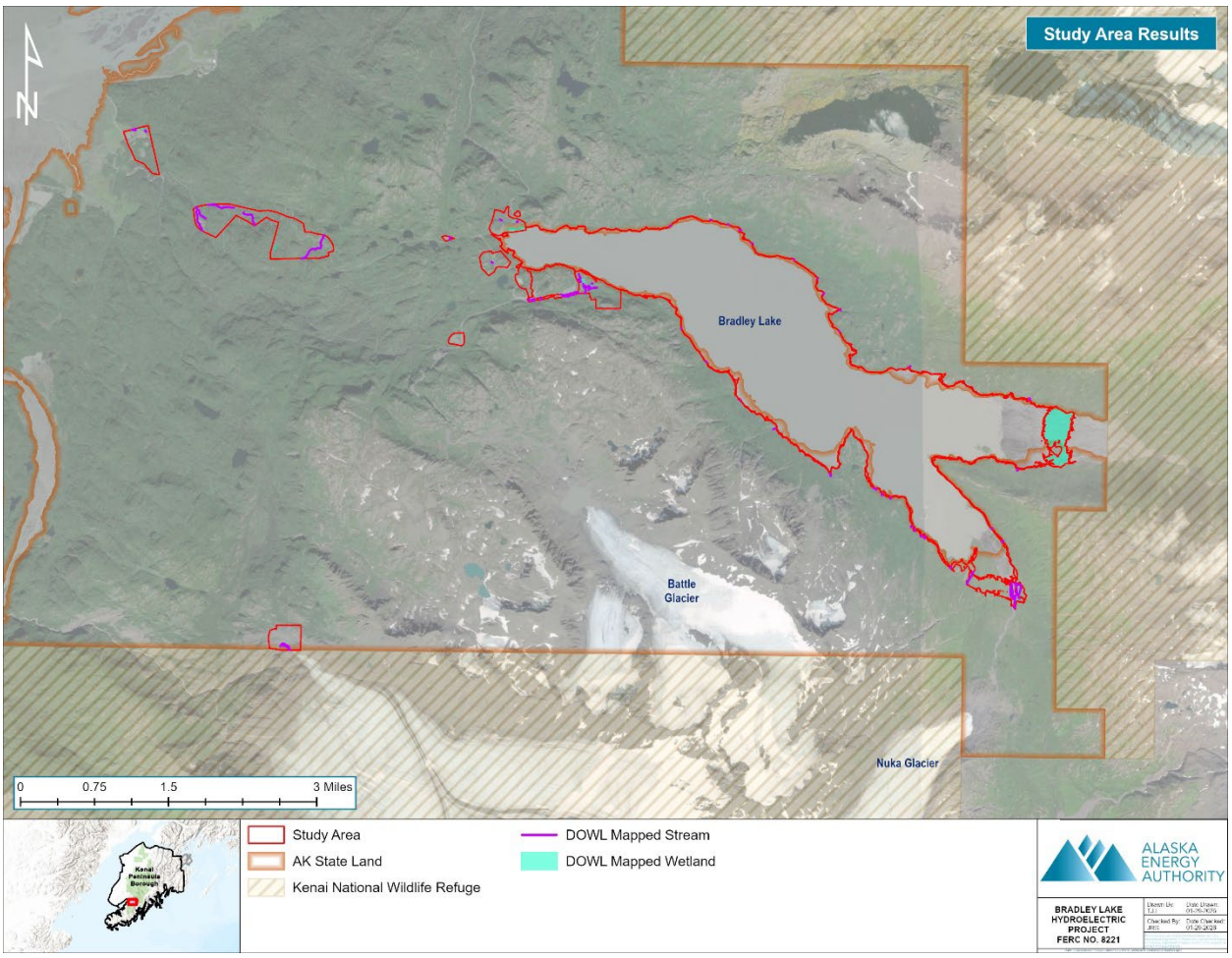


Figure 5-1 DOWL Wetland Mapping within the Bradley Expansion Project study area, 2024 and 2025.

NWI wetland mapping was conducted in 1977, which was both before more recent high-quality aerial imagery and modern Geographic Information System (GIS) mapping techniques and prior to the completion of the Bradley Lake Dam and access roads and the Upper Battle Creek Diversion and access roads. DOWL wetland mapping consisting of on-the-ground fieldwork combined with GIS landscape-scale wetland mapping identified more wetland acres than the NWI. The difference in wetland mapping was predominantly in Bradley Lake and the Kachemak Creek and Upper Bradley River inlets, the construction camp pad, and the proposed Dixon Diversion Dam site which was recently deglaciated after the NWI mapping was conducted.

HGM classification is used to evaluate geomorphic setting, water source and its transport, and hydrodynamics (Brinson 1993). The wetlands and surface water in the study area fall into depressional, riverine, and slope HGM classifications (Table 5-5). Depressional

wetlands and surface water include kettles, potholes, and vernal pools. They typically receive hydrology from precipitation. Riverine wetlands and surface water form linear strips in the landscape and receive hydrology from streams. Slope wetlands include surface water slope and groundwater slope that receive hydrology in the form of precipitation, overland flow, throughflow, or groundwater.

Table 5-5 Hydrogeomorphic classifications of wetlands in the study area.

HGM Classification	Pool Raise (acres)	Remaining Study Area (acres)
Depressional	0.84	0.13
Riverine	0.01	2.13
Slope	0.66	0.21
Subtotal	**1.51**	**2.47**

Note: Numbers have been rounded to one decimal place, so sums are not exact; HGM includes wetlands only, waters are excluded from this table.

Most wetlands and surface water within the study area are connected by a surface connection through several small, high-gradient streams flowing into Bradley Lake and then through the Bradley Lake Project powerhouse, Bradley River or into the Martin River, all of which flow to Kachemak Bay, a traditional navigable water. This is only apart from small isolated alpine and subalpine depression ponds and swales, where there is no surface connection. At lower elevations, palustrine riverine wetlands are above estuarine and marine habitat associated with Kachemak Bay. This area has been distinguished from estuarine habitat since the Bradley Lake Road was developed, and the hydroelectric project facilities were completed in 1991.

6.0 DISCUSSION

A wetland delineation was conducted to assess aquatic resources present within the study area. Wetlands were classified by Cowardin Classification and HGM characteristics in a study area composed of buffered components for the proposed Project with fill placement or inundation due to the proposed Bradley Lake pool raise. This report has identified 83.9 acres of wetlands and waters within the pool raise and 14.8 acres of wetlands and waters within the remaining study area. Approximately 635.3 acres (86.6 percent) were determined to be upland habitat (Table 5-3).

Within the HUC12 systems, the largest portion of study area wetlands falls in the Bradley Lake watershed and drains through to the Bradley Lake Project powerhouse and the Bradley River, primarily consisting of riverine habitat. Due to the receding glaciers at the head of Bradley Lake, soil development is relatively new with dominant gravels and cobbles and thin to no organic layers. The braided stream channels consist of active channel, recently disturbed areas devoid of vegetation, and vegetated areas with minimal soil development and less frequent hydrologic indicators. These areas within the braided stream system and located below the bankfull elevation of the active channel are mapped as part of the riverine system. Positive hydrologic observations include drift deposits and alders stripped of lower leaves (higher leaves intact).

The Battle Creek watershed consists of subalpine terrain and intermittent streams typical of steep topography with high relief, accumulating sediment and storing water near the pour point where it drains into Humpy-Creek-Frontal Kachemak Bay watershed. In the upper catchment-alpine terrain, swales accumulate precipitation and drain to Battle Creek upstream of the Battle Creek Diversion.

The Martin River watershed wetlands consist of riverine wetlands in alpine terrain at the toe of the Dixon Glacier and headwaters of the Martin River.

7.0 STUDY STATUS AND SCHEDULE

The Wetland Delineation Study is considered complete. This wetland delineation report and data will be used to assess potential impacts to wetlands in the FERC license amendment application, develop avoidance and minimization measures, identify compensatory mitigation requirements, as applicable, and obtain a USACE Section 404 permit. A functional assessment of jurisdictional wetlands will be completed at the time of Section 404 permitting.

8.0 REFERENCES

ABR. 2024. 2024 Vegetation and Wildlife Habitat Mapping Study Report. Amendment to Bradley Lake Hydroelectric Project (FERC No. 8221), Dixon Diversion Project. Prepared for Alaska Energy Authority.

Alaska Department of Fish and Game (ADF&G). 2024. Alaska Fish Resource Monitor, Anadromous Waters Catalog. Data downloaded September 2024: https://adfg.maps.arcgis.com/apps/MapSeries/index.html?appid=a05883caa7ef4f7ba17c99274f2c198f.

Alaska Energy Authority (AEA). n.d. Railbelt Energy, Bradley Lake Hydroelectric Project. https://www.akenergyauthority.org/What-We-Do/Railbelt-Energy/Bradley-Lake-Hydroelectric-Project. Accessed November 2025.

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Prepared for the U.S. Army Corps of Engineers. Page 101. Technical report; WRP-DE-4.

Collet, D.M. 2002. Willows of Southcentral Alaska. Kenai Watershed Forum.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. La Roe. 1979. Classification of wetlands and deepwater habitats of the United States. Wetland Classification System, U.S. Department of the Interior. Jamestown, ND.

DOWL. 2024. Wetland Delineation Report. Amendment to Bradley Lake Hydroelectric Project (FERC No. 8221), Proposed Dixon Diversion. Prepared for the Alaska Energy Authority. December 2024.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service. Washington, D.C.

Gallant, A.L., E.F. Binnian, J.M. Omernik, and M.B. Shasby. 1995. Ecoregions of Alaska. U.S. Geological Survey Professional Paper 1567. Prepared in cooperation with Colorado State University and the Environmental Protection Agency.

Kleinschmidt Associates. 2022a. Initial Consultation Document. Amendment to Bradley Lake Hydroelectric Project (FERC No. 8221), Proposed Dixon Diversion. Prepared for the Alaska Energy Authority. April 27, 2022.

Kleinschmidt Associates. 2022b. Draft Study Plan. Amendment to Bradley Lake Hydroelectric Project (FERC No. 8221), Proposed Dixon Diversion. Prepared for the Alaska Energy Authority. November 2022.

Munsell Color. Production 2024. Munsell Soil-Color Charts with genuine Munsell color chips

Natural Resources Conservation Service (NRCS). 2024. Web Soil Survey. U.S. Department of Agriculture. Data downloaded September 2024: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Pojar, J., and A. MacKinnon. 2013. Alpine plants of the Northwest: Wyoming to Alaska. Lone Pine Media Productions (B.C.) Ltd.: B.C. Ministry of Forests, Vancouver, British Columbia.

Pojar, J., and A. MacKinnon. 2016. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska. Lone Pine Media Productions (B.C.) Ltd.: B.C. Ministry of Forests, Vancouver, British Columbia.

Pratt, V.E. 1990. Field Guide to Alaskan Wildflowers: Commonly Seen Along Highways and Byways. Alaskakrafts; 1st edition.

Tande, G., and R. Lipkin. 2003. Wetland sedges of Alaska. Alaska Natural Heritage Program. Environment and Natural Resources Institute, University of Alaska Anchorage.

U.S. Army Corps of Engineers (USACE). 1987.Corps of Engineers Wetlands Delineation Manual. Technical Report Y-871. Vicksburg, Mississippi. Corps, Waterways, Experiment Station.

USACE. 2007. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0). ERDC/EL TR-07-24. Wetlands Regulatory Assistance Program. Washington D.C.

USACE. 2023. 2022 National Wetland Plant List, Version 3.6-Alaska Region. U.S. Army Engineer Research and Development Center. Vicksburg, MS.

U.S. Fish and Wildlife Service (USFWS). 2024. National Wetlands Inventory, Wetlands Mapper. Data downloaded September 2024: https://www.fws.gov/wetlands/data/mapper.html.

