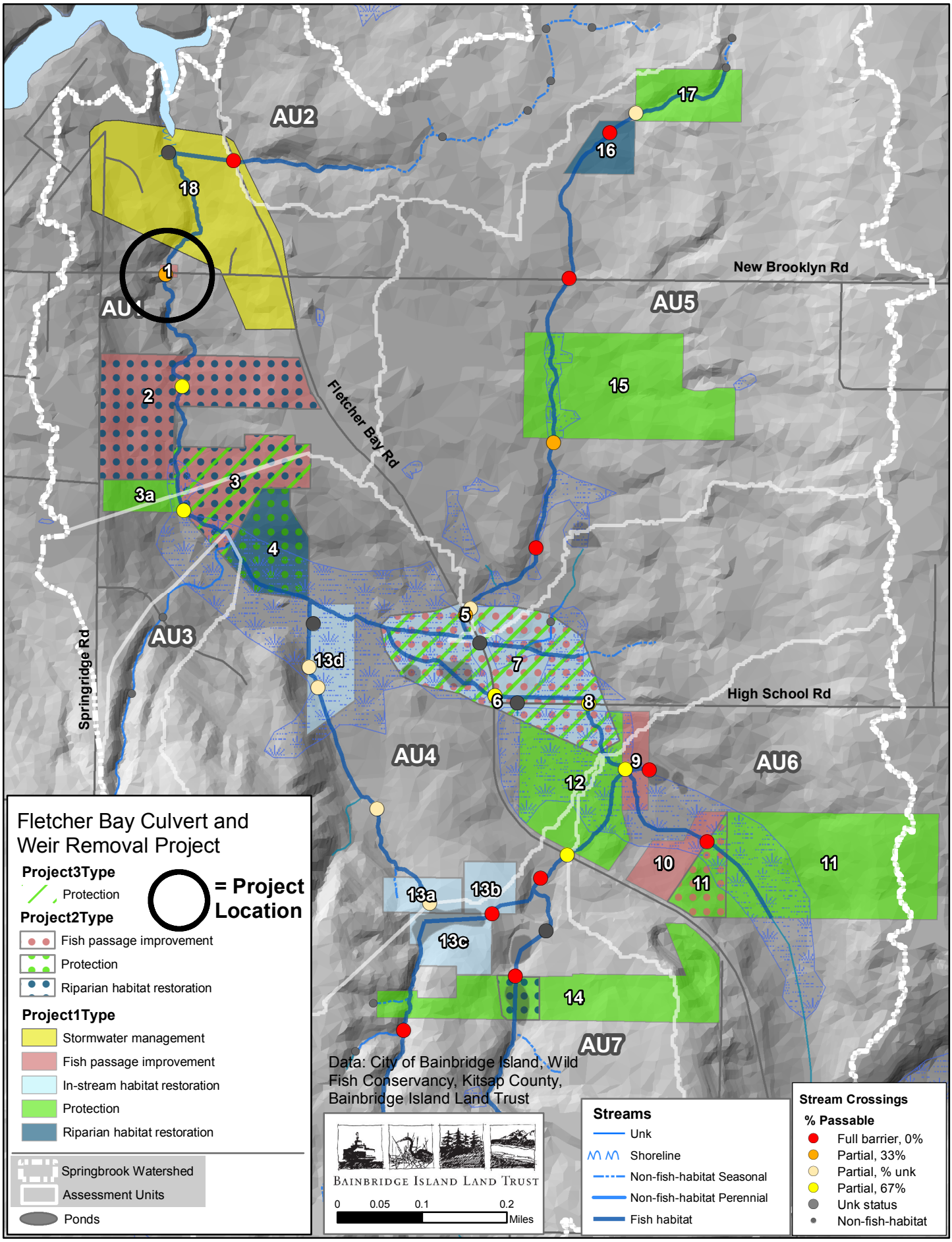
Appendix III Project 1

Fletcher Bay Culvert and Weir Removal and Stream Restoration Project

Conceptual Design


AU2
AU1
AU3
AU4
AU5
AU6
AU7
New Brooklyn Rd
Fletcher Bay Rd
Springridge Rd
High School Rd
1
2
3
3a
4
5
6
7
8
9
10
11
12
13a
13b
13c
13d
14
15
16
17
18
Fletcher Bay Culvert and Weir Removal Project
Project3Type
Protection
= Project Location
Project2Type
Fish passage improvement
Protection
Riparian habitat restoration
Project1Type
Stormwater management
Fish passage improvement
In-stream habitat restoration
Protection
Riparian habitat restoration
Springbrook Watershed
Assessment Units
Ponds
Data: City of Bainbridge Island, Wild Fish Conservancy, Kitsap County, Bainbridge Island Land Trust
Bainbridge Island Land Trust
0 0.05 0.1 0.2 Miles
Streams
Unk
Shoreline
Non-fish-habitat Seasonal
Non-fish-habitat Perennial
Fish habitat
Stream Crossings
% Passable
Full barrier, 0%
Partial, 33%
Partial, % unk
Partial, 67%
Unk status
Non-fish-habitat

Fletcher Bay Culvert and Weir Replacement

Site Description

Approximately 1100 feet upstream from where Springbrook Creek enters Fletcher Bay, exists the first road crossing on the Springbrook Creek mainstem. This crossing, under Fletcher Bay Road NE, is a partial barrier which includes eight concrete weirs, 70 feet of armor along both sides of the bank, and a 5 ft. wide by 100 ft. long steel culvert. Upstream of the culvert are two weirs and approximately 30 feet of armor along both banks. The downstream-most weir below the culvert is failing and water now passes through a crack in its foundation and through large rocks armoring the bank rather than spilling over the top of the weir. The City of Bainbridge Island has installed plastic sheeting and sandbags to temporarily restore fish passage function to the lowest weir. WDFW identifies this complex as 33% passable and has assigned it a Prioritization Index (PI) of 24.66 (WDFW culvert ID #15-0340); this is one of the highest PI's of 44 PI calculations WDFW has performed on Bainbridge Island. This crossing affects fish access to 3.6 miles of fish habitat upstream. Below the failing weir the channel is incised and scoured down to hardpan for approximately 200 ft. potentially affecting spawning habitat. The entire 999 acre Springbrook Creek watershed drains to this location.

Specific Goals

