

Treatments to Mitigate Aquatic Habitat Impacts Associated With Land and Resource Developments

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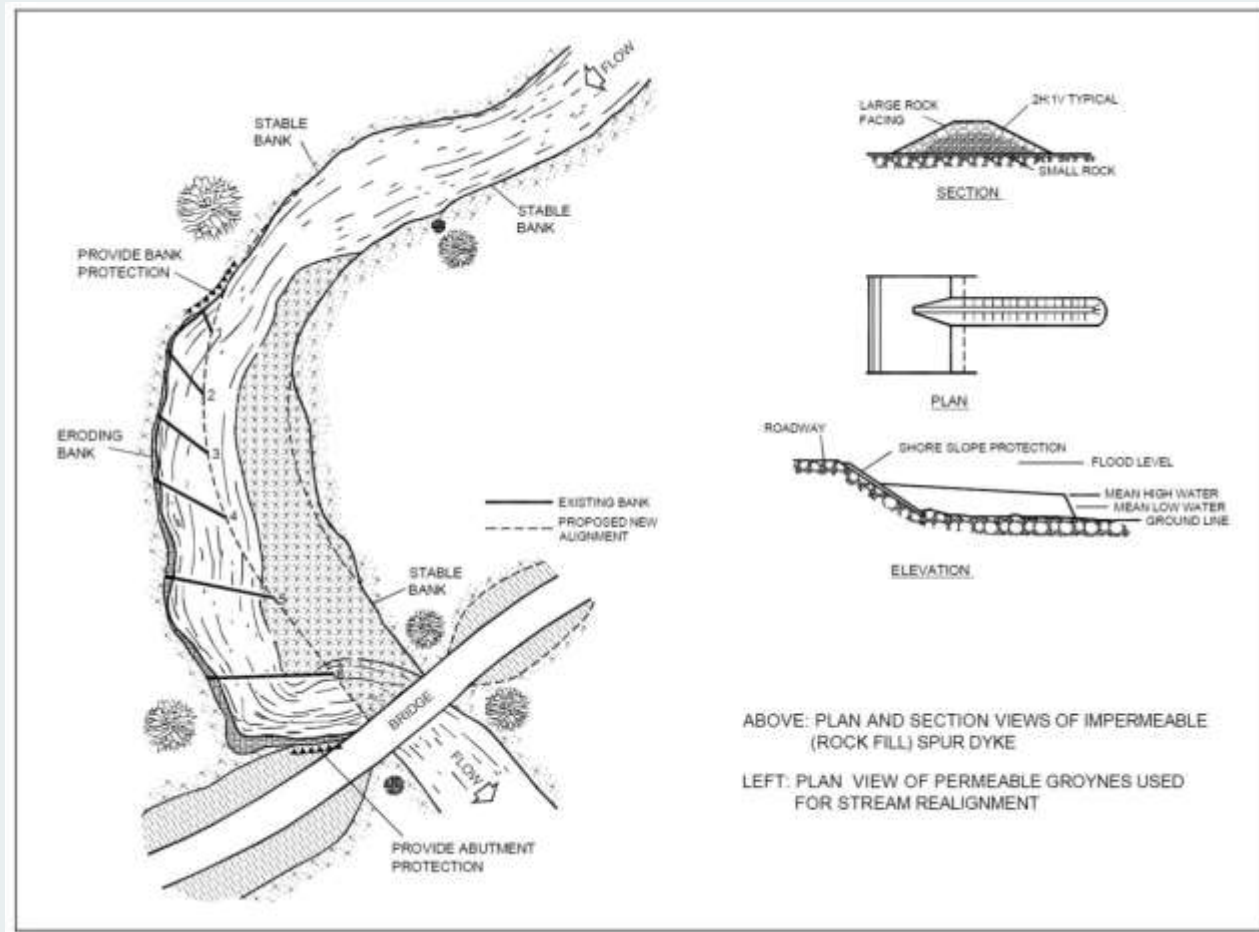
NATURAL CHANNEL SYSTEMS
5th International Conference
September 26 & 27, 2016
Niagara Falls, Ontario

Hess Creek Alignment Jeopardizing Integrity of Trans-Alaska Pipeline



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Concept of Deflector Placement



1991. Guidelines for Stabilising Waterways, Rural Water Commission of Victoria, Standing Committee on Rivers and Catchments, Victoria, Australia.



