



Lewis River Hydroelectric Projects Settlement Agreement

Lower Constructed Channel Habitat Options

Presentation to the Aquatics Coordinating Committee (ACC)

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Ariel, Washington**

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Lower Constructed Channel

- Length: 1100 ft
- Width: 30 to 60 feet
- Relatively low gradient of 1.3%
- Flow control at inlet – 14 cfs
- Seepage flow from adjacent canal
- Gravel and boulders with significant fine sediment inputs
- Outlet drains to Lewis River



Habitat Assessment

- **Physical Assessment**

- Form
- Process
- Function

- **Biological Assessment**

- Species present
- Future species
- Limiting habitat types

Habitat Assessment – Physical



- Early succession riparian community
- Constant discharge
- Generally low gradient
- Fine sediment transport
- Beaver activity
- Surprisingly unstable

Habitat Assessment – Biological

Assumed fish to benefit at present

- Rainbow trout
- Cutthroat trout
- Brook trout
- Kokanee

Resident

As they are re-introduced

- Spring Chinook
- Winter run Steelhead
- Coho

Anadromous

Habitat Assessment – Biological

Limiting habitat conditions

- **Pools – residual depth**
- **Spawning – lack of gravel, fine sediments, low velocities**
- **Access – potential velocity barrier at mouth**
- **Cover – lack of effective in-channel wood**
- **Stability – long-term stability is compromised by site and riparian conditions**

Habitat Assessment – Conclusion

The Constructed Channel exists as a functioning channel that appears to support a variety of fish species as well as other aquatic organisms.

However, there are limitations to the productivity of the site that could be improved upon with a moderate intervention.













Habitat Goals

Physical

- Enhancement of existing habitat
- Promote long-term channel stability
- Promote long-term stability of habitat elements
- Improve riparian health and diversity
- Reduce fine sediment inputs
- Improve flushing and/or storage of fine sediments

Habitat Goals

Biological

- Enhancement of existing habitat
- Create additional spawning
- Improve riparian health and diversity
- Improve quality and diversity of rearing habitat
- Reduce or eliminate barriers to migration
- Increase instream habitat diversity

Proposed Habitat Plan

Habitat Plan was designed to:

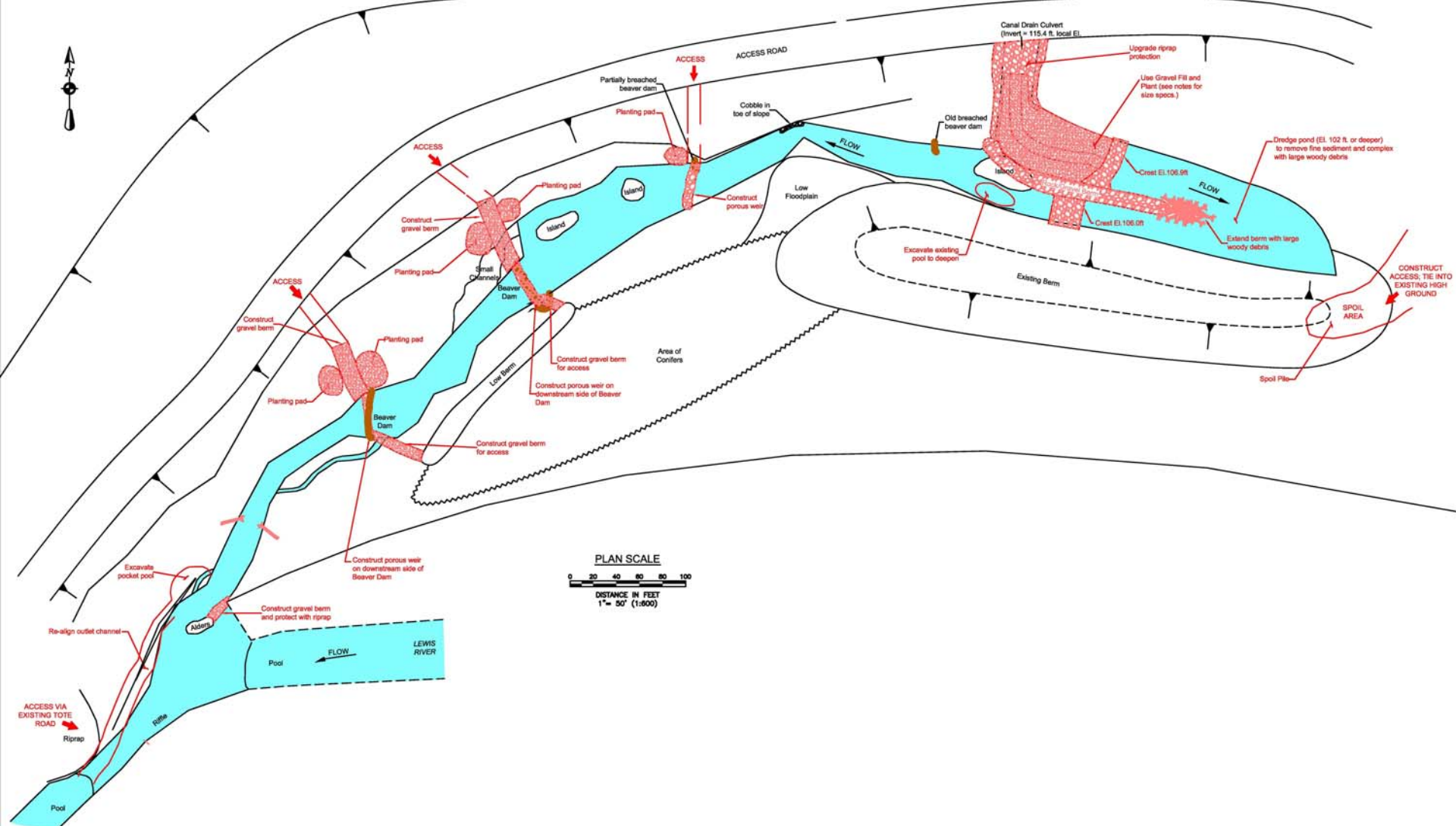
- Function within the existing processes
- Minimize adverse impacts to the site
- Be constructible
- Provide various design components that can be implemented independently
- Allow post-construction modification without machine access

