EF 28

Side-Channel Habitat Enhancement – Conceptual Design

Reach: EF Lewis 8A
River mile: 9.0 to 9.5
Reference page in main document: 55

Site Description

This site consists of a high flow channel in the river right (north) floodplain area that is not active at summer low flow periods. The existing channel is approximately 3,400 feet long and originates on private property upstream of the proposed extent of restoration work at this site. The terminus of the channel (jct with the mainstem) is located at approximately river mile 9 (see overview photo on page 3). A long levee system runs adjacent to this channel for much of its length; it is closest to the channel at the Clark County maintenance yard and upstream. Some of the upstream portion of the channel may have been partially created from excavation for levee material for the adjacent levee. In the downstream portion of the site, a complex of historical mainstem meander scrolls are located throughout the floodplain area and offer numerous possibilities for locating side-channel and connected off-channel habitats. This area was the site of extensive gravel bar mining in the mid 1900s.

Existing conditions

At the time of the survey, temperature was cooler in the upstream portion of the flood channel (52°F) compared to the mainstem (58°F) and the channel downstream. Average gradient is 0.5%. Site observations of standing water during the summer and cool temperatures indicate significant groundwater connectivity.

This site is located in an active channel migration area. A point bar avulsion occurred just downstream of this site in January 2009. Over the past several years, lateral channel migration rates have been high at the West Daybreak site on the opposite side of the river. These conditions, and their implications for potential erosion or avulsion into the project area, must be considered during the analysis phase of this project. In addition, future design of treatment alternatives at the West Daybreak site will influence conditions in the project area. It is imperative that design of this project consider what is planned or implemented at West Daybreak.

Treatment Strategy and Alternatives

Recommended treatments:

- Excavate ~2,300 ft long side-channel connected with the main channel in the summer. Utilize existing flood channel and channel scar depressions.
- Excavate additional off-channel (backwater) habitats connected to the side-channel. Use existing channel scar depressions.
- Create pool-riffle sequences in side-channel. Install habitat enhancement features including large woody debris and spawning gravel.

Example of restored side-channel

Alternatives:

- Several alternative locations exist for the side-channel and off-channels. These will be determined with further analysis.
- A long backwater channel (not connected to mainstem at upstream end) could be constructed in lieu of the side-channel if analysis indicates significant impacts to aquatic habitat from flow reductions in mainstem.
- The project could extend further upstream with participation of the upstream private landowners.

Expected Benefits – Limiting Factors Addressed

Physical habitat – 1) Enhanced availability of side-channel and off-channel habitat throughout the year, 2) Increased hyporheic flow connectivity, 3) Enhanced quantity and quality of habitat features including pools and riffles, bank complexity and cover, and instream woody debris.

Biological – 1) Enhanced winter high flow refuge for coho and steelhead, 2) Enhanced spawning for coho and steelhead, with potential benefits to chum and Chinook spawning, 3) Enhanced quantity and quality of cool-water summer rearing for coho and steelhead, 4) Increased habitat complexity and cover for rearing fish that will provide diverse foraging opportunities and protection from predators.