Constructed in 2005

Hess Creek Design

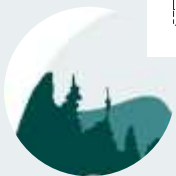
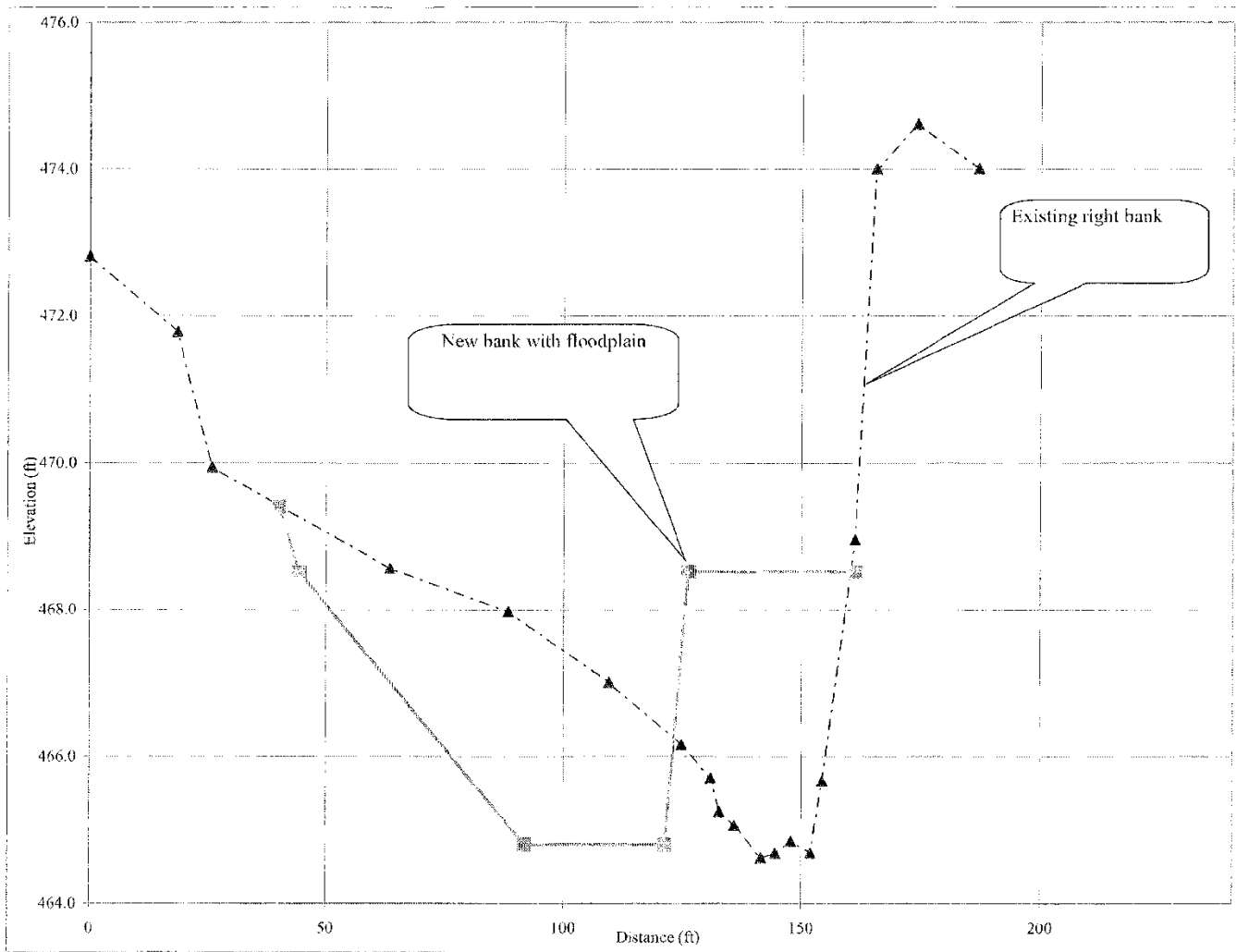


