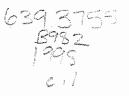
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FISHERIES ASSESSMENT OF

PROPOSED RIP RAP SITES FROM KM 17

TO KM 25 MORICE RIVER 1998

prepared by

DAVID BUSTARD AND ASSOCIATES LTD.

for

BC MINISTRY OF FORESTS

Morice District

May 1998

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APPENDIX 1

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1.0 INTRODUCTION

David Bustard and Associates Ltd. was retained by the Ministry of Forests (Morice District) to undertake fisheries assessment work on the Morice River from Km 17 to Km 25 (Morice Forest Service Road). Slope failures along this section have led to a number of proposed remedial works, including rip rap placement at sites identified by Ministry of Environment, Lands and Parks (MOELP) and the Department of Fisheries and Oceans (DFO) staff as sensitive to fish utilizing the mainstem Morice River.

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The Morice River is a major salmon and steelhead producer of provincial significance. Whately et al. (1978) provide the best background information describing the steelhead fishery in the Morice River. A detailed description of all fish species utilizing the Morice River is presented in Envirocon Ltd. (1984).

1.1 Proposed Rip Rap Sites

Background information describing the proposed slope stabilization works and the history of remedial activities along this section of road are summarized in a report prepared by Geonorth Engineering Ltd. (1997). Based on this report, three main areas of works adjacent to the Morice River were identified:

- Km 25 Riparian vegetation removal and rip rap placement along a 155 m length¹ of bank that would extend upstream from existing rip rap (Photo 1).
- Km 23 Lengthen an existing rip rap placement along this section to protect the base of a 30-m long slide on the Morice River (Photo 2).
- Km 17.5 Complete a rip rap blanket at the toe of a slide along the river at this location².

¹ This length is based on site measurements in March 1998.

² This proposal has been withdrawn based on comments by Geonorth Engineering Ltd. during a field examination of this site on April 24, 1998. Slope movement rates have increased and other measures to stabilize the situation are considered higher priority.

1.2 Fisheries Concerns

A meeting with MOELP and DFO in Smithers³ identified the following concerns related to proposed works along the Morice River:

- The location at Km 25 is considered to be an important adult steelhead overwintering site. Concern for altered hydraulic conditions that might change the suitability of this site for overwintering steelhead due to the placement of rip rap into the river channel was identified.
- The need for information describing the utilization of rip rap by juvenile fish was identified as important in evaluating the overall impacts of rip rap placements along the Morice River mainstem.
- Concern for loss of riparian areas and the impacts of this on aesthetics and recreation use along the Morice River was expressed by fisheries management agencies.
- Concerns that present shoreline irregularities creating fish habitat diversity will be replaced by a straight rip rap facing were identified.
- An overall plan that addresses all of the proposed rip rap placements and shows the existing rip rap locations along this section of the Morice River was requested.

1.3 Study Objectives

- To delineate the extent of adult steelhead overwintering in the Morice River from Km 17 to Km 25, and to evaluate the proposed rip rap projects relative to the specific holding areas.
- To conduct juvenile fish sampling at existing rip rap sites and compare these to results from sampling at sites of proposed rip rap placement.
- To make specific design recommendations for rip rap placements that take into account sizing, placement, and riparian vegetation concerns.

³ Meeting with Andy Witt (MOELP) and Pierre Lemieux (DFO), February 4, 1998.

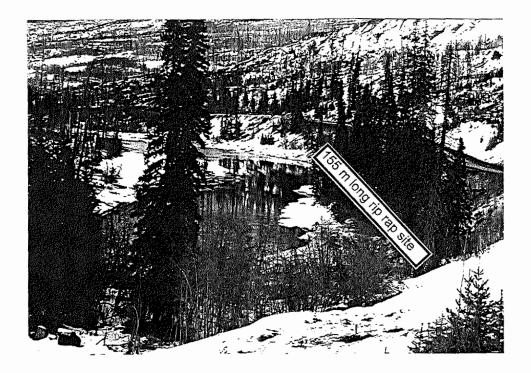


Photo 1. Proposed rip rap site at Km 25 of the Morice River. The conifer riparian zone on the river's right side is located on the section where rip rap is to be placed.



Photo 2. This small rotational failure is located at Km 23 of the Morice River. Rip rap is proposed for approximately 60 m along this section. The adjacent channel is dry during the low flow March period.

METHODS

2.1 Steelhead Overwinter Surveys

Snorkel surveys were conducted from Owen Canyon to Km 17 (Aspen Campground) on March 7 and 17th (Figures 1a and 1b). The first survey was in the 2.5 km section from the canyon to Km 23. The second survey extended from Km 23 to Km 17.

