Englishman River Water Service

Prepared for:
Fisheries and Oceans Canada
September 3, 2014

Prepared By: Mike Squire, AScT
AWS / ERWS Program Manager

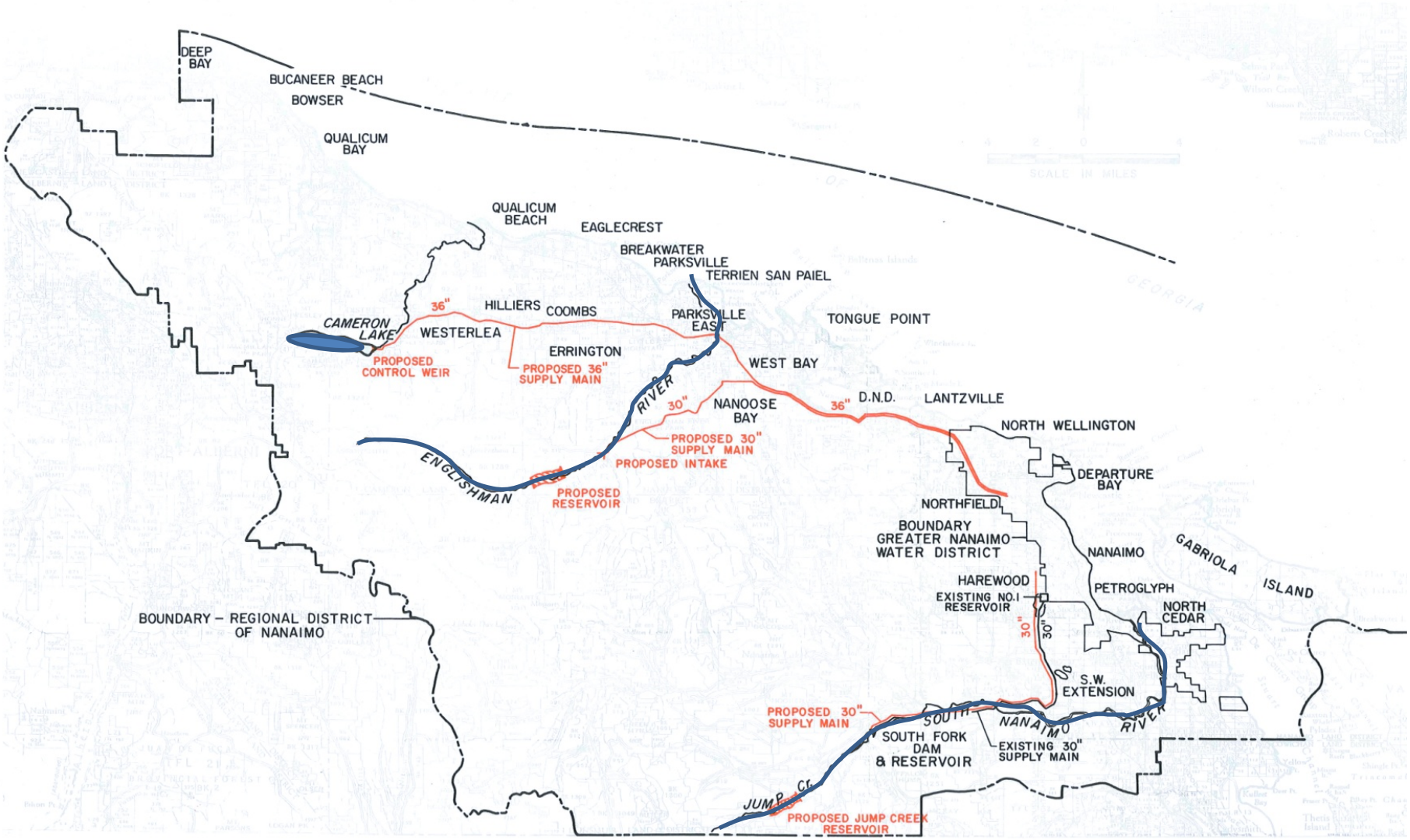
englishman river
WATER SERVICE

An environmentally sensitive use of water to improve fish habitat and domestic water supply.

Drinking water is the public's biggest natural resource and ensures our best security for the future.

Regional Water Supply..... HISTORY

- Original Study started in early 1970s



Regional Water Supply ..... HISTORY

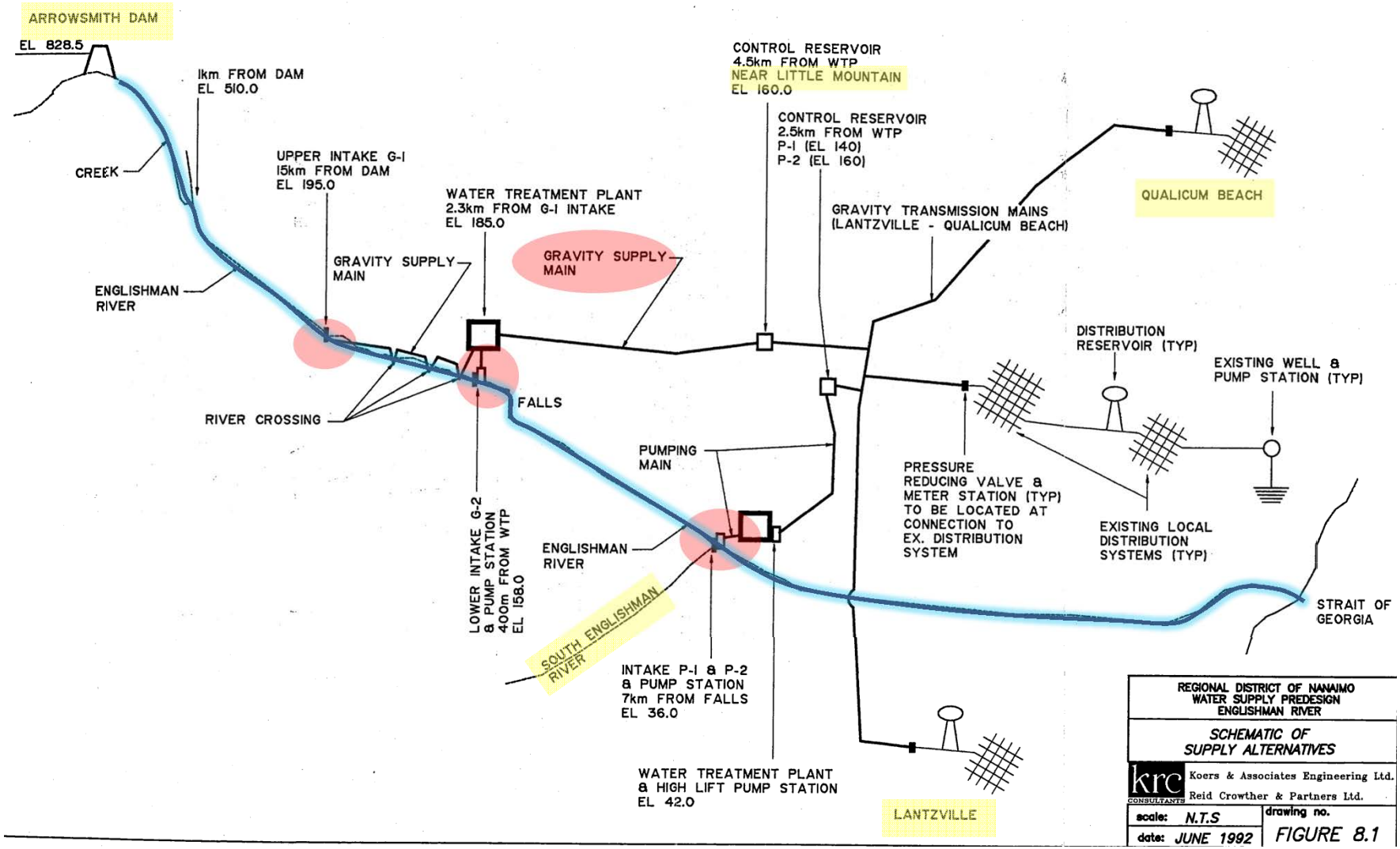
- City of Nanaimo, more feasible to develop their own surface water supply system
- Cameron Lake ruled out

The Province wanted us to look at a regional approach and the creation of a joint venture partnership to look towards the Englishman River as a single source of surface water supply for the regional as a “win –win” for both future domestic potable water supply and fisheries enhancements.

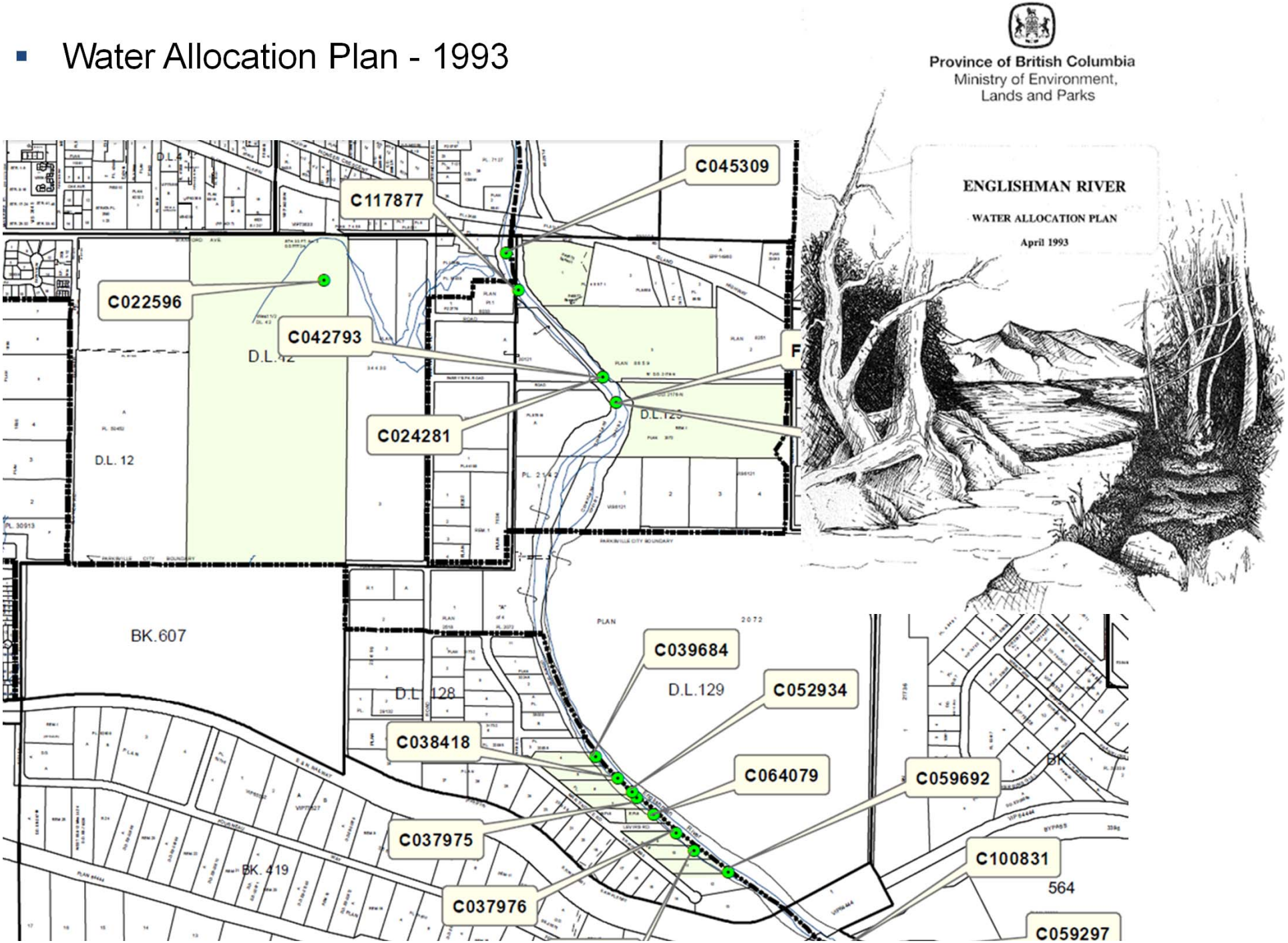
- 1992 - First Options Presented

Formal Discussions with:

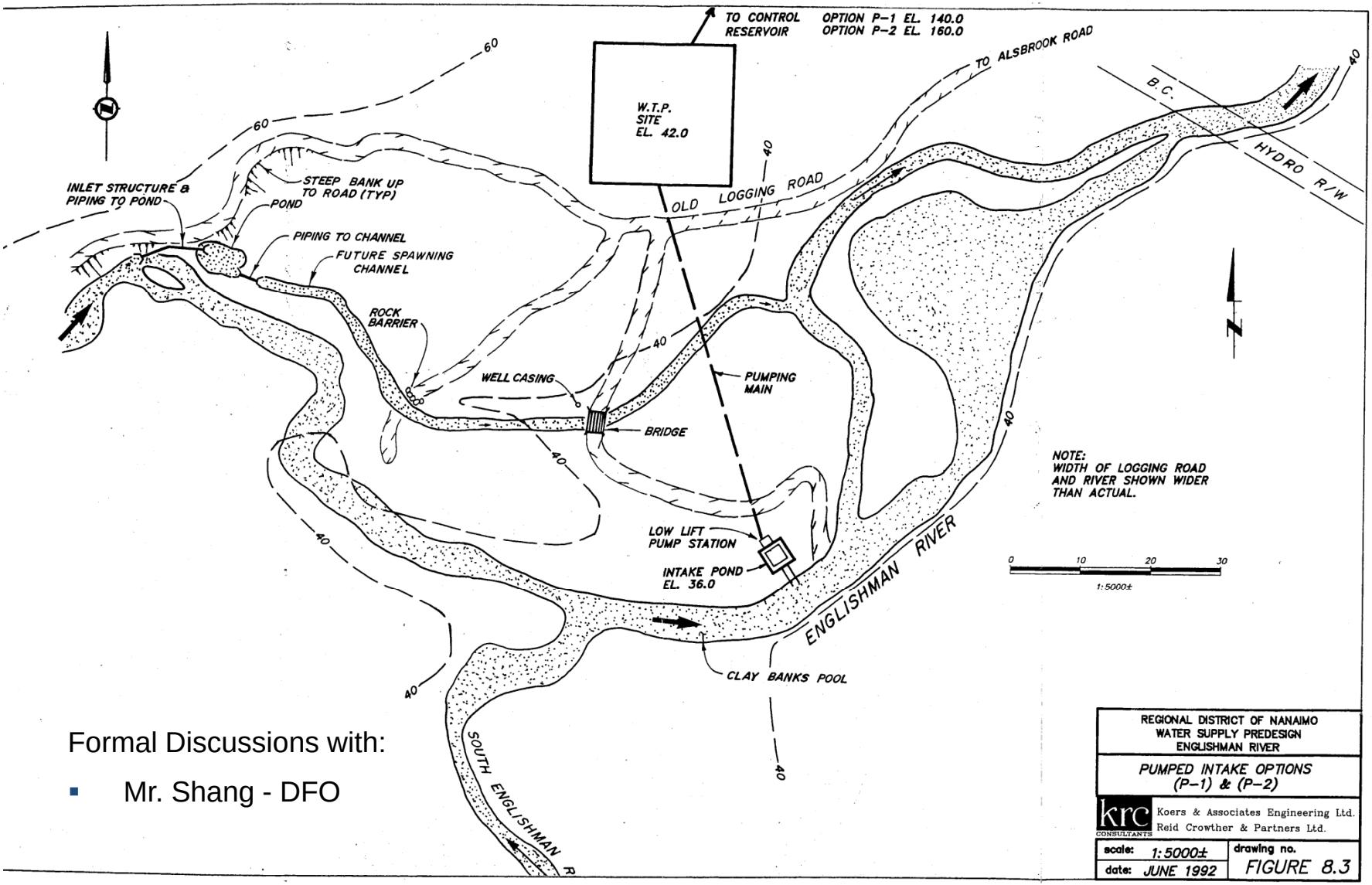
- Mr. Eliasen - DFO
- Mr. Reid - MoE



- Water Allocation Plan - 1993



- August 1995 - Formal Application submitted with the proposed point of diversion at the confluence of the South Englishman River to MOELP and works be constructed on a phased approach.