July 23, 2009



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Cross Section Changes



Hess Creek Post-Construction

September 2007

Spring Freshet 2006



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Hess Creek

Vegetation on New Floodplain

2008 – Three Years After Construction



Hess Creek Four Years After Construction

July 23, 2009



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7 & 11 Years After Construction

August 24, 2012

July 18, 2016



Grey Stream – Fish Passage & Channel Stability

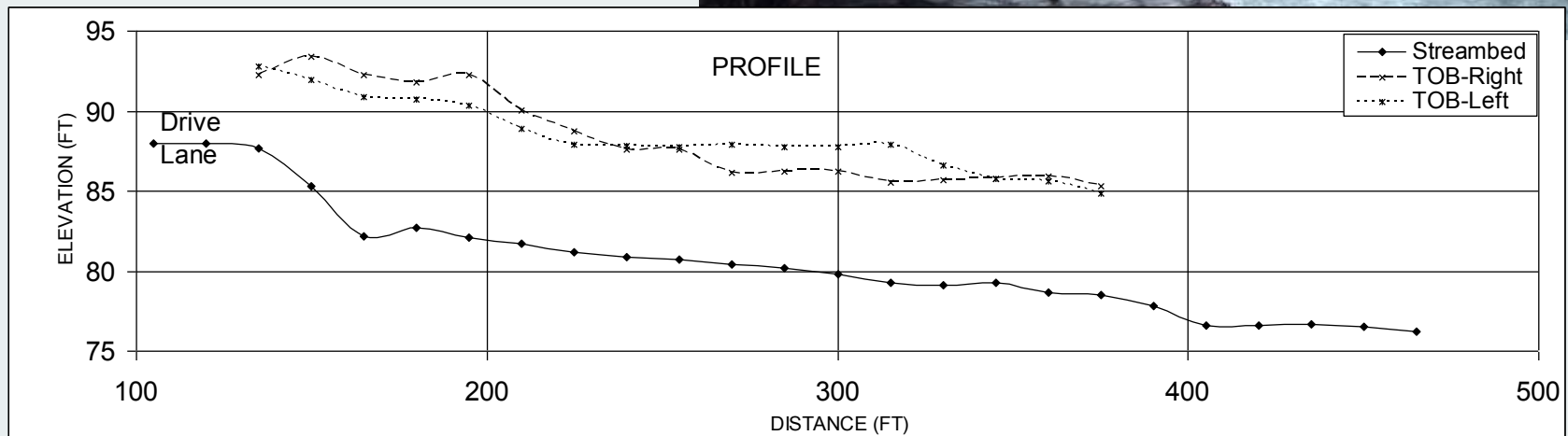
Drainage area 6.0 km²

Bankfull width 9.1 m

Gradient 3.3%

$Q_{\text{mean annual flood}} = 7.9 \text{ m}^3/\text{s}$

$Q_{50} = 23 \text{ m}^3/\text{s}$



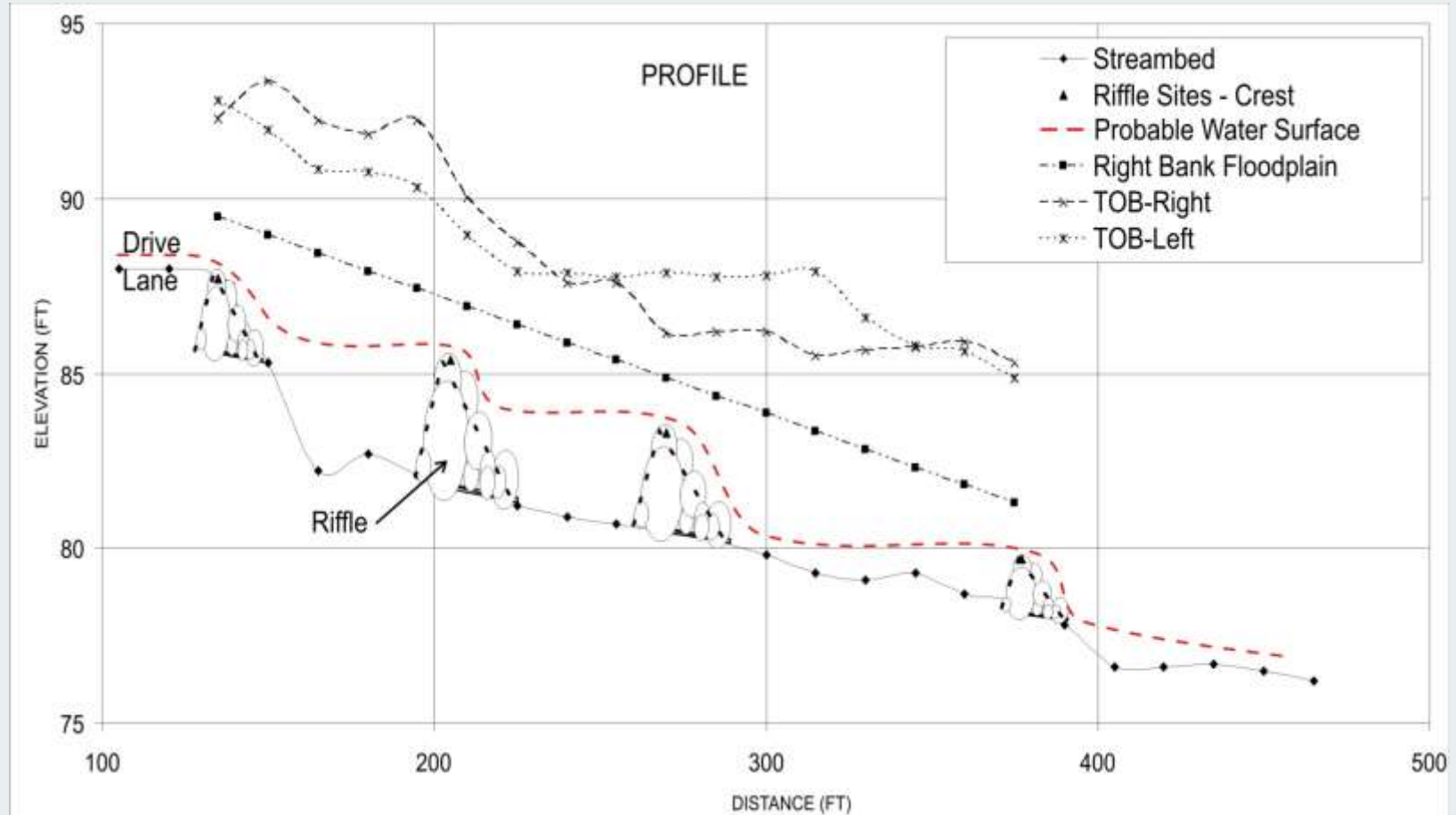
Grey Stream – Existing Condition



- Channel had down-cut by ~1 m
- Pink salmon migration impediment at drive lane crossing



Grey Stream – Riffle Design



Four Riffles with 15:1 (6.7%) & 20:1 (5%) downstream face slopes with drops between riffles of 0.6-1.1 m (2.1-3.6 ft)