Proposed Habitat Options

Components:

- Outlet channel realignment
- Channel narrowing using LWD
- Porous rock weirs
- Raised planting pads
- Inlet channel realignment
- Off-channel ponds and pools
- Coniferous riparian planting

Proposed Habitat Options

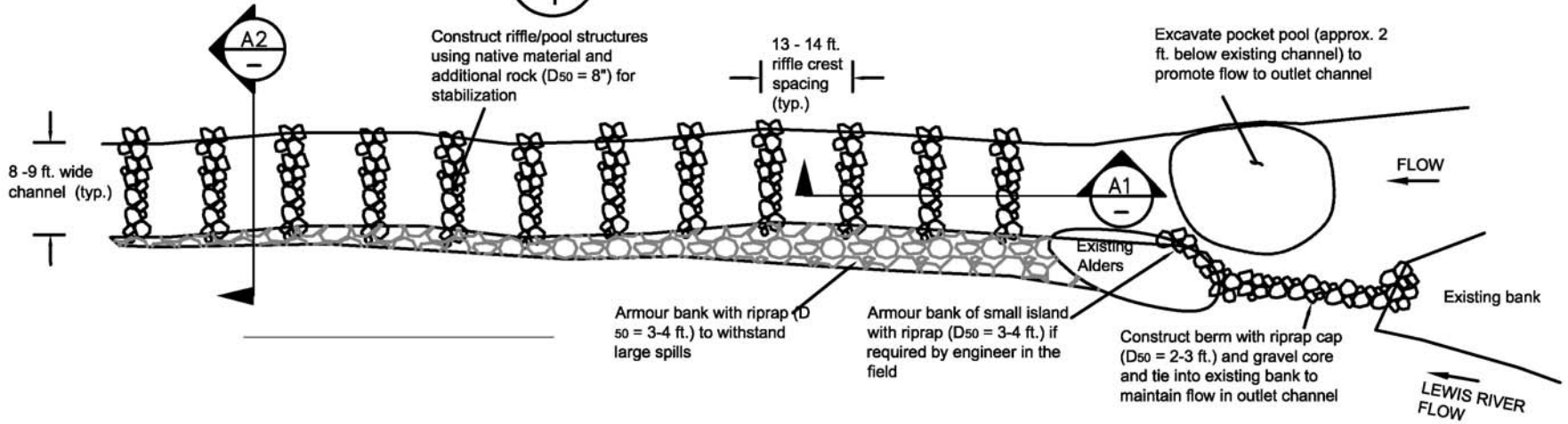


Proposed Habitat Options

PLAN DETAIL A OUTLET CHANNEL

TYPICAL (n.t.s.)