Formal Discussions with:

- Mr. Shang - DFO

Arrowsmith Water Service (AWS)..... HISTORY

- 1996 - AWS Agreement (Cost Sharing / Ownership) referendum

o	City of Parksville	- 63.9 %
o	Regional District of Nanaimo	- 22.4 %
o	Town of Qualicum Beach	- 13.7 %

- November 1996 – As part of the stakeholder consultation process for the water licence an Application Report was prepared by Mr. Bob Cook of the Ministry of Environment.

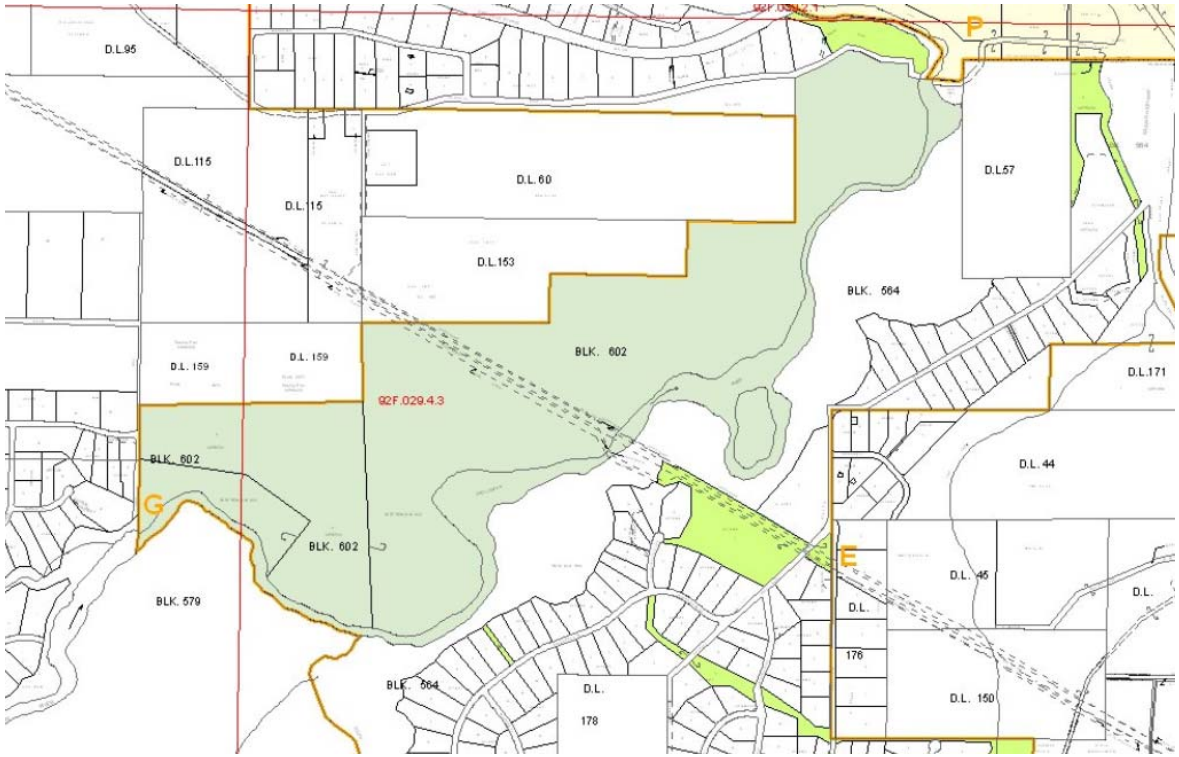
"Future plans are to re-locate the intake further upstream above the urban development. The initial water licence application indicated that the intake location be near the confluence with the South Englishman River. In discussions with the applicants and fisheries agencies, the future intake location would be located on the Englishman River between the South Englishman River confluence and the new Island Highway bridge."

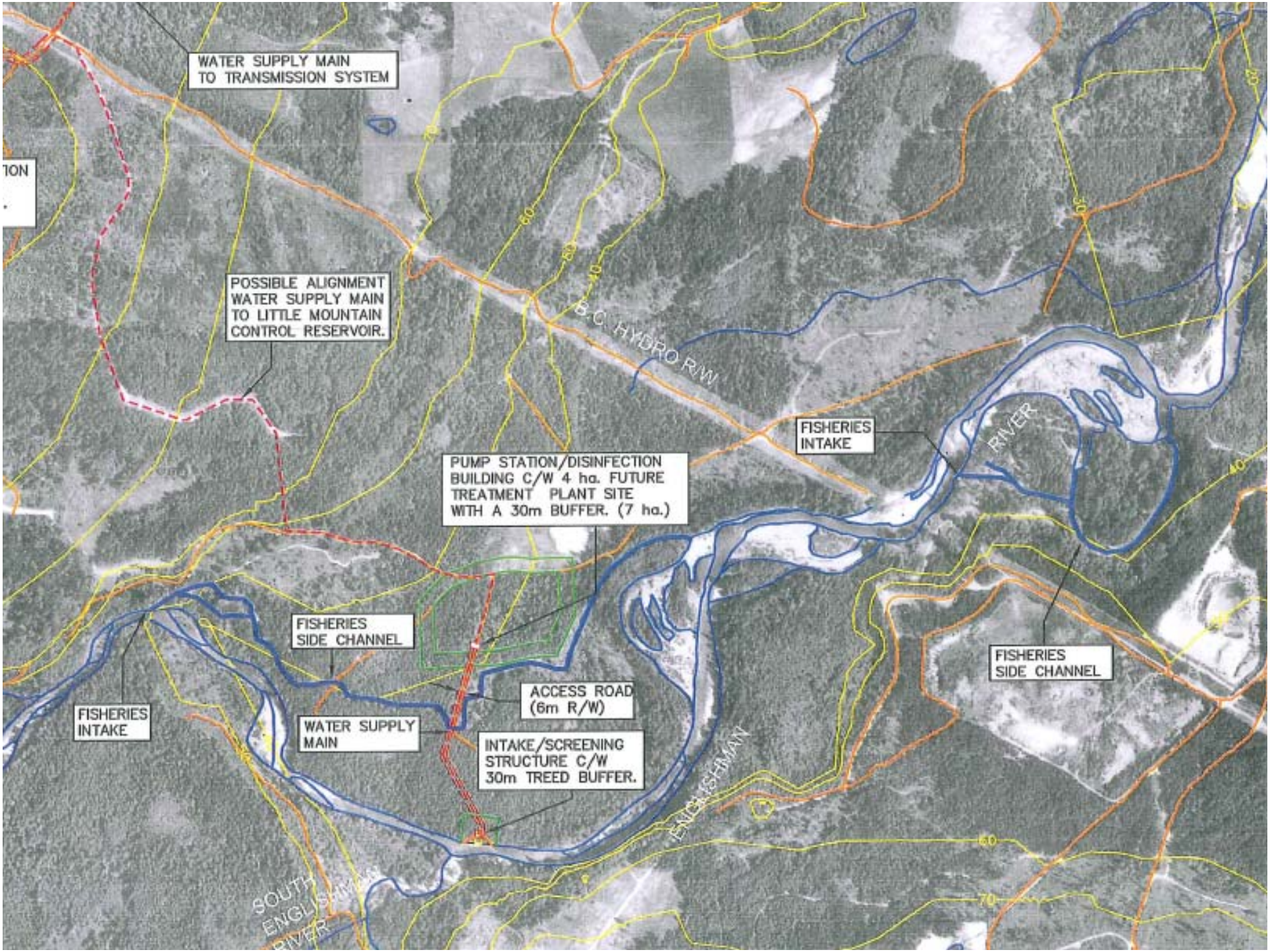
Formal Discussions with:

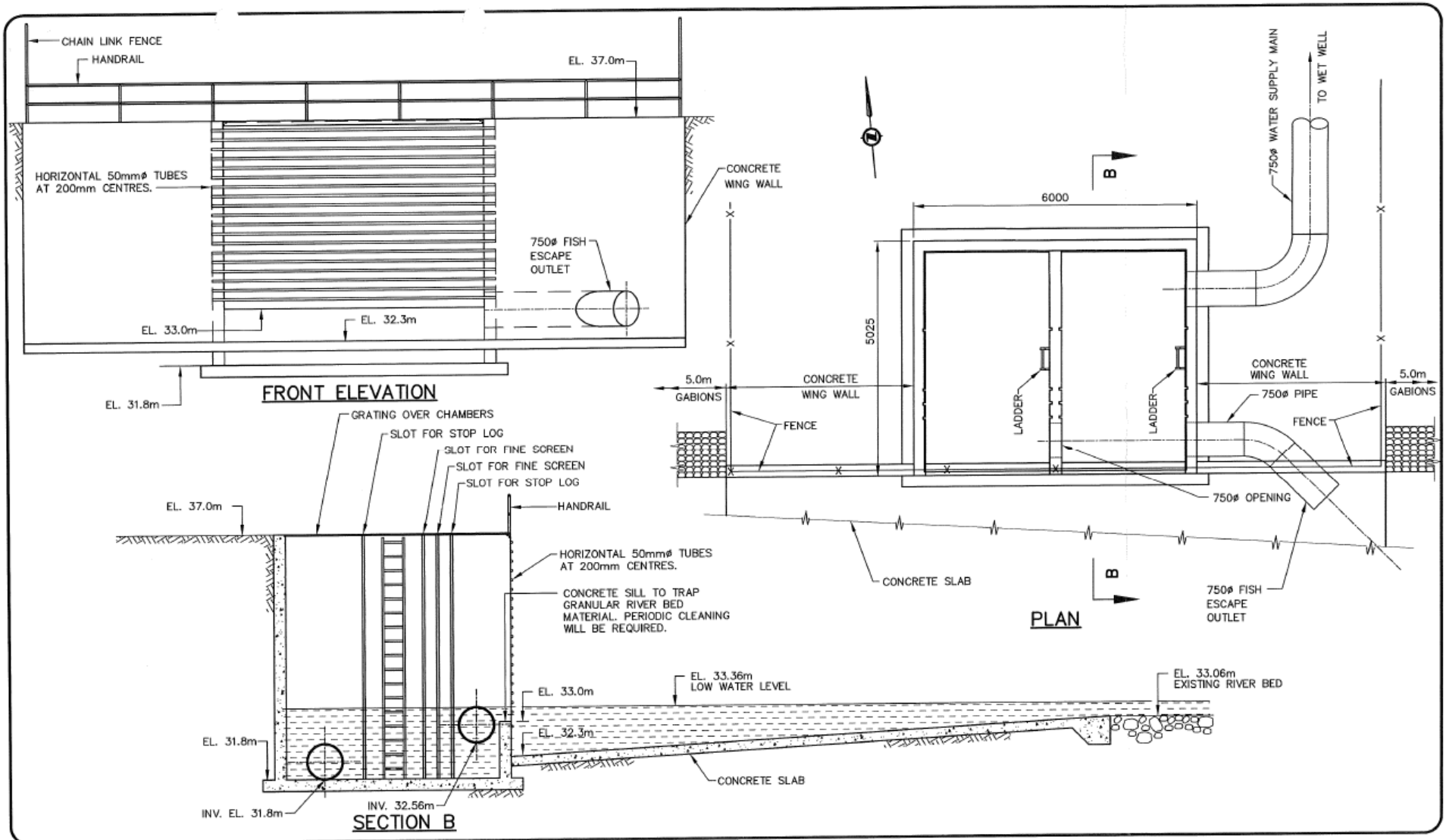
- Mr. R. Eliason – DFO & Mr. G. E. Reid – Provincial Fisheries Section

Conditional Water Licence

- March 1997 – Conditional Water Licence issued based on the premise of utilizing the existing City of Parksville intake in the interim until such time the future water intake location be located above the highway 19 bridge.
- AWS was formed and all efforts were focused on the construction of the Arrowsmith Dam and acquisition of Block 602 and preliminary design of the intake.



