



WETLAND MITIGATION BANKING PLAN

Eagle Hill Road and RAISE Loop Road Projects
Shoalwater Bay Indian Reservation
Tokeland, Washington

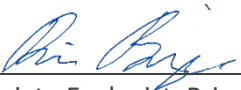
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Under Contract to:

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**Wetland Mitigation Bank Use Plan
Eagle Hill Road and RAISE Loop Road Project
Shoalwater Bay Indian Reservation
Tokeland, Washington**

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EXECUTIVE SUMMARY

Landau Associates, Inc. (Landau), under contract to Red Plains Professionals (Red Plains), has compiled this wetland mitigation banking plan in support of the Shoalwater Bay Tribe (SBIT) Eagle Hill Road and RAISE Loop Road projects (Project). The Project entails clearing and grading to convert an existing unimproved gravel road into a 2-lane paved roadway, provide stormwater treatment, install utilities, and construct two residential duplexes and residential lots. The Project will result in unavoidable impacts to various wetlands and streams, which are summarized in the table below.

Table ES-1. Wetland and Stream Impacts

Wetland Impacts			Stream Impacts			
Wetland Name	Ecology Rating	Impact (acres)	Stream	Ordinary High Water Mark Width (inches)	Stream Type	Impact linear feet (acres)
Wetland B	Category III	0.02	Stream 1	10	Non-fish seasonal	84 (0.002)
Wetland C	Category IV	0.13	Stream 2	18	Non-fish seasonal	118 (0.004)
Wetland D	Category IV	0.001	Stream 3	22	Non-fish seasonal	213 (0.009)
Wetland E	Category IV	0.02	Stream 4	16	Non-fish seasonal	510 (0.02)
Wetland F	Category IV	0.03	Stream 5	14	Non-fish seasonal	82 (0.002)
Wetland G	Category IV	0.05	Stream 6	28	Fish-bearing	72 (0.008)
Wetland H	Category IV	0.01	-	-	--	
Wetland I	Category IV	0.04	-	-		
Wetland J	Category IV	0.03	-	-		
Wetland K	Category IV	0.02	-	-		
Total Wetland Impacts		0.351	Total Stream Impacts			1,079 (0.05)

Impacts to these regulated natural resources will be mitigated through the transfer of credits from the SBIT Ghost Dike Advanced Mitigation Site.

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LIST OF ABBREVIATIONS AND ACRONYMS

°	degree
AWMS	Ghost Dike Advanced Wetland Mitigation Site
BIA	Bureau of Indian Affairs
CSZ	Cascadia Subduction Zone
cy	cubic yards
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
ft	foot/feet
HGM	hydrogeomorphic
Landau	Landau Associates, Inc.
NWIFC	Northwest Indian Fisheries Commission
PFO	palustrine forested
Project	Eagle Hill Road and RAISE Loop Road projects
Rating System	Ecology Wetland Rating System for Western Washington
Red Plains	Red Plains Professional, Inc.
SBIT	Shoalwater Bay Indian Tribe
SWIFD	Statewide Washington Integrated Fish Distribution
Type F	fish-bearing
Type Ns	non-fish-bearing seasonal
USACE	US Army Corps of Engineers

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1.0 INTRODUCTION

The Shoalwater Bay Indian Tribe (SBIT) is proposing to construct a series of roadway improvements referred to as the RAISE Loop project on Tribal land located north of Highway 105 near Tokeland, Washington (Figure 1). This project will convert the gravel North Cove Beach Access Road and RAISE Loop Road to a 2-lane paved arterial road.

Concurrently with the RAISE Loop Project, SBIT is proposing to improve a short distance of currently paved and graveled Eagle Hill Road, construct two residential duplexes, and create two residential lots as part of the Eagle Hill Road Project. The RAISE Loop project is essentially an extension of the Eagle Hill Road alignment. These two projects are adjacent to each other and are interrelated and interdependent.

Both of the projects are located within Tribal Trust Land and SBIT Reservation Land and are therefore subject to Bureau of Indian Affairs (BIA) review. The Eagle Hill project will receive federal funds from the Department of Housing and Urban Development (HUD), which is acting as the lead agency for National Environmental Policy Act compliance. The Federal Highway Administration is funding the RAISE Loop project and is acting as lead agency in conjunction with the BIA. Both projects are currently proceeding through separate NEPA Environmental Assessment (EA) process and will be constructed concurrently. Due to the interrelated nature of the projects, the SBIT is applying for a single Section 404 Clean Water Act permit from the US Army Corps of Engineers (USACE). The two projects will henceforth be referred to as the “Project”.

2.0 PURPOSE AND NEED

This section provided a brief overview of the purpose and need for the Project.

2.1 Purpose

The proposed Project is the result of a decades-long planning process to provide to Tribal members safe public services and housing opportunities that are not at risk to natural disasters. The Project represents the first construction phase of a multi-phased project to relocate Tribal members and essential services out of flood-prone and tsunami-risk areas that the Tribe currently inhabits along the Willapa Bay coastline.

The completion of the Project will result in the construction of approximately 3.66 miles of 24-foot (ft)-wide roadway and 5-ft-wide attached sidewalk and will include the installation of utilities (water, sewer, telecommunications, sewer, and stormwater) to facilitate residential development in higher-elevation areas of the reservation. SBIT's goal is to eventually relocate all housing, schools, healthcare, and other vital services to higher elevation areas of Tribal-managed lands.