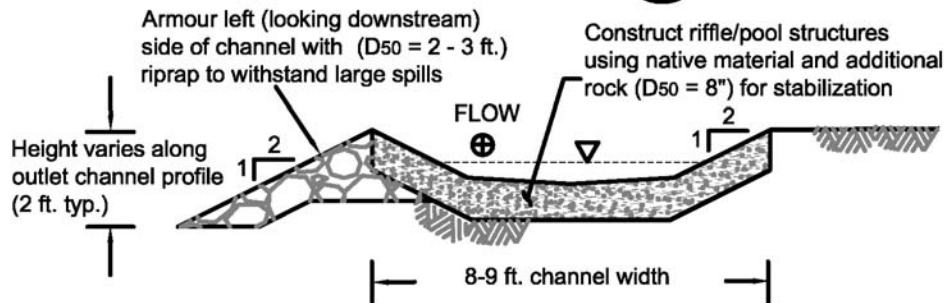
A
1



SECTION DETAIL A2

TYPICAL (n.t.s.)

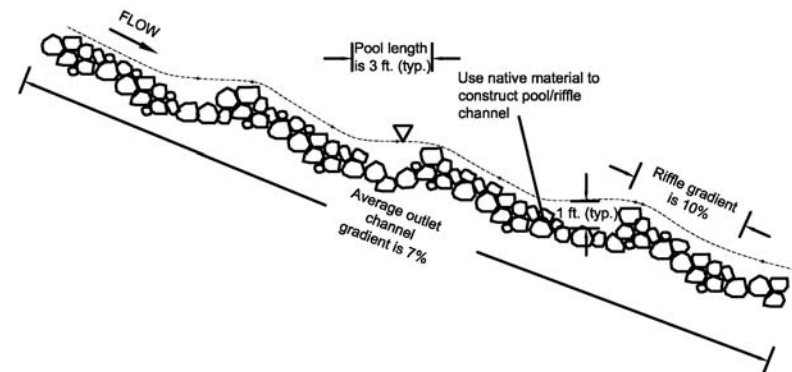
A2
-



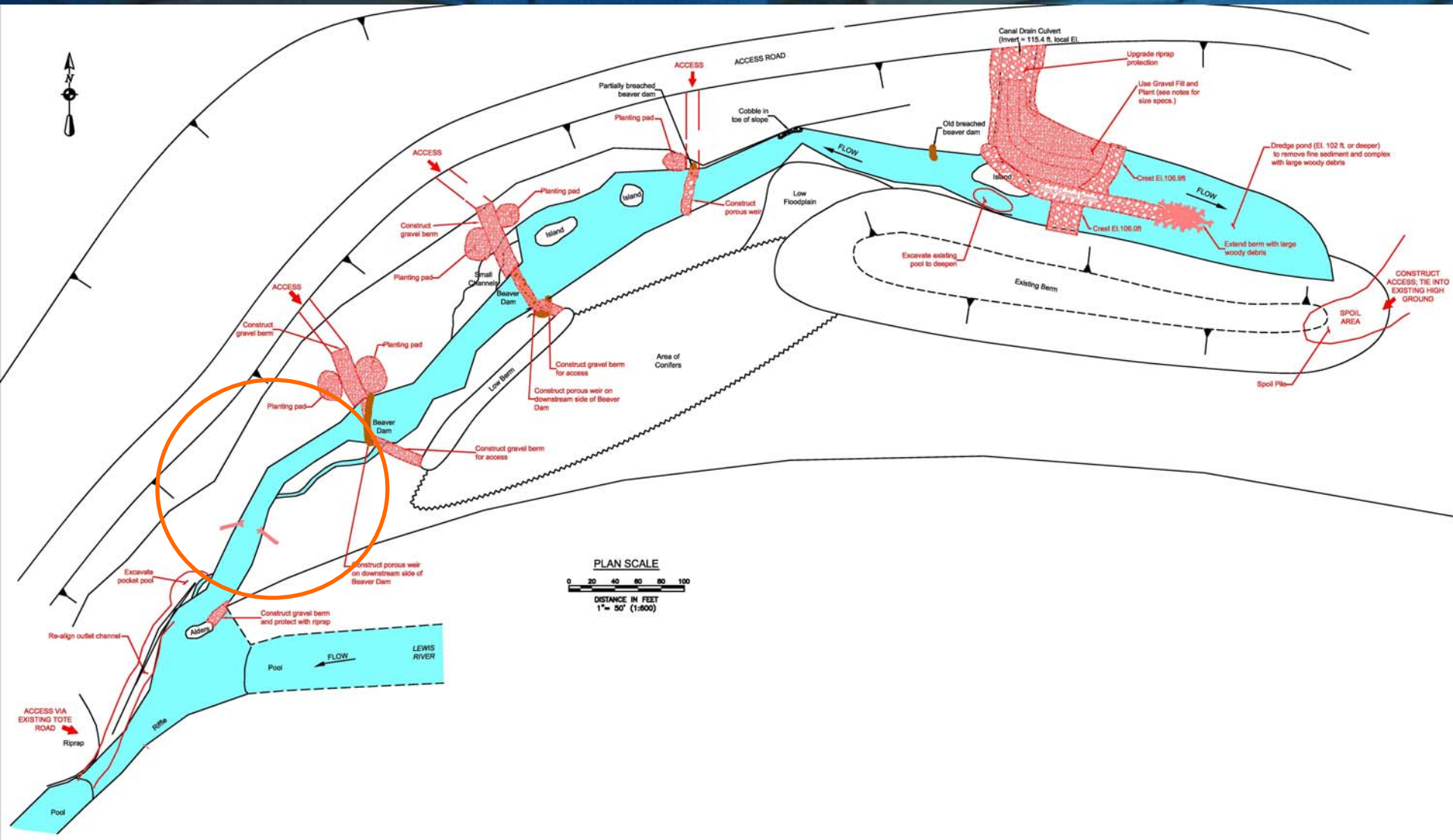
LONGITUDINAL PROFILE A1

TYPICAL (n.t.s.)

A1
-



Proposed Habitat Options