Access and Landownership

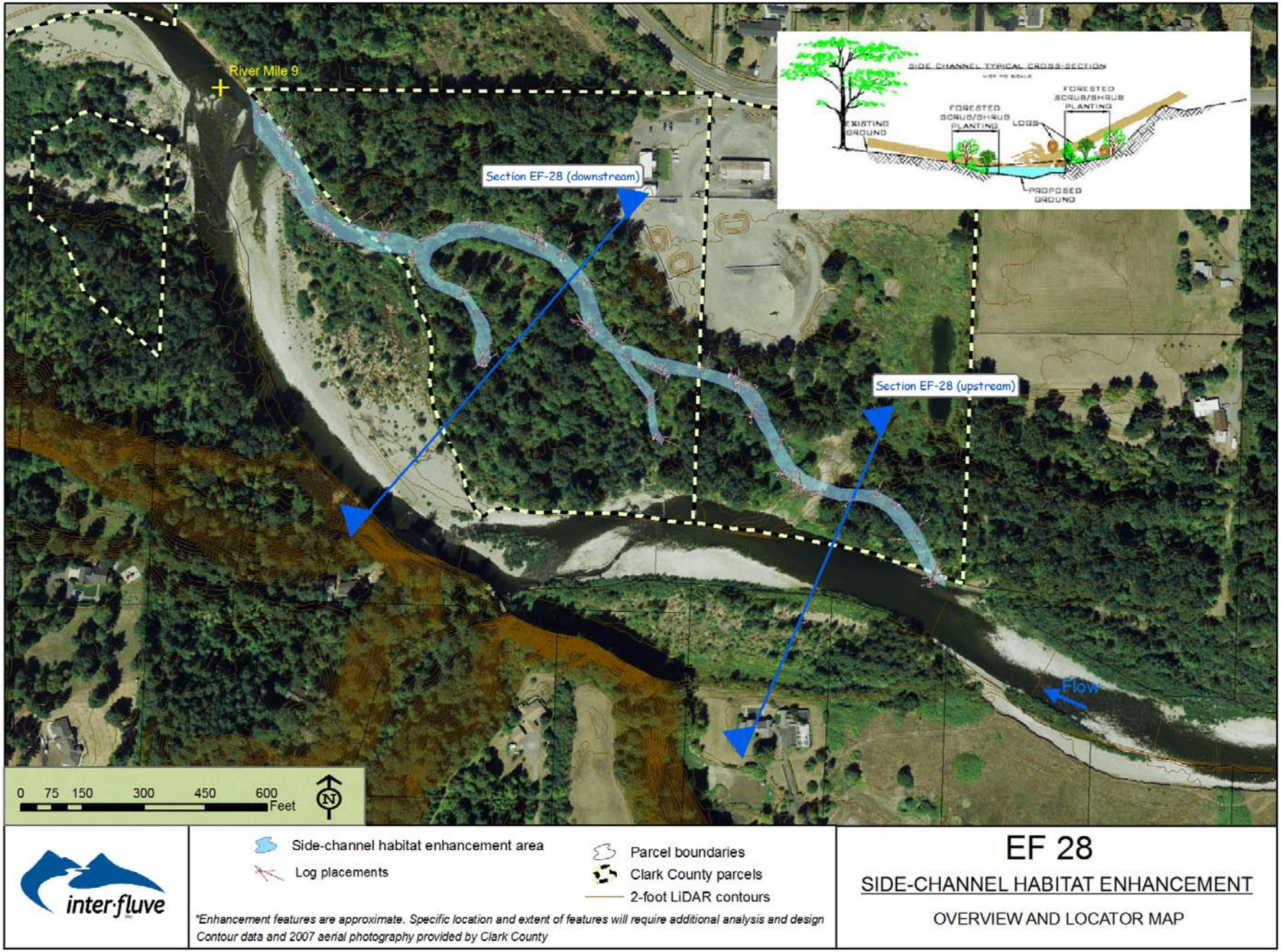
Access can be obtained through numerous locations, including 1) through the County maintenance yard, and 2) across County property from NE 269th Street at several locations. Property ownership is Clark County. There is private land upstream of the site where additional work could occur if there is landowner participation.