The primary objective of this project is to replace an undersized culvert, failing weir complex, and bank armor with a crossing structure, allowing an unconstrained stream passage below Fletcher Bay Road and a naturalized stream and bank. Removing the undersized culvert and weirs will improve fish passage, the transport of sediment and large woody debris, and remove the need for ongoing maintenance/repair of the failing culvert and weir complex. Bank bioengineering and imported streambed material will be used to reconstruct the eroded channel features downstream from the existing undersized structure.

Another goal is to avoid negative impacts from the undersized culvert and failing weir complex that will be exacerbated in the coming decades as intensity and frequency of hydrologic events occur as a result of climate change.

The project team, Washington Department of Fish and Wildlife, Suquamish Tribe and the City of Bainbridge Island examined the project site multiple times to discuss restoration options. The 1996 KCM, Inc. design drawings were obtained and examined as well as past survey information. Interviews with Wayne Daley, project manager for the 1996 culvert installation took place, as well as interviews with upstream landowners. As part of this project a total station survey was performed as well as examination of LIDAR data.

A bridge option (option 1) and culvert design option (option 2) were developed for discussion.

Option 1 (Sheet 2)

Option 1 replaces the undersized barrier culvert with a 60' x 34' bridge and regrades the channel in the vicinity of the newly installed bridge. Bank armoring will be removed and the bank will be reconstructed using coir-wrap bioengineering techniques. The bioengineering will protect the stream bank until and after the planted vegetation takes root. All construction is to be done during the dry summer months.

Pros

Replacing the undersized culvert and weir configuration with a steel bridge would benefit fish migration and restore natural wood and sediment transport processes. A bridge will accommodate a larger range of flows than the existing culvert or even a replacement culvert as proposed in Option 2 and will require less long term maintenance. Removing the bank armoring and bioengineering will enhance fish habitat and reduce erosion and sedimentation associated with the exacerbated scouring of the banks and channel bed.