2.2 Need

The need for relocation is driven by increased risks associated with sea-level rise, chronic flooding, and the potential for catastrophic tsunami impacts generated by an earthquake along the Cascadia Subduction Zone (CSZ). Sea-level rise and associated shoreline erosion have been persistent and well-documented challenges in the Willapa Bay area. Historically, Cape Shoalwater served as a natural barrier protecting the entrance to Willapa Bay; however, it has receded approximately 2.16 miles since 1876. A 2019 study conducted by the SBIT found that the mouth of Willapa Bay is experiencing one of the most rapid rates of erosion along the Pacific Coast. This ongoing erosion, combined with documented sea-level rise, poses a significant threat to the SBIT community, much of which is situated within the low-lying areas of the Reservation.

The most critical driver for the project is the need to reduce the substantial risk to life, infrastructure, and cultural resources posed by tsunami hazards. In addition to tsunamis generated by distant seismic events, SBIT faces an acute threat from a potential CSZ earthquake occurring off the coasts of northern California, Oregon, and Washington. Scientific evidence indicates that the CSZ has historically produced earthquakes of magnitude 8.0 or greater at an average recurrence interval of approximately 500 years. Tsunami inundation modeling for a CSZ event indicates that the SBIT community could experience water depths ranging from 17 to 22 ft. Furthermore, the estimated time between the onset of earthquake shaking and tsunami arrival is approximately 15 minutes, providing minimal time for evacuation.

The consequences of a CSZ-generated tsunami would be devastating. In addition to the significant risk to human life, critical Tribal infrastructure, services, and economic resources would likely be destroyed. Even for those who survive the initial event, the earthquake is anticipated to cause up to 8.5 feet of coastal subsidence, further increasing long-term vulnerability to storm surge, tidal inundation, and chronic flooding.

3.0 PROJECT OVERVIEW

The proposed Project is located immediately north and east of Tokeland, Washington within Water Resource Inventory Area 24 (Willapa Watershed; Figure 1). The centroid of the project is located at latitude 46.737497 degrees (°) and longitude -124.041743°. The project area is located within the following township and ranges: Section 03, T14N, R11W; Section 24, T15N, R11W; and Section 33, T15N, R11W.

The Project traverses undeveloped commercial forestlands that have been subject to regular harvest and replanting activities since the 1970s (Figure 2). The project area shown in Figure 2 represents the clearing and grading limits for the Project. The project area generally follows ridgelines that are orientated north/south along the Eagle Hill Road segment and North Cove Beach Access Road segment and east/west along the RAISE Loop Road segment (Figure 3).

The Project will result in the construction of the following:

- Approximately 3.66 miles of 24-ft-wide roadway with a 5-ft sidewalk on one side
- Washington Department of Ecology (Ecology)-compliant vegetative filter strips for stormwater treatment with no outfalls to surface waters.
- Underground utilities within the roadway alignment that include electricity, water, telecommunications, stormwater, and sewer
- 144 new light poles for roadway illumination
- Grading of two 1-acre residential lots
- Two duplexes that house two families each.

Project plans for all three road segments are located in Appendix A of this report. It should be noted that the North Cove Beach Access Road plans in Appendix A were developed prior to the plans for the RAISE Loop project. For funding and permitting purposes, the two projects were combined into what is now referred to as the RAISE Loop project.

The Project will have a footprint of approximately 57.58 acres that encompasses all necessary cut-and-fill areas. To facilitate the cost-effective construction and reduce trucking of material off site, the Project has been designed to represent a balanced cut and fill to the maximum extent possible. Total cut-and-fill estimates for the project equal 776,500 cubic yards (cy) of cut and 658,500 cy of fill.

Individual aspects of the project are detailed below.

3.1 Timber Harvest

Prior to the start of clearing activities, timber harvest boundaries will be clearly marked in the field with staking, flagging, or paint. Special attention will be paid to wetlands and streams within the project area to prevent incidental impacts to these sensitive areas during clearing activities.

Timber will be harvested from the forested portions of the project area. The total area of timber harvest will equal approximately 47 acres. Approximately 85 percent of the 47 acres to be harvested is coniferous forest that was planted between 2005 and 2018.

Timber will be harvested using traditional harvest methods that may include yarding and skidding logs to established landing areas. The majority of the timber will not be required to be yarded due to the proximity of the trees to the road alignment. Harvest trees will be delimbed and stacked for eventual transport off site. Logs will be loaded and transported off site using existing gravel roads.

3.2 Erosion and Sediment Control Measures

Prior to initiating any earth-disturbing activities, wetlands, streams, and any sensitive habitats will be located and marked near the active project site. Areas not slated for disturbance will be flagged to reduce the potential for unanticipated disturbance.

Temporary erosion and sediment control measures will be installed prior to any earth-disturbing activities. Silt fencing, inlet protection, slope protection and matting, wheel washes, and rocked construction entrances will be utilized to prevent the offsite tracking of materials. Erosion control measures will be evaluated, maintained, and updated throughout the lifetime of the Project to limit erosion and stormwater runoff.