U.S. Geological Survey (USGS). 2024. NHDPlus High Resolution (National Hydrography Dataset). Data downloaded September 2024: https://www.usgs.gov/core-science-systems/ngp/nationalhydrography/nhdplus-high-resolution.

Viereck, L.A., C.G. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska Vegetation Classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-GTR-286. Portland, OR.

Viereck, L.A. 2007. Alaska trees and shrubs. University of Alaska Press. Fairbanks, AK. 370 pp.

APPENDIX A

CONSULTATION RECORD

ALASKA ENERGY AUTHORITY

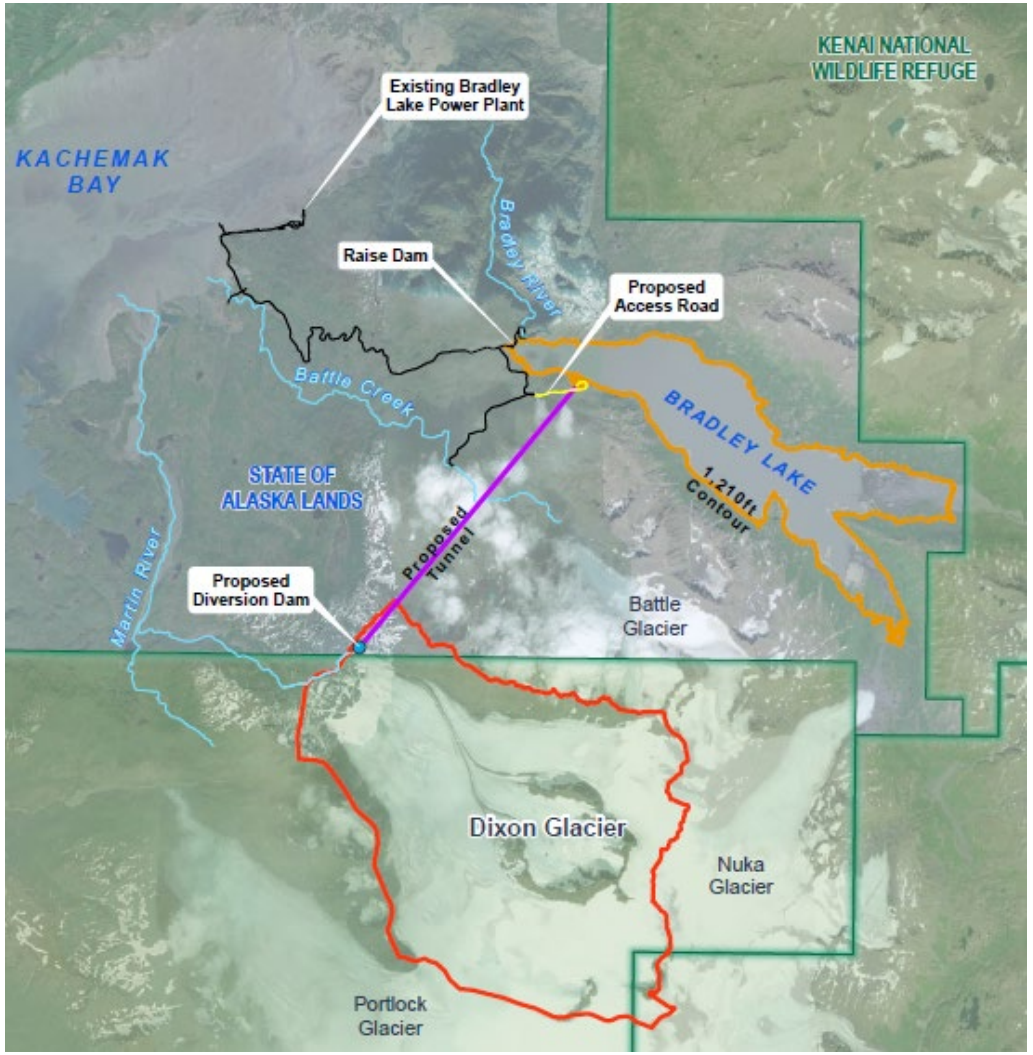
DIXON DIVERSION

Bryan Carey, P.E.
Director of Owned Assets

USACE Pre-application Meeting
May 7, 2024

ALASKA ENERGY AUTHORITY

Project Overview

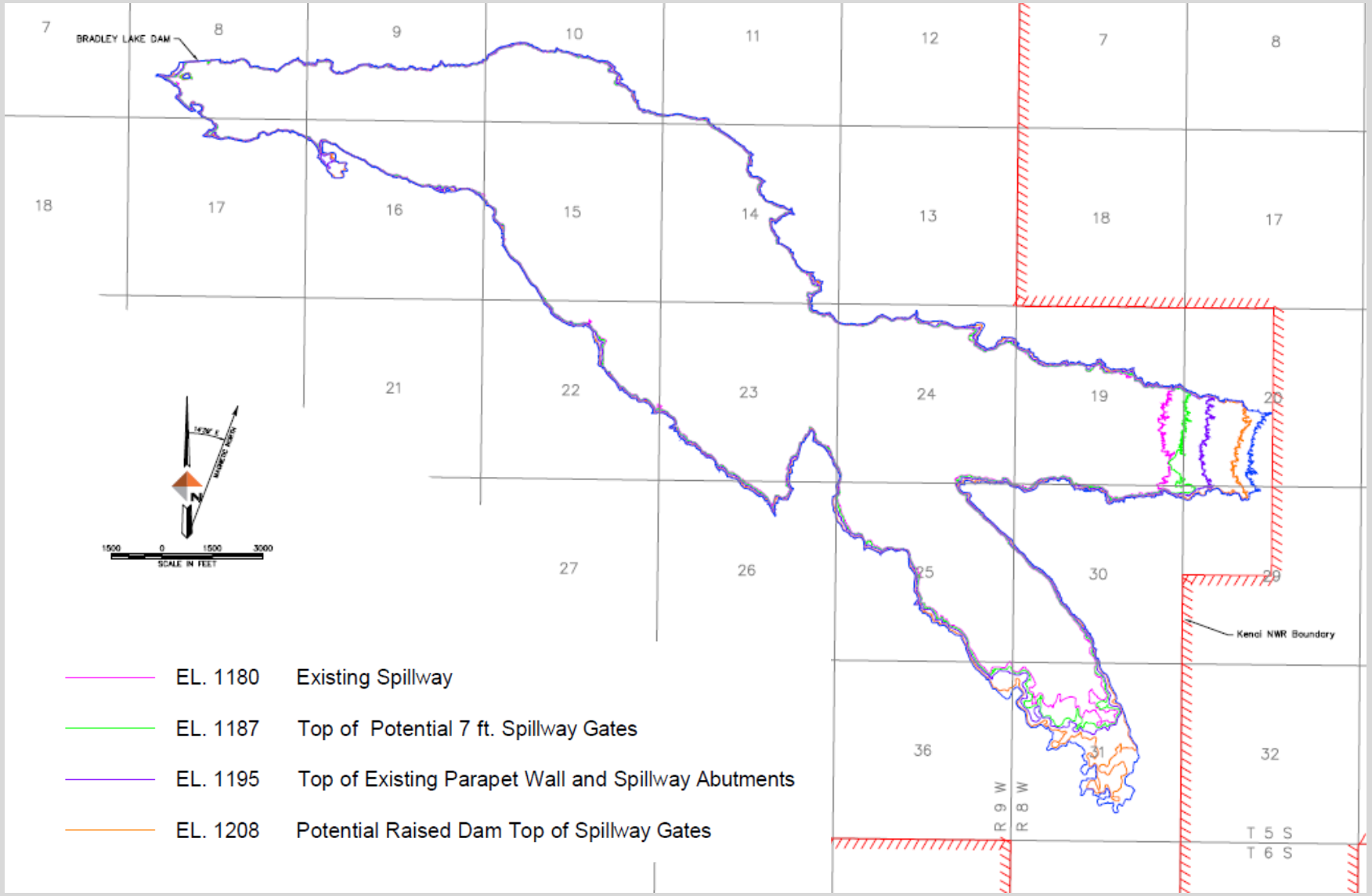


Project Elements:

- Raise Bradley Dam and Lake
- New Dixon Diversion Dam
- Diversion Tunnel to Bradley Lake
- New Access Road from Battle Creek road to tunnel outlet
- Underground Power Line

Bradley Lake Dam and Pool Raise

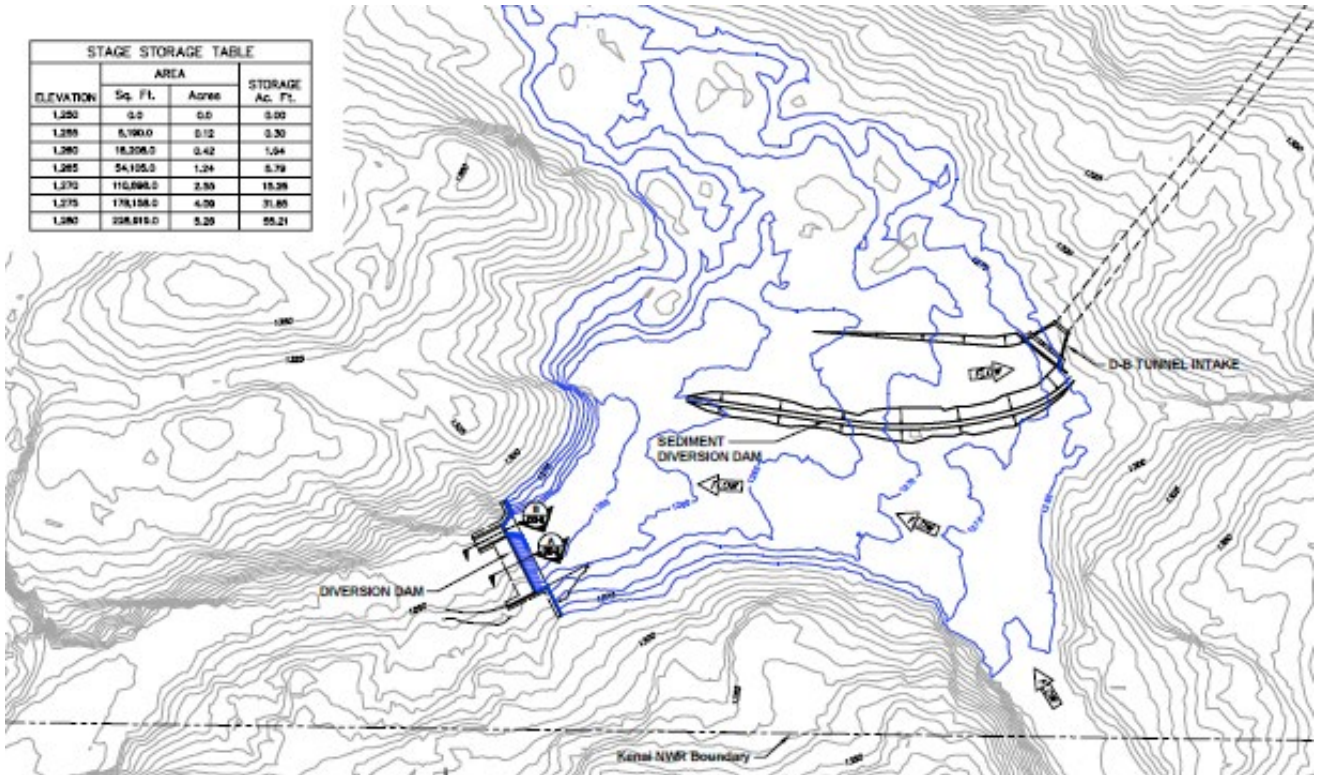
- Up to 28-ft WSE increase
  - 1,208 ft elev
  - 404 acres
  - State land