Two swimmers in dry suits conducted the surveys on warm sunny days to ensure good light conditions. Total numbers and locations of all fish observations were recorded on slates and marked on an air photo mosaic.

Specific overwintering areas identified by MOELP staff based on steelhead tagging surveys (Lough 1995) were compared to the snorkel observations. These surveys were part of a population estimate conducted in the winter of 1993/94.

2.2 Juvenile Fish Assessments

The juvenile fish assessments used electrofishing and minnow trapping as sample methods. The electrofishing assessments were conducted at three locations along the edge of existing rip rap (Photo 3) and three locations along the section of proposed rip rap placement (Photo 4). Catch results for these sites were combined for comparisons. All juvenile assessments were conducted in the vicinity of Km 25, as this is the main area of proposed works⁴. The juvenile assessments were conducted between March 25 and April 15, 1998 and were representative of juvenile winter habitat utilization.

Electrofishing was conducted within sites enclosed using rebar and stopnets. Two-pass removal was used at each of the sites. All fish captured were counted, sorted by species, measured to the closest mm fork length, and subsequently returned to the location of capture. Site characteristics including area sampled and habitat descriptions (DFO/MOE Stream Survey Forms) were measured for each of the sites. Two-pass removal estimates for density calculations were derived using methods outlined in Seber and LeCren (1967).

Fifteen baited (roe) minnow traps were placed overnight along slow deep sections of rip rap and along the mainstem channel at the proposed rip rap site at Km 25.

⁴ The immediate shoreline in the vicinity of the proposed rip rap placement at Km 23 was dry during the spring assessments (Photo 2).

3.0 RESULTS

3.1 Adult Surveys

Viewing conditions for the adult surveys in early March were excellent. The entire section was ice-free throughout March. Visibility in the river upstream from Houston Tommy Creek was at least 7 m. Downstream from Houston Tommy Creek, visibility was approximately 2 m on March 17th. Water temperatures were less than 3° C during the surveys. Swimmers could see to the bottom of nearly all pools (the exception was the deep pool at Owen Canyon).

A total of 213 steelhead was observed in this 8 km section of the Morice River (Table 1). Of this total, 58 (27%) were located in the run at Km 25 immediately adjacent to the proposed project area. An additional 10 sites accounted for the balance of the observations in this portion of the Morice River (see Figures 1a and 1b for specific locations).

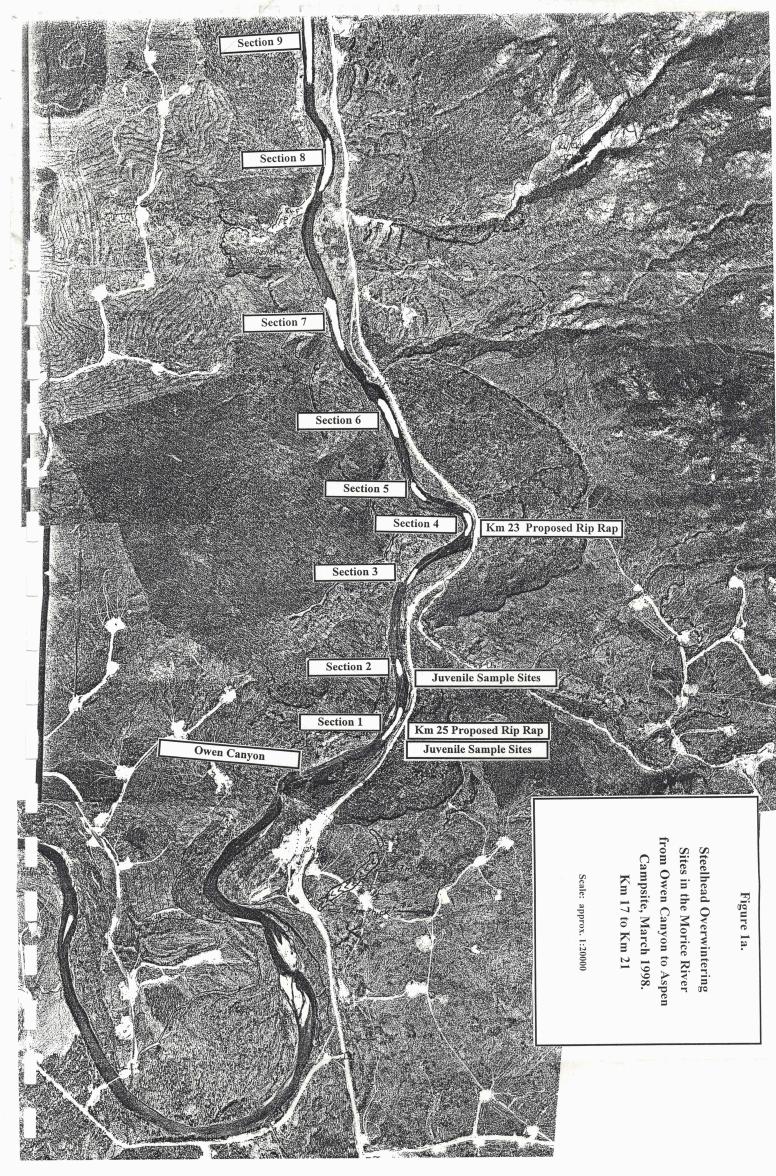
This total does not represent all of the steelhead present in this section of the river. Although two swimmers were effective at covering much of the holding water, we suspect some steelhead moved around the swimmers without being observed.