3.3 Clearing and Grubbing

All remaining brush and vegetation following timber harvest from the grading areas will be cleared using mechanical methods. This will most likely be a combination of brush mowers and excavator-mounted flail mowers. The upper 12 inches of soil on the site is not suitable for structural fill and will be stripped with common excavators and bulldozers. Six inches of the strippings will be screened and stockpiled to be used as topsoil. The remaining stripping will be disposed of in an approved upland location. Stripping and subsequent grading will be phased to prevent exposed inactive areas from becoming a source of erosion. This material will be collected and transported to an approved upland disposal site via dump trucks. The disposal location has not been designated at this time, but this area will be an upland location that is subject to review and approval by Tribal staff prior to depositing spoil materials. Once areas have been sufficiently stripped, preliminary and final grading activities will commence.

3.4 Access and Staging

Existing gravel access roads will be utilized to provide access to the project area. There will be two large staging areas located at the north and south portions of the project area (Figure 3). These two staging areas will be utilized throughout the entirety of the Project for staging fill materials, storing equipment, and serving as laydown areas for utility infrastructure. The two staging areas will be established at the initiation of construction.

3.5 Grading

Grading will be initiated once areas have been successfully brushed and stripped. The cut slopes will be surveyed and grade stakes installed to guide the removal and transport of material. Cutting will be facilitated with graders, excavators, and bulldozers as deemed appropriate by the contractor.

To the maximum extent possible, excavated material will be used as fill within the project area. Transportation of excavation spoils will be a combination of pushing material with bulldozers when the fill areas are close and loading and trucking spoils material with excavators and dump trucks when the fill areas are too far to effectively push material.

Following preliminary grading, base rock material will be imported and placed along the roadbed alignment to facilitate proper compaction and the eventual placement of utilities and asphalt roadway.

3.6 Utility Installation

Utilities will be installed below the roadbed alignment. Utility installation will likely occur during the second construction season after base rock has been placed within the road alignment to limit erosion. Utility installation will require excavation of the base rock layers and installation of water, stormwater, sewer, electric, and telecommunications. Utility installation will follow standard construction practices with pipes installed atop compacted gravels and backfilled. Utility manholes for maintenance and future access will be installed.

3.7 Culvert Replacement

The outlet of the existing culvert that conveys Stream 6 under North Cove Beach Access Road is perched, and the surface water drop is a fish passage barrier. In addition to the perched nature of the culvert outlet, it is currently undersized for flows and results in a hydraulic jump. Stream 6 is the only perennial fish-bearing stream within the project area and is listed as providing habitat for coho salmon (*Oncorhynchus kisutch*). The Project proposes to replace this culvert with an 8-ft-diameter concrete culvert. The culvert will be partially buried and contain streambed material with a low-flow channel to allow for fish passage. Culvert plans are currently being developed.

The proposed culvert replacement will be completed concurrent with the road improvements to minimize the window of potential disturbances to Stream 6 during construction. The in-water work will be completed within the US Army Corps of Engineers (USACE)-designated in-water work window of July 15 to October 15.

3.8 Paving and Concrete

Following preparation of the roadbed, the entire alignment will be paved with hot-mix asphalt. Asphalt will be applied with a standard dump truck and asphalt spreader combination and then compacted with a vibratory drum roller. Painting and stripping will be completed with a standard paint application truck.

All the proposed sidewalks and any transitions will be formed in place. Concrete will be poured, screed, and floated both by hand and with mechanical trowels. After proper concrete setup, forms will be pulled and disposed of off site.

4.0 EXISTING CONDITIONS

The forestlands surrounding the project area have been subject to historic and recent commercial timber harvest. Gravel roads have been constructed through these forestlands to facilitate timber harvest and hauling. Most of the forestlands adjacent to the project area exist as either clear-cut harvested lands or medium-aged, second-growth timber. Land uses adjacent to the project area include a single-family residence and police station, both of which are in the southwestern portion of the project area.

Wetlands and waters within the project area were delineated by Landau in the early spring of 2026. The completed delineation report is located within Appendix B. A total of 11 wetlands and six streams were identified during the delineation (Figure 4). The wetlands and waters within the project area are summarized below.

4.1 Wetlands

A total of 11 palustrine wetlands are located within the project area. The wetlands are summarized in Table 1 below and generally described in the following sections.

Table 1. Project Area Wetlands

Feature Name	Feature Size within Project Area (acres)	HGM/Cowardin Classification	Ecology Rating
Wetland A	0.00	Depressional/PFO	Category III
Wetland B	0.02	Depressional/PFO	Category III
Wetland C	0.13	Slope/PFO	Category IV
Wetland D	0.001	Slope/PFO	Category IV
Wetland E	0.02	Slope/PFO	Category IV
Wetland F	0.03	Slope/PFO	Category IV
Wetland G	0.05	Slope/PFO	Category IV
Wetland H	0.01	Slope/PFO	Category IV
Wetland I	0.04	Slope/PFO	Category IV
Wetland J	0.01	Slope/PFO	Category IV
Wetland K	0.02	Slope/PFO	Category IV

Abbreviations and Acronyms:

HGM = hydrogeomorphic

PFO = palustrine forested

4.1.1 Wetlands A and B

Wetlands A and B are the only depressional wetlands within or directly adjacent to the project area. Wetland A was delineated in the field but later discovered to be outside of the project limits. These wetlands have vegetation classes that include emergent, scrub-shrub, and forested within an overall

Cowardin classification of forested. These wetlands are supported from overland flow from adjacent slopes as well as groundwater expression. The overstory of the wetland is dominated by Oregon ash (*Fraxinus latifolia*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and scattered Sitka spruce (*Picea sitchensis*). Shrub-layer vegetation is dominated by salmonberry (*Rubus spectabilis*), willow (*Salix* sp.), and red-osier dogwood (*Cornus sericea*). Emergent layer vegetation includes slough sedge (*Carex obnupta*), soft rush (*Juncus effusus*), small-fruited bulrush (*Scirpus microcarpus*), water parsley (*Oenanthe sarmentosa*), and giant horsetail (*Equisetum telmateia*). Soils consist of muck and clay with prominent redoximorphic concentrations and sulfur odor. Positive indicators of wetland hydrology include standing water in some areas and saturation at the surface. The boundaries of both wetlands adjacent to the project area were observed to correspond with the toe of fill slopes of the gravel road that has bisected this once-single wetland into two discrete wetlands. Wetlands A and B were rated as Category III wetlands using the Ecology Wetland Rating System for Western Washington (Rating System; Ecology 2014). Photographs of Wetland A and B are presented in Figures A and B below.

Figure A. Wetland A Facing East



Figure B. Wetland B Facing West



4.1.2 Wetlands C through K

Wetlands C through K are similar enough to be described together. Representative photographs of the wetlands are presented in Figures C through H. Details of individual wetlands are presented in the attached wetland delineation report (Appendix B). These wetlands are classified as slope wetlands and are located in concave drainages within the project area and are supported through a combination of runoff from adjacent uplands and “daylighting” of subsurface water flows. The overstory in these wetlands is dominated by red alder (*Alnus rubra*) trees. A few of the wetlands have shrub layer present including salmonberry (*Rubus spectabilis*), vine maple (*Acer circinatum*), and red alder saplings. Emergent vegetation within the wetlands is generally sparse with dominant species that include

creeping buttercup (*Ranunculus repens*), slough sedge (*Carex obnupta*), skunk cabbage (*Lysichiton americanus*), lady fern (*Athyrium cyclosorum*), and water parsley (*Oenanthe sarmentosa*). Wetlands C through K were all rated as Category IV wetlands under the Rating System.

Figure C. Lower Portion of Wetland C



Figure D. Dense Slough Sedge in Wetland D



Figure E. Typical Vegetation in Wetlands F–I



Figure F. Wetland J and Type F Stream



Figure G. Wetland K Within Drainage



Figure H. Typical Vegetation in Wetland K



4.2 Waterways

Landau delineated the ordinary high water mark of six waterways within the project area. Five of these waterways are Type Ns (non-fish-bearing seasonal), and one is a Type F (fish-bearing). These streams are detailed below and summarized in Table 2. Photographs of the onsite streams are presented in Figures I through N.

Table 2. Project Area Waters

Feature Name	Approximate Bankfull Width (inches)	Documented Fish Use	DNR Stream Type
Stream 1	10	No	Ns
Stream 2	18	No	Ns
Stream 3	20	No	Ns
Stream 4	21	No	Ns
Stream 5	14	No	Ns
Stream 6	28	Yes	F

Abbreviations and Acronyms:

DNR = Department of Natural Resources

F = fish-bearing

Ns = non-fish-bearing seasonal

Stream 1

Stream 1 is located in the southeast portion of the project area within an area that was subject to a relatively recent landslide. This stream starts as a seep and quickly becomes a channelized stream with an identifiable bed and bank. The stream has an average OHWM width of approximately 10 inches and a depth of 2 to 3 inches. The stream has a small contributing area, and it is likely that the stream ceases to flow during the summer months. This stream meets criteria to be classified as a Type Ns stream.

Stream 2

Stream 2 is located in the northern portion of the project area within a steep, confined drainage. This stream starts as a hillside seep where groundwater is expressed and quickly becomes a channelized stream with an identifiable bed and bank. The stream has an average OHWM width of approximately 18 inches and a depth of 2 to 3 inches. The stream has a small contributing area, and it is likely that the stream ceases to flow during the summer months. This stream meets criteria to be classified as a Type Ns stream.

Stream 3

Stream 3 is located in the northwest corner of the project area. This stream is a tributary of Stream 4 within a steep and narrow drainage and flows for approximately 200 ft before draining into Stream 4. This stream has an average OHWM width of approximately 22 inches and a depth of approximately 2 inches. The stream was actively flowing at the time of the site visit and likely goes dry in the summer months. This stream meets criteria to be classified as a Type Ns stream.

Stream 4

Stream 4 is located immediately west of Stream 3 within a steep drainage feature. This stream starts as a small seep, and overland flows quickly become channelized within a bank that is approximately 16 inches wide and 1 to 2 inches deep. This stream meets criteria to be classified as a Type Ns stream.

Stream 5

Stream 5 is a very small and short tributary to Stream 4 located in the northwest corner of the project area. This stream starts at the edge of a forested wetland (Wetland I) and travels downhill within a very narrow drainage for approximately 50 ft before draining into Stream 4. The OHWM width is approximately 14 inches wide and 2 inches deep. This seasonal stream would be classified as a Type Ns stream.