Proposed Habitat Options

PLAN DETAIL B LOWER CHANNEL

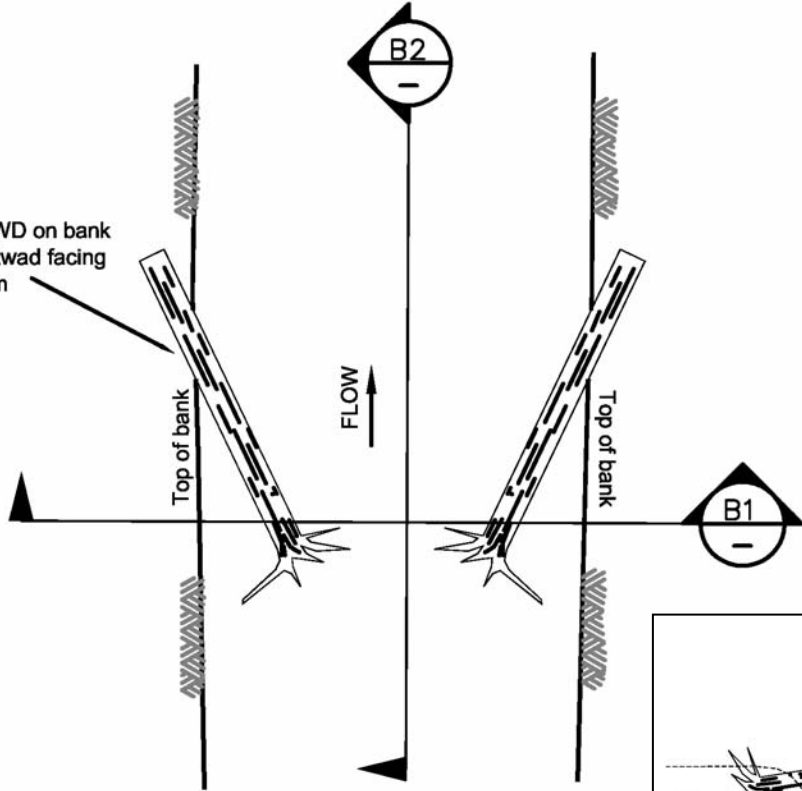
TYPICAL (n.t.s.)

B
1

B2
-

B1
-

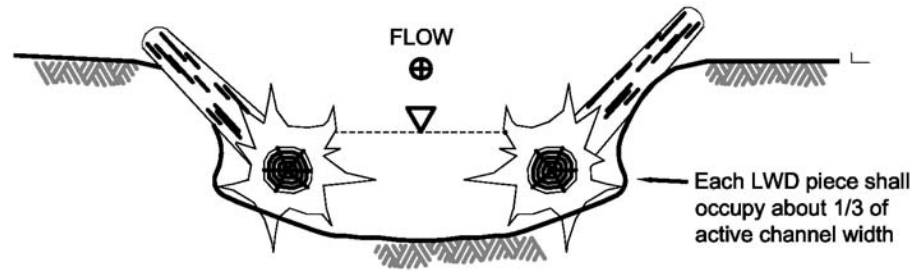
Place LWD on bank with rootwad facing upstream



SECTION DETAIL B1

TYPICAL (n.t.s.)