Dixon Glacier Source

Dixon Diversion Dam and Intake Location

- 25 ft high, ~75 ft long diversion dam near toe of Dixon Glacier

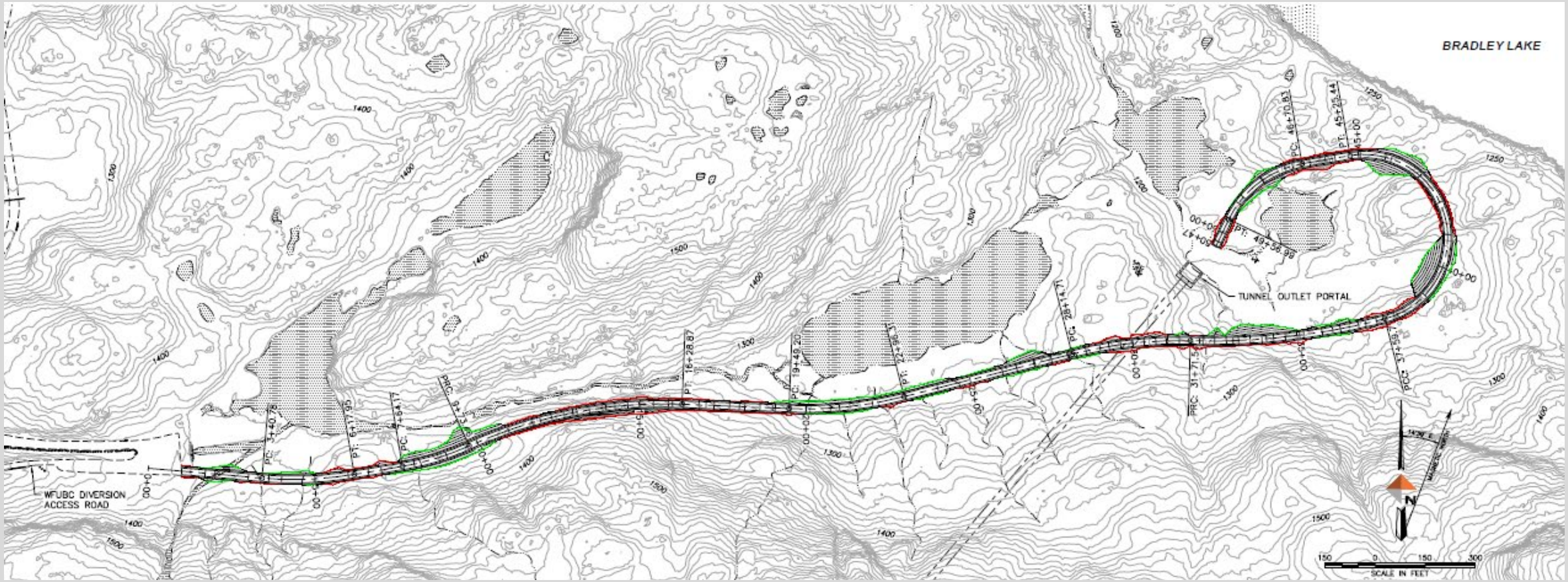


This is an example rendition of potential design alternative

Diversion Tunnel

- Diversion Dam to Bradley Lake
- 4.7 miles long

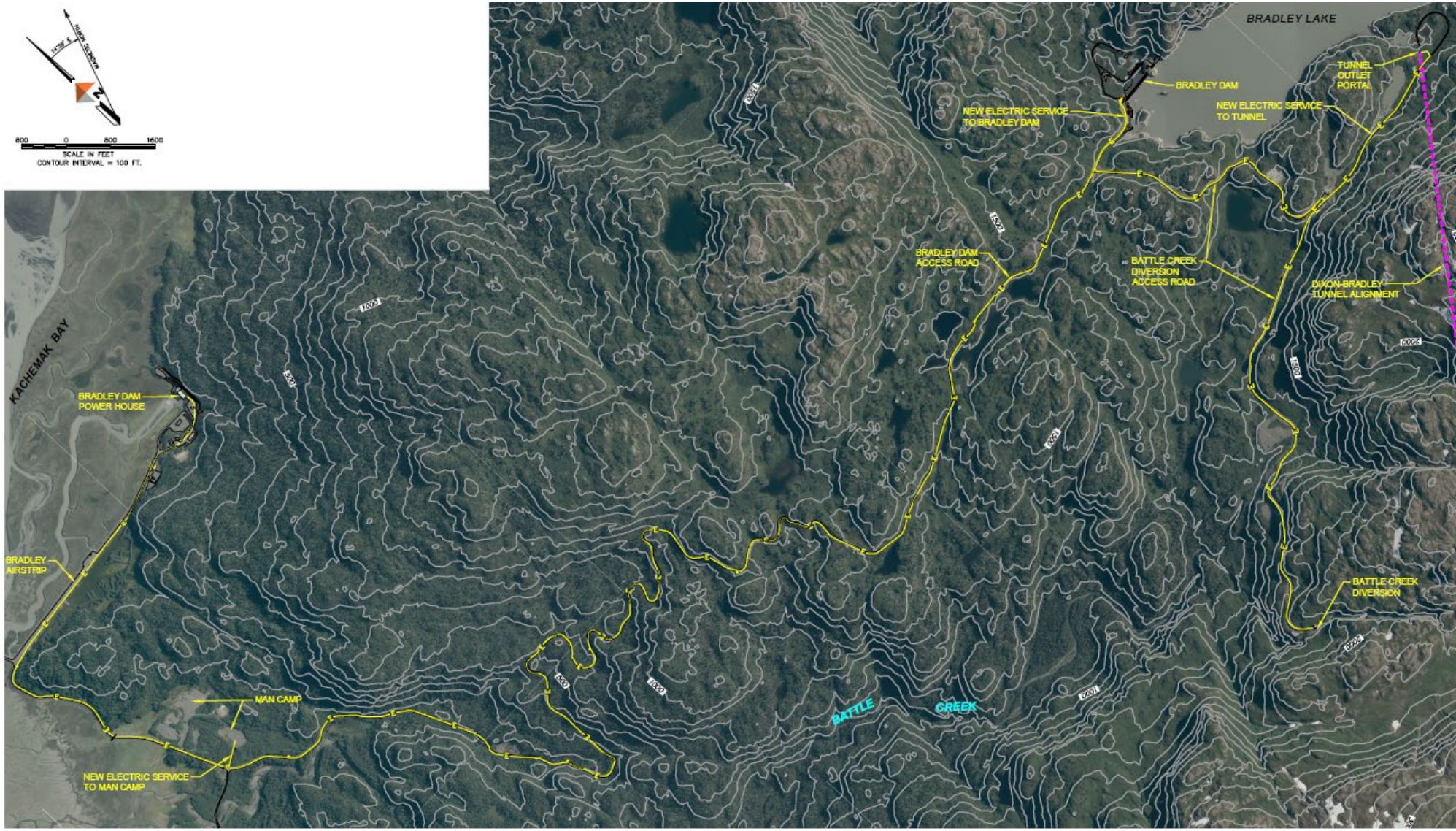
New Access Road



New 16-ft wide gravel-surfaced access road from WFUBC Diversion Road to the Dixon Tunnel outlet portal

Underground Power Line

- Along existing road from powerhouse to Bradley Dam, and Battle Creek Diversion
- Along new road to Dixon tunnel outlet portal
- Within tunnel to Dixon Diversion
- Spur to worker camp



QUESTIONS?

From:	Josh Grabel
To:	Baggett, Nicholas S CIV USARMY CEPOA (USA)
Cc:	Betsy McGregor
Subject:	Dixon Diversion Project Pre-App Info
Date:	Friday, May 3, 2024 2:46:58 PM

Nick,

Here is some reference information before our Pre-app meeting next week:

https://www.akenergyauthority.org/What-We-Do/Railbelt-Energy/Bradley-Lake-Hydroelectric-Project/Dixon-Diversion-Project

https://www.akenergyauthority.org/Portals/0/Bradley%20Lake%20Hydroelectric%20Project/2022.04.01%20Dixon%20Diversion%20ICD.pdf?ver=2022-05-17-162731-313

The current project includes:

- Raise Bradley Dam and Lake
- New Dixon Diversion Dam
- Diversion Tunnel to Bradley Lake
- New Access Road from Battle Creek Road to tunnel outlet
- Underground Power Line

ABR put together a nice presentation with an AEA overview here:

https://www.akenergyauthority.org/Portals/0/Bradley%20Lake%20Hydroelectric%20Project/2024.03.19%20AEA%20Dixon%20Division%20JAM%20Terrestrial%20FSP%20(Final).pdf?ver=reCrYLn0ebBgjJuox66Ang%3d%3d

Slide Pages 8-11 are the current project being proposed.

Here is a proposed agenda for our discussion:

1. Introductions
2. Project Overview
3. 2024 Wetland Delineation Plan
4. Section 404 Permitting

Thanks,

Josh Grabel, PWS
Environmental Specialist

DOWL

(907) 562-2000 | office
(907) 865-1258 | direct

dowl.com

MEETING NOTES

PROJECT:	Dixon Diversion Project	DATE:	May 7, 2024
PROJECT NUMBER:	DOWL 63471	TIME:	2:00 pm
ORGANIZER:	Josh Grabel	SUBJECT:	2024 Wetland Delineation

PARTICIPANTS:	ORGANIZATION:
Nicholas Baggett	US Army Corps of Engineers (USACE), Project Manager
Josh Grabel	DOWL
Betsy McGregor	Kleinschmidt
Bryan Carey	Alaska Energy Authority
Ryan McLaughlin	Alaska Energy Authority

Agenda

1. Introductions
2. Project Overview- Bryan
3. 2024 Wetland Delineation Plan- Josh
4. Section 404 Permitting
5. Questions

Notes

Bryan gave a complete project overview and Josh went through the 2024 wetland delineation plan to evaluate the 5 areas presented in the project overview:

- Raise Bradley Dam and Lake
- New Dixon Diversion Dam
- Diversion Tunnel to Bradley Lake
- New Access Road from Battle Creek Road to tunnel outlet
- Underground Power Line

Nick- indicated new impounded areas of Bradley Lake will need wetlands delineation data and to be included in the report. At tunnel inlet, need to collect wetland delineation data for impounded area behind diversion dam.

Betsy- AEA, has OHW been documented at the tunnel inlet?

Bryan- OHW has not been set with flagging or markers on the ground. Lidar data has been collected.

Josh- the wetland delineation would collect photo points at the tunnel inlet since the proposed fill and inundation area is rocky, with limited vegetation, and digging may not be possible for a sample point soil pit.

Nick- for the 1-mile access road, USACE needs to know the location of all the stream/drainage crossings by type (intermittent, ephemeral, perennial) and width. No functional assessment is needed for the wetland delineation study area and should be completed for impacts associated with the permit application.

Betsy- AEA, would hydrology be maintained under the road?

Bryan- yes, culverts would be put in place to maintain hydrology. Otherwise, the road could get washed out with water backing up behind it. There is approximately 9 feet of precipitation per year in the area. Having the road washout would be expensive for a remote location. It is cheaper to install culverts. What used to be the headwaters of East Fork Battle Creek, at the west end of the proposed road, flows year-round. AEA is thinking a large culvert or bridge would be placed across it. Bradley Lake does not have any fish and there are no resident or anadromous fish in the project area. The ponds north of the proposed road and at the tunnel outlet flow into Bradley Lake.

Betsy- USACE, would the inundation be considered impacts to waters of the U.S.?