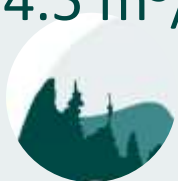
Grey Stream – Channel Capacity

Channel Capacity with Proposed Riffle

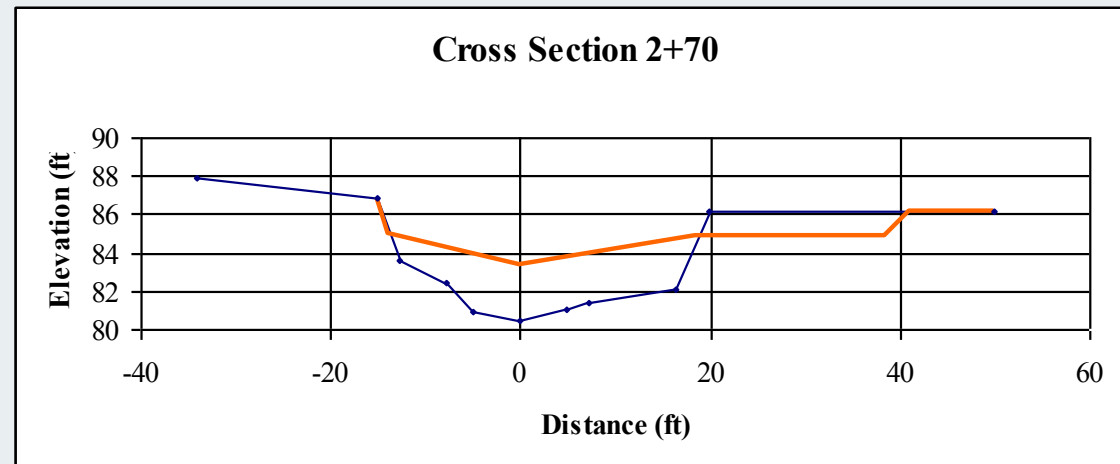
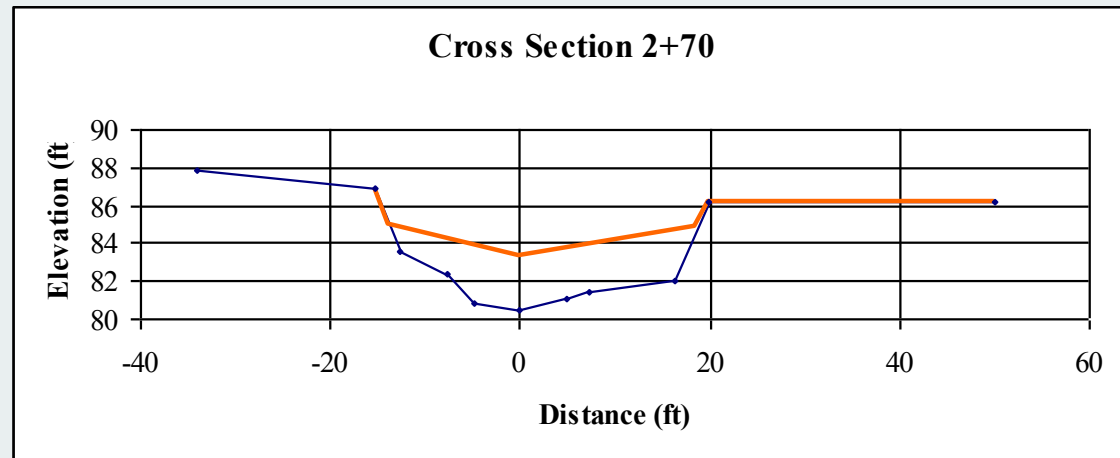
22.4 m³/s – very close to
 $Q_{50} = 23 \text{ m}^3/\text{s}$

Channel Capacity with Riffle + Floodplain

- Channel Discharge of 8.8 m³/s to top of floodplain
- Floodplain Discharge of 4.5 m³/s



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Mean Annual Flood = 7.9 m³/s