This project specifically addresses the following limiting factors present within the Springbrook Creek Watershed: fish passage, large woody debris recruitment, flood plain function, sediment transport and distribution, loss of spawning habitat.

Cons

Installing a bridge is expensive. There is a large amount of fill that needs to be removed to construct a bridge.

Option 2 (Sheet 3)

Option 2 is similar to Option 1, but instead of a steel bridge the existing undersized culvert and weir configuration is replaced with a 24 ft. wide concrete arch culvert.

Pros

Option 2 provides benefits similar to those afforded by Option 1. A 24' wide arch culvert will likely be slightly less expensive to purchase and install compared to a 60' steel bridge.

Cons

A 24' wide arch culvert is more likely to constrict flows during large storm events, requires structures to remain in the stream, does not address as many limiting factors, may require more maintenance, and will likely have a shorter life span, compared to a 60' steel bridge. Relative to a 60' long bridge, an arch culvert is less likely to accommodate changes to watershed hydrology that are likely to result from climate change over the lifespan of the structures.

Selected Option

The project team and the City of Bainbridge Island preferred the conceptual structure and channel modifications described in Option 1 in order to restore fish passage, remove substantial bank armoring, restore natural processes at the downstream-most crossing in the watershed and in this reach, remove the need of ongoing maintenance/repair needs of culverts, and accommodate potentially higher flow patterns in the watershed.

Project team rationale for recommending this project as the #1 project in the Springbrook Creek Watershed was that it addresses the following limiting factors: fish passage, riparian habitat, sediment transport, in stream complexity (large wood transport and restoring stream to its historical profile and gradient), water quality (temperature), stream hydrology, and landowner (COBI) willingness.

Additionally, the project team focused on sequencing projects moving upstream from Fletcher Bay. This project is the lowest barrier in the creek system, making it a priority to address in the near term in order to provide access to upstream habitat.

Photo 1

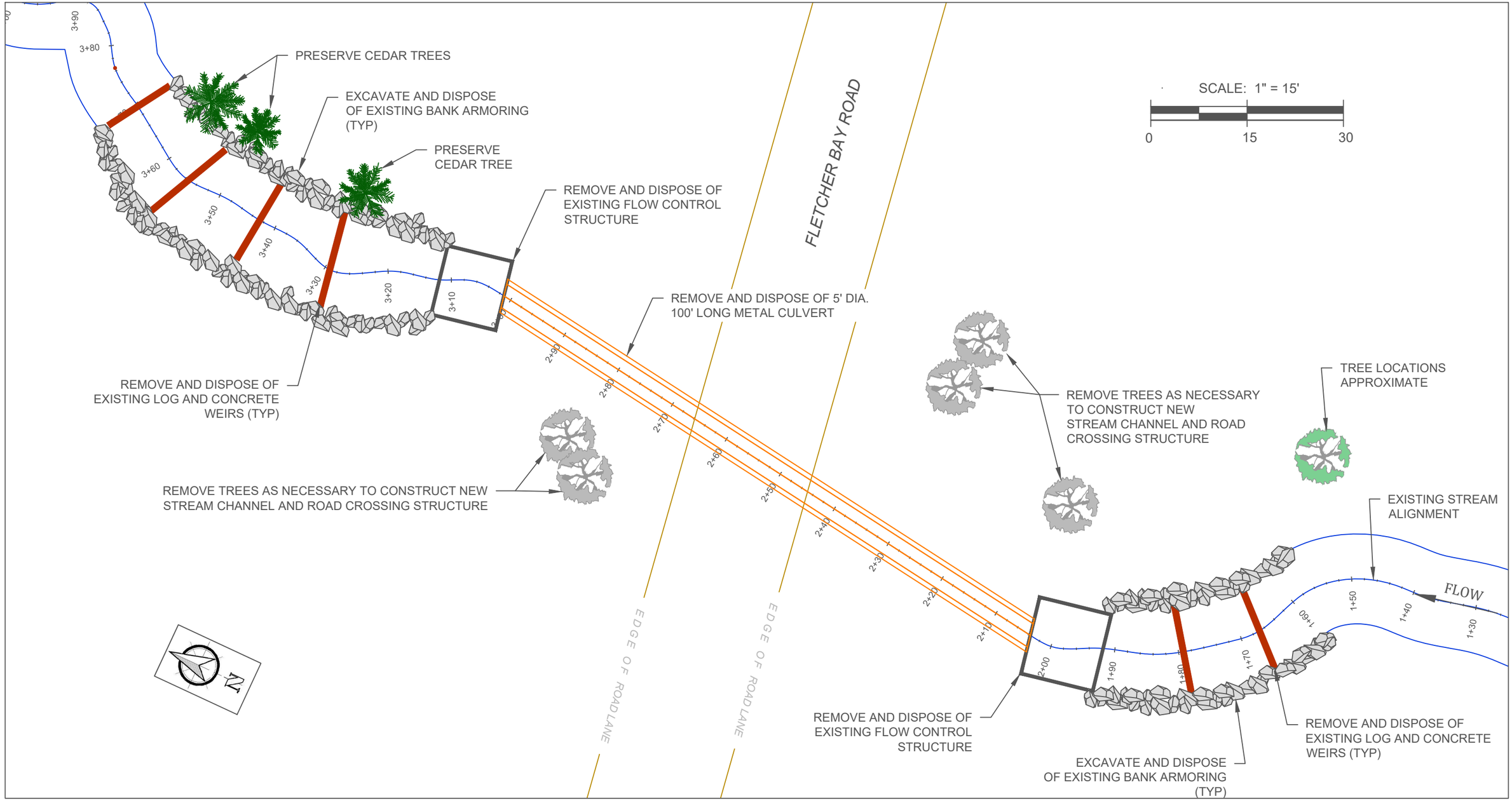
Photo 1: Looking south towards culvert and Fletcher Bay Road at the bottom of the existing weir complex. Illustrates temporary repair of weir system.