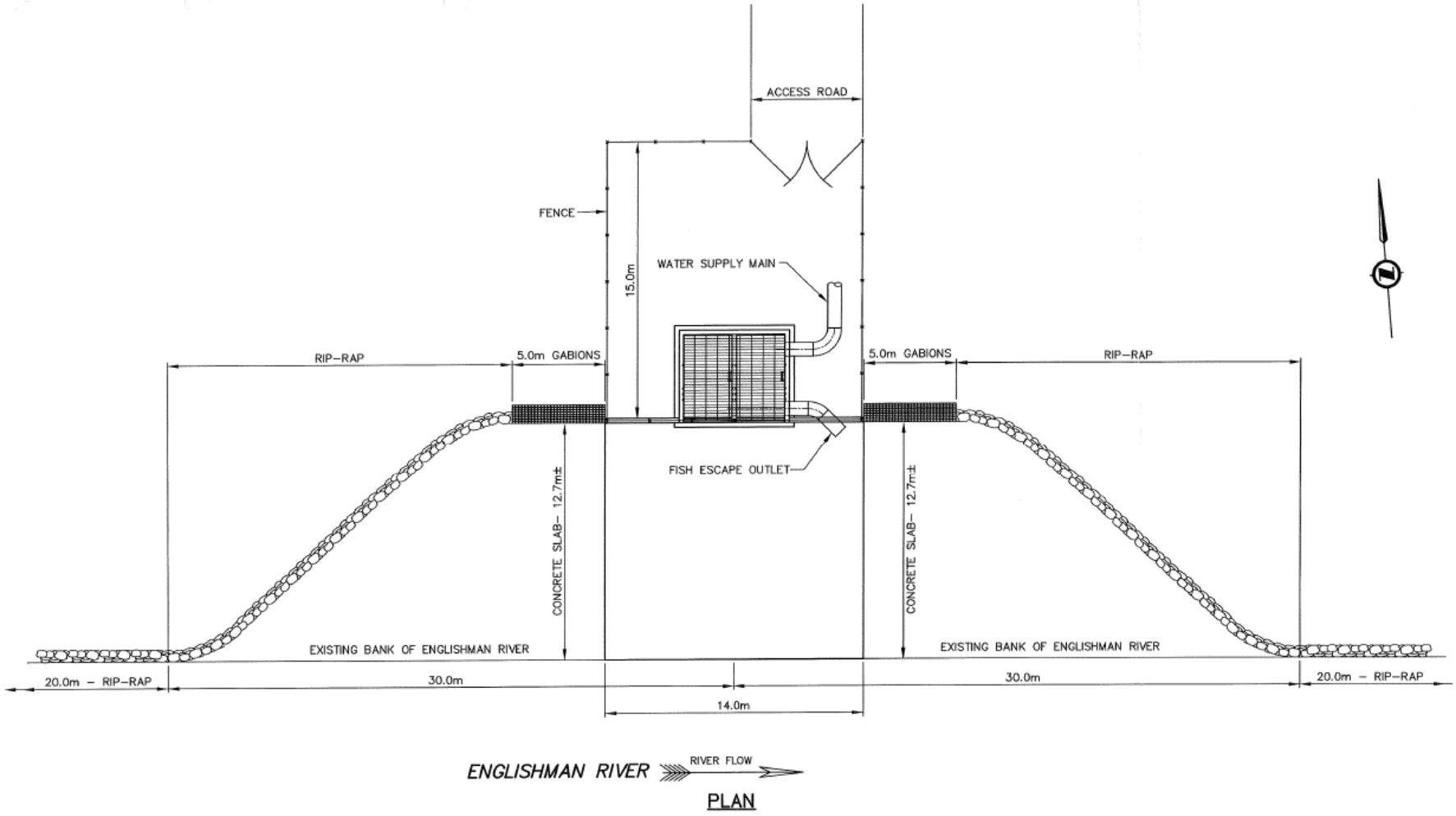

WATER SUPPLY MAIN
TO TRANSMISSION SYSTEM
POSSIBLE ALIGNMENT
WATER SUPPLY MAIN
TO LITTLE MOUNTAIN
CONTROL RESERVOIR.
B.C. HYDRO R/W
FISHERIES
INTAKE
RIVER
PUMP STATION/DISINFECTION
BUILDING C/W 4 ha. FUTURE
TREATMENT PLANT SITE
WITH A 30m BUFFER. (7 ha.)
FISHERIES
SIDE CHANNEL
ACCESS ROAD
(6m R/W)
FISHERIES
INTAKE
WATER SUPPLY
MAIN
INTAKE/SCREENING
STRUCTURE C/W
30m TREED BUFFER.
FISHERIES
SIDE CHANNEL
ENGLISHMAN
SOUTH
ENGLISH
RIVER



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

CLIENT	ARROWSMITH WATER SERVICE
PROJECT	INTAKE LOCATION STUDY

TITLE	INTAKE STRUCTURE
APPROVED	
DATE	DECEMBER 2003
JOB No.	M0032
SCALE	1:75
DWG No.	FIGURE 4



PLAN

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

CLIENT	ARROWSMITH WATER SERVICE
PROJECT	INTAKE LOCATION STUDY

TITLE	INTAKE LAYOUT		
APPROVED		SCALE	1:200
DATE	DECEMBER 2003	DWG No.	FIGURE 3
JOB No.	M0032		

History……..

- Dam Constructed in 1998 - 1999

Arrowsmith Lake Dam Construction - 1998

History……..

Commissioned in 2000 / 2001

Storage = 9 million m^3

Typical Operational Period:

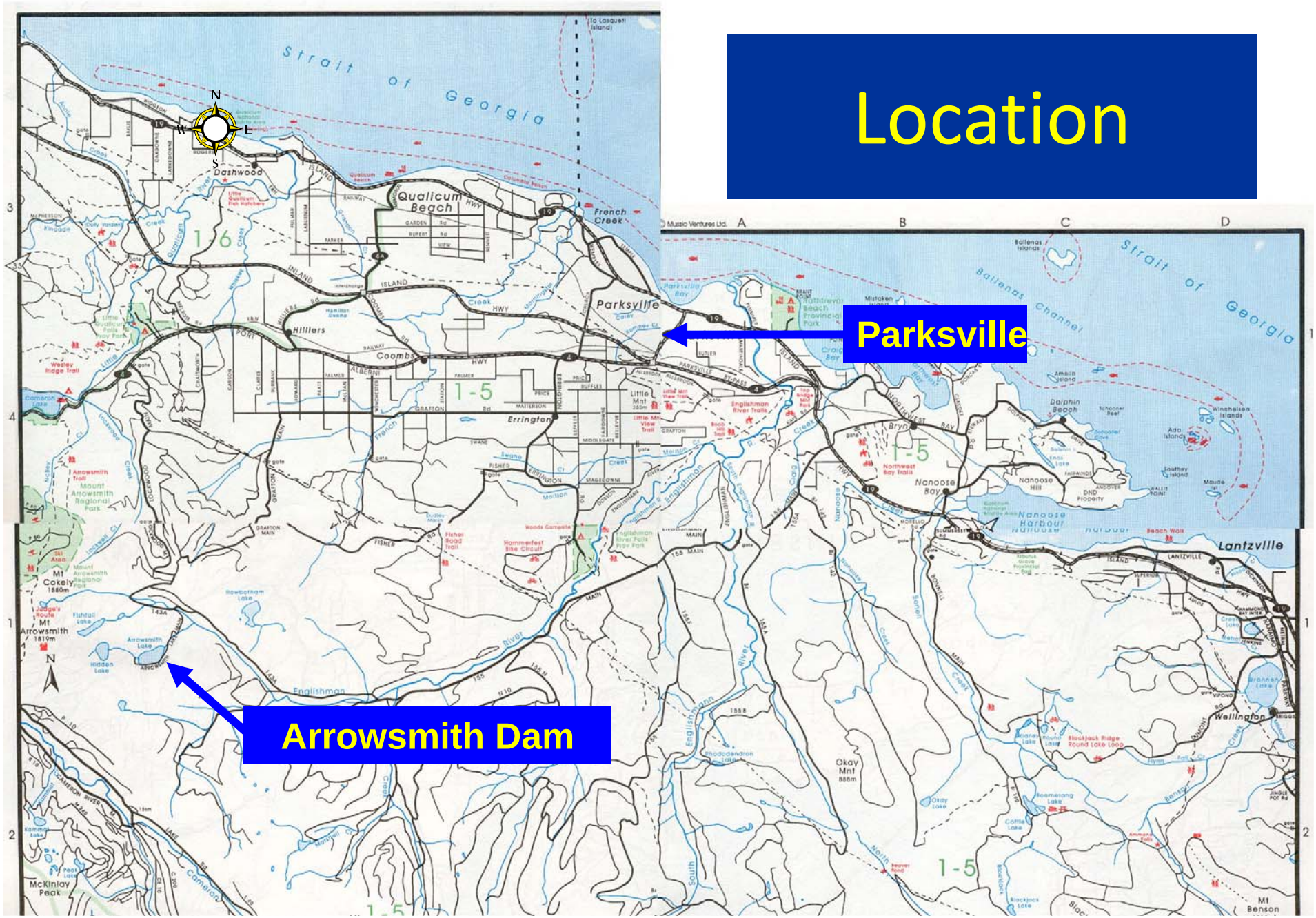
May to October

Arrowsmith Lake Reservoir

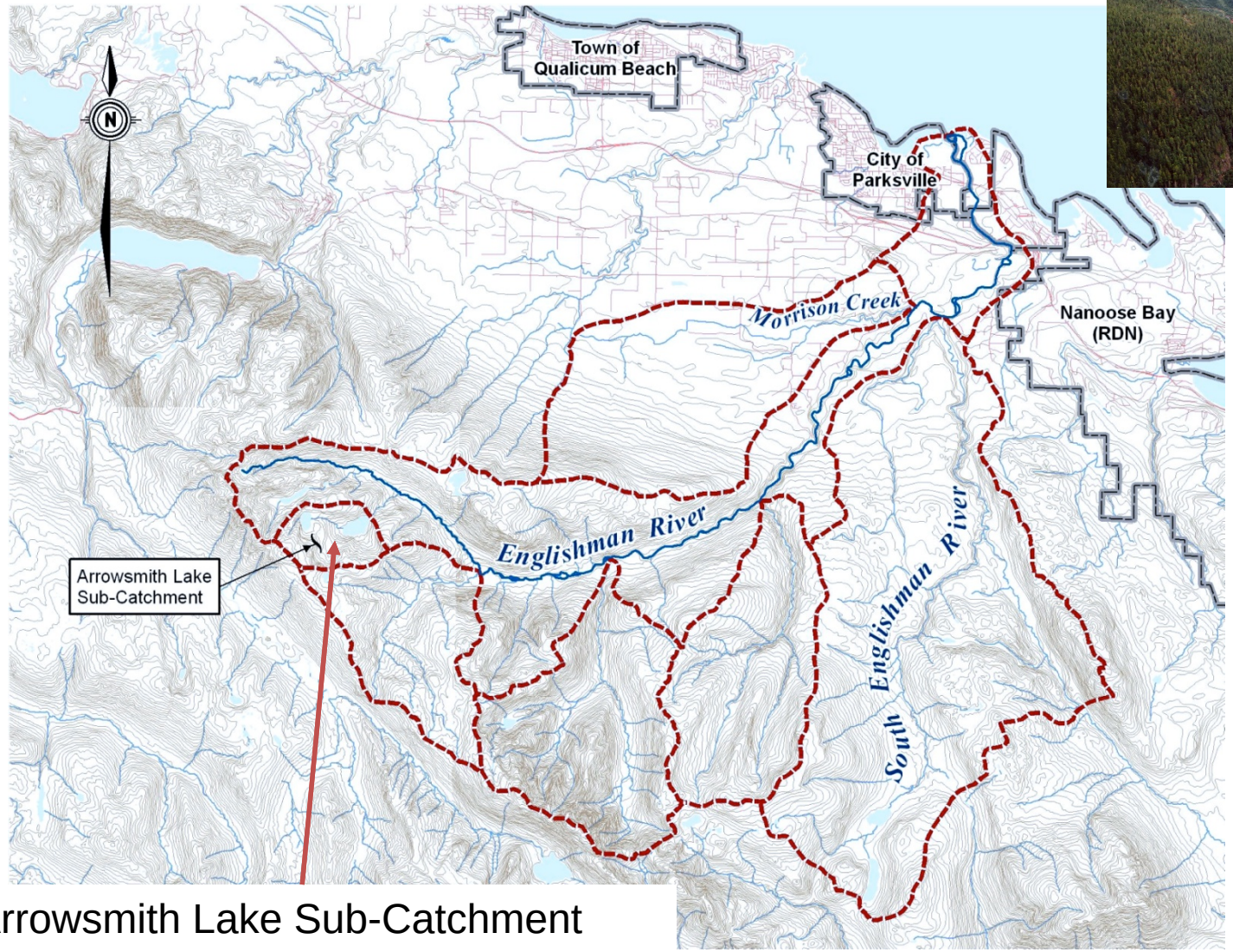
Arrowsmith Dam

Arrowsmith Dam – Control Station

Location


Parksville
Arrowsmith Dam
Strait of Georgia
Qualicum Beach
Dashwood
Parksville
Hilliers
Coombs
Errington
French Creek
Nanoose Bay
Lantzville
Wellington
Mt Arrowsmith
Mt Cokely
McKinlay Peak
Mt Benson
Okay Mnt
Ballenas Channel
Dolphin Beach
Nanoose Harbour
Mount Arrowsmith Regional Park
1-5
1-6

DRAINAGE AREAS



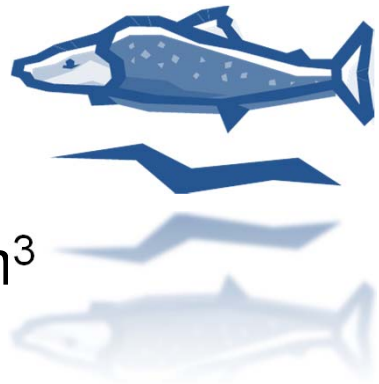
Arrowsmith Lake Sub-Catchment Area
= 5 km^2 (1.5 %)

Total Englishman River Drainage Basin
= 324 km^2

RESERVOIR STORAGE

Top Water Level	= 828.5 m
Natural Water Level (Lake)	= 816 m
Low Water Level	= 802 m

Additional Storage	= 5 million m^3
Total Storage	= 9 million m^3



Approx. storage allocated for fisheries enhancement = 4.5 million m^3

FISHERIES FLOW TARGETS

*Mean Average Discharge (MAD) = 13.70 m^3/s

Critical Rearing Flow (1:79 Year occurrence) = 0.70 m^3/s (5.1 % MAD)
DFO & MoE Target – Preferred Rearing Flow = 1.13 m^3/s (8.2 % MAD)
(Lower Reaches of E.R.)