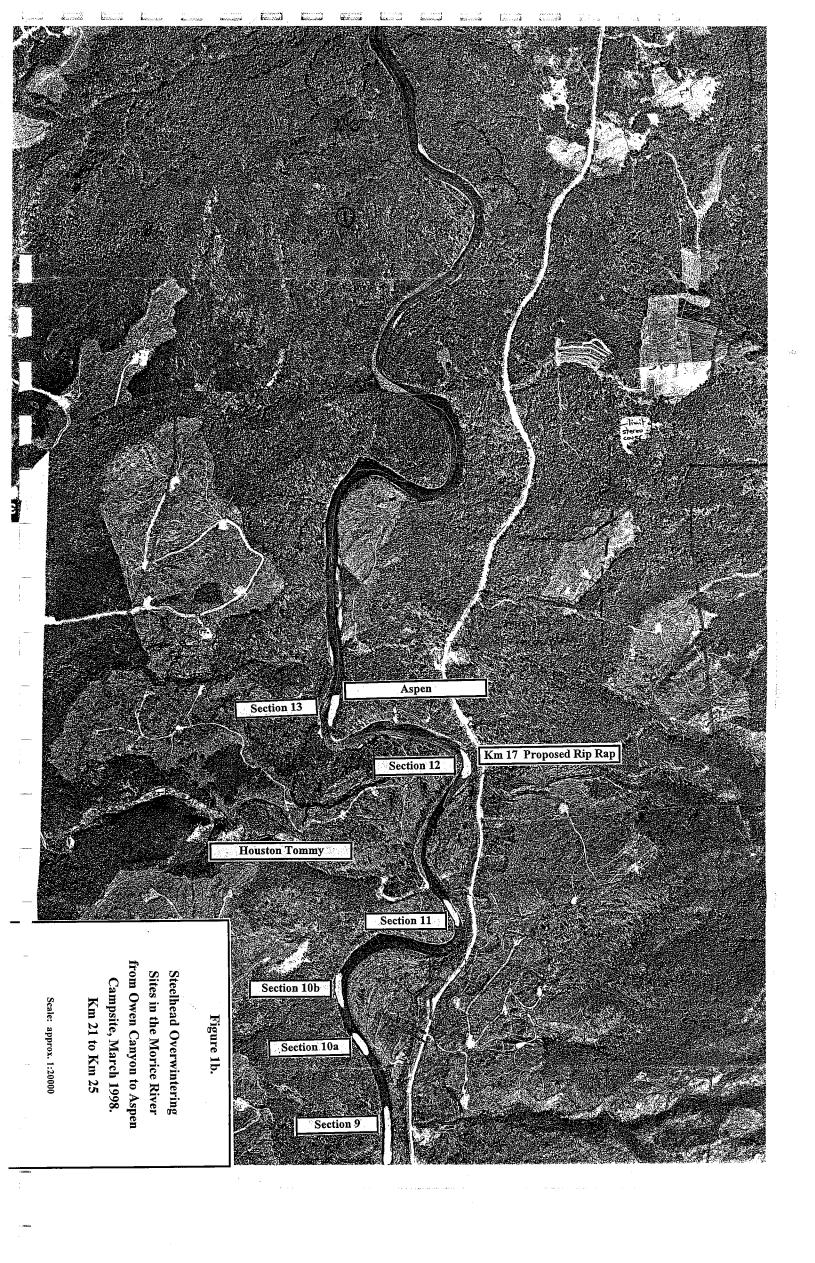
As well, 22 adult bull trout and 21 mountain whitefish were observed in this section of the Morice. Most bull trout were holding in Section 7. These fish were typically holding with groups of steelhead.