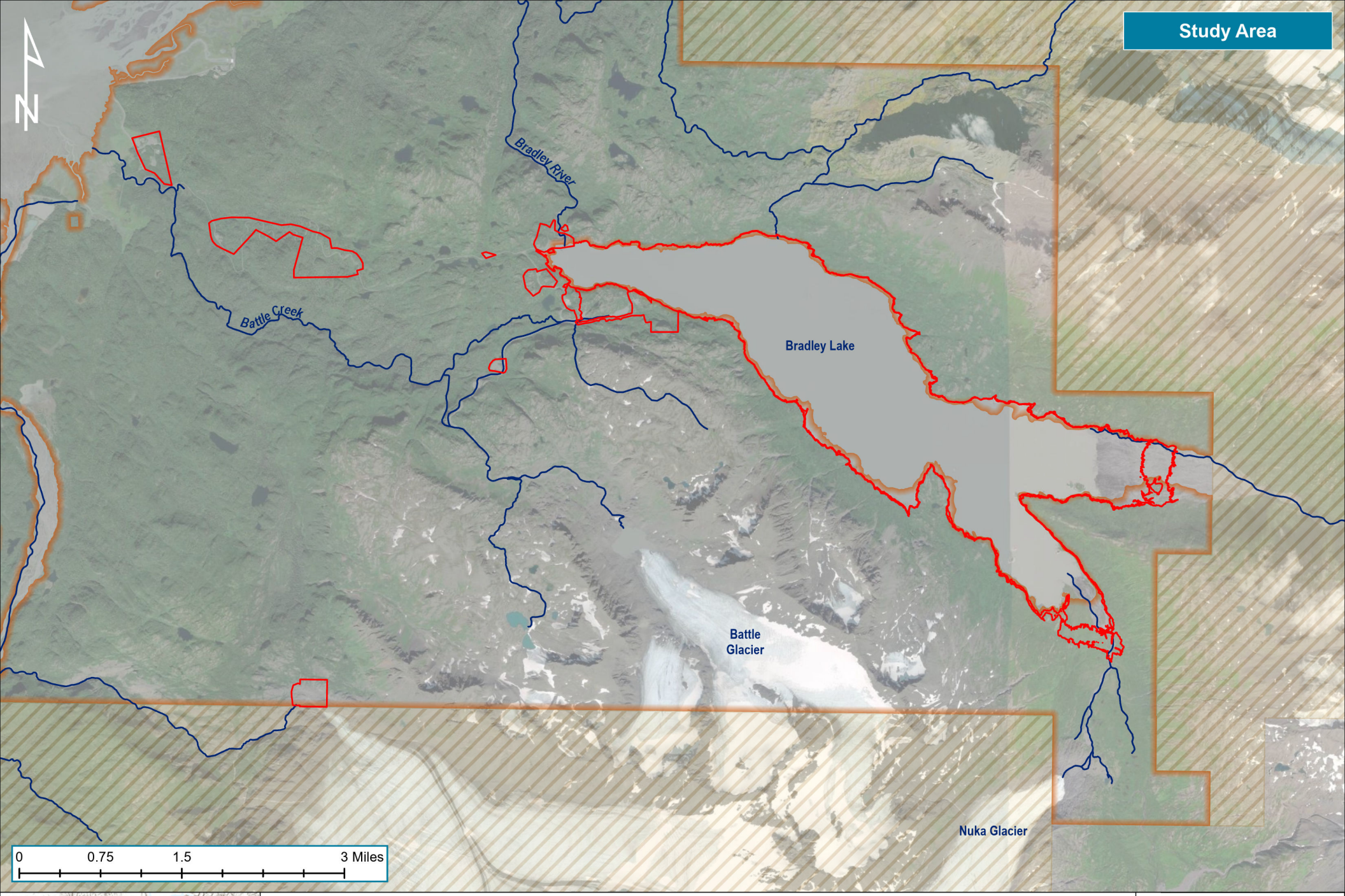
Nick- USACE has to consider all impacts including the impounded area even though it isn't considered fill. Nick will look into permitting through USACE based on impacts. Mitigation discussions should be early on in permitting. Currently, USACE is missing several staff and a 2024 Fall wetlands report deliverable is ideal for review.

Bryan- historically, there was a lake. The site was identified as a potential hydropower resource in the 1950s. The USACE had first considered constructing a hydro project at the site, but the State took over when the project stalled. The State licensed and constructed the existing Bradley Lake Dam. The lake level rise and dam were mitigated for during the original permit. The West Fork Upper Battle Creek diversion did not increase the maximum normal pool elevation of the lake..

Action Item	Assigned To	Completed
Forward 2017 permit to USACE for Battle Creek Diversion	Josh	5/7/2024
Review impounded area decision to include in wetland delineation	Nick	5/7/2024

APPENDIX B

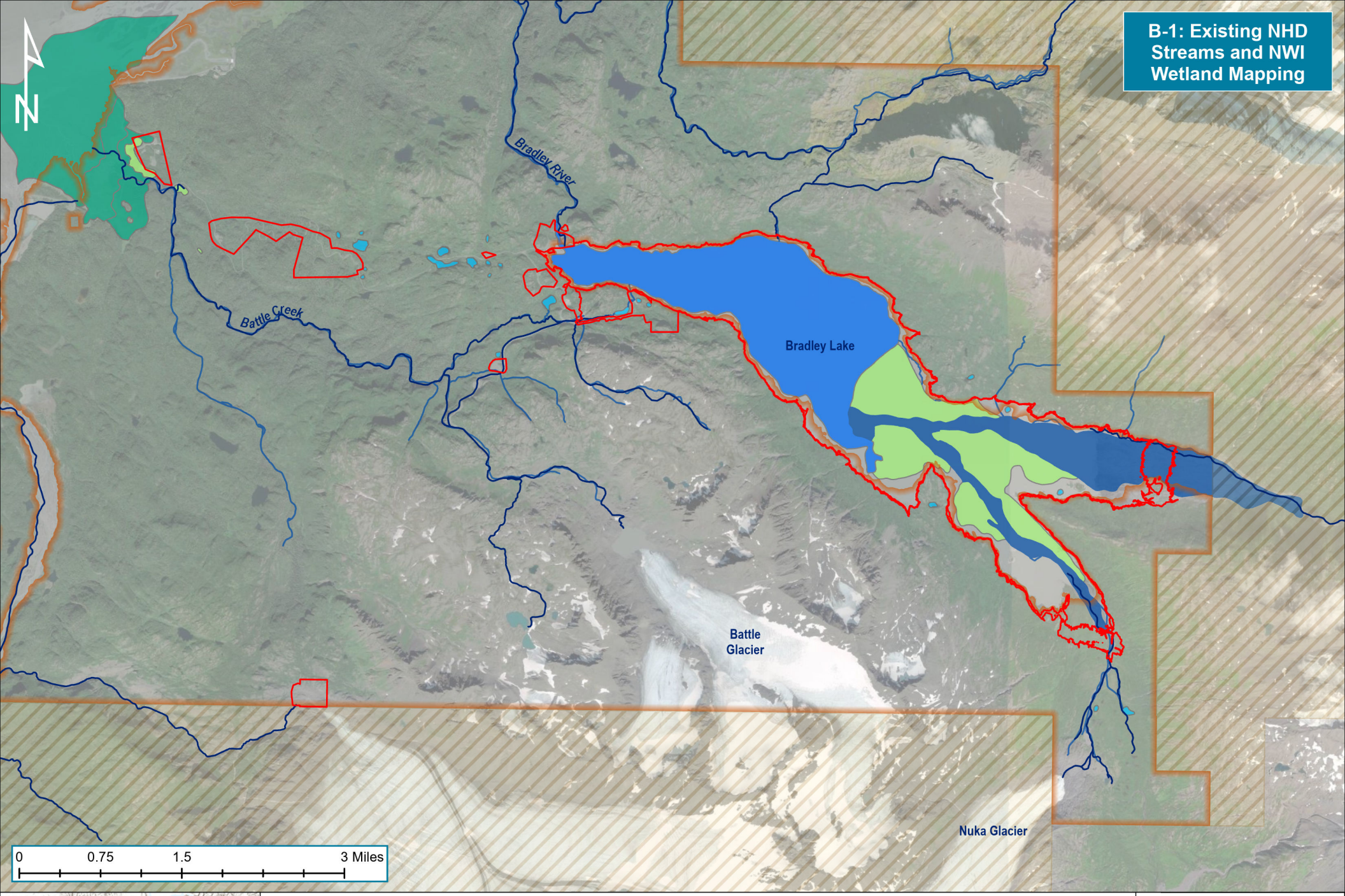
FIGURES: EXISTING NHD STREAMS AND NWI WETLAND MAPPING, NRCS MAPPED SOILS, AND WETLAND DELINEATION



ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

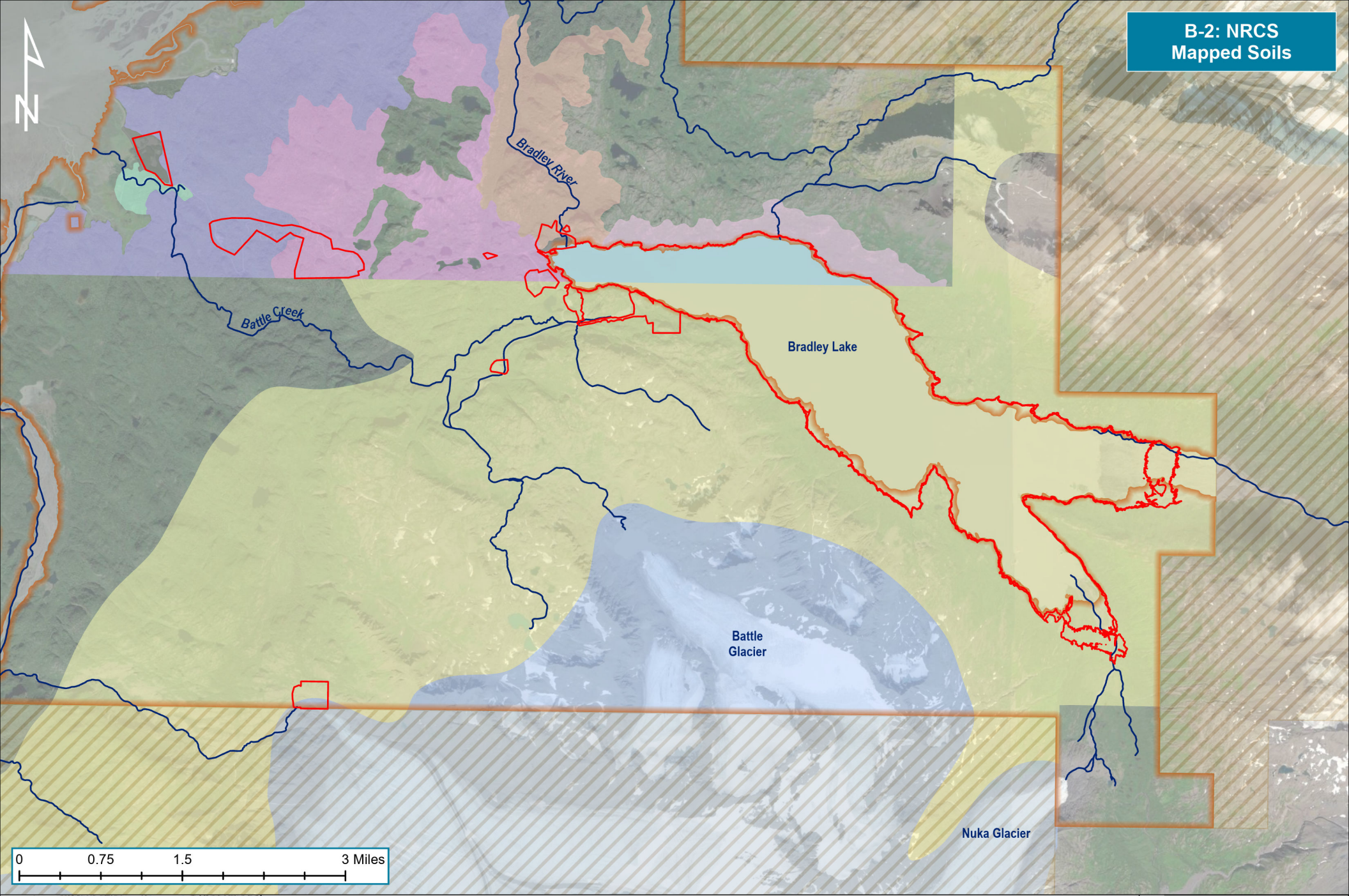


ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT
FERC NO. 8221

Drawn By: TJJ
Date Drawn: 01-29-2026
Checked By: JRG
Date Checked: 01-29-2026

B-2: NRCS Mapped Soils



- Study Area
- AK State Land
- Kenai National Wildlife Refuge
- Hydrography

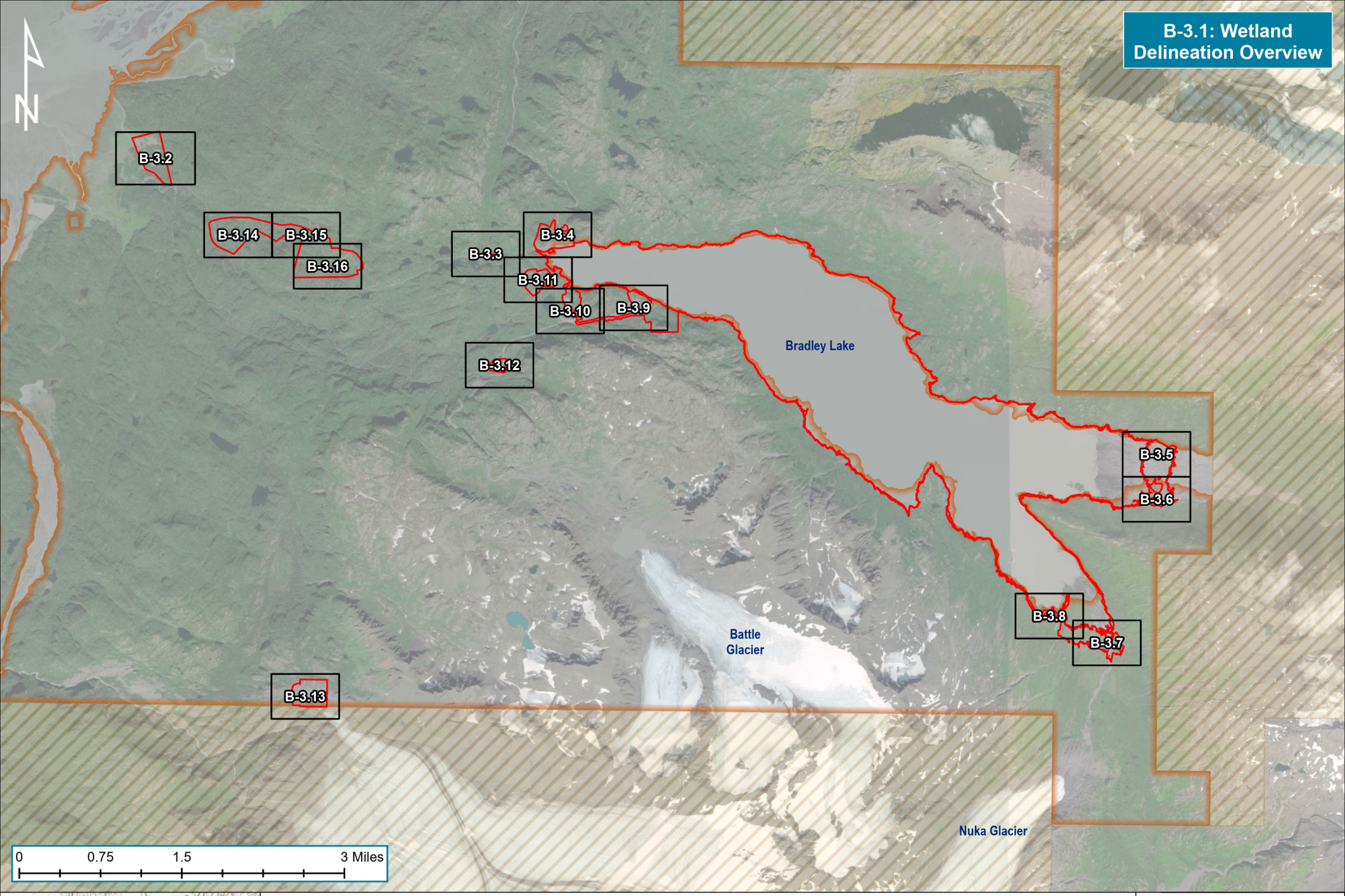
NRCS Soils Within Study Area

- Chenega silt loam, 0 to 2 percent slopes
- Lithic Haplocryands-Alic Haplocryands-Rock outcrop complex, 25 to 45 percent slopes
- Lithic Haplocryands-Alic Haplocryands-Rock outcrop complex, 45 to 100 percent slopes
- Southern Alaska Coastal Mountains-Maritime Alpine-Barren Mountains
- Southern Alaska Coastal Mountains-Maritime Subalpine and Alpine-Mountains
- Tutka-Kasitsna-Rock outcrop complex, very steep
- Tutka-Portgraham complex, hilly to steep
- Urban land
- Water, fresh

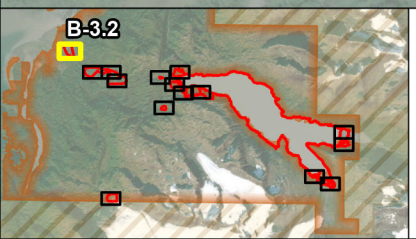
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026


B-3.1: Wetland Delineation Overview
N
B-3.2
B-3.14
B-3.15
B-3.16
B-3.3
B-3.4
B-3.11
B-3.10
B-3.9
B-3.12
Bradley Lake
B-3.5
B-3.6
B-3.8
B-3.7
Battle Glacier
B-3.13
Nuka Glacier
0
0.75
1.5
3 Miles
Kenai Peninsula Borough
Study Area
AK State Land
Kenai National Wildlife Refuge
Detail Map Location
ALASKA ENERGY AUTHORITY
BRADLEY LAKE HYDROELECTRIC PROJECT
FERC NO. 8221
Drawn By: TJJ
Date Drawn: 01-29-2026
Checked By: JRG
Date Checked: 01-29-2026

B-3.2: Wetland Delineation



Study Area

Field Point

- Photo Point (Wetland)
- Photo Point (Upland)
- Sample Point (Wetland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R2UBH
- R4SBC

DOWL Mapped Wetland (Cowardin)

- PEM1B
- PEM1C
- PEM1E
- PSS1B
- R2UBH
- Upland

DOWL Mapped HGM

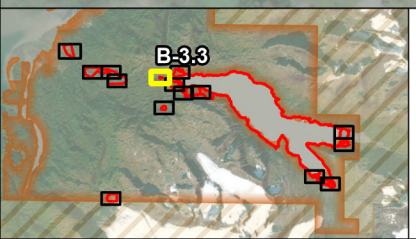
- Riverine
- Slope
- Water

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.3: Wetland Delineation



Study Area

Field Point

Photo Point (Upland)

DOWL Mapped Stream (Cowardin)

R3UBH

DOWL Mapped Wetland (Cowardin)

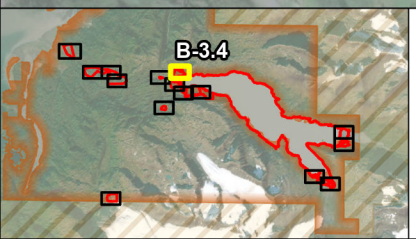
Upland

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.4: Wetland Delineation



Study Area

Field Point

Photo Point (Upland)

DOWL Mapped Stream (Cowardin)

R3UBH

R4SBC

DOWL Mapped Wetland (Cowardin)

L1UBH

L2UBH

R3UBH

Upland

DOWL Mapped HGM

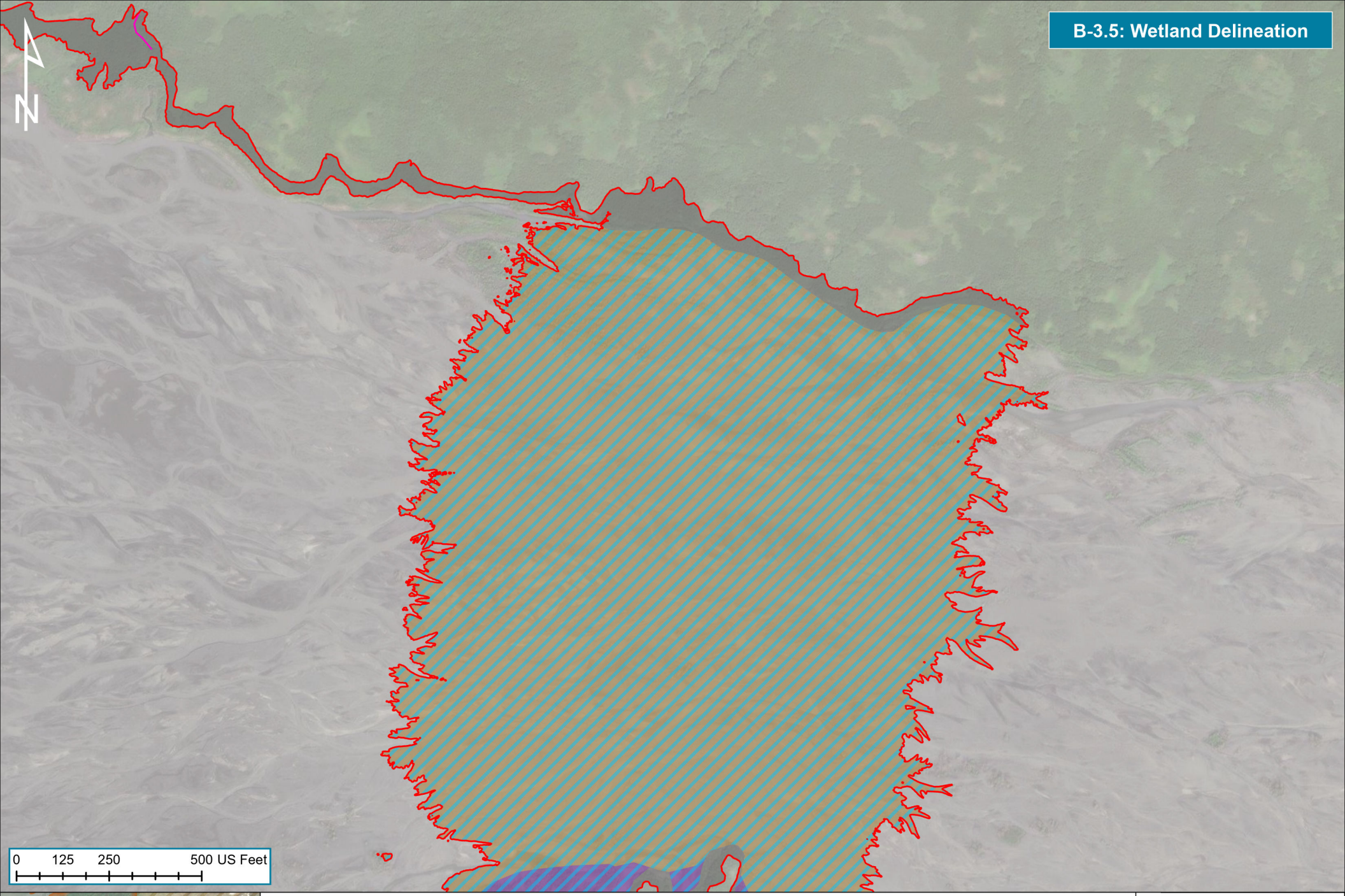
Water

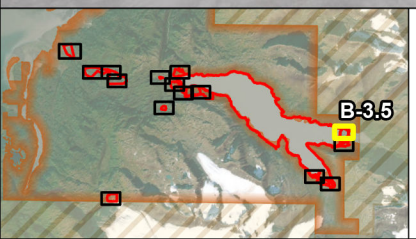
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.5: Wetland Delineation