Data and Analysis Requirements

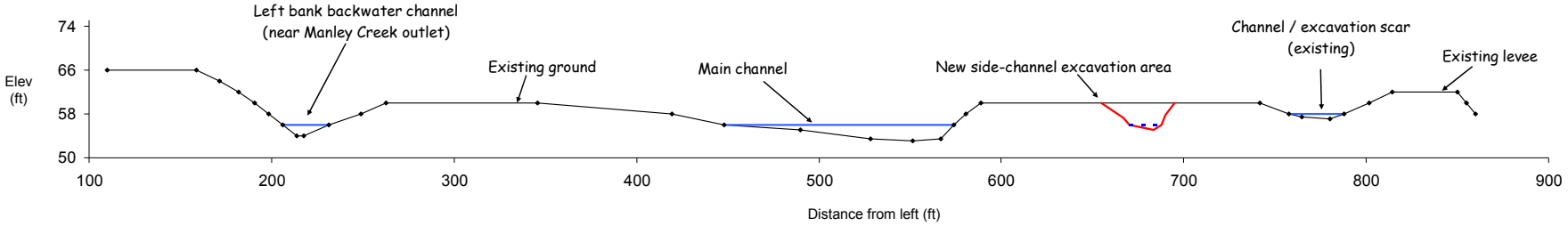
Evaluate effects of reduced flow in mainstem; in particular, ensure there is adequate flow for fish to access Mill Creek during migration periods. At least one low-flow season of groundwater monitoring and pump tests are recommended to determine groundwater contribution rates and required excavation extents. Hydraulic analysis, flood inundation analysis, and a geomorphic assessment will be required to support final designs. Habitat enhancements will be subject to significant potential impact from beavers; these impacts should be addressed as part of project design.

LCFRB Habitat Strategy Summary

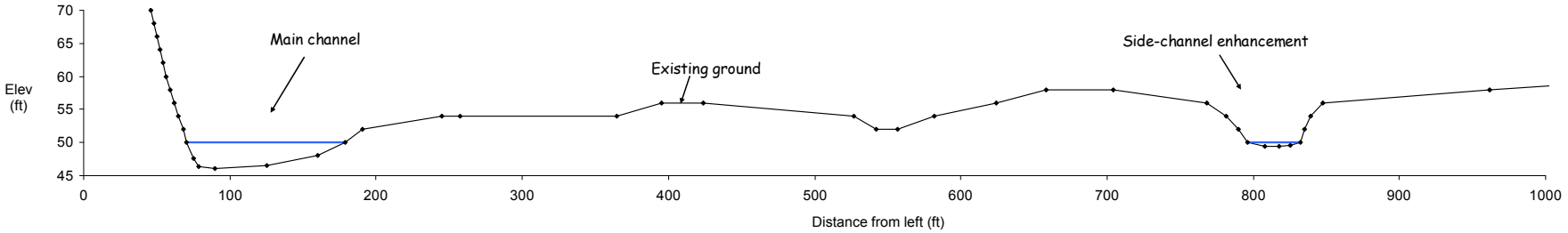
EF Lewis 8A						
Tier	**1**					
Length (m)	**2,011**					
Population	**WSTH**	**SSTH**	**FCH**	**Coho**	**Chum**	**Multi Species**
Recovery Plan Priority	P	P	P	P	P	
Species Reach Potenial (H,M,L)	M	L	H	H	H	
Restoration Vaue	68%	25%	33%	83%	52%	52%
Preservation Value	32%	75%	67%	17%	48%	48%
Access to blocked habitats	-	-	-	-	-	L
Stream channel habitat structure & bank stability	H	L	H	H	H	H
Off channel & side channel habitat	H	M	H	H	H	H
Floodplain function and channel migration processes	H	L	H	H	H	H
Riparian conditions & functions	H	M	M	H	M	H
Water quality	H	M	M	M	L	H
Instream flows	H	M	H	H	H	H
Regulated stream management for habitat functions	-	-	-	-	-	L
Watershed conditions & hillslope processes	H	M	H	H	M	H


River Mile 9
Section EF-28 (downstream)
Section EF-28 (upstream)
Flow
SIDE CHANNEL TYPICAL CROSS-SECTION
NOT TO SCALE
EXISTING GROUND
FORESTED SCRUB/SHRUB PLANTING
LOGS
FORESTED SCRUB/SHRUB PLANTING
PROPOSED GROUND
0 75 150 300 450 600 Feet
N
inter·fluve
Side-channel habitat enhancement area
Log placements
Parcel boundaries
Clark County parcels
2-foot LiDAR contours
*Enhancement features are approximate. Specific location and extent of features will require additional analysis and design
Contour data and 2007 aerial photography provided by Clark County
EF 28
SIDE-CHANNEL HABITAT ENHANCEMENT
OVERVIEW AND LOCATOR MAP