Table 2 compares the results of spring (late March 1994) angling surveys to recapture marked fish in this section of the Morice (Lough 1995) to the snorkel observations conducted in 1998. The angling surveys also identified the Km 25 run in Section 1 as an important site, based on the numbers of fish captured at this site (30% of total) compared to the other runs in this 8 km section of the river.

Data provided in the MOELP tagging surveys gives us some perspective on the relative importance of the study section compared to other reaches of the Morice River in terms of overwintering fish. Based on the 1994 studies, just over 500 steelhead were estimated in this section, comprising 18% of the total estimated steelhead population between Aspen Campground and Morice Lake (Table 3). Conditions were unsuitable for recaptures in the river section downstream from Aspen during the 1994 studies, although significant numbers of steelhead were holding in this section in the fall.

It should be noted that the marks were undertaken during the fall, and the recaptures were done in the spring. Some steelhead movements between sections occur during this time period as outlined in Lough (1994). Similar winter movements were recorded for Morice steelhead following radio telemetry studies in 1979 (Envirocon Ltd. 1984).





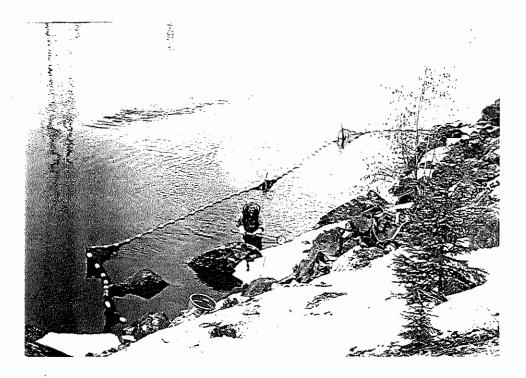


Photo 3. Enclosed electrofishing site along existing rip rap section at Km 25 of the Morice River.

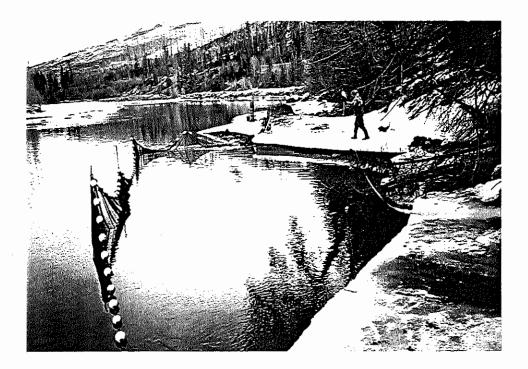


Photo 4. Enclosed margin site along Km 25 section of Morice River proposed for rip rap placement.

SECTION	STEELHEAD	BULL TROUT	OTHER	COMMENT
1 - Km 25	58	0		Proposed rip-rap section.
2 - Km 24.8	9	· 1		Overhanging tree to along island.
3 - Km 23.8	7	1	•	
4 - Km 23.5 corner	5	3		
5 - Km 23	4	0.		
6 - Km 22.7	24	1		Section A
7 - Km 22 to 22.5	38	14		Section B
8 - Km 21	14	0		Section D - rock bluff
9 - Km 20 to 20.7	26	1	1 MW	Top of E
	9	1		Bottom of E
10 - Km 19.8	10		20 MW	Top of F
	1		,	Outer corner
11 - Km 18.8	8	1		Section G
				u/s from Houston Tommy
12 - Km 17 to Km 18.6	0	0		Visibility reduced to 1-2 m
	-			d/s from Houston
				Tommy.
TOTAL	213	22	21	

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Table 1. Snorkel survey results for Morice River from Km 25 (Owen Canyon)downstream to Km 17 (Aspen Campground) during early March 1998.

Section	Number Angled ⁵	%	Snorkel Observations	%
1 - Km 25 - d/s Owen Canyon	21	30.4	58	27.2
2 - Km 24.8	0	0.0	. 9	4.2
3 - Km 23.8	0	0.0	7	3.3
4 - Km 23.5 - corner	1	1.4	5	2.3
5 - Km 23	7	10.1	4	1.9
6 - Km 22.7	0	0.0	24	11.3
7 - Km 22.5 - Flat run	8	11.6	38	17.8
8 - Km 21 - Horseshoe	5	7.2	14	6.6
9 - Km 20 - Garbage Can	10	14.5	35	16.4
10 - Km 19.8	0	0.0	11	5.2
11 - Km 18.8	7	10.1	. 8	3.8
12 - Km 17.5	5 .	7.2	0	0.0
13 - Km 17.0 - Aspen	5	7.2	. 0	0.0
Total	69	100	213	100

Table 2. Comparison of MOELP angling summary (1994) versus snorkel
observations (1998) for Morice River Km 17 to Km 25.