Stream 6

Stream 6 is located in the southern portion of the project area and is the only stream identified within the project area that likely flows year-round. This stream flows down a moderately steep drainage and through a gently sloping floodplain that contains Wetland K. The stream passes through a corrugated steel culvert that is perched above the channel on the downstream end. The channel has an average OHWM width of 28 inches as it flows through the project area. The Statewide Integrated Fish Distribution website has Stream 6 as being potentially accessible by coho and winter steelhead (NWIFD;

accessed May 7, 2026). Based on the width and slope, Stream 6 meets the physical criteria to be considered a Type F stream.

Figure I. Stream 1



Figure J. Stream 2



Figure K. Stream 3



Figure L. Stream 4



Figure M. Stream 6 Above Culvert



Figure N. Stream 6 Culvert



4.3 Wetland Functions

Wetlands provide numerous functions based on the individual wetland's physical characteristics, hydrogeomorphic (HGM) classification, and position in the landscape. The Seattle District of the USACE does not currently have a quantitative wetland functional assessment methodology. Regardless, a qualitative assessment of wetland functions will help identify which functions will be lost from proposed wetland impacts. The assessment of wetland functions for this project provide a generalized score for a variety of well-recognized functions for wetlands within the region. Table 3 below addresses the core ecological functions of the wetlands within the project area and provides a high (H), Moderate (M), or Low (L) scoring.

Table 3. Wetland Function Summary

Function Group	Wetland Name										
	A	B	C	D	E	F	G	H	I	J	K
Water Storage and Delay	H	H	L	L	L	L	L	L	L	L	L
Ground Water Recharge	H	H	L	L	L	L	L	L	L	L	L
Sediment/Toxicant Sequestration	H	H	L	M	L	L	L	L	L	M	M
Nutrient Sequestration	H	H	L	L	L	L	L	L	L	L	L
Support of Plant Diversity	H	H	L	L	L	L	L	L	L	M	L
Wildlife Habitat Functions	H	H	L	L	L	L	L	L	L	M	M
Hydroperiod Modulation	M	M	L	L	L	L	L	L	L	L	L
Production Export	M	M	L	L	L	L	L	L	L	L	L
Carbon Storage	H	H	L	L	L	L	L	L	L	L	L

Notes:

High (H), Moderate (M), Low (L), or absent (A).

Wetlands A and B provide a significant level of wetland function owing to their depressional nature, which provides significant hydrologic and water quality benefits by detaining precipitation and overland flows. Detention of surface water allows for sediment sequestration, water storage and delay, and hydroperiod modulation functions. These wetlands also provide a high degree of wildlife habitat and plant diversity functions as they contain structurally complex habitats with forested, scrub-shrub, emergent, and open water habitats. Lastly, the dense vegetation community present within these wetlands provides a significant amount of pollutant uptake and carbon storage.

Wetlands C through K provide a lower level of wetland function due to their small individual sizes, limited vegetation diversity, and slope classification. While densely vegetated sloped wetlands can provide water quality benefits through attenuation of surface flow velocities and uptake of pollutants, the lack of water storage and minimal contact time lowers the amount of pollutant uptake functions that can be provided. Only Wetland D has a vegetation community dense enough to provide these types of functions. Wetlands C through K occur in areas of groundwater expression, so their primary hydrologic function is maintenance of downstream flows, not water storage and delay or de-synchronization of upland inputs and downstream outputs.

Both structural and vegetation diversity is low within Wetland C through K. The only canopy species present within these wetlands is red alder, which is common throughout the project area. Shrub-layer vegetation in most of the wetlands is generally very low and limited to one or two different species. The very small size of these wetlands underscores their inability to provide habitat for wetland-dependent species, as they do not contain enough land area to support even small numbers of these species.

4.4 Stream Functions

Streams can provide numerous functions and benefits based on their physical configuration, flow regime, position in the watershed, and connectivity to downstream systems. These parameters are deeply interdependent. Examples of this would be slope and discharge affect sediment transport, which determines channel shape, which therefore determines hydraulic conditions, which ultimately drives aquatic habitat creation and ability to support aquatic life. Table 4 below summarizes the functions provided by the streams within the project area.

Table 4. Stream Function Summary

Function Group	Stream Name					
	1	2	3	4	5	6
Maintain Down Steam Baseflows	L	L	L	L	L	M
Sediment Transport	L	L	L	L	L	M
Primary Productivity	A	A	A	A	A	M
Food Web support	A	A	A	A	A	M
Fish Habitat	A	A	A	A	A	M
Aquatic Species Habitat	A	A	A	A	A	M
Nutrient Export	L	L	L	L	L	M
Hyporheic Exchange	A	A	A	A	A	M
Sediment Storage	A	A	A	A	A	M

Notes:

High (H), Moderate (M), Low (L), or absent (A)

Except for Stream 6, all the streams in the project area are small, intermittent channels that are supported by seasonal groundwater discharge. These streams function as headwaters in the steep upper sections of their collective watersheds and are too steep for fish to access. While all these channels have ordinary high water marks and a defined bed and bank, none of the streams have a continuous layer of stream sediments. Bed material consists of silts and sands with small pockets of gravels. This is likely due to the steepness of the channels, seasonal nature of water flows, and high levels of sediment transport. There appears to be no avenue for primary productivity in these streams. The primary ecological function of these streams is transportation of sediment and support of downstream flows.