Photo 2: Looking north from Fletcher Bay Road to series of weirs below the culvert. Illustrates armor on the bank, channelization of the stream, and weir system.

Photo 3: Looking north to culvert and Fletcher Bay Road. Illustrates undersized culvert, difference between stream channel width and culvert size, constrained channel, and road fill.

Photo 3

Photo 2



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Mod: 08/27/2018, 10:09 | Plotted: 08/27/2018, 10:13 | Layout: 4

DATE:	08-27-2018
DRAWN BY:	S. KROPP
DESIGNED BY:	A. STONKUS, P.E.
CHECKED BY:	
JOB NO. :	

Wild Fish Conservancy
15629 Main Street NE
Duvall, WA 98019
Phone: 425-788-1167

EXISTING CONDITIONS

FLETCHER BAY ROAD CULVERT REPLACEMENT

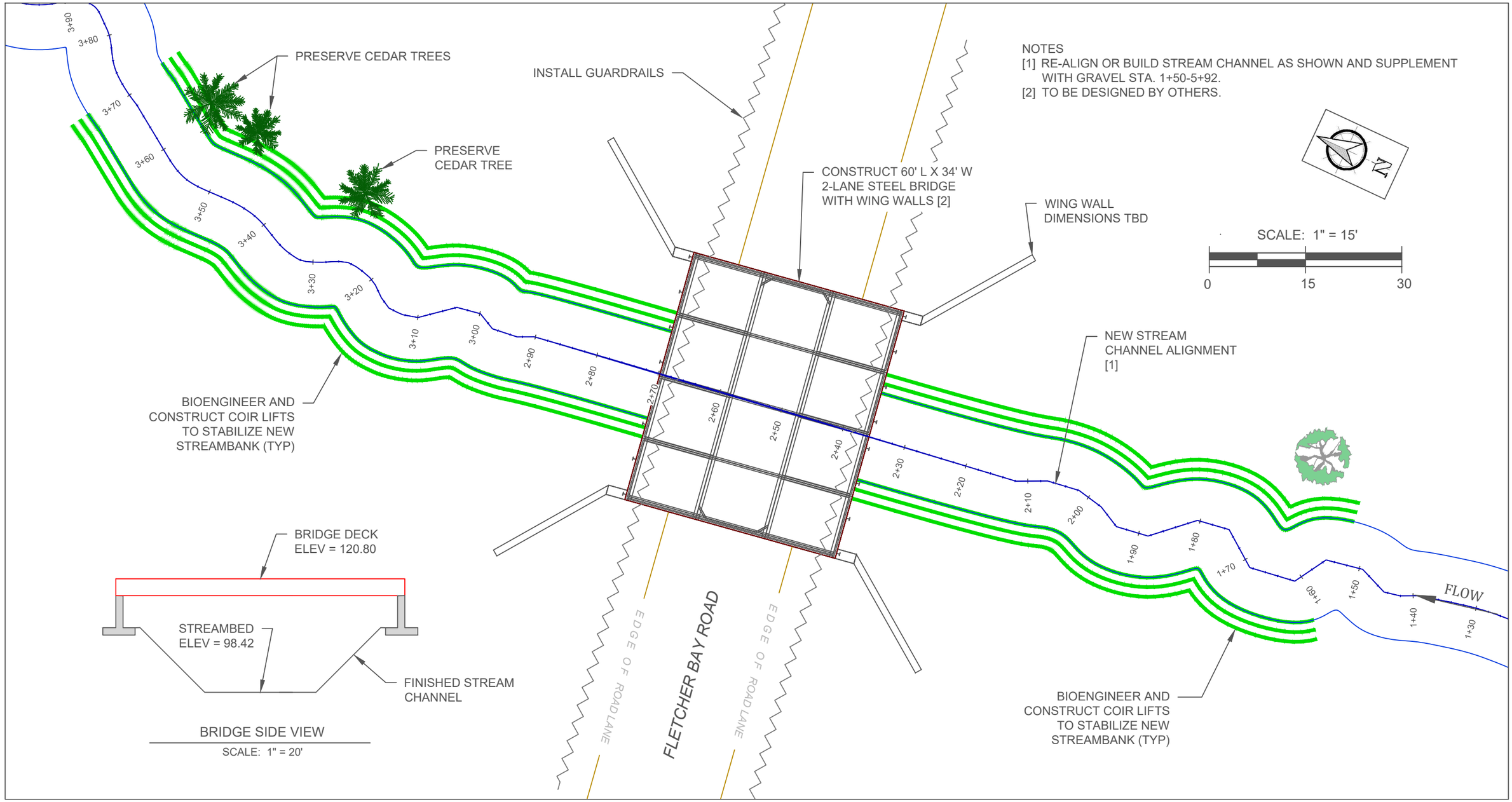
BAINBRIDGE ISLAND, WA

REVISIONS	DATE