Study Area

DOWL Mapped Stream (Cowardin)
- R4SBC

DOWL Mapped Wetland (Cowardin)
- R3UBC
- R3UBH
- Upland

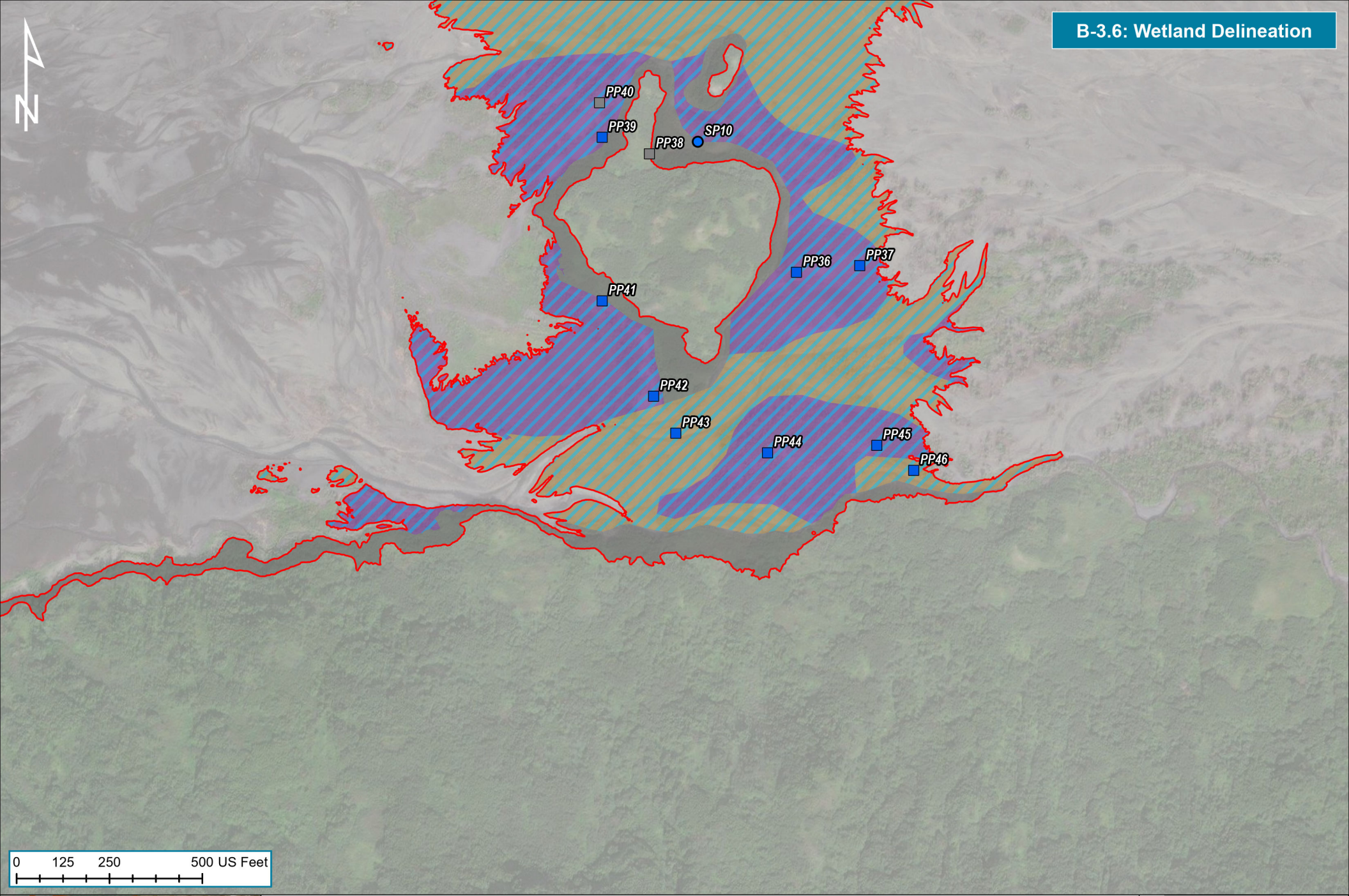
DOWL Mapped HGM
- Water

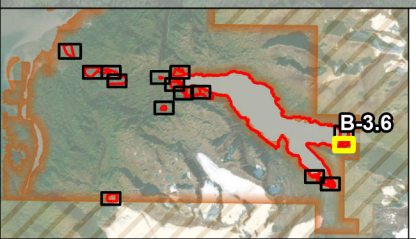
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.6: Wetland Delineation





Study Area

Field Point

- Photo Point (Water)
- Photo Point (Upland)
- Sample Point (Water)

DOWL Mapped Wetland (Cowardin)

- R3UBC
- R3UBH
- Upland

DOWL Mapped HGM

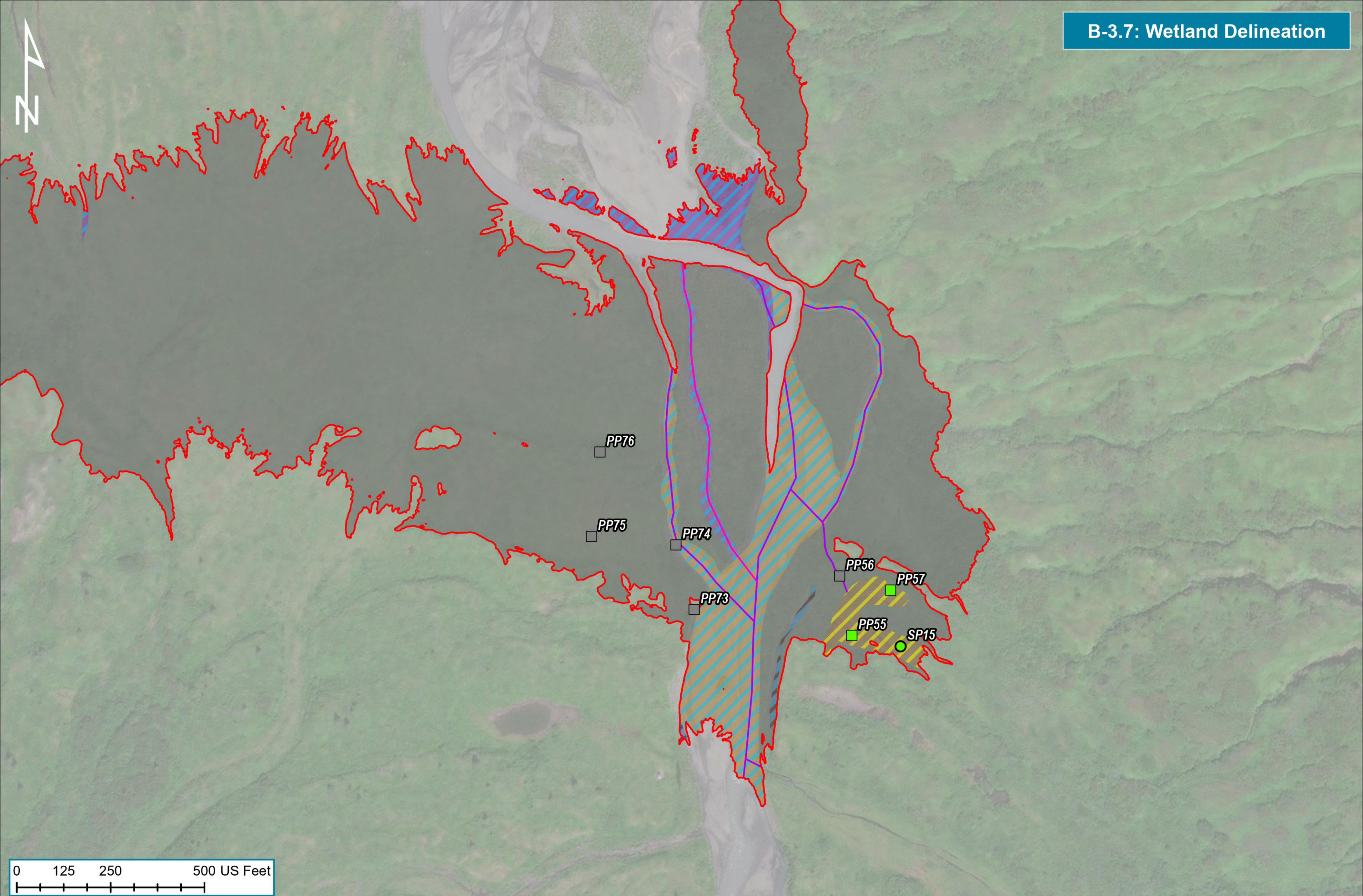
- Water

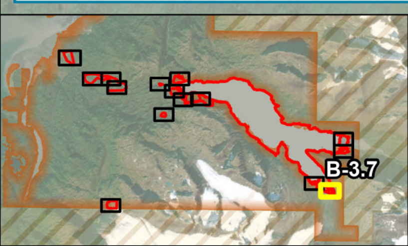
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.7: Wetland Delineation





Study Area

Field Point

- Photo Point (Wetland)
- Photo Point (Upland)
- Sample Point (Wetland)

DOWL Mapped Stream (Cowardin)

- R3UBH
- R4SBC

DOWL Mapped Wetland (Cowardin)

- PEM1C
- PSS1/EM1C
- PSS1C
- R3UBC
- R3UBH
- R4SBC
- Upland

DOWL Mapped HGM

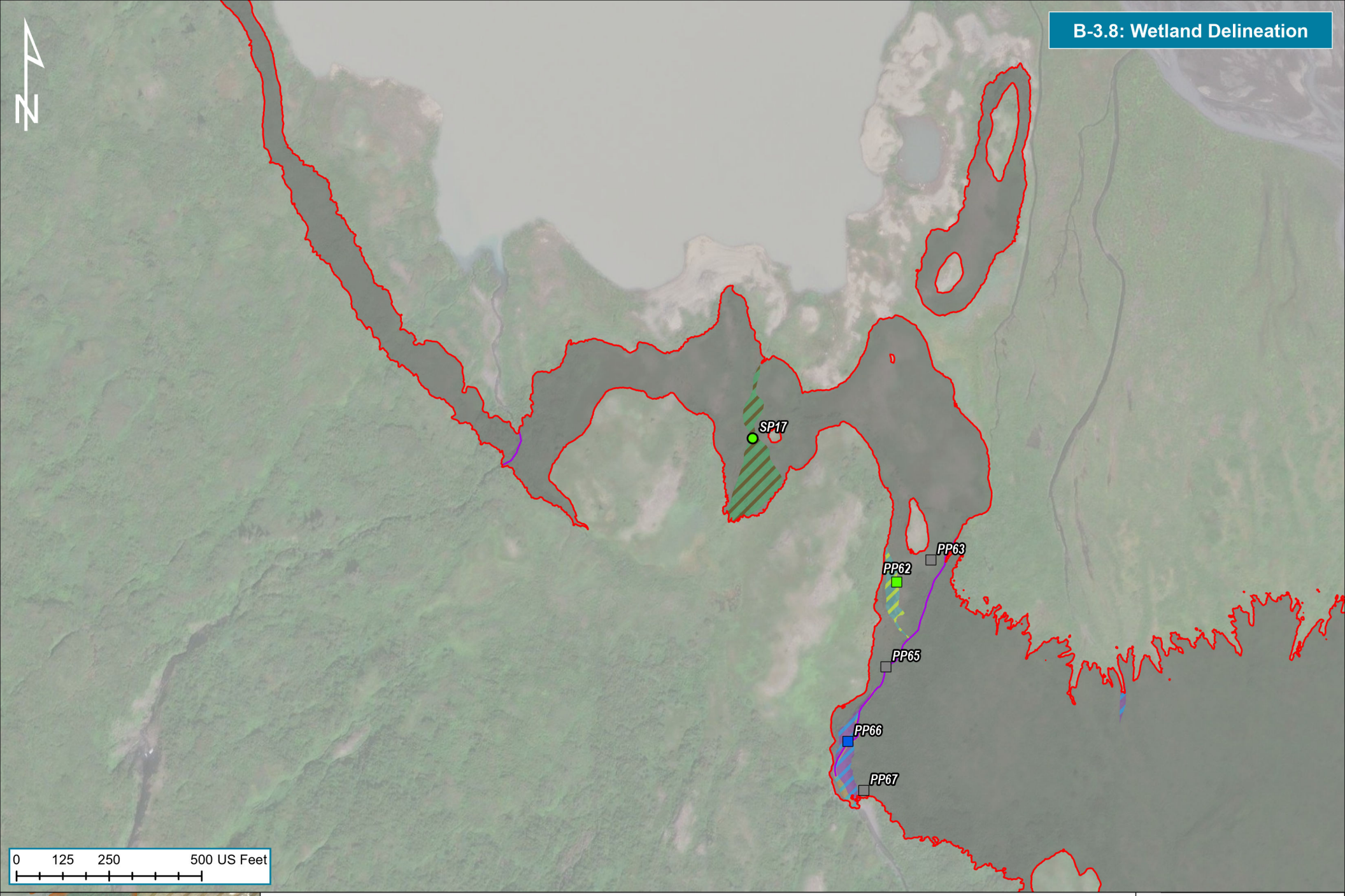
- Depressional
- Riverine
- Slope
- Water