Stream 6 is the only perennial stream in the project area that supports aquatic life in the form of benthic macroinvertebrates, crustaceans, and various other aquatic organisms. Additional primary productivity functions were observed in the form of small patches of algae and leaf litter. Stream 6 provides channel diversity, with pools, glides, and riffles observed within the project area.

5.0 AVOIDANCE AND MINIMIZATION OF IMPACTS

The following section addresses SBIT's efforts to avoid and minimize impacts to waters of the United States, including jurisdictional wetlands.

5.1 Alternative locations

A formal analysis of different project areas utilized for the proposed Project has not been completed because other project areas will not meet the principal requirements of the project. These requirements are outlined below.

5.1.1 Land Ownership

SBIT has a limited amount of land available for development within the Reservation or on Tribal Trust Land managed by the BIA. Even though SBIT has acquired more land adjacent to the Reservation, there are no additional areas large enough to support the full build-out of the relocation plans.

5.1.2 Location

One of the key aspects of the proposed Project is to provide a tsunami evacuation route in the event of a significant earthquake. The proposed Project is within a location that is in close proximity to the existing Tribal homes and businesses. The entrance to the Project along Eagle Hill Road is the closest road to Tokeland Road and services most of the Tribal residences, offices, and business.

5.2 Impact Avoidance

Due to the location of the proposed road alignment and the amount of necessary earthwork to achieve the Project objectives, total avoidance of all wetland impacts is not feasible. Impacts to Wetland A, a Category III forested wetland, were made possible by shifting the road a small amount to the north. While this shift did result in minor impacts to Wetland B, the impacted areas of Wetland B are significantly less diverse and provide a lower number of wetland functions.

5.3 Impact Minimization

The proposed 24-ft-wide roadbed is designed in accordance with current road standards and is the minimal width to provide for two lanes of travel along the road. In addition to the road width requirements, there are other design considerations, such as multi-modal requirements, suitable grades, safety sight lines, and cut and fill requirements.

An estimated 776,500 cy of cut will be generated during grading operations. To the maximum extent possible, material generated during preliminary grading will be utilized for structural fills. The road alignment location has been chosen to avoid the steepest slopes within the project area and minimize grading requirements. Total fills will equal approximately 658,500 cy of material. All the proposed wetland and stream impacts are a result of the planned fills along the alignment. Due to the steep nature of the Project site, shifting the road alignment to avoid wetland and stream impacts is not

feasible, as it would move the road into steeper terrain, thereby creating the need for larger and steeper fill slopes.

Almost half of the proposed impacts will result from a significant number of fills in the northwest corner of the Project at the intersection of RAISE Loop Road and North Cove Beach Access Road (Figure 3). This area will be used for equipment staging, temporary fill storage, and utility material stockpiling and storage during construction of the road and installation of utilities. This stockpiling site was chosen due to its ease of access, central location, ability to receive a large amount of material generated by grading activities, and proximity to flatter areas to the south and west of the planned fills. Fills in this area will generate a large amount of space suitable for development. Future phases of the Project will utilize this entire area to serve as the “town center” of the development and provide community services such as schools, healthcare, and Tribal offices.

6.0 UNAVOIDABLE IMPACTS

The proposed Project will permanently impact a total of 10 different wetlands and six streams. This section details the planned impacts as well as anticipated reductions in wetland and water functions.

6.1 Wetland Impacts

All of the proposed impacts will result from the deposition of fill material. The cumulative total for wetland impacts is 0.351 acres. The proposed wetland impacts are summarized in Table 5 below.

Table 5. Wetland Impact Summary

Wetland Name	Figure	Ecology Rating	Cowardin Classification	Impact (acres)
Wetland B	Figure 5	III	Palustrine Forested	0.02
Wetland C	Figure 7	IV	Palustrine Forested	0.13
Wetland D	Figure 9	IV	Palustrine Forested	0.001
Wetland E	Figure 11	IV	Palustrine Forested	0.02
Wetland F	Figure 13	IV	Palustrine Forested	0.03
Wetland G	Figure 13	IV	Palustrine Forested	0.05
Wetland H	Figure 17	IV	Palustrine Forested	0.01
Wetland I	Figure 17	IV	Palustrine Forested	0.04
Wetland J	Figure 19	IV	Palustrine Forested	0.03
Wetland K	Figure 21	IV	Palustrine Forested	0.02
Total Wetland Impacts				0.351

Figure 4 provides an overview of the locations of the proposed wetland impacts and serves as a key to the individual impact figures for each wetland. Figures 5 through 22 present the wetland and water impact details and existing and proposed cross sections.

6.2 Wetland Function Impacts

The only wetland within the project area that provides a significant number of wetland functions is Wetland B, the palustrine forested, depressional-class wetland located adjacent to Highway 105. A total of 0.02 acres of this wetland will be impacted along its eastern margin. Vegetation to be impacted is limited to the emergent vegetation community located at the toe of the existing fill slope. No native shrubs or trees will be impacted. Impacts to this wetland will result in minor decreases to the following functions: water storage and delay, ground water recharge, sediment and nutrient sequestration, support of wildlife habitat, and support of native plant diversity. Impacts to functions are considered minimal, as less than 5 percent of the total wetland area will be impacted.