SHEET NO.

1

SHEET _____ of XX



BRIDGE SIDE VIEW

SCALE: 1" = 20'

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OPTION 1: STEEL BRIDGE

FLETCHER BAY ROAD CULVERT REPLACEMENT

BAINBRIDGE ISLAND, WA

REVISIONS	DATE

SHEET NO.

2

SHEET ____ o f XX

NOTES
[1] RE-ALIGN OR BUILD STREAM CHANNEL AS SHOWN AND SUPPLEMENT WITH GRAVEL STA. 1+50-5+92.
[2] SPREAD FOOTINGS OR BASE PLATES SHALL BE A MINIMUM OF 2-FEET BELOW THE MAXIMUM ANTICIPATED DEPTH OF SCOUR.
[3] MINIMUM OF 2-FEET COVER.

PRESERVE CEDAR TREES

PRESERVE CEDAR TREE

INSTALL GUARDRAILS

CONSTRUCT 24'W X 34'L ARCH CULVERT

FLETCHER BAY ROAD

BIOENGINEER AND CONSTRUCT COIR LIFTS TO STABILIZE NEW STREAMBANK (TYP)

NEW STREAM CHANNEL ALIGNMENT [1]

BIOENGINEER AND CONSTRUCT COIR LIFTS TO STABILIZE NEW STREAMBANK (TYP)