⁵ March 18-22, 1994.

Section	Fall	Spring	Recaptures	Estimate ⁶	%
Morice Lake to bridge	4	61	4	61	2.2
Bridge to Lamprey Ck	81	89	11	614	22.0
Lamprey Ck to Owen Canyon	69	91	3	1609	57.5
Owen Canyon to Aspen	43	69	5	512	18.3
Aspen to Three Mile	58	0	0	na	na
			•.	2796	100

Table 3. Population estimates by section for Morice River steelhead in 1993/94.

The data indicates that the 8 km section of river from Aspen Campground to Owen Canyon provides important overwintering habitat for steelhead adults, and that the specific run located at Km 25 is the most heavily utilized site in this section.

Detailed habitat measurements could not be conducted during the snorkel surveys. However observations indicated a tendency for steelhead to be holding towards the tail end of runs, often in areas 1 to 2 m deep over cobble and boulder bed material. Holding locations were characterized by moderate stream velocities up to approximately 1 m/s. We suspect that the combination of streamflow (velocity and laminar flow), depth and bed material are all important in determining whether or not a site is suitable.

Riparian cover was variable over the range of sites that steelhead were observed in the 8 km section of the Morice, including some sites with rip rap and an immature alder edge.

3.2 Juvenile Surveys

Estimates of juvenile fish based on electrofishing surveys at existing rip rap and proposed sites for rip rap placement are shown in Table 4. The data represents a combination of catch results for three sites at each location. The detailed results for each site are presented in Appendix 1.

⁶ Based on modified Peterson mark-recapture by section.

Table 4. Comparison of juvenile fish abundance and habitat characteristics in rip rap and proposed rip rap sections on the Morice River, March and April 1998.

			N/100 m*m	N/100 m	Mean Run	Surface	Bed Mate	Bed Material (cm)
-				a Niter N	Depth (cm)	Depth (cm) Velocity (cm/s)	D90	D50
	Sthd	+ [^	8.0	24.1				
	Chin	+0	0	0				
Rip Rap	Chin	1+	0.5	1.6	67	45	97	28
	Pink	+0	1.1	3.2				
	Cottid	1+	2.8	8.5				
	Sthd	+]<=	2.1	8.9				
Non	Chin	+0	0.8	3.4				
Rip Rap	Chin	1+	9.6	41.0	62	9	53	20
	Pink	+0	2.1	8.9				
	Cottid	=>1+	2.1	8.9				

The results indicate that steelhead parr were the predominant fish species utilizing the existing rip rap sites at Km 25. Estimates of 24 steelhead parr/100 m of rip rap edge or 8 fish/100m² of habitat sampled were obtained during the surveys. The density estimates indicate that the rip rap sites were providing good habitat for steelhead parr when compared to estimates (typically less than 5 parr/100m²) derived from past sampling in the Morice mainstem (Bustard 1992).

Observation during sampling indicated that the steelhead parr were wintering right in the rip rap and not in the larger river cobbles off the edge of the rip rap placements. These steelhead parr ranged in size from 51 to 143 mm fork length and are assumed to be a mix of age 1+ to age 3+ fish.

Sampling along the edge of the non rip rap sites (predominantly low velocity cobble sites) indicated that chinook juveniles were most abundant, with a small number of steelhead parr and newly-emerged chinook and pink fry also present (Table 4). Chinook estimates were 41 chinook juveniles/100m of stream margin or 10 chinook/100m² of habitat. These densities of chinook juveniles were comparable to a mean of 8 chinook/100m² estimated for all mainstem Morice River sites sampled during a fall program conducted in 1991 (Bustard 1992). These chinook normally leave the Morice River system as smolts within 1-2 months of the April sampling.

The habitat utilized by juvenile chinook at the non rip rap sites was very similar to the undisturbed section of the rip rap site in terms of depth and bed material (Table 4). However, water velocities were nearly ten times higher at the rip rap sites, and we suspect this accounted for the difference in chinook utilization between the two sites. Chinook overwinter in the coarse bed material at sites with low overhead water velocity.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The studies during March and April 1998 confirm that the 8 km section of Morice River from Owen Canyon to the Aspen Campground provides important overwintering habitat for steelhead adults. The specific run located right at the site of proposed bank protection at Km 25 is the most heavily utilized site in this section of river.

A combination of water velocity and flow characteristics, depth and bed material are thought to be important characteristics of steelhead overwintering sites in this section of the Morice. Riparian edge characteristics were highly variable at 10 other holding locations.