Grey Stream – Constructed 2004



Lowered Right Bank
Floodplain



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Grey Stream – June 2005



Grey Stream – June 2008



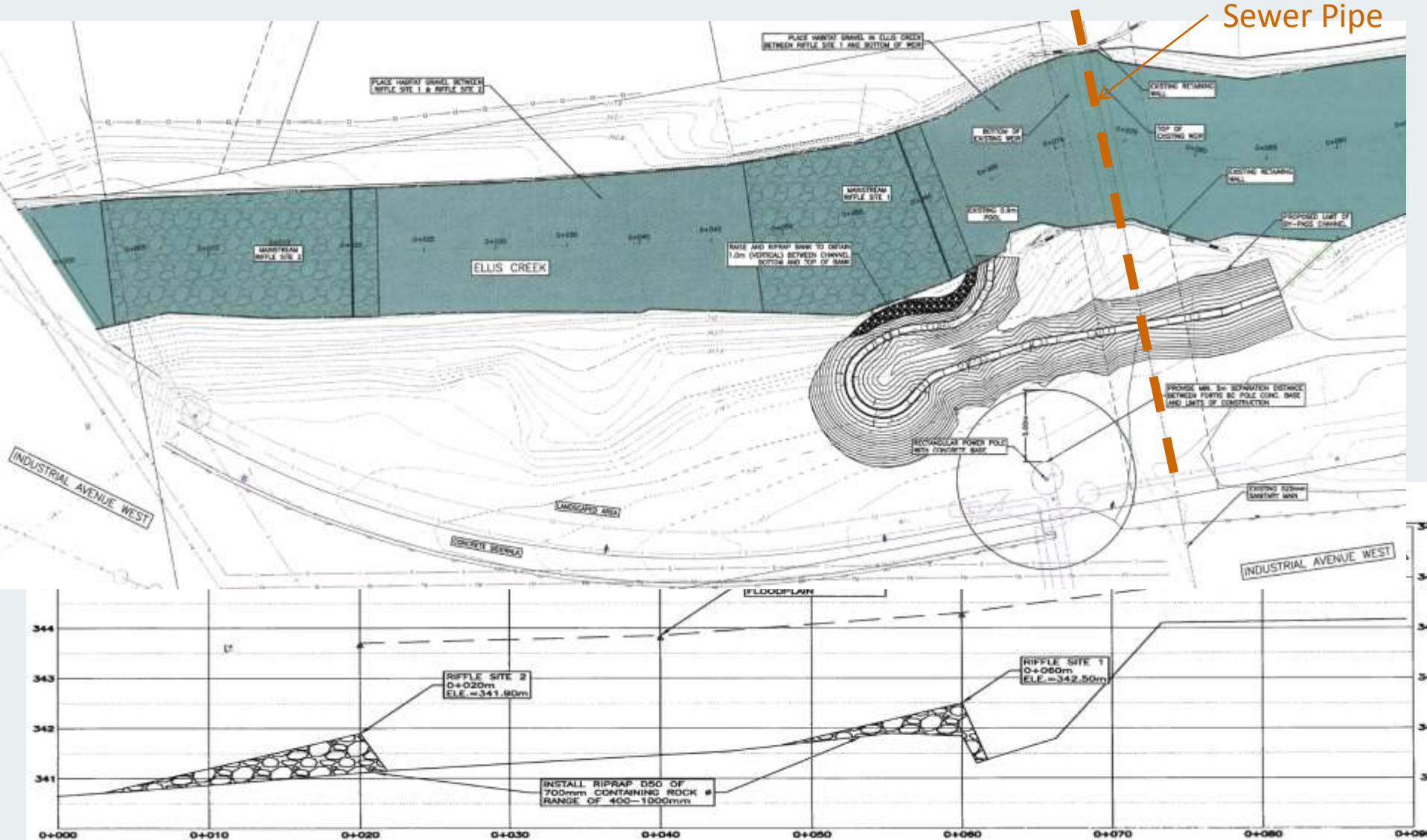
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Ellis Creek Bypass Fishway