FLOW

EDGE OF ROAD LANE

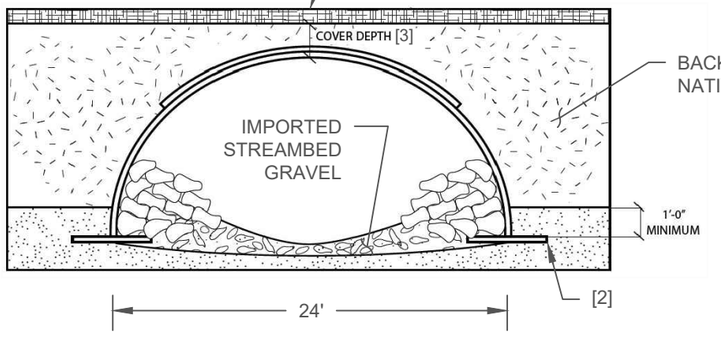
EDGE OF ROAD LANE

N

SCALE: 1" = 15'

0 15 30

3+90 3+80 3+70 3+60 3+50 3+40 3+30 3+20 3+10 3+00 2+90 2+80 2+70 2+60 2+50 2+40 2+30 2+20 2+10 2+00 1+90 1+80 1+70 1+60 1+50 1+40 1+30



ARCH CMP CULVERT DETAIL
SCALE: NTS

C:\Users\sjkro\Documents\Work Files\01. PROJECTS - Active\20. Springbrook Creek\Fletcher Bay Road (Downstrm)\Design Drawings\02. Sheets\(6) Option 2 - Arch Culvert.dwg
Mod: 08/27/2018, 10:12 | Plotted: 08/27/2018, 10:13 | Layout: 4

DATE:	08-27-2018
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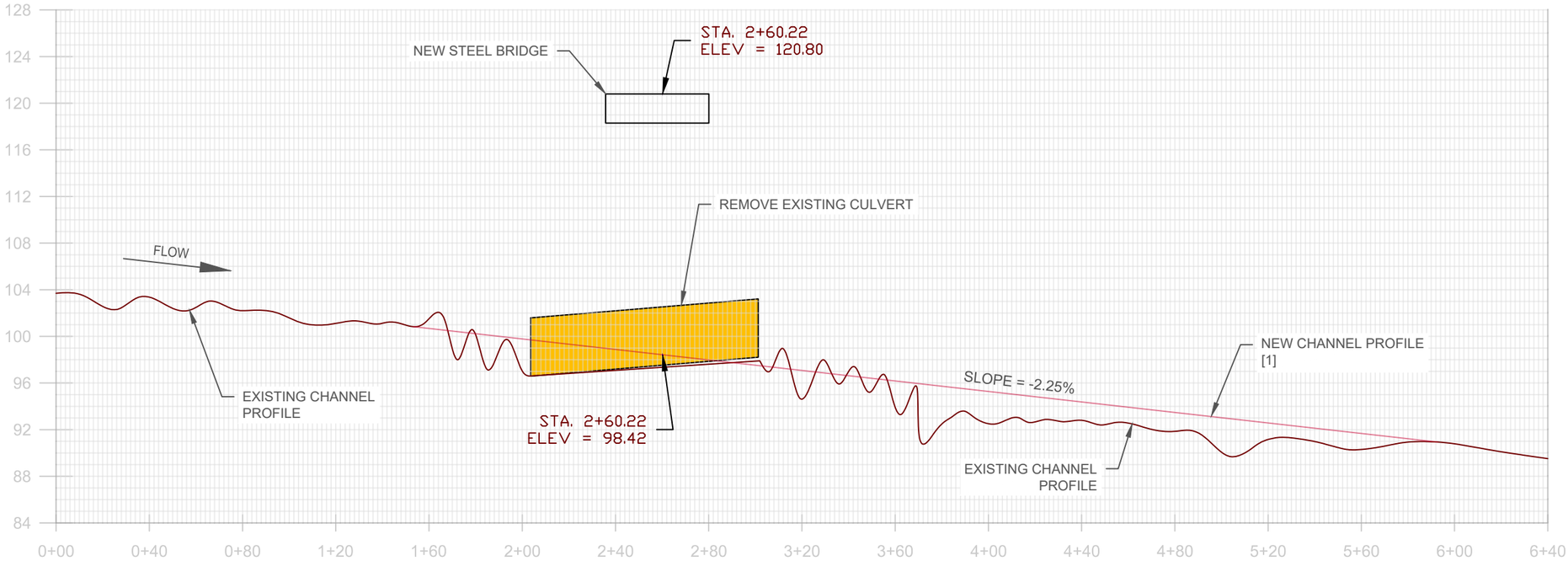
OPTION 2: ARCH CULVERT