Section EF-28 (upstream)



Section EF-28 (downstream)



Standard Construction Sequence

Pre-excavation | *Following rough grading* | *Post-implementation* | *5 years following construction*

CROSS-SECTIONS AND TYPICAL CONSTRUCTION SEQUENCE

Notes:
Cross-sections are derived from LiDAR contours. Bathymetry is estimated based on site and aerial photograph observations. In some cases, minor corrections are made to LiDAR data that is believed to be representative of vegetation and not the ground surface.

EF 28

SIDE-CHANNEL HABITAT ENHANCEMENT

Planning-level cost estimate for EF 28

Note: This is a preliminary cost estimate for planning purposes. Actual costs for design and construction activities may vary substantially from these estimates. Assumptions for time requirements and material quantities have been made based on limited information that is available for the site. Additional information obtained during site investigations will be needed to determine actual quantities and costs. Estimates based on 2009 costs.

Description	Unit	Quantity	Unit Cost	Total Cost	Comment
Mobilization and demobilization	LS	1	$24,000	$24,000	Calculated at 5% of construction sub-total
Temporary access road	LF	1,000	$40	$40,000	Assumes two access points; from the County yard and/or NE 269th Street
Excavate & stockpile/dispose	CY	5,100	$15	$76,500	Assumes active channel width of 20 feet and average excavation depth of 4ft for upstream 700 feet (3 CY per lineal foot) and 2ft for lower 2,000 feet, including connected back channels (1.5 CY per lineal foot). Final design criteria and analysis will likely alter these estimates up or down. Assume haul will be less than 1,500 feet. Haul distances greater than 1,500 feet off site on road will substantially increase haul costs.
Channel earthwork and reshaping	LF	900	$50	$45,000	Assumes one-third of the length receives significant re-grading to create pool and riffle habitat.
Large wood purchased and delivered to site	EA	220	$400	$88,000	Asuumes 20% delivered with root wads attached. Frequency of LWD = >20 pieces/100 meters.
Boulder ballast purchased and delivered to site	EA	330	$100	$33,000	Assumes 1.5 - 2 yard boulders. Assumes 1.5 boulders per log.
Wood placement	EA	220	$300	$66,000	Wood placed in small jams and individual placements.
Streambank revegetation	SF	27,000	$1	$27,000	Assumes average of 5 feet on each bank for entire length.
Riparian revegetation (above bank)	AC	2.5	$15,000	$37,500	Assumes 20 feet revegetation on each side of channel. Includes follow-up maintenance.
Construction oversight	HR	450	$130	$58,500	Assumes 6 weeks of construction oversight, 12 hour days, 1.25 staff.
Construction Sub-Total				**$495,500**	
Concept Level Construction Contingency (20%)				$99,100	
Construction Total				**$594,600**	
Project Delivery					Items below are calculated as a percent of the construction sub-total
Permitting (4%)				$19,820	
Detailed Engineering Design (15%)				$74,325	
Contract Administation (5%)				$24,775	
Project Delivery Sub-Total				**$118,900**	
TOTAL ESTIMATE				**$714,000**	rounded to nearest $1,000

General Notes:

Cost includes a 20% construction contingency
Costs assume all materials (wood and rock) are purchased and hauled to the site from a nearby source
Considerable savings could be gained by reducing the total length of the side-channel
Boulder ballast requirements may be able to be reduced depending on hydraulics analysis
Assumes no spawning gravel supplementation. Importing gravels will increase costs.

Key

LS = Lump sum
CY = Cubic yard
LF = Lineal foot
SF = Square foot
AC = Acre
EA = Each
FF = Face foot (square foot of bank face)
HR = Hours