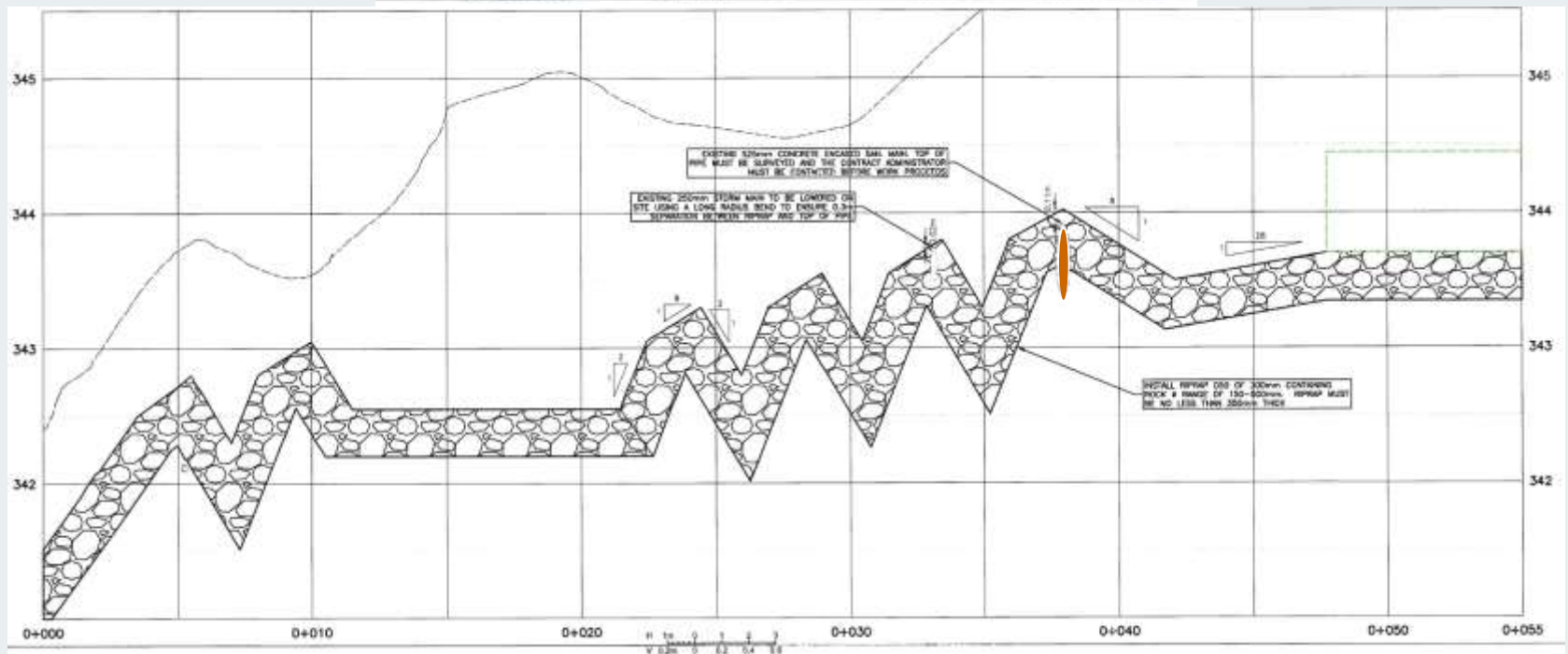
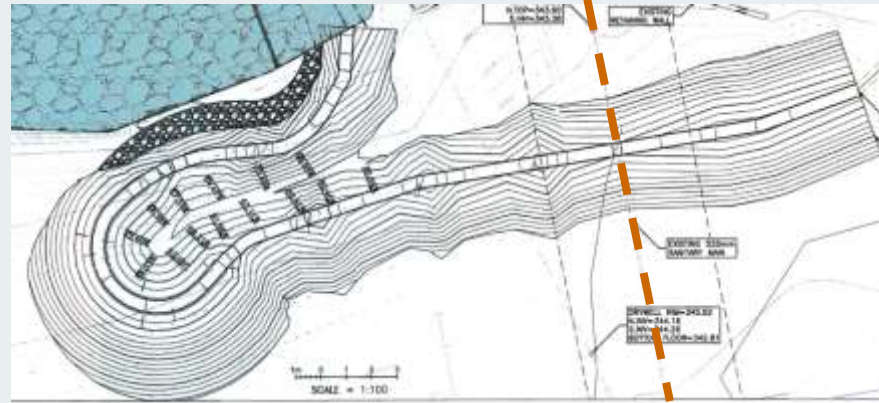
- Ellis Ck – tributary to Okanagan River
- Sewer main embedded within ~2.2 m high concrete weir across Ellis Creek
- Rainbow trout & kokanee – spawning, rearing, overwintering