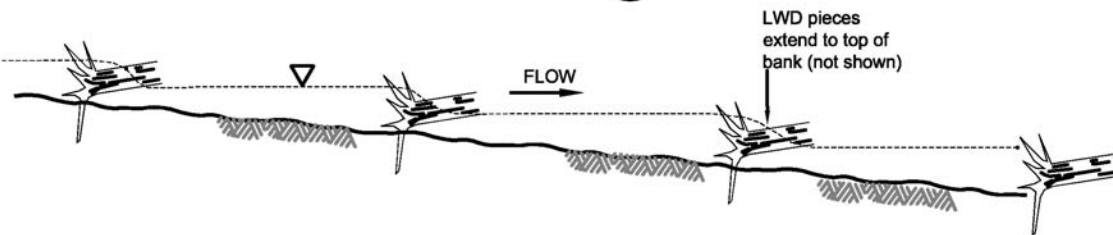
B1
-



SECTION DETAIL B2

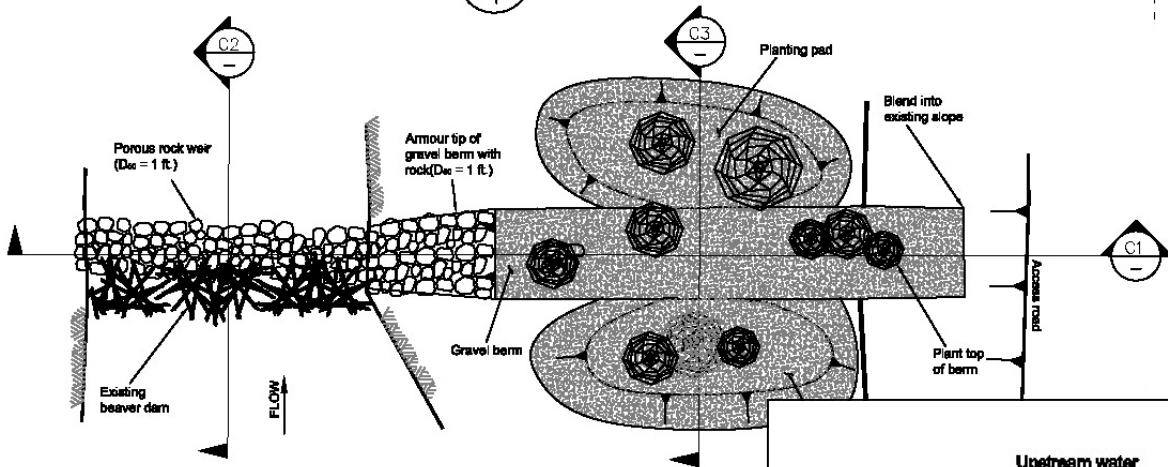
TYPICAL (n.t.s.)

B2
-

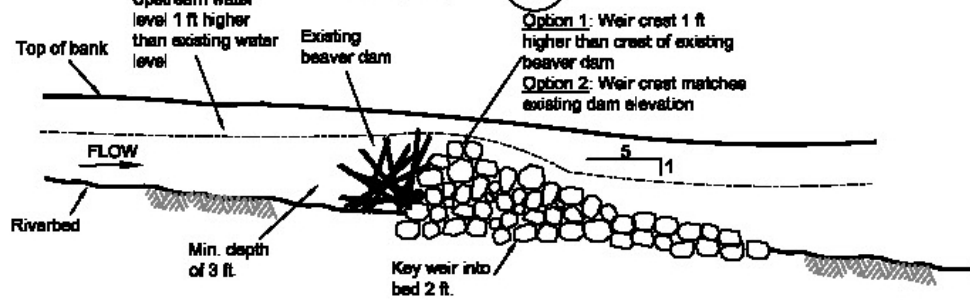


Proposed Habitat Options

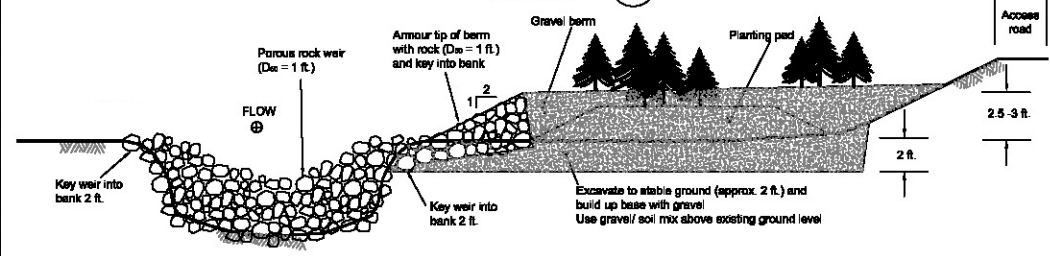
PLAN DETAIL C1
TYPICAL (n.t.s.)