FLETCHER BAY ROAD CULVERT REPLACEMENT

BAINBRIDGE ISLAND, WA

REVISIONS	DATE

SHEET NO.
3
SHEET ____ of XX



STREAM PROFILE

SCALE: 5H:1V

NOTES
[1] SUPPLEMENT WITH GRAVEL TO ELEVATE STREAMBED TO FINAL GRADE.

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STREAM PROFILE

FLETCHER BAY ROAD CULVERT REPLACEMENT

BAINBRIDGE ISLAND, WA

REVISIONS	DATE

SHEET NO.

4

SHEET ____ of XX

Wild Fish Conservancy
Cost Estimate Template

Revised 9/7/2018

Project Name: **Fletcher Bay Road Option 1: 30' wide Steel Bridge**
Date: 09/07/18
Estimate By: SK. AS. JG
Stream: Springbrook Creek
Proposed Correction: Remove culvert and replace with steel bridge.
Restore stream channel and add LWD.

Description	Unit	Quantity	Cost	Amount	Sub Total	
Mobilization / Site Preparation						
Mobilize	L.S.	1	$34,000	$34,000		Assume 10% of construction costs less bridge cost. Mob, demob, surveying and staking.
Bypass	L.S.	1	$2,500.00	$2,500		
Access	L.S.	1	$7,500.00	$7,500		Provide temporary access and traffic control during construction.
Erosion Control	L.S.	1	$3,000.00	$3,000		
Utilities	L.S.	1	$15,000.00	$15,000		Water line.
MOBILIZATION SUB TOTAL					$62,000	
Excavation						
Excavation, Common	C.Y.	1300	$15.00	$19,500		Includes floodplain, overbank and stream re-alignment excavations.
Excavation Disposal	C.Y.	1000	$45.00	$45,000		Haul to an approved receiving site.
Asphalt Removal / Disp.	C.Y.	33	$125.00	$4,148		Take to an approved facility.
Rmv. & Disp. Culvert	L.S.	1	$4,500.00	$4,500		Remove and dispose of culvert
Concrete Recycling	L.S.	1	$3,000.00	$3,000		
Riprap Disposal	Tons	360	$6.00	$2,160		Assume 1.8 tons per lineal foot of streambank.
EXCAVATION SUBTOTAL					$78,308	
Bridge Installations						
Purchase Bridge	L.S.	1	$320,000.00	$320,000		Estimate provided by BigR Bridges. Includes bridge, abutments, and wing walls.
Install Bridge	L.S.	1	$50,000.00	$50,000		Install includes bridges, precast sills, sheet pile backwalls and wingwalls.
Resurface Road	L.S.	1	$30,000.00	$30,000		Includes gravel base course, crushed rock base layer and hot mix asphalt.
BRIDGE INSTALLATIONS SUBTOTAL					$400,000	
Stream Channel and Bioengineering						
Excavation, Channel	C.Y.	341	$50.00	$17,037		
Streambed Material	C.Y.	1396	$50.00	$69,778		Includes cost of materials and labor.
Large Woody Debris	Each	10	$700.00	$7,000		
Install Coir Wrap	L.F.	1200	$25.00	$30,000		Includes cost of all materials and labor.
Revegetation	Acres	0.6	$25,000.00	$15,000		Costs of invasive control, native plants, and installation included.
STREAM CHANNEL AND BIOENGINEERING SUBTOTAL					$138,815	
CONSTRUCTION TOTAL					$679,123	
Sales Tax	9.60%				$65,196	
Engineering	18%				$74,642	18% of construction total less bridge cost. Includes geotech, final designs, and construction oversight.
Topo Survey					$3,500	
Fish Exclusion					$3,000	
Project Management					$8,000	
Indirect Costs	25%				$70,586	
Permitting	6%				$19,327	
Contingency (construction)	35%				$237,693.04	
PROJECT TOTAL					$1,161,068	