<u>Design</u> constraints of Dam – Fisheries Benefit (Summer Flow Augmentation of Dam)

Low Flow (1:14 year occurrence) = 1.24 m^3/s (9.05 % MAD)
Fair Rearing Flow = 1.36 m^3/s (10 % MAD)
Good Spawning and Rearing Flow = 2.05 m^3/s (15 % MAD)

Given……Provisional Operating
Rule Based on Maintaining
1.6 m^3/s

*Englishman River Water Allocation Plan – MoE, April 1993

Fisheries Benefits:

Monthly Average Discharge Volumes
Englishman River *1913 - 2010*

6/20/2011

Year	June	July	August	September	October	
1913	9.25	5.43	1.01		7.94	
1914	7.24	2.42	0.63			
1915	3.04	1.24	0.78	0.68	17.50	
1916	17.30	9.11	3.04	1.15	2.18	
1917	11.70	4.60	1.24	1.42		
1970	6.38	1.43	0.65	0.88		
1971	13.30	7.11	2.06	2.04		
1979	2.85	2.40	0.65	6.06	12.90	
1980	5.94	3.39	0.84	1.21	1.61	
1981	4.95	1.75	0.65	2.84	21.50	
1982	12.00	3.50	1.03	0.71	22.80	
1983	6.59	5.16	1.04	0.97	2.96	
1984	7.33	2.84	0.72	1.21	17.20	
1985	4.64	1.29	0.50	0.85	10.30	
1986	4.88	1.79	0.53	0.42	1.29	
1987	5.94	1.55	0.58	0.34	0.29	
1988	8.32	3.07	0.87	0.70	1.84	
1989	4.32	1.93	0.87	0.40	5.79	
1990	6.65	1.32	0.38	1.02	21.60	
1991	2.15	0.89	7.10	3.10	0.64	
1992	1.31	1.04	0.42	0.84	6.87	
1993	6.17	1.34	0.50	0.25	1.13	
1994	4.06	1.14	0.48	0.46	3.36	
1995	4.09	1.62	0.91	0.35	7.49	
1996	3.41	1.16	0.33	0.50	8.29	
1997	9.48	5.37	1.98	5.62	28.40	
1998	4.00	1.63	0.39	0.34	2.34	
1999	18.01	10.5	4.38	2.11	4.87	Arrowsmith Dam in Operation
2000	8.51	2.59	2.29	1.58	8.58	
2001	3.51	1.52	2.51	1.72	3.27	
2002	6.83	2.14	1.72	1.58	1.11	
2003	3.6	1.34	1.23	1.57	31.7	
2004	2.85	2.06	1.83	2.89	8.9	
2005	3.55	1.85	1.74	1.76	10.3	
2006	6.49	2.34	1.61	1.18	1.03	
2007	3.41	3.91	1.77	1.79	11.21	
2008	7.97	2.42	2.04	2.07	4.59	
2009	3.06	1.27	1.26	1.50	5.39	
2010	8.98	2.50	1.66	3.63	9.13	

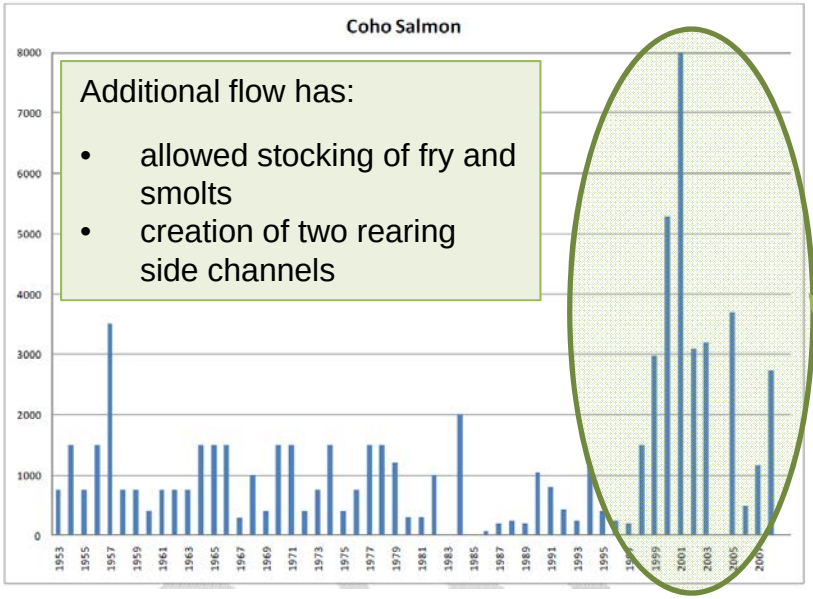
Values of below 1.0 cubic metres per second

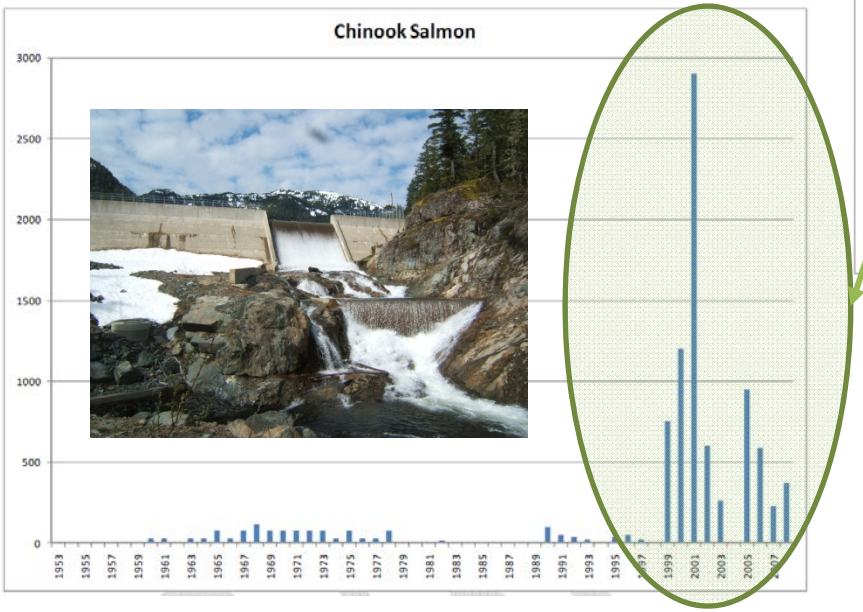
Values greater than or equal to 1.6 cubic metres per second

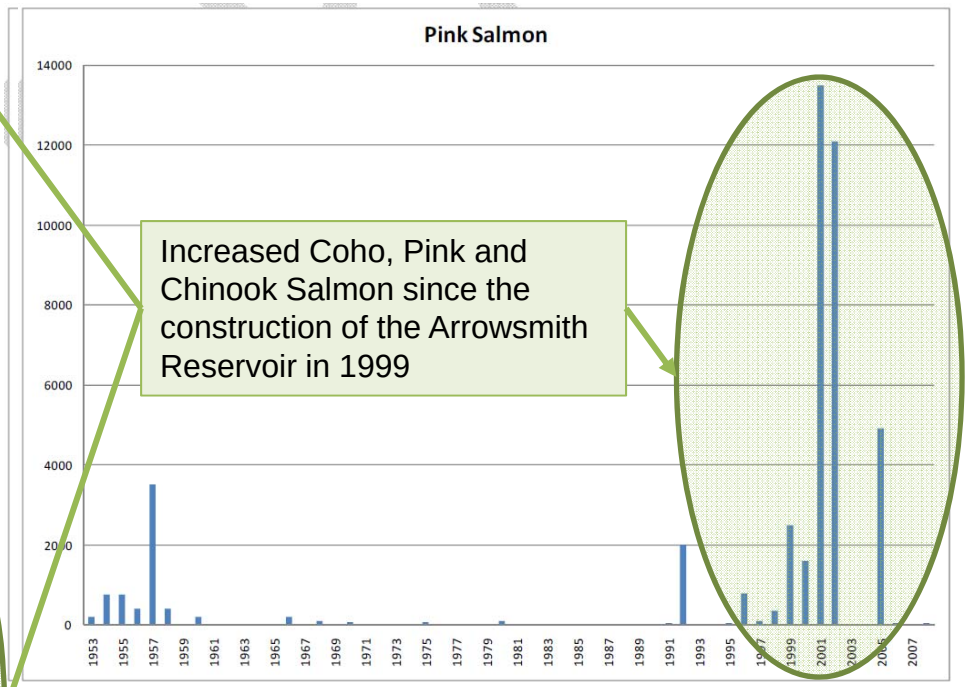
Note:
This information was taken from the Water Survey of Canada Archived Hydrometric Data - Englishman River near Parksville site 08HB002 - Monthly Mean Discharge (m3/s)

AWS Englishman River Historical.xls

Fisheries Benefits

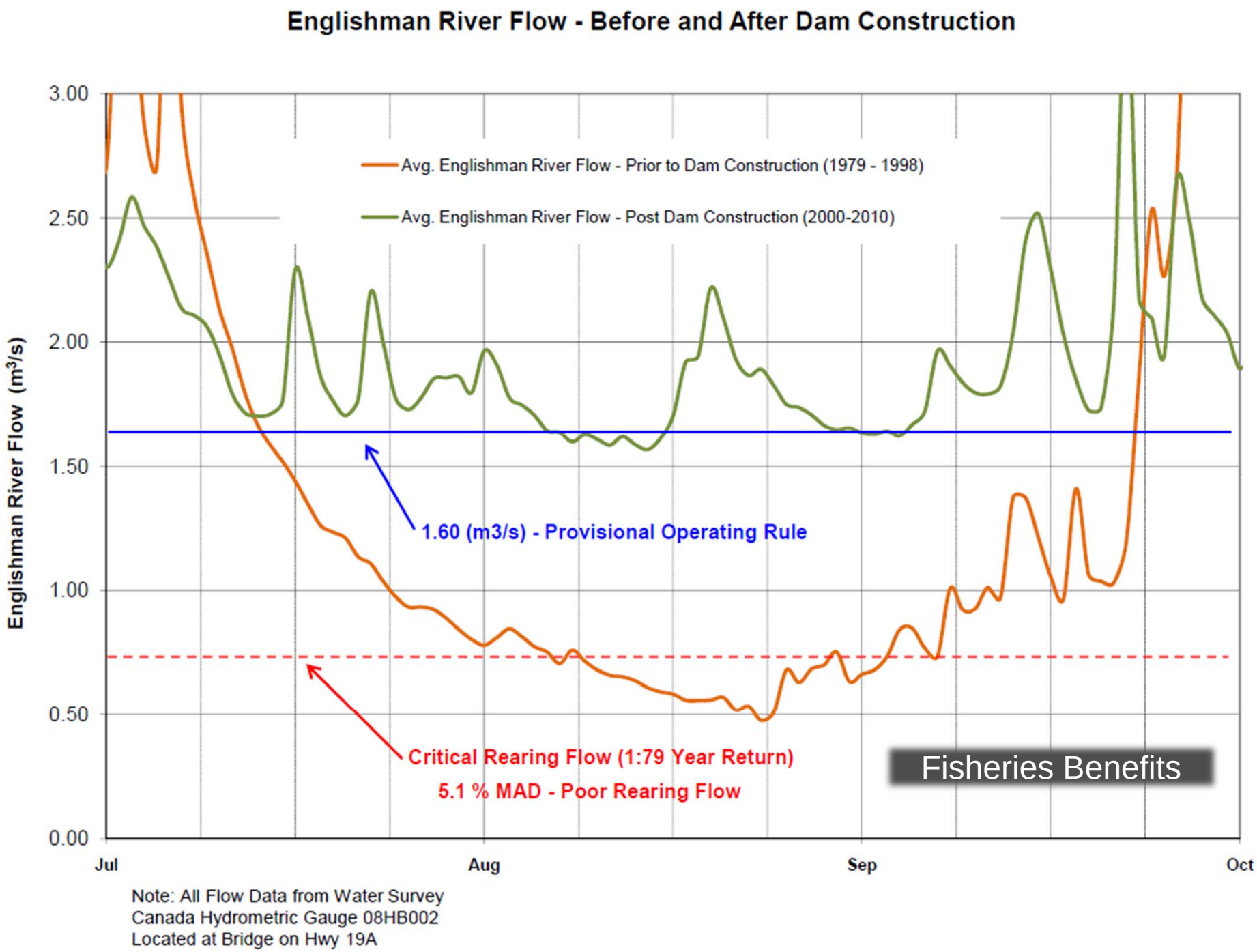






Source: Draft Report V1.0 Englishman River Instream Flow Study – Background Data Review. Prepared from DFO by Ecofish Research Ltd.

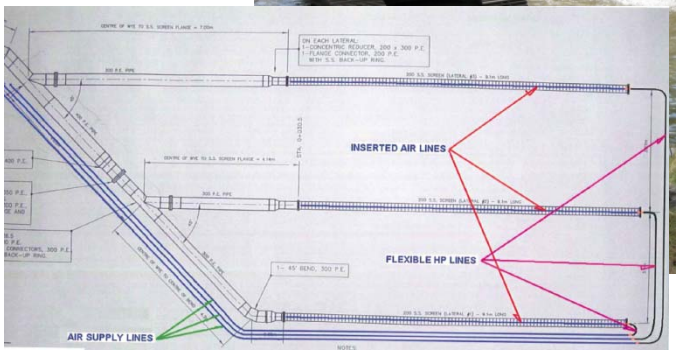
DFO Salmon escapement estimates – 1953 - 2008

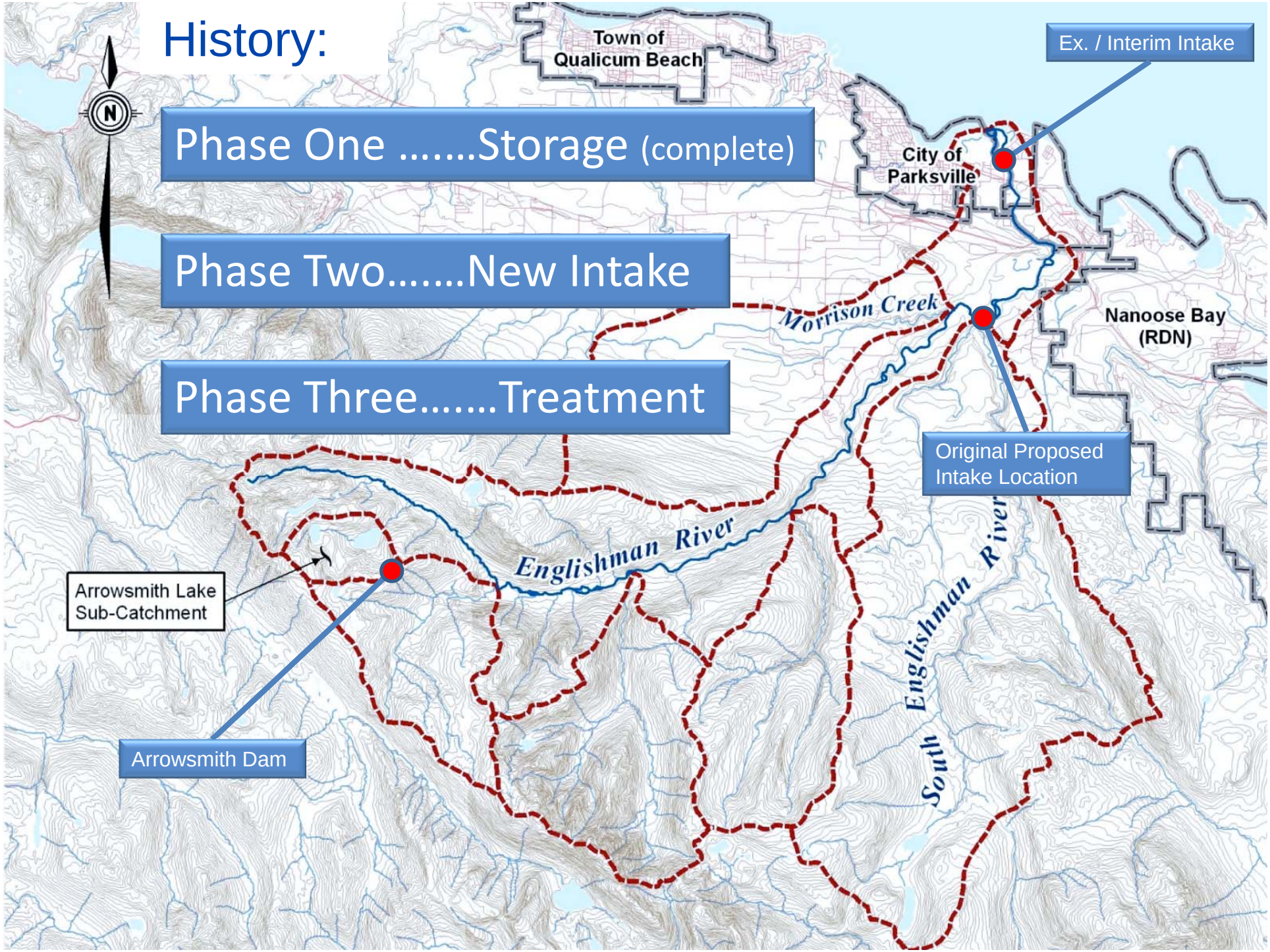

Englishman River Flow - Before and After Dam Construction
Englishman River Flow (m³/s)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jul
Aug
Sep
Oct
Avg. Englishman River Flow - Prior to Dam Construction (1979 - 1998)
Avg. Englishman River Flow - Post Dam Construction (2000-2010)
1.60 (m3/s) - Provisional Operating Rule
Critical Rearing Flow (1:79 Year Return)
5.1 % MAD - Poor Rearing Flow
Fisheries Benefits
Note: All Flow Data from Water Survey
Canada Hydrometric Gauge 08HB002
Located at Bridge on Hwy 19A

Why do we need a New Intake ?