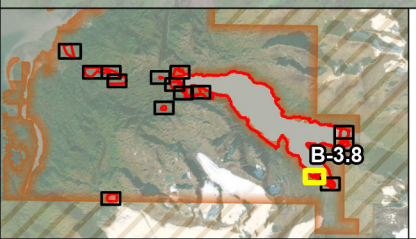
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.8: Wetland Delineation





Study Area

Field Point

- Photo Point (Water)
- Photo Point (Wetland)
- Photo Point (Upland)
- Sample Point (Wetland)

DOWL Mapped Stream (Cowardin)

- R3UBH

DOWL Mapped Wetland (Cowardin)

- PEM1C
- PSS1B
- R3UBC
- R3UBH
- Upland

DOWL Mapped HGM

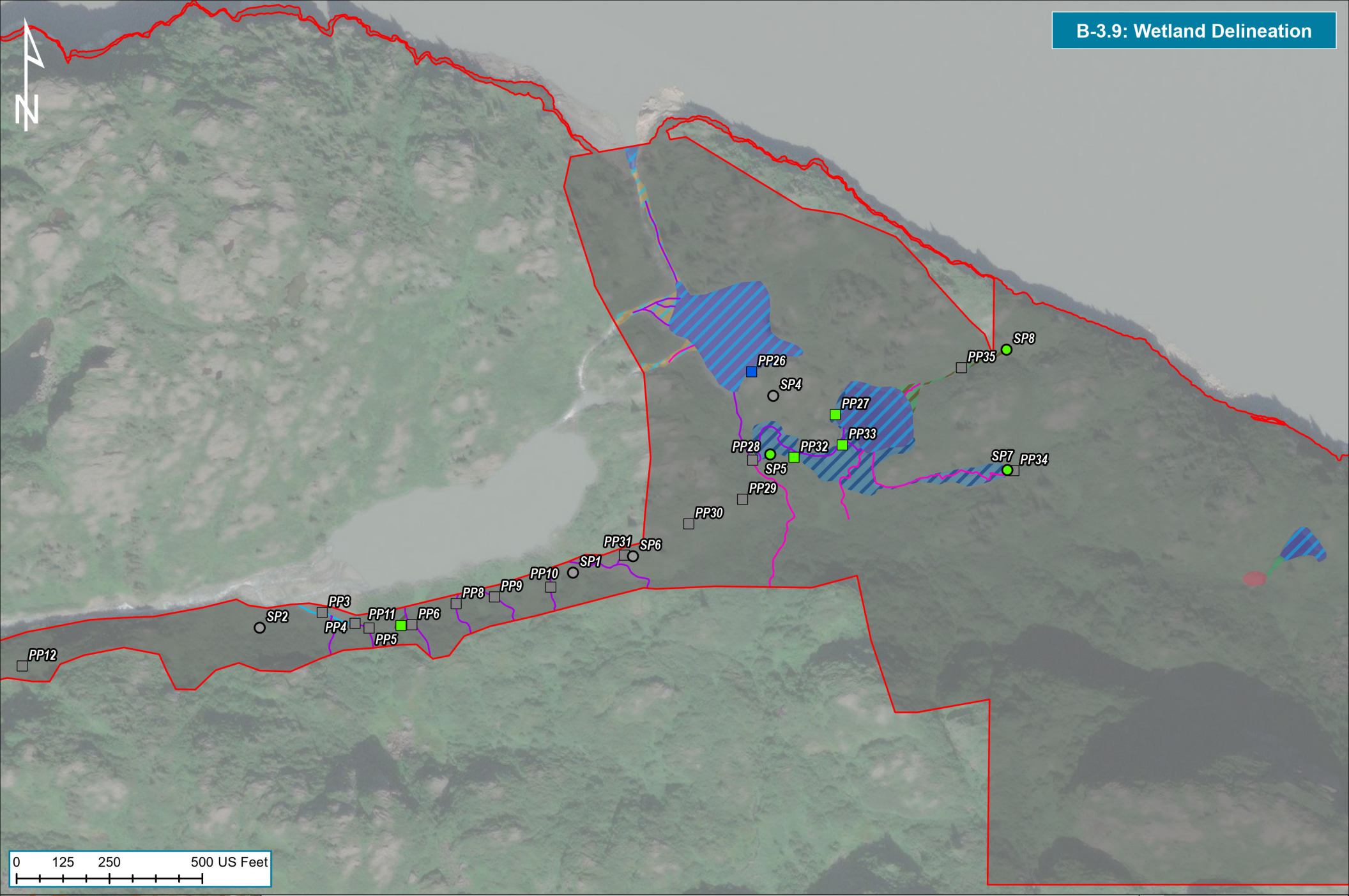
- Depressional
- Slope
- Water

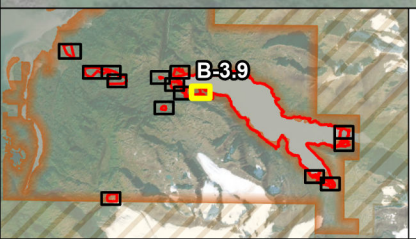
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.9: Wetland Delineation





Study Area

Field Point

- Photo Point (Water)
- Photo Point (Wetland)
- Photo Point (Upland)
- Sample Point (Wetland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R3UBC
- R3UBH
- R4SBC

DOWL Mapped Wetland (Cowardin)

- L2UBH
- PEM1B
- PEM1C
- PSS1B
- PSS1C
- PUBH
- R3UBH

DOWL Mapped HGM

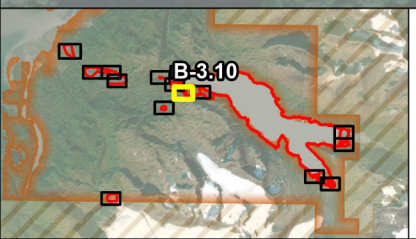
- Riverine
- Slope
- Water

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.10: Wetland Delineation



Study Area

Field Point

- Photo Point (Upland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R4SBC

DOWL Mapped Wetland (Cowardin)

- L1UBH
- PUBH
- R3UBH
- R3UBJ
- R4SBC
- Upland

DOWL Mapped HGM

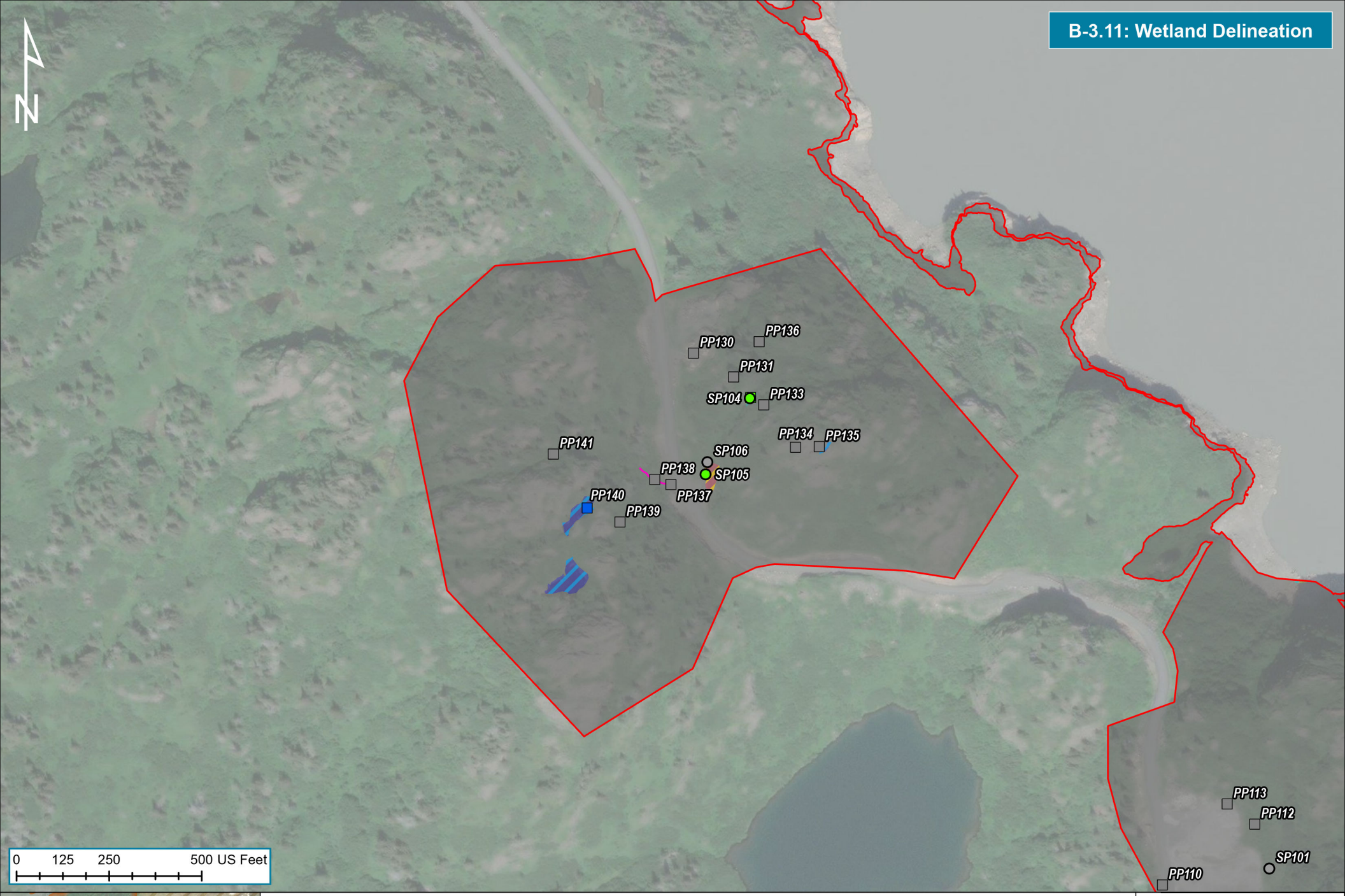
- Water

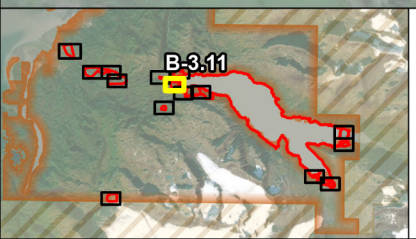
ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.11: Wetland Delineation