Steelhead parr dominated the use the of rip rap edge located just downstream from the study area during the late March and April sampling. Chinook juveniles were present in

the loose cobbles along the outside edge of the Km 25 site proposed to be rip rapped. The proposed rip rap project should not affect this habitat. Replacement of the clay bed material with rip rap along sections within the high-water section should improve potential rearing at higher flow conditions.

Aesthetics and recreation are important considerations on the mainstem Morice River. The Km 25 site is characterized by a short section of mature conifer forest along the edge (Photo 1). Much of the forested edge of the river has been lost in this section of the Morice River. The removal of the riparian edge at Km 25 will result in a decline in the aesthetic/recreation features along this section of river until a well-developed riparian edge can be re-established.

4.2 Recommendations

Km 25 Morice River

Based on the above observations and discussions with agency personnel we recommend that the following be incorporated into the design of rip rap placements at Km 25:

- Rip rap placement at this site should not extend beyond the existing high water mark at this site to ensure that hydraulic conditions are not altered. Precise requirements of overwintering steelhead are not known, but the site is presently receiving very high use. Site design objectives should be to avoid any risk to the flow characteristics at this site from construction of the rip rap berm that would narrow the exisiting channel during high-flow conditions.
- It is acceptable to pull back exposed clay areas within the high water zone when this area is dewatered during the low flow period, and replace with rip rap. Sediment control measures (site enclosure) are needed if this is to be undertaken. The work should be conducted during the lowest flow period in the Morice (February to mid-April).
- The rip rap placement should follow the existing bank configuration at this location to maintain the present flow characteristics.
- While it is recognized that most of the riparian vegetation will be lost during the rip rap placement, efforts should be made to retain whatever is possible while still undertaking construction of an adequate rock placement. The design of the rip rap should incorporate sites that will be suitable for the establishment of riparian vegetation as soon as the construction is complete. This may include special planting structures built into the rip rap berm and replacing soil on the berm to allow the rapid re-growth of trees. Efforts to save some of the smaller vegetation presently at this site to re-establish at the end of the project should be considered in the design.

• The construction contractor undertaking the above works must clearly understand the objectives and special considerations at this site at the time the contract is tendered so any extra costing requirements can be built into the estimate.

Km 23 Morice River

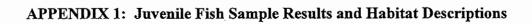
The fisheries protection measures at the proposed rip rap site at Km 23 should be directed at creating juvenile fish habitat to replace edge habitat lost at this location. Given these objectives the following is recommended:

- Do not encroach beyond the high water edge at this location. Material can be pulled back and replaced with rip rap, but do not move out into the channel area with the face of the rip rap berm, as this location probably provides good chinook and steelhead rearing habitat at moderate flow conditions.
- Use large rip rap that creates an edge that mimics the existing irregular margin. Placement of some large rocks scattered out from the berm edge is recommended to break up the water velocities in this section, making the site more suitable for juvenile rearing, particularly during high flow conditions.
- Planting sites should be built into the design of the rip rap berms and vegetation should be re-established at these location at the end of construction. A mix of native conifers and fast-growing deciduous species is recommended.
- Construction at this site should also be timed for the late winter low-flow period. The channel adjacent the construction site was dry during the late winter of 1998.

5.0 LITERATURE CITED

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			R ELECTROFIS	SHING SITE 1998			
SITE:	RR1	REACH:		DATE: Ma	ar 26/98 PI	10TO: A	4/4-6
SITE LO(CATION: F	Rip rap edge - uppermost sit ACCESS:	e, ~100 m below top	of rip rap section.			
		ACCESS:	<u>v</u> 2	EFFORT:	PASS 1	650	
				(sec)	PASS 2	658	-
				(300)	PASS 3		4
MARGIN	= 1 FULL=2			L			
					TEMP (C):	3.0	4
S = SIDE	/ M = MAIN:	M	SLOPE (%):	<1	TIME:	11:40	· ·
					COND.(uS):	30.0	
SAMPLIN	NG COMMENTS:	Site was enclose	d with rebar and sto	pnets.			