Deficiencies in current Parksville water intake (Three Horizontal Well Screens)

- Becoming increasing difficult to operate due to the age of the existing infrastructure and the current location being adjacent to a single family residential neighbourhood.
- Only two of the three infiltration gallery legs are operational
- The intake gallery is under the Englishman River gravel bed and current maintenance procedures implicate fish habitat
- In flood plain and therefore becomes inaccessible during flood events
- Type of intake does not lend itself for future expansion



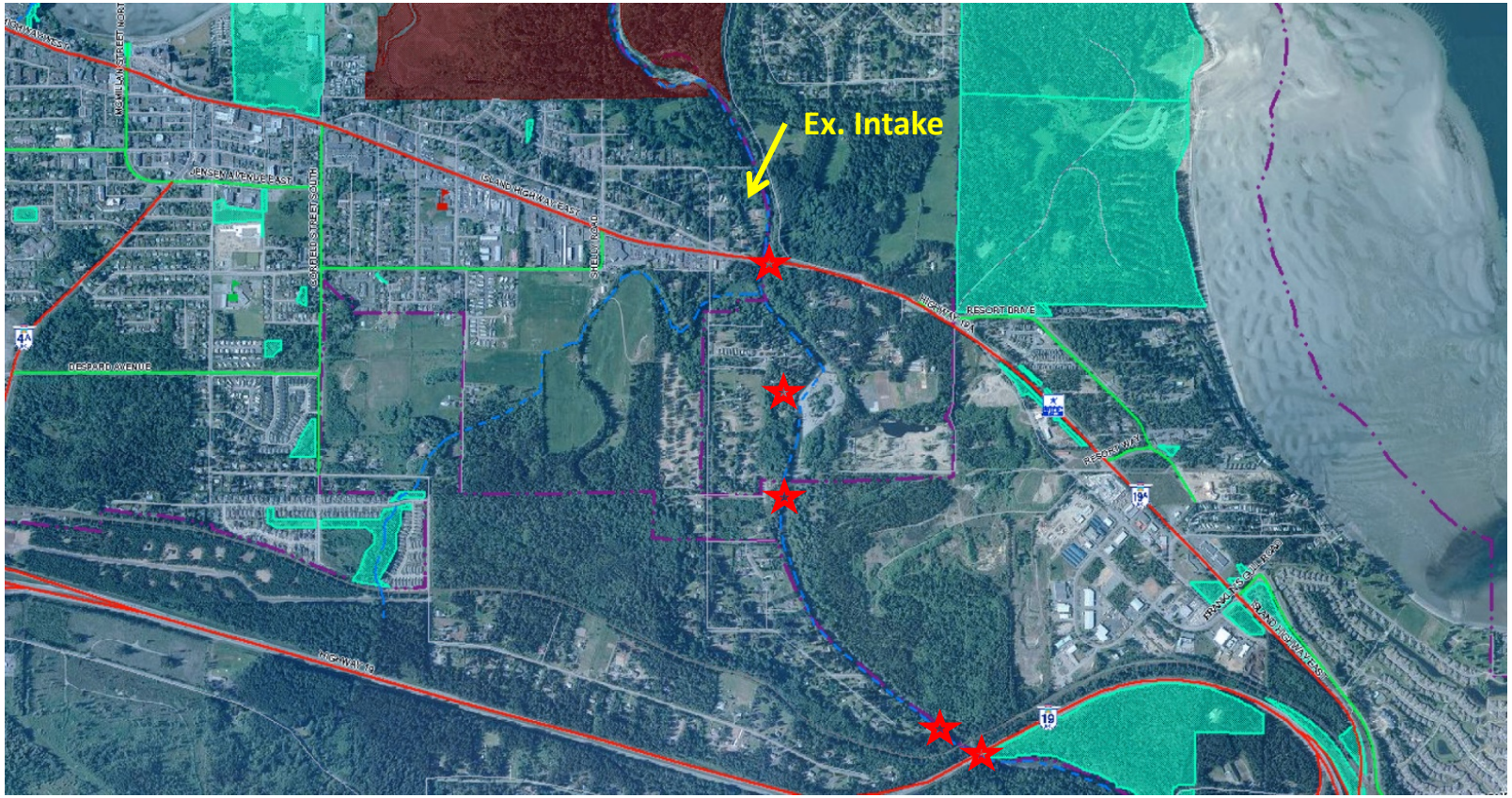

History:
Phase One .....Storage (complete)
Phase Two.....New Intake
Phase Three.....Treatment
Town of Qualicum Beach
City of Parksville
Ex. / Interim Intake
Morrison Creek
Nanoose Bay (RDN)
Original Proposed Intake Location
Englishman River
South Englishman River
Arrowsmith Lake Sub-Catchment
Arrowsmith Dam

2005 Meeting : Vancouver Island Health Authority (VIHA) Concerns

Existing / Interim Intake Location

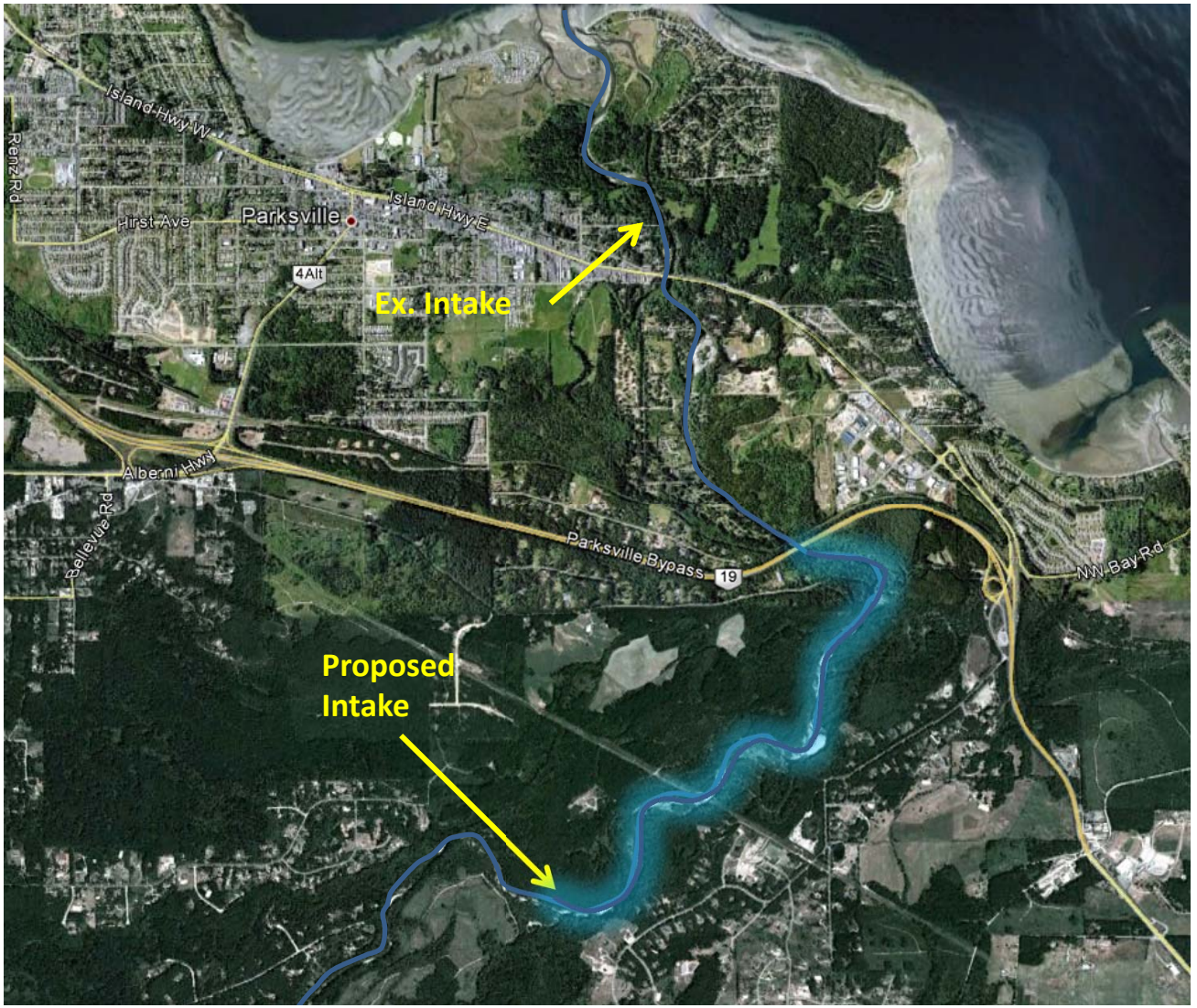
Location (**risk** of contamination):

- Below two Highways……fuel spill
- Below Railway / Septic Fields / Oil Tanks
- Below Flood Plain / In Flood Plain
- Below Sanitary Sewer Crossing

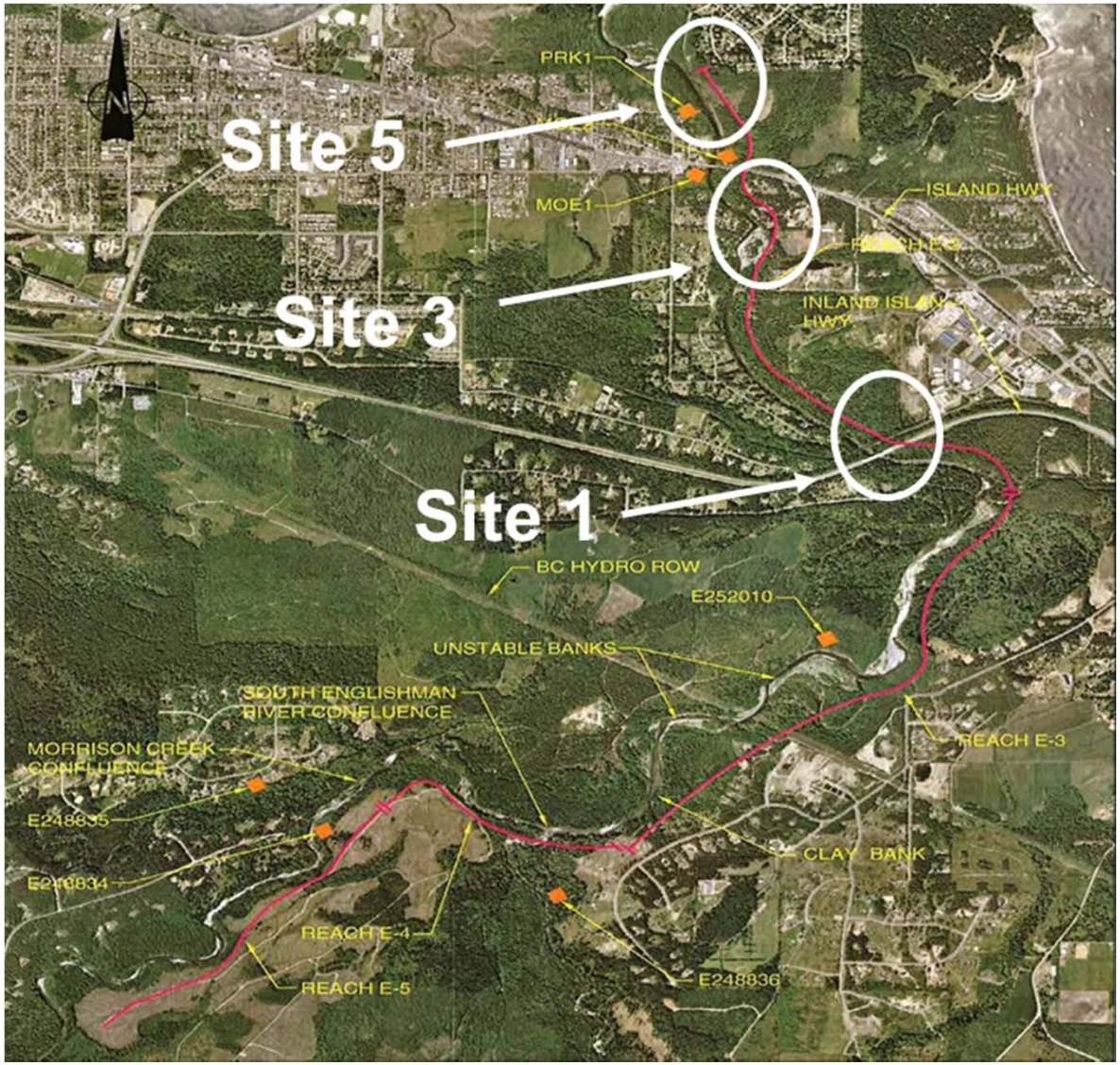


Department of Fisheries and Oceans (DFO)

……As far downstream as possible to allow <u>more water for fish</u>



Next Stage of Planning Investigation:



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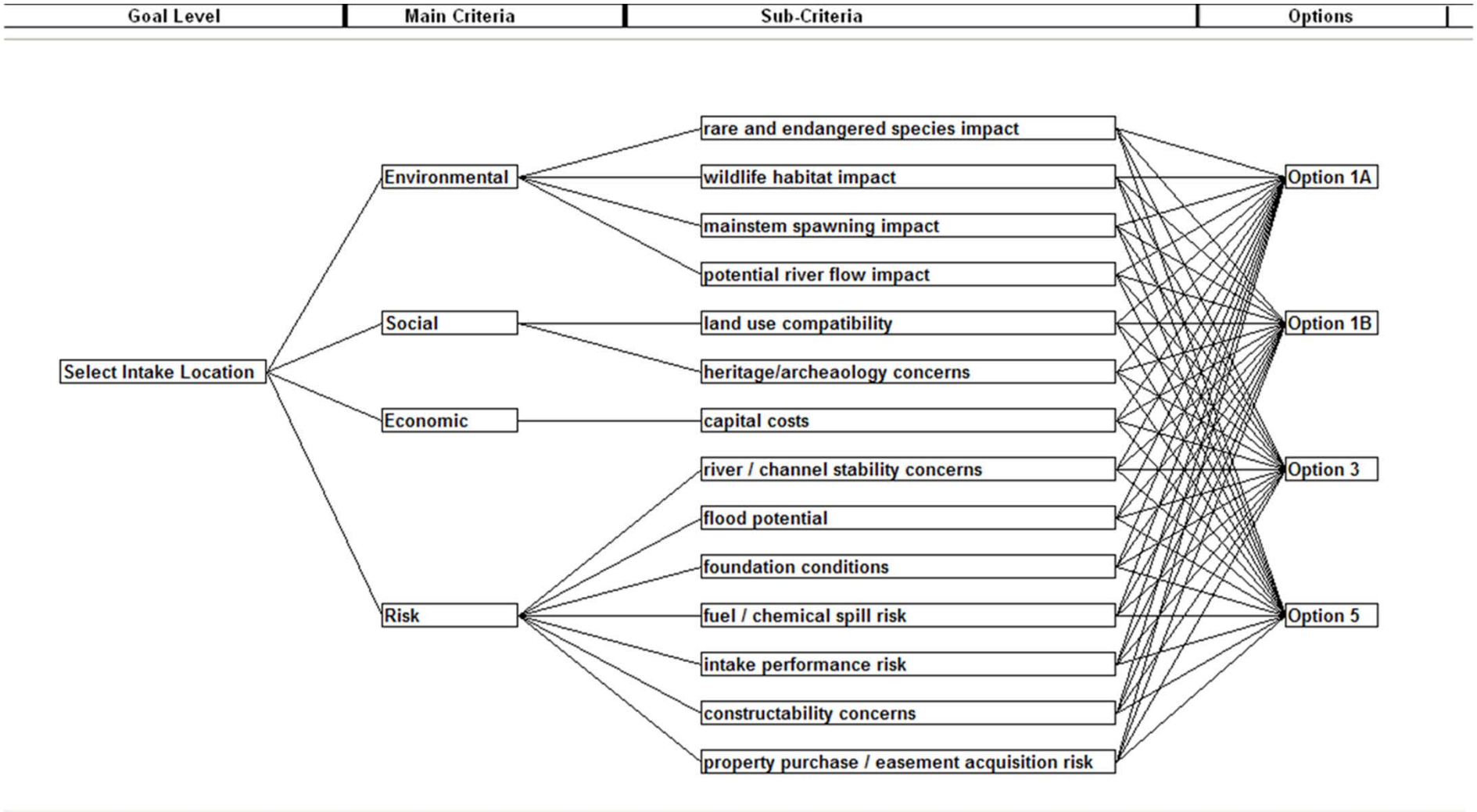
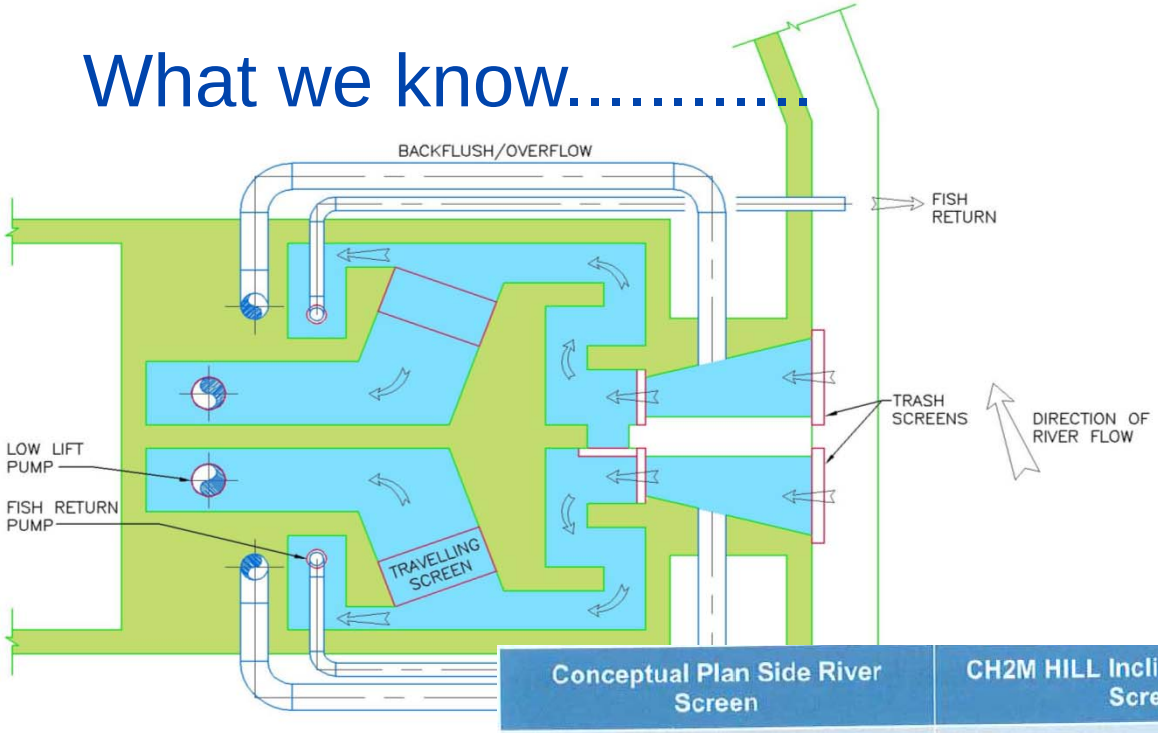


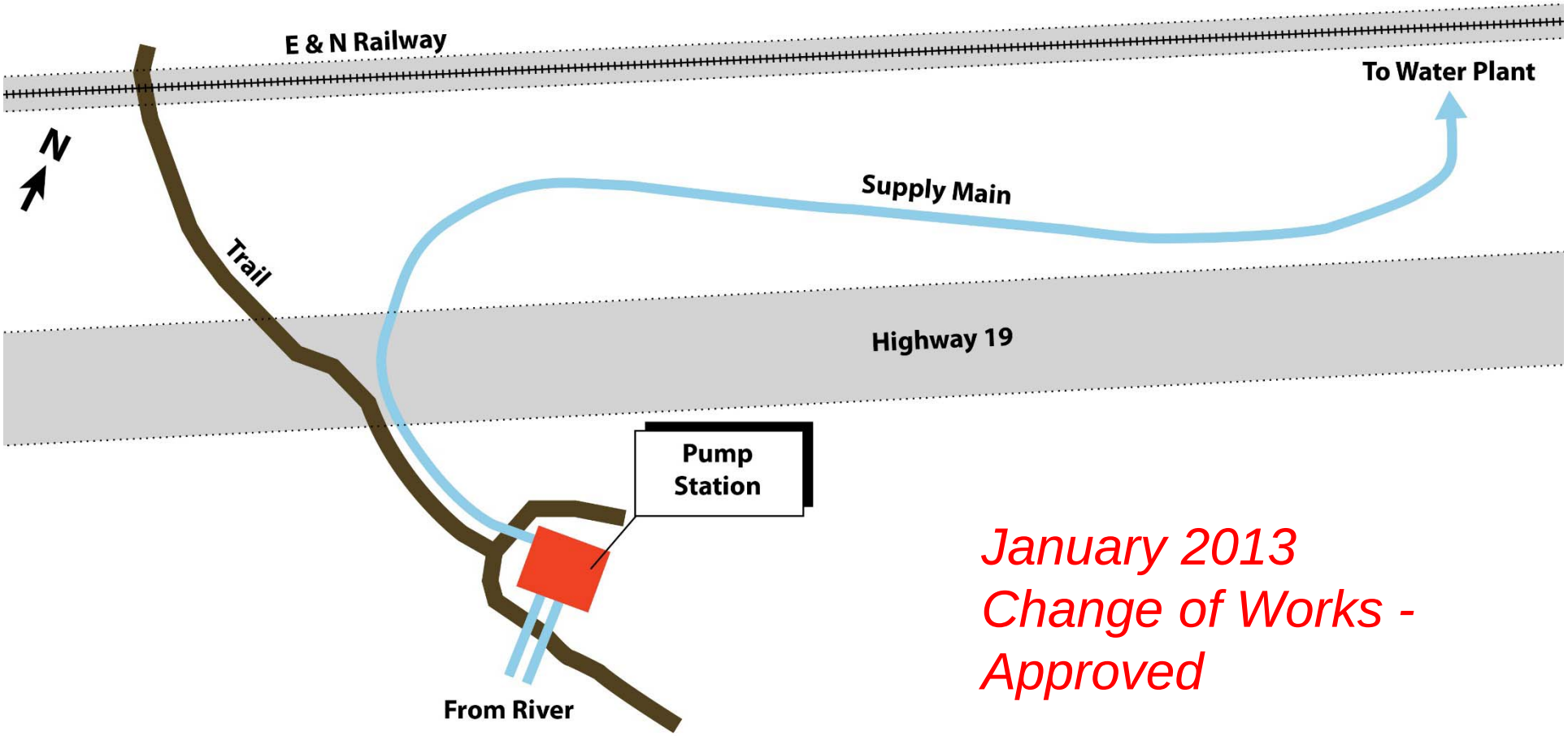
What we know.....



Current Recommendation:
- Riverbank Side Inlet

Conceptual Plan Side River Screen	CH2M HILL Inclined Side River Screen	Coanda Effect
No need to enter river	No need to enter river	Self cleaning, no anticipated need to enter river.
Minimal impact on fish access and recreational river use	Minimal impact on fish access and recreational river use	Potential impact on fish access and recreation river use
Moderately low risk of harming fish	Low risk of harming fish	Mitigate fish impact with ladder
Proven System	Proven System	Proven system
Mechanically more complex	Mechanically simple	Mechanically simple
Cleaned by motor and brushes/sprays	Cleaned by air	Self cleaning
Larger footprint	Smaller footprint	Small footprint
More difficult to incorporate river flow measurement	Easier incorporation of river flow measurement	More difficult to incorporate river flow measurement
Higher capital cost	Lower capital cost	Lower capital cost
Higher O&M cost	Low O&M cost	Low O&M cost

Pump Station Location



January 2013
Change of Works -
Approved

What we know.....

Current Recommendation:
- Riverbank Side Inlet

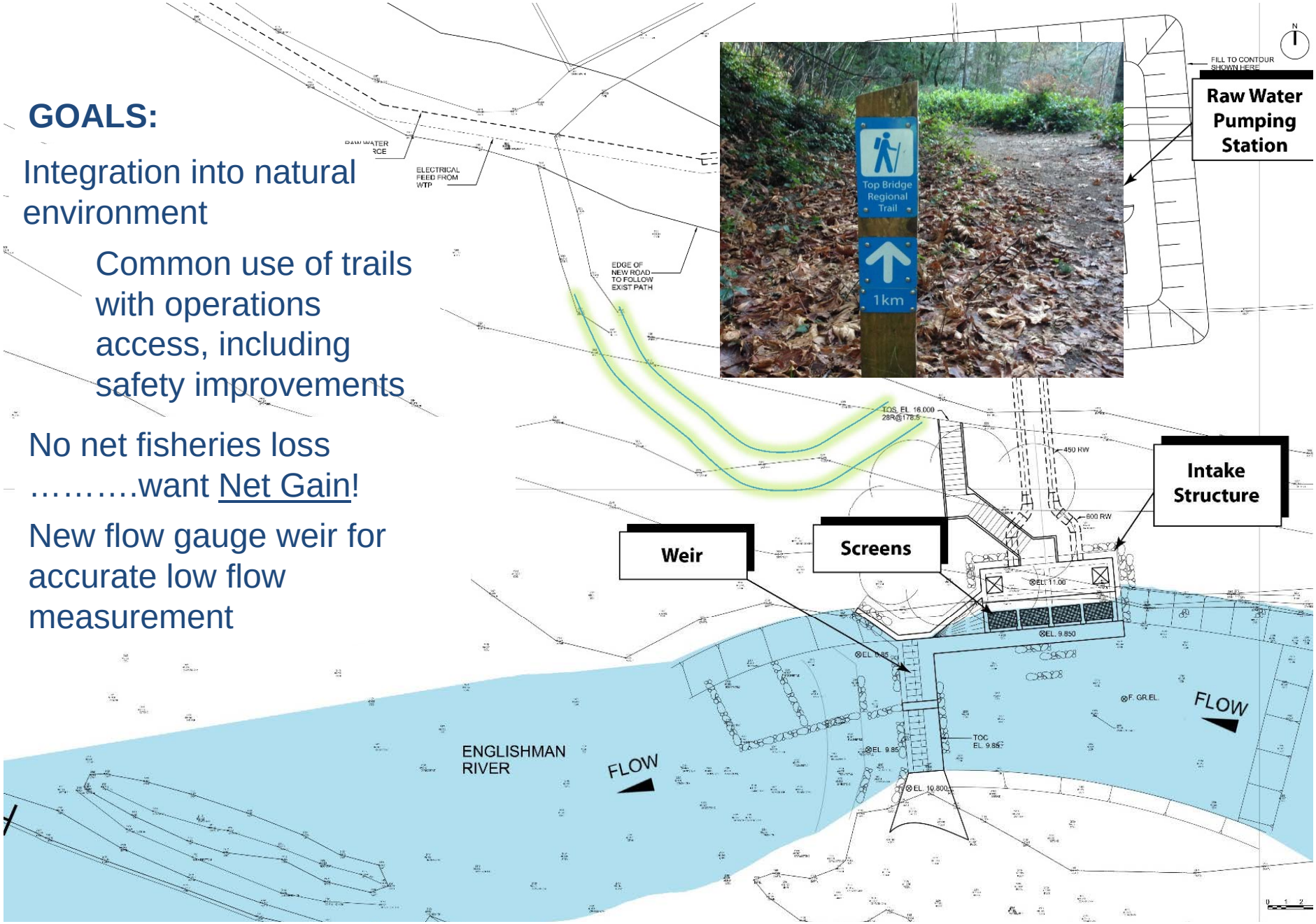
GOALS:

Integration into natural environment

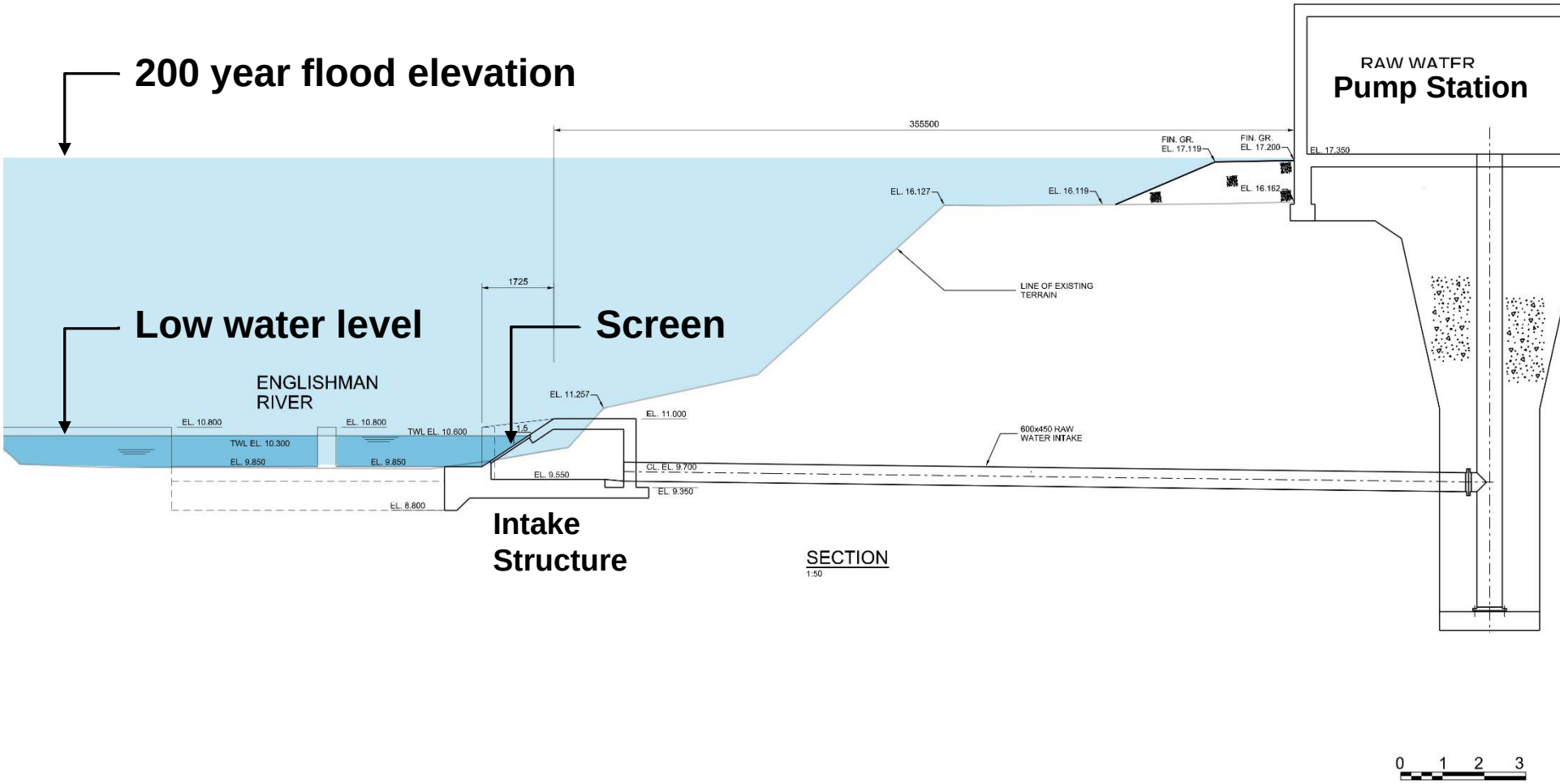
- Common use of trails with operations access, including safety improvements

No net fisheries loss ……want Net Gain!

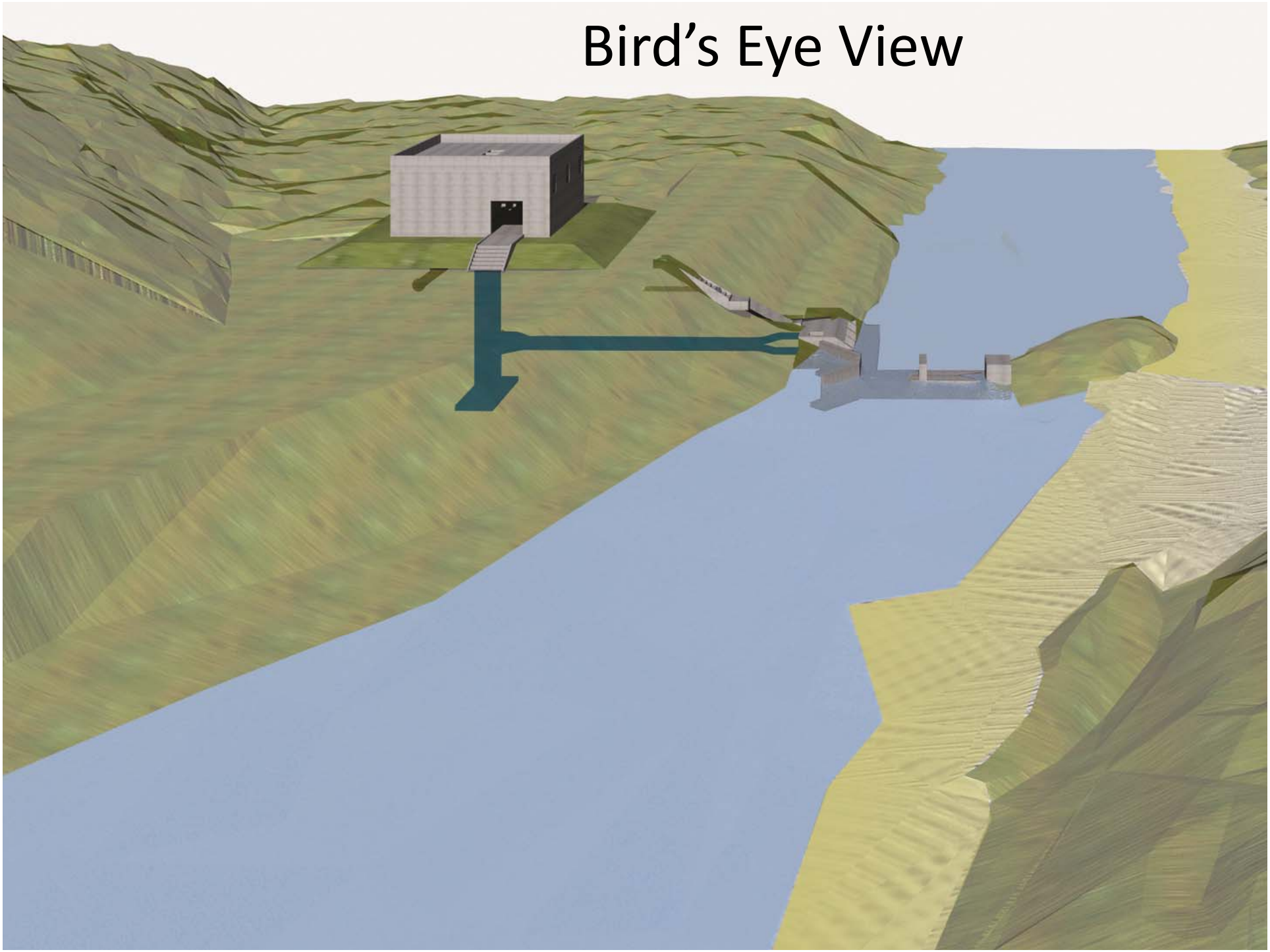
New flow gauge weir for accurate low flow measurement



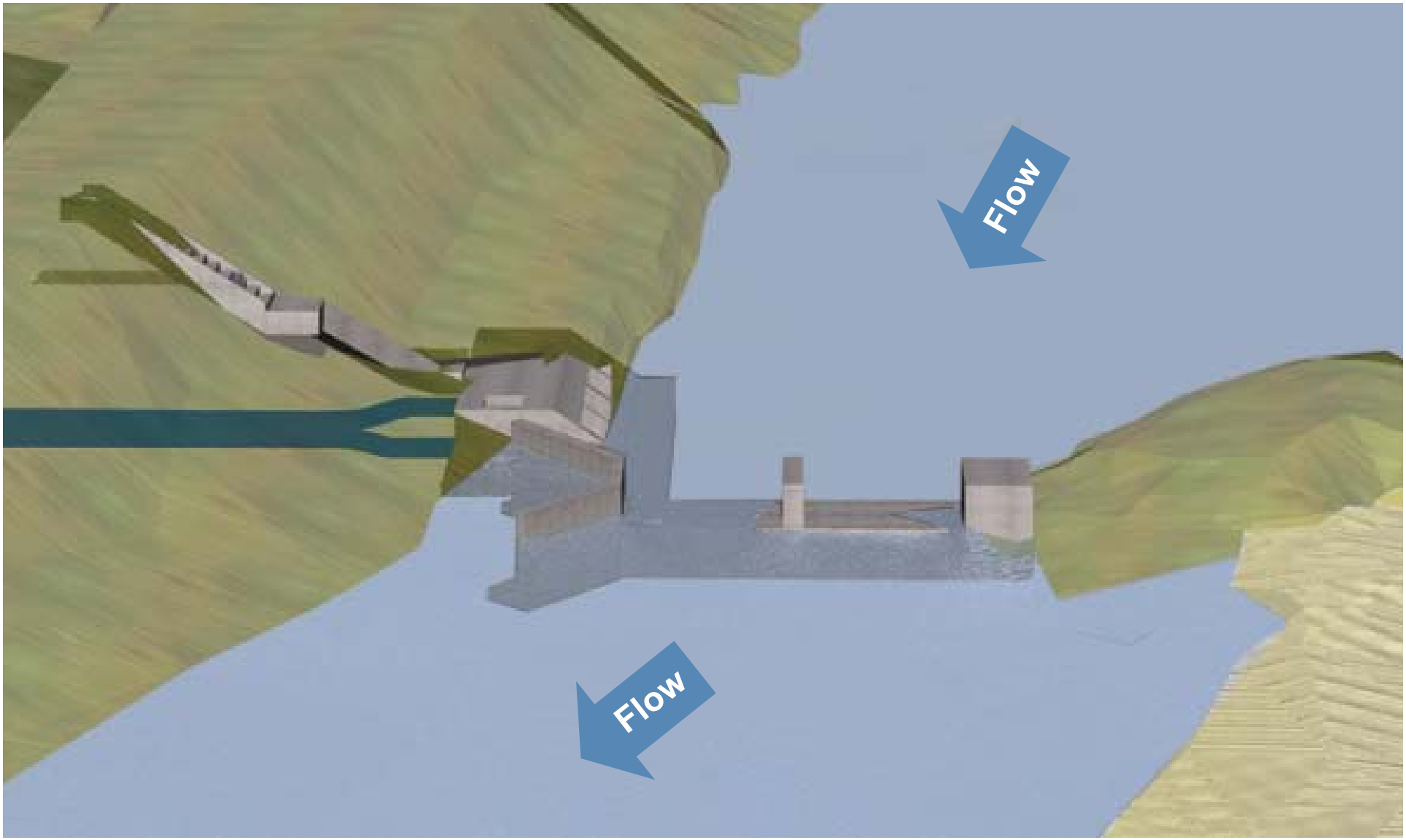
Weir, intake and pump station section



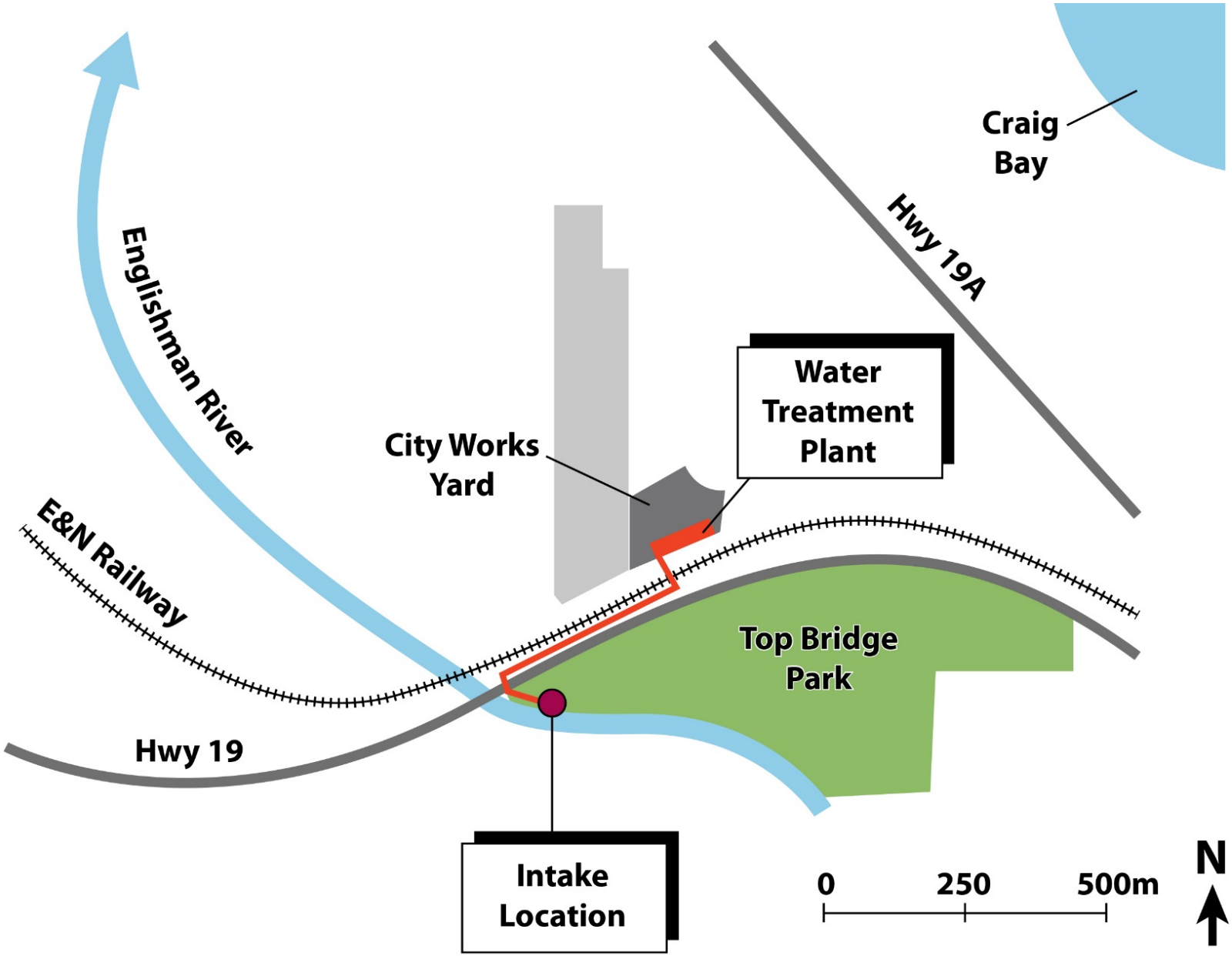
Bird’s Eye View



How it works



New water plant location



ASR.....