Fishway Design – Plan View



Pool-Riffle Profile – Bypass Channel



Ellis Ck Bypass Fishway



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Bypass Channel Flows into Deep Pool Created by Mainstem Riffle



Agricultural Lands Along Streams



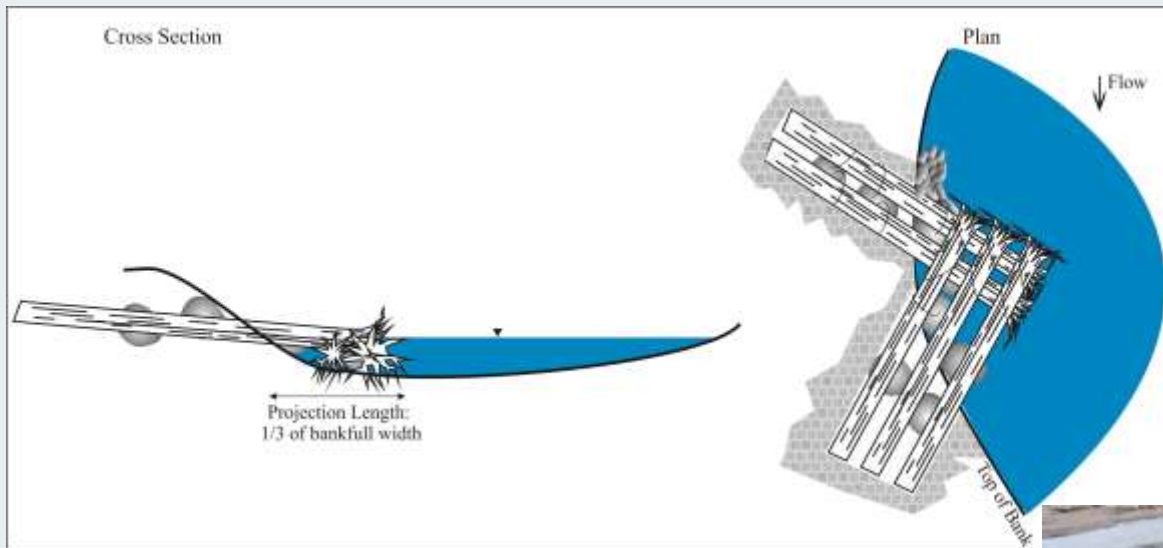
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Riparian Loss Affecting Channel Morphology and Aquatic Habitats

- Riparian trees and shrubs eliminated
- Accelerated bank erosion rates
- Increased sediment transport contributing to aggradation, braiding, overwidening, pool in-filling & sedimentation of spawning gravels, decreased diversity of mesohabitats
- Lack of LWD recruitment



Embedded Log Cover Structure



Objectives:

- Cover in pools
- Pool scour
- Some bank protection



Series of Deflectors Along Bank



LWD structure spacing of ~ 4 times projection length offers some bank protection

Coldwater River



LWD Structures - Nicola River



Thank You



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