As outlined in Section 4.3 above, the remaining wetlands provide minimal function due to the slope HGM classification, low amount of plant diversity, and relatively small size. Based on the characteristics of these wetlands, a small decrease in sediment sequestration, plant diversity, and wildlife habitat wetland functions is anticipated.

6.3 Stream Impacts

The proposed grading will result in the loss of 0.05 acres of stream habitat. This area of impact will result from the filling of 1,091 ft of intermittent, non-fish-bearing waters and 72 ft of perennial, fish-bearing stream. Stream impacts are summarized in Table 6 below.

Table 6. Stream Impact Summary

Stream	Figure	Ordinary High Water Mark Width (inches)	Stream Type	Impact Feet (acres)
Stream 1	Figure 11	10	Non-fish seasonal	84 (0.002)
Stream 2	Figure 11	18	Non-fish seasonal	118 (0.004)
Stream 3	Figure 14	22	Non-fish seasonal	213 (0.009)
Stream 4	Figure 14	16	Non-fish seasonal	510 (0.02)
Stream 5	Figure 17	14	Non-fish seasonal	82 (0.002)
Stream 6	Figure 19	28	Fish-Bearing	72 (0.008)
Total Stream Impacts				1,079 (0.05)

Impacts to the seasonal headwater streams within the project area will result from the importation of fill material. Prior to the placement of dense fill material, the streams and wetlands to be impacted will be filled to a depth of at least 3 ft with clean gravels and crushed angular drainage rock. This drainage rock will ensure that the proposed stream impacts will not disrupt downstream baseflows as the presence of this pervious layer will allow for continued groundwater discharge.

Impacts to Stream 6 will result from the installation of a fish-passable culvert. Despite the upsizing of the culvert to an 8-ft-diameter pipe, the culvert will need to be extended to ensure a fish-passable slope. The new culvert will be 78 ft longer than the existing culvert, resulting in the loss of 72 ft of open channel. Culvert replacement plans are presented in Figures 23 and 24. Stream Function Impacts

6.4 Stream Function Impacts

Due to the physical characteristics of the seasonal streams within the project area, the functions that these streams supply are severely limited. These functions include support of downstream flows through the expression of groundwater, sediment export, and some degree of nutrient export. The proposed filling of stream sections will include the placement of drainage rock to ensure that groundwater flows and eventual expression continue following completion of the Project. As a result, the primary functions that will be impacted by the seasonal stream impacts are a reduction in sediment and nutrient export.

Impacts to the perennial, fish-bearing stream (Stream 6) will result in a minor decrease in several stream functions. The decrease in functions will result from sections of the stream not receiving sunlight due to the extension of the culvert. This will result in decreases in primary productivity, food web support, nutrient export, and hyporheic exchange. However, the new culvert will result in an increase in fish habitat by means of allowing fish to access the portions of the stream above the culvert. The culvert replacement will provide fish access to approximately 1,700 linear ft of new habitat.

7.0 MITIGATION

SBIT is proposing to transfer credits generated by the Ghost Dike Advanced Wetland Mitigation Site (AWMS) to compensate for the loss of palustrine wetlands and waters. The AWMS was completed to generate wetland mitigation credits that could be applied to SBIT-sponsored projects. The complete plan is included in Appendix C of this document. The AWMS is summarized below.

7.1 Ghost Dike Advanced Wetland Mitigation Site

The AWMS covers 20.32 acres of Tribally owned land along the northern shoreline of Willapa Bay. This project re-established and rehabilitated estuarine wetlands by restoring natural hydrology and establishing native vegetation. This was accomplished through completion of the following mitigation activities:

- Removing the remnant Ghost Dike and grade to match surrounding marsh plain elevations (8.5 to 10 ft North American Vertical Datum 1988)
- Filling existing borrow ditches and incised channels to restore tidal sheet-flow flooding across the marsh
- Excavating 12 new high marsh tidal channels to restore hydrologic connectivity between the bay and the marsh plain
- Revegetating graded areas with native seed and allowing natural recruitment from surrounding marsh
- Placing woody debris habitat piles and brush bundle wave break barriers using material cleared from the dike
- Removing invasive species (Scot's broom, narrowleaf cattail, European dune grass).

Prior to completion of these actions, the wetland was rated as a Category II under the Rating System due to the presence of the dike and ditches that negatively affected the functions of the wetland. Following the completion of the proposed enhancements, the wetland would be rated as a Category I wetland.

7.2 Need for Estuarine Wetland Enhancement

Estuarine wetlands are some of the most valuable and limited ecosystems in Washington State. It has been estimated that 90 percent of estuarine wetlands in the Puget Sound and 50 percent of estuarine wetlands in the lower Columbia River have been lost to development (NOAA; accessed May 7, 2026). Estuarine wetlands are of critical importance to several species of salmon that utilize these habitats to forage in productive habitats and grow, undergo physiological changes to adapt to salt water, and avoid predation before out-migrating to the marine environment (Simenstad et al. 1982). The importance of estuarine wetlands is underscored by the Rating System, which automatically designates them as Category I or Category II wetlands based on their special characteristics.