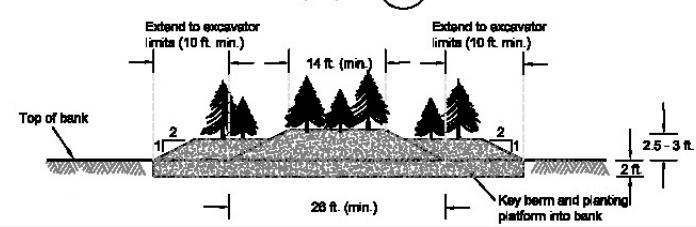
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TYPICAL (n.t.s.)



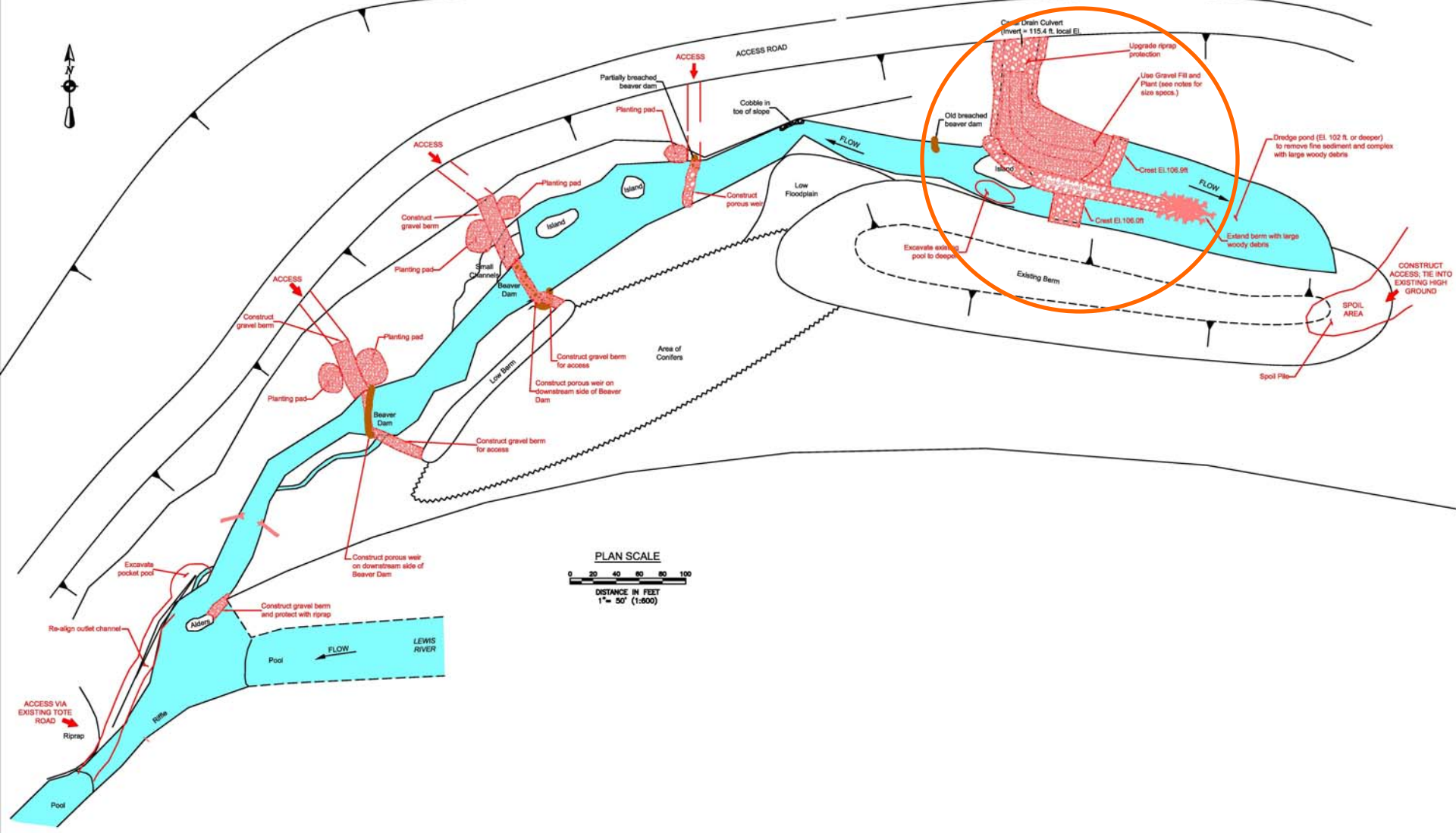
SECTION DETAIL C1
TYPICAL (n.t.s.)



SECTION DETAIL C3
TYPICAL (n.t.s.)