POPULATION ESTIMATES:

		FL	FL	MEAN		PASS		EST.	95%	C.I.			BIO-
SPECIES	AGE	RANGE	MEAN	WT (g)	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS (g/m*m)
Sthd	0+												
Sthd	=>1+	88-143	110.8	nm	4	0	na	4.0	4	4	0.052	17.5	
Chinook	0+												
Chinook	=>1+												
Pink	0+	34-37	35.5	nm	1	1	na	2.0	2	na	0.026	8.8	
Cottid	=>1+	68-105	86.3	nm	3	1	na	4.5	4	8	0.059	19.7	
TOTAL		l		لـــــــا				11			0.138	46.1	

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	WET	CHAN		SITE		SITE	DEPTI
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
(m)	(m) [.]	(m)		(%)		TYPE (%)	
0	3.1	nm	LOD		POOL		
5	3.9		COBBLE	100	RIFFLE		
10	3.9		IN VEG		RUN	100	80
15	4.2		OVER VEG		OTHER		
20	. 3.5		CUTBANK		•		
25	3.1		DEEP POOL				
30	1.7				D90	100	
35			TOTAL	95	D50	30	
40					(cm)		
				· ·			
	3.3	nm					
REA	76.2	MARGIN (M)	22.8				

HABITAT COMMENTS:	2 lamprey ammocoetes were observed.
	The pink fry were not yet buttoned up. Sculpins were present in the cobbles.
	SST were present in the rip rap, were dark in color, and inactive.
	Surface velocity: 0.349 m/s.

SITE: RR2	REACH:		DATE: M	ar 26/98 PHOTO	: A4/7, 8
SITE LOCATION:	Rip rap margin site, 15 m d	/s from Site RR1.			
	ACCESS:	V2			
-		-	EFFORT: (sec)	PASS 1 PASS 2 PASS 3	525 512
MARGIN = 1 FULL=2				TEMP (O)	
S = SIDE / M = MAIN:	M	SLOPE (%):	<1	TEMP (C): TIME: COND.(uS):	3.0 12:30 30.0
SAMPLING COMMENT	S: Site was enclos	ed with rebar and stop	onets.		

POPULATION ESTIMATES:

		FL	FL	MEAN		PASS		EST.	95%				B10-
SPECIES	AGE	RANGE	MEAN	WT (g)	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS (g/m*m
Sthd	0+	r		r1									
Sthd	0+ =>1+	77-168	122.0	nm	5	1	na	6.3	6	8	0.101	29.5	
Chinook	0+								_				
Chinook Pink	=>1+ 0+	76	76.0	nm	0	1	па	1.0	1	1	0.016	4.7	
Cottid	=>1+												
				<u> </u>									
TOTAL								7			0.117	34.2	

	WET	CHAN		SITE		SITE	DEPTH
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
<u>(m)</u>	(m)	(m)	·····	(%)		TYPE (%)	
		1					
0	1.1	nm	LOD		POOL		
5	2.7		COBBLE	100	RIFFLE		
10	3.6		IN VEG		RUN	100	51
15	3.7		OVER VEG		OTHER		
20	3.4		CUTBANK			•	
25	3.0		DEEP POOL				
30					D90	70	
35			TOTAL	95	D50	30	
40					(cm)		
	2.9	nm					
REA	61.8	MARGIN (M)	21.2				

Photo A4 # 9: rainbow juvenile. Surface velocity: 0.349 m/s.

.

SITE: RR3	REACH:		DATE: M	lar 26/98 PHOTO	D: A4/9, 10
SITE LOCATION:	Rip rap margin site, 50 m d ACCESS:	/s from Site RR2.			
			EFFORT: (sec)	PASS 1 PASS 2 PASS 3	<u>та</u> па
MARGIN = 1 FULL=2				TEMP (C):	3.0
S = SIDE / M = MAIN:	Μ	SLOPE (%):	<1	TIME: COND.(uS):	15:00 30.0
SAMPLING COMMENT	S: Site was enclos	ed with rebar and stop	pnets.		

POPULATION ESTIMATES:

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		FL	FL	MEAN		PASS		EST.	95%	C.I.			BIO-
SPECIES	AGE	RANGE	MEAN	WT (g)	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS (g/m*m)
Sthd	0+												
Sthd	=>1+	51-113	83.0	nm	2	2	na	4.0	4	nm	0.079	21.4	
Chinook	0+												
Chinook	=>1+												
Pink	0+		L										
Cottid	≈>1 +	107	107.0	nm	1	0	na	1.0	1	1	0.020	5.3	
				<u> </u>									
		L	<u> </u>	<u> </u>				_			0.000		
TOTAL								5			0.099	26.7	

	WET	CHAN		SITE		SITE	DEPTH
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
(m)	(m)	(m)	<u> </u>	(%)		TYPE (%)	
. 0	2.4	nm	LOD	5	POOL		<u> </u>
5	2.8		COBBLE	95	RIFFLE		
10	3.3		IN VEG		RUN	100	71
15	3.0		OVER VEG		OTHER		
20	3.2		CUTBANK			<u> </u>	
25	1.5		DEEP POOL				
30					D90	120	
30 35			TOTAL	95	D50	25	•
40				••••••••••••••••••••••••••••••••••••••	(cm)		
REA	2.7 50.5	nm MARGIN (M)	18.7		·		

HABITAT COMMENTS:

1 lamprey ammocoete was observed.