7.3 Wetland Functional Lift

The completion of the AWMS project provided significant functional lifts in several key functional groups. These include the following:

- Increased water quality functions through the sequestration of sediments and nutrient uptake
- Restoration of hydrologic functions by restoring natural flood pathways and creating channels to improve nutrient exchange and assist in marsh accretion
- Improve habitat functions for fish, shorebirds, waterfowl, shellfish, and other marsh and tidal-dependent wildlife
- Dramatic increases in carbon sequestration by establishing aquatic and semi-aquatic vegetation subject to tidal inundation.

While the AWMS was conducted on estuarine wetlands, there is a significant amount of overlap with the functions provided by the AWMS and the functions that will be lost from the palustrine wetland impacts. This is especially the case for water quality functions, support of natural hydrologic pathways, support of native vegetation, and carbon sequestration.

In addition to the replacement of the wetland functions, the AWMS project also provides increases in functions that directly relate to the onsite stream functions. These include restoration of natural hydrology, sediment conveyance and storage, and a significant amount of aquatic organism habitat and primary productivity.

7.4 Wetland Credits and Ratios

The AWMS site generated a total of 7.10 acres of mitigation credits. These were generated at different ratios depending on the mitigation that was completed as summarized in Table 7 below.

Table 7. Credit Generation

Mitigation Type	Acres	Ratio	Credits Generated
Re-establishment (dike removal)	2.12	1:1	2.12
Rehabilitation (ditch filling)	1.69	2:1	0.85
Rehabilitation (marsh and channel excavation)	16.51	4:1	4.13
Total	20.32		7.10

The ratios for use of the AWMS have been established in the AWMS Mitigation Plan (Appendix C). As the AWMS becomes more mature and wetland functions increase, the value of the credits increases by reducing the credit-to-debit ratio. Table 8 summarizes the credit use formula for the AWMS.

Table 8. Age of Mitigation (years)

Age of Mitigation (years)	Wetland Category Impacted			
	Category I Palustrine or Estuarine	Category II Palustrine or Estuarine	Category III	Category IV
0-1	4:1	3:1	2:1	1.5:1
2	4:1	2.5:1	1.8:1	1.4:1
3 and 4	3.5:1	1.75:1	1.5:1	1.25:1
5 and 6	3:1	1.5:1	1.25:1	1:1
7,8, and 9	2.5:1	1.25:1	1:1	0.85:1
10+	2:1	1:1	0.90:1	0.75:1

Construction of the AWMS was completed as planned in 2023. The appropriate credit ratios based on 3-year age of mitigation are therefore 1.5:1 for Category III wetland impacts and 1.25:1 for Category IV wetland impacts.

7.5 Mitigation Accounting

Table 9 below provides the mitigation accounting for the Project based on the wetland impacts and mitigation ratios provided in Table 8 above.

Table 9. Mitigation Accounting

Wetland Category	Impact Area (acres)	Credit Ratio	Credits Required
Category III	0.02	1.5:1	0.03
Category IV	0.331	1.25:1	0.41
Stream Impacts	0.05	(Category II) 1.75:1	0.09
Total Advanced Wetland Mitigation Site Credits Required			0.53

7.6 AWMS Credit Balance

SBIT has not utilized any of the AWMS bank credits to date. As such, all of the produced mitigation credits are available for use. The most recent mitigation monitoring report for the AWMS is attached as Appendix D.

8.0 USE OF THIS REPORT

The findings presented herein are based on Landau’s understanding of USACE wetland delineation methodology; interpretation of the vegetative, soil, and hydrologic conditions observed during the field investigation; and review of background information for the project area. Within the limitations of scope, schedule, and budget, services were provided in accordance with generally accepted sensitive-area investigation principles and practices. Landau makes no other warranty, either expressed or implied.

This report was prepared for the exclusive use by Red Plains and SBIT for specific application to this project. No other party is entitled to rely on the information, conclusions, and/or recommendations included in this document without the express written consent of Landau. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau, shall be at the user’s sole risk.

9.0 REFERENCES

- Ecology. 2014. Washington State Wetland Rating System for Western Washington: 2014 Update (Effective January 2015). Publication No. 14-06-029. 14-06-029. Washington State Department of Ecology. October 2014. <https://fortress.wa.gov/ecy/publications/SummaryPages/1406029.html>.
- NOAA. Puget Sound Nearshore Habitat Conservation Calculator. National Oceanic and Atmospheric Administration, Fisheries. <https://www.fisheries.noaa.gov/west-coast/habitat-conservation/puget-sound-nearshore-habitat-conservation-calculator>.
- NWIFC. Statewide Integrated Fish Distribution (SWIFD) Web Map. Northwest Indian Fisheries Commission. <https://geo.nwifc.org/swifd/>.
- Simenstad, Charles A., K. Fresh, and E. Salo. "The Role of Puget Sound and Washington Coast Estuaries in the Life History of Pacific Salmon: An Unappreciated Function." *Estuarine Comparisons, Proceedings of the Sixth Biennial International Estuarine Research Conference*, Gleneden Beach, Oregon, 1982.