Study Area

Field Point

- Photo Point (Water)
- Photo Point (Wetland)
- Photo Point (Upland)
- Sample Point (Wetland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R4SBC

DOWL Mapped Wetland (Cowardin)

- L1UBH
- PEM1B
- PEM1C
- PUBH
- Upland

DOWL Mapped HGM

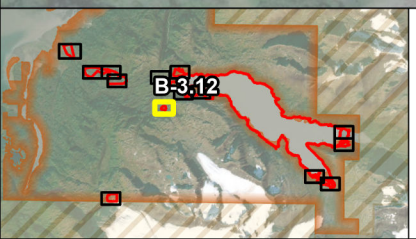
- Depressional
- Water

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.12: Wetland Delineation



Study Area

Field Point

- Photo Point (Upland)
- Sample Point (Upland)

DOWL Mapped Wetland (Cowardin)

- PSS1/EM1C
- PUB1C
- Upland

DOWL Mapped HGM

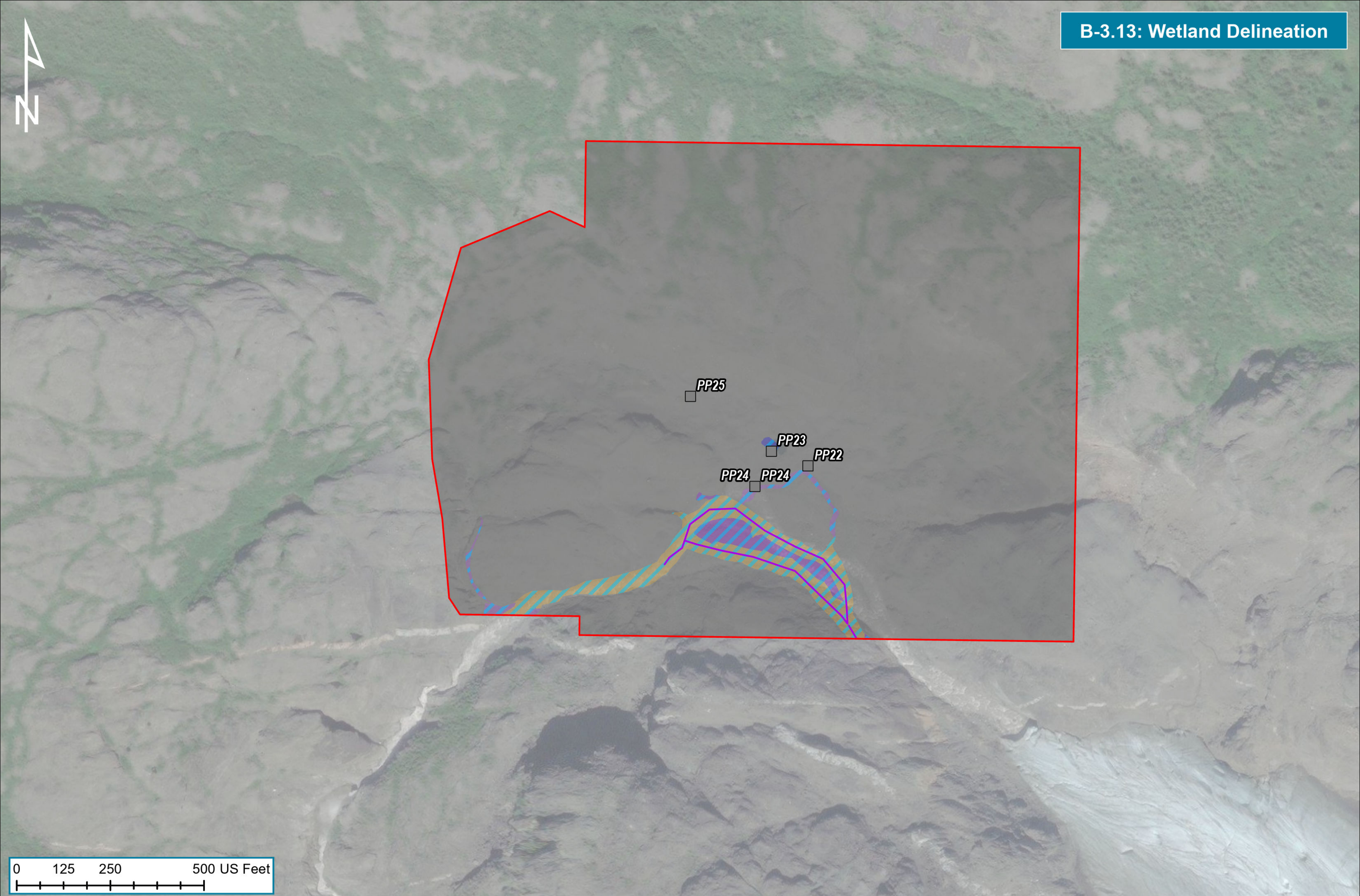
- Depressional

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By:	Date Drawn:
TJJ	01-29-2026
Checked By:	Date Checked:
JRG	01-29-2026

B-3.13: Wetland Delineation



Study Area

Field Point

- Photo Point (Water)
- Photo Point (Upland)

DOWL Mapped Stream (Cowardin)

- R3UBH

DOWL Mapped Wetland (Cowardin)

- PUBH
- R3UBC
- R3UBH
- R4SBC
- Upland

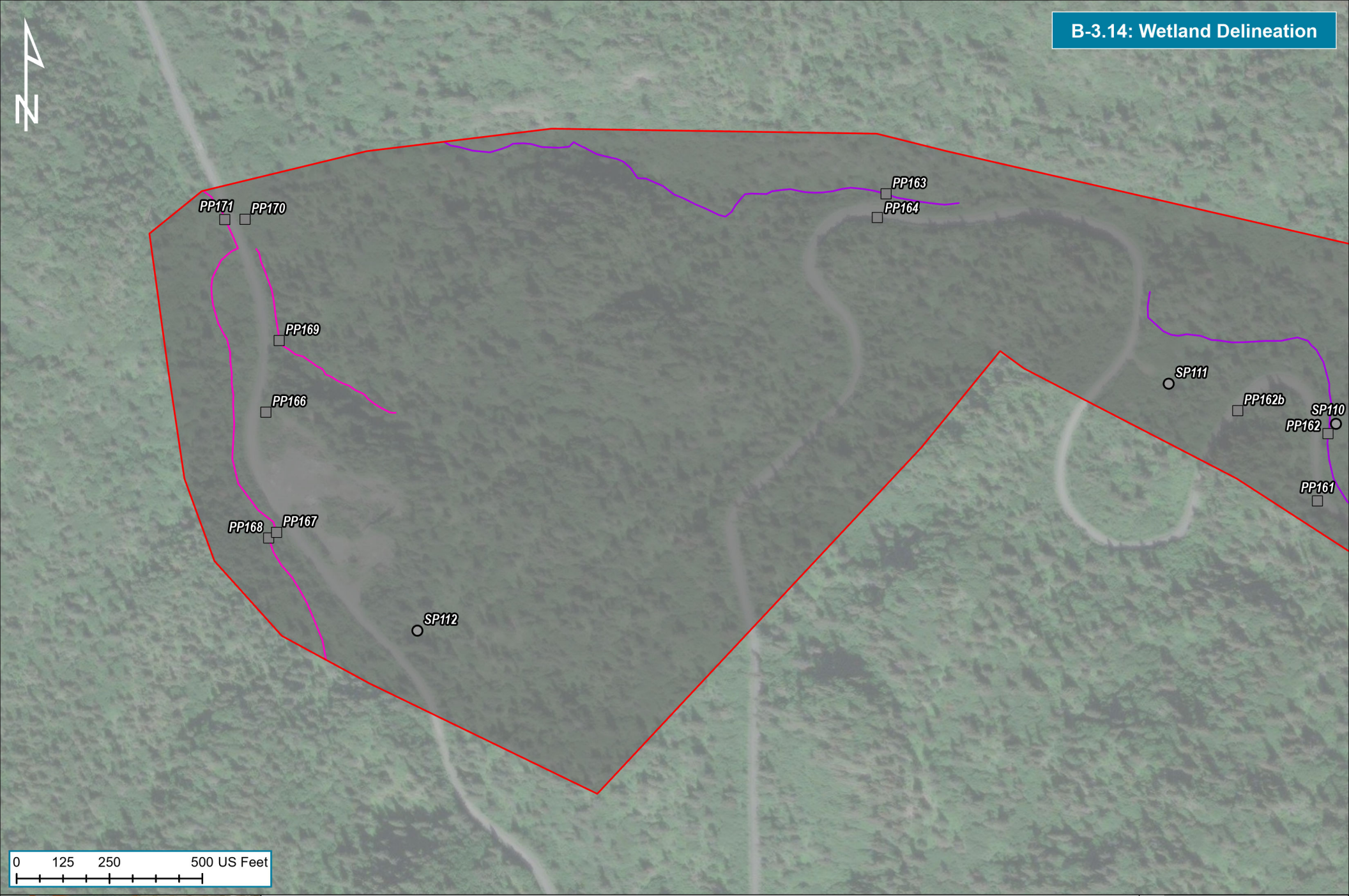
DOWL Mapped HGM

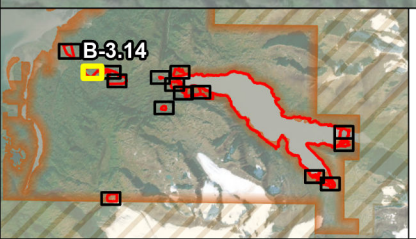
- Water

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221	Drawn By: TJJ	Date Drawn: 01-29-2026
	Checked By: JRG	Date Checked: 01-29-2026

B-3.14: Wetland Delineation





Study Area

Field Point

- Photo Point (Upland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R3UBH
- R4SBC

DOWL Mapped Wetland (Cowardin)

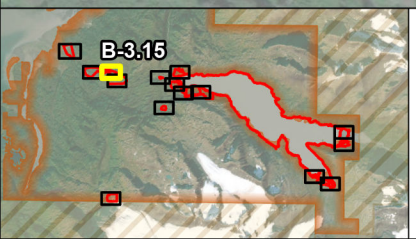
- Upland

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.15: Wetland Delineation



Study Area

Field Point

- Photo Point (Upland)
- Sample Point (Upland)

DOWL Mapped Stream (Cowardin)

- R3UBH

DOWL Mapped Wetland (Cowardin)

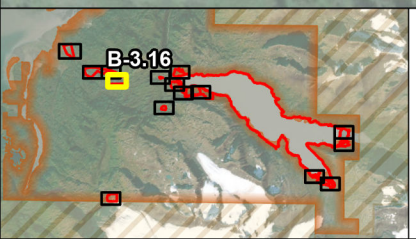
- Upland

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

B-3.16: Wetland Delineation



Study Area

Field Point

Photo Point (Upland)

DOWL Mapped Stream (Cowardin)

R3UBH

DOWL Mapped Wetland (Cowardin)

PUBH

Upland

ALASKA ENERGY AUTHORITY

BRADLEY LAKE HYDROELECTRIC PROJECT FERC NO. 8221

Drawn By: TJJ	Date Drawn: 01-29-2026
Checked By: JRG	Date Checked: 01-29-2026

APPENDIX C

FIELD DATA: USACE DATA SHEETS, PHOTO LOG, AND ALL OBSERVED PLANT SPECIES

The associated files will be provided under separate cover due to size.