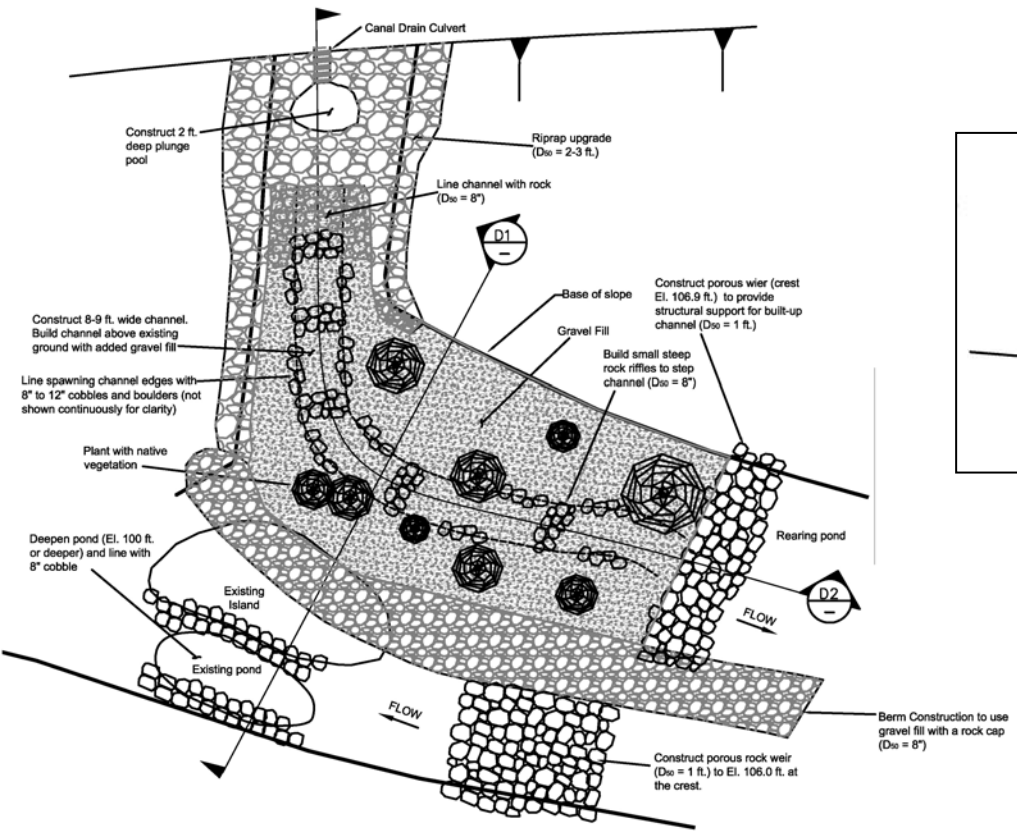


Proposed Habitat Options



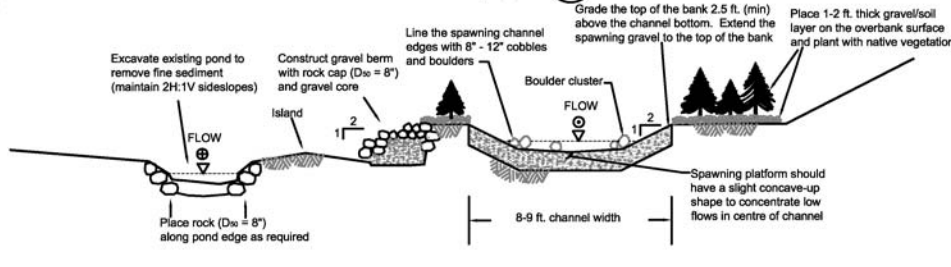
PLAN DETAIL D1
TYPICAL (n.t.s.)

D1
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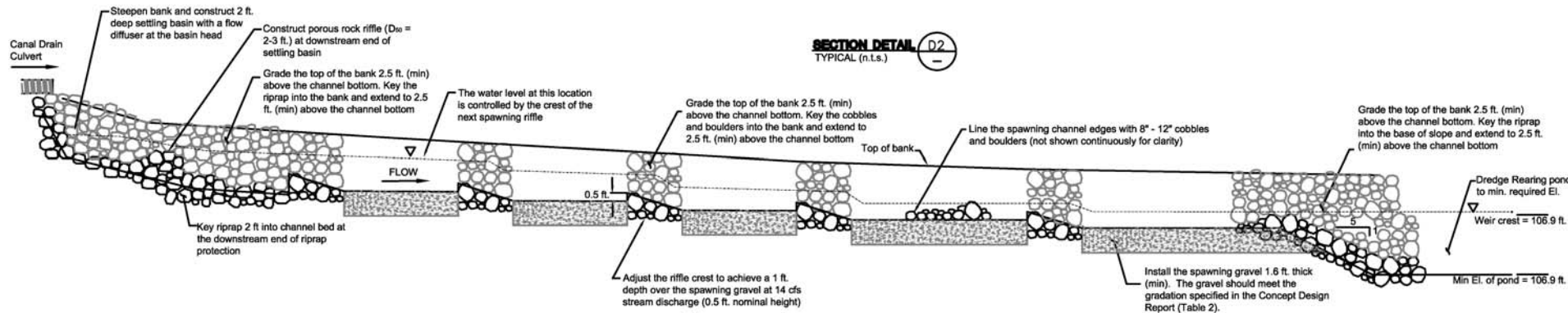
SECTION DETAIL D1
TYPICAL (n.t.s.)