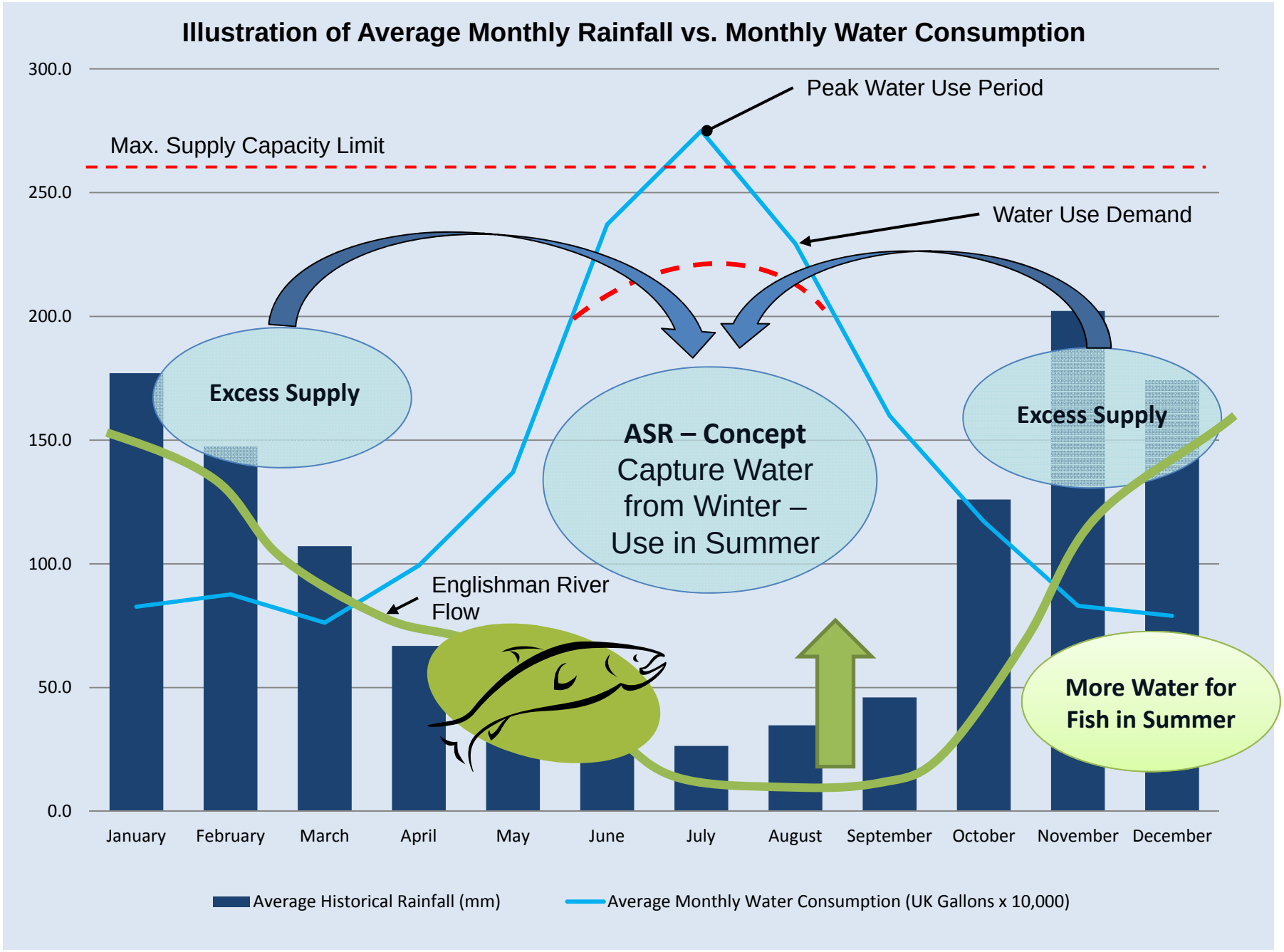
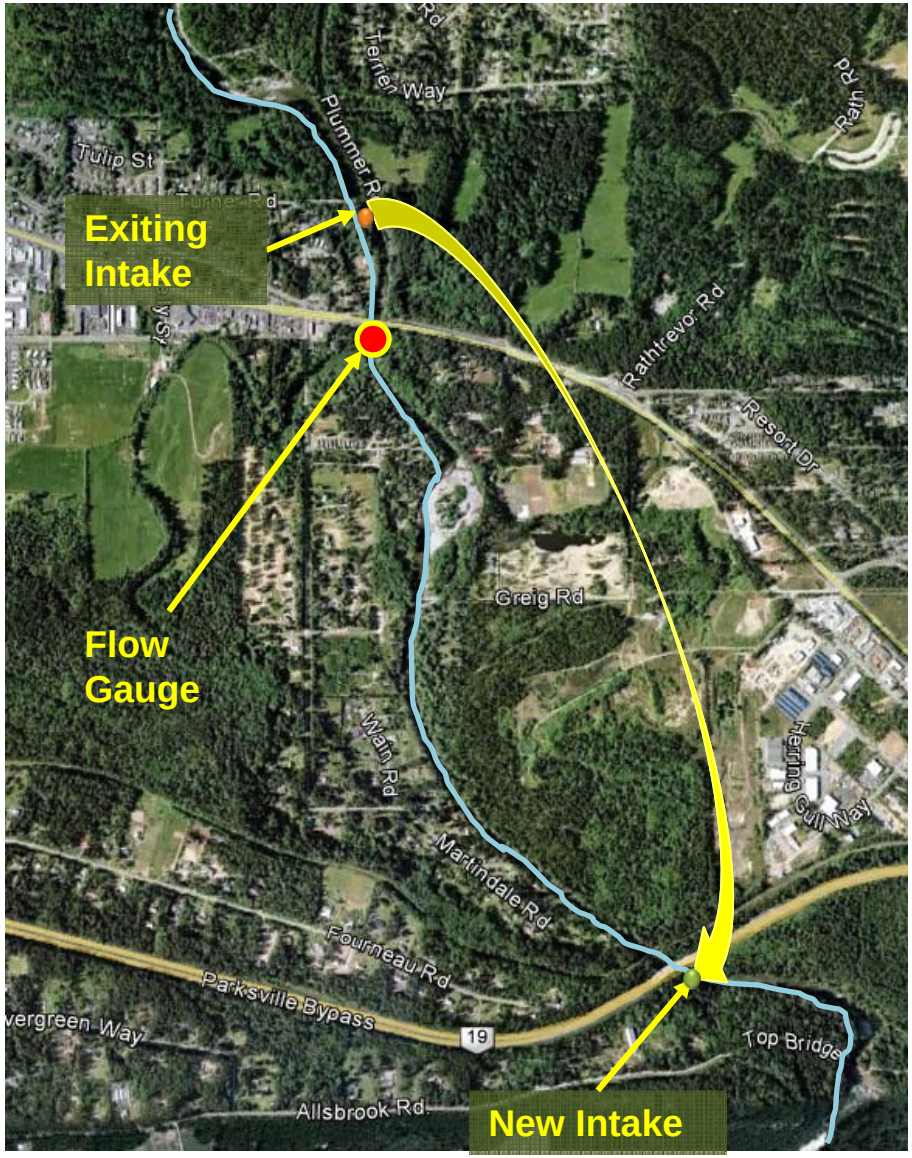


Illustration of Average Monthly Rainfall vs. Monthly Water Consumption
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Peak Water Use Period
Max. Supply Capacity Limit
Water Use Demand
Excess Supply
ASR – Concept
Capture Water from Winter – Use in Summer
Excess Supply
Englishman River Flow
More Water for Fish in Summer
January
February
March
April
May
June
July
August
September
October
November
December
Average Historical Rainfall (mm)
Average Monthly Water Consumption (UK Gallons x 10,000)

Summary..... Provisional Operation Rule



Rule: = 1.6 m^3/s

Value given to us by Province:

is a quantity greater than instream fish flow maintenance plus future maximum monthly water withdrawal.

Instream Fish Flow Maintenance:
= 1.13 m^3/s +

Future max. monthly water withdrawal = 0.34 m^3/s

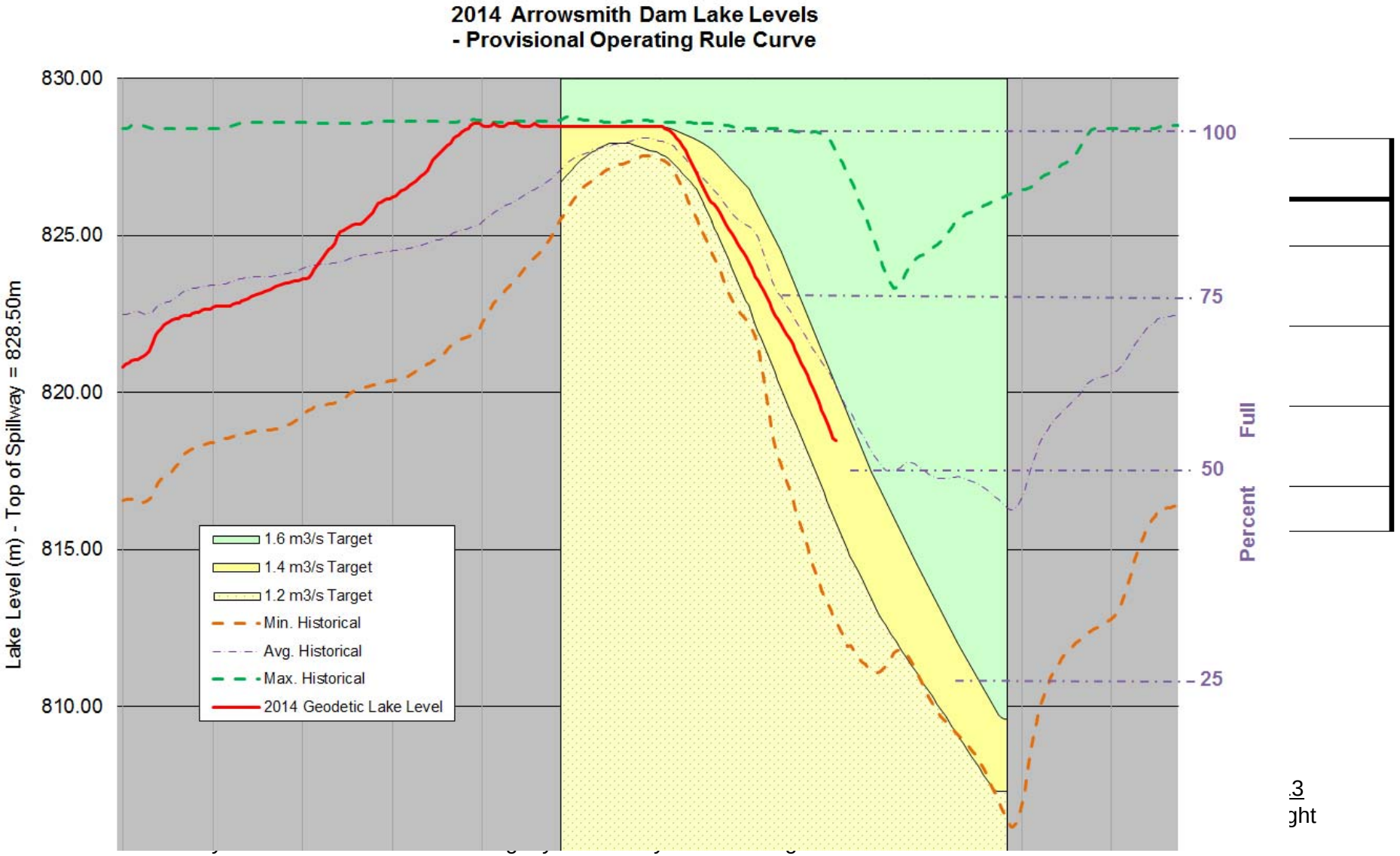
New Provisional Rule:

~ 1.25 m^3/s

Based on Intake being upstream of the flow gauge and within design constraints of the dam (1:15 year drought)

Provisional Operation Rule

As part of the process to modify the Arrowsmith Lake Reservoir Provisional Operation Rule, we formally recommend the following:



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Provisional Operation Rule

- Cancel the Water Licences belonging to the City of Parksville in favour of a revised Operation Rule and Relocation of Works permit. The water licenses are:
  - C022058 – City of Parksville Waterworks = 132,745.8 m^3/year
  - C023297 – City of Parksville Waterworks = 82,966.1 m^3/year
  - C026692 – City of Parksville Waterworks = 663,729.14 m^3/year
- Continue to promote a partnership committee of DFO, MoE and ERWS staff to determine reservoir releases on an annual basis for all conditions.

Final Thoughts……going forward

- Well Water is our cheapest source of supply
- An upstream intake location (upstream of original plan) would provide a gravity feed and would therefore reduce operational costs (i.e. no pumping).

However: in an effort to be good *Stewards of the Watershed:*

- We are aware of our local aquifer levels are declining and the actual yield in the Parksville aquifer is not enough to sustain existing and future populations.
- We have a partnership with Federal and Provincial fishery agencies to improve fish habitat in the Englishman River.

We have already made considerable fisheries enhancements / mitigation works to the Englishman River as part of constructing our new intake:

- Purchased Block 602 Lands
- Construction of the Arrowsmith Dam
- Annual operation and maintenance costs of the GSC flow gauge
- Moving the intake to a lower location
- Reviewing innovative technologies (ASR) to reduce peak water consumption during critical summer months

These efforts need to be recognized if want to go forward with meaningful future mitigation works.

An environmentally sensitive use of water to improve fish habitat and domestic water supply.

THANK YOU……..questions ?

www.englishmanriverwaterservice.ca