D1
-



SECTION DETAIL D2
TYPICAL (n.t.s.)

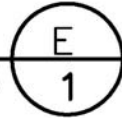
D2
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Proposed Habitat Options

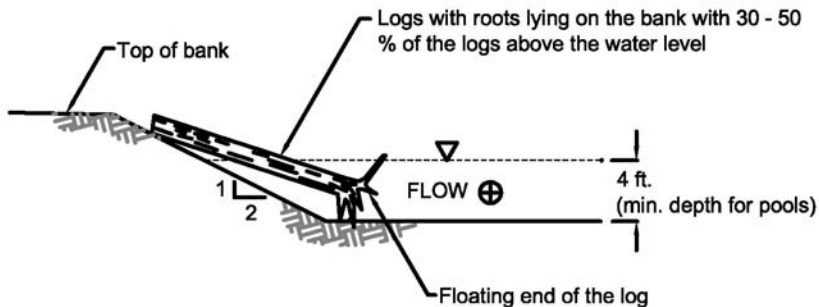
DETAIL E LWD PLACEMENT OPTIONS

TYPICAL (n.t.s.)



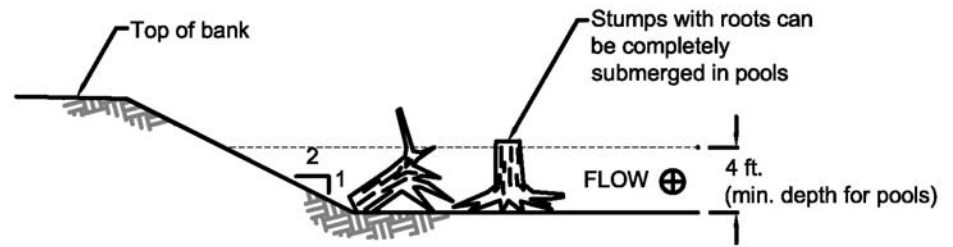
PARTIALLY SUBMERGED TREE

Channels and pools



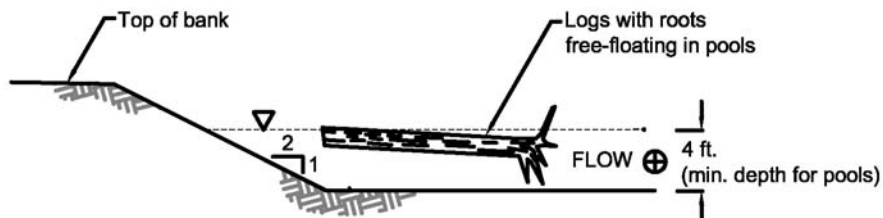
SUBMERGED STUMP

Channels and pools



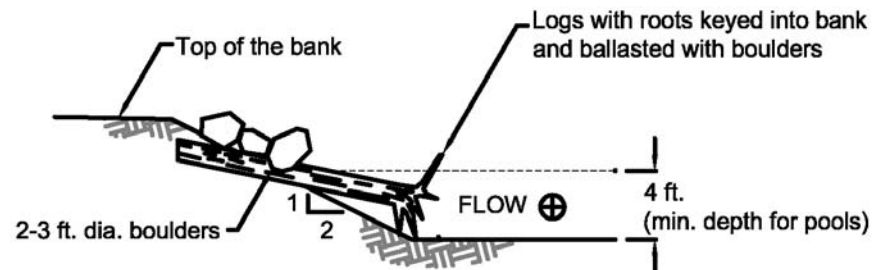
SUBMERGED TREE

Pools only



PARTIALLY BURIED TREE

Channels and pools



Proposed Habitat Options

Riparian planting

Purpose:

- Accelerate natural succession
- Greater diversity in the riparian community
- Improve habitat for non-aquatic species
- Make use of raised planting pads and access routes

Method:

- Mix of species but mostly conifers
- Some fruit bearing species

Log Structures



Riparian Community

Interaction with a mature riparian community:

- Channel form
- Nutrient cycles
- Shading



Riparian Enhancement



Planted: 2003
Photo: 2006

Constructed Channels



Howlow River, Vancouver
Island

Questions and Discussion...