Surface velocity: 0.566 m/s.

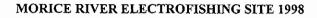
SITE: N1	REACH:		DATE: M	ar 27/98 PHOT	O: A4/11, 12
SITE LOCATION:	Margin site in proposed rip 1	ap section; along fo	rested edge at Km 25.		
	ACCESS:	V2			
			EFFORT:	PASS 1	785
			(sec)	PASS 2	589
				PASS 3	
MARGIN = 1 FULL=2					
	•			TEMP (C):	1.5
S = SIDE / M = MAIN:	M	SLOPE (%):	<1	TIME:	9:00
				COND.(uS):	40.0
SAMPLING COMMENT	S: Site was enclose	d with rebar and sto	pnets.		

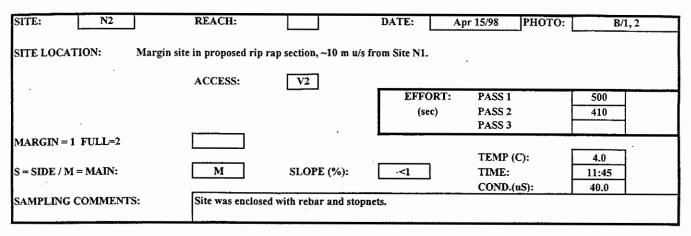
POPULATION ESTIMATES:

		FL	FL	MEAN		PASS		EST.	95%	C.I.			BIO-
SPECIES	AGE	RANGE	MEAN	WT (g)	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS (g/m*m)
Sthd	0+												
Sthd	=>1+	39	39.0	nm	1	0	na	1.0	1	1	0.008	4.6	
Chinook	0+	38	38.0	nm	0	1	na	1.0	1	1	0.008	4.6	
Chinook	=>1+	50-68	61.6	nm	8	1	па	9.1	9	10	0.074	41.7	
Pink	0+	34-36	35.0	nm	1	1	па	2.0	2	nm	0.016	9.1	
Cottid	=>1+	65-128	95.3	nm	3	0	na	3.0	3	3.	0.024	13.7	
TOTAL			L					16			0.131	73.7	

	WET	CHAN		SITE		SITE	DEPTH
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
(m)	(m)	(m)	10	(%)		TYPE (%)	
0	4.8	nm	LOD	5	POOL		
5	6.5		COBBLE	95	RIFFLE		
10	7.0		IN VEG		RUN	100	64
15	5.7		OVER VEG		OTHER		
20	4.2		CUTBANK			the second se	
25			DEEP POOL				
30					D90	45	
35			TOTAL	70	D50	25	
40					(cm)	L	
	5.6	13m					
AREA	123.5	MARGIN (M)	21.9				
ABITAT C	COMMENTS:	Cl	inook fry was not yet buttoned up.				

HABITAT COMMENTS:	Chinook fry was not yet buttoned up.
:	Sampled a slow cobble/silt bay area.
	No fish were caught in sandy areas; chinook were caught in the cobbles.
	Surface velocity: 0.06 m/s.





POPULATION ESTIMATES:

		FL	FL	MEAN		PASS		EST.	95%	- C.I.			BIO-
SPECIES	AGE	RANGE	MEAN	WT	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS
				(g)									(g/m*m)
Sthd	0+			1									
Sthd	v+ => i +	85-102	90.8	nm	4	1	na	5.3	5	7	0.072	27.8	
Chinook	0+	38	38.0	BM	1	0	na	1.0	1	1	0.014	5.2	
Chinook	=>1+ ·	57-78	69.7	nm	9	1	na	10.1	10	11	0.137	52.7	
Pink	0+	35	35.0	nm	1	0	na	1.0	1	1	0.014	5.2	
Cottid '	≈>]+	86, 88	87.0	nm '	1	1	na	2.0	2	nm	0.027	10.4	
									•				
TOTAL		L		1				19			0.264	101.3	
IUIAL								19			0.264	101.3	

	WET	CHAN		SITE	· · · ·	SITE	DEPTH
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
(m)	(m)	(m)		(%)			
				· · · ·		r	
.0	3.0	nm	LOD		POOL		
5	4.8		COBBLE	95	RIFFLE		
10	4.4		IN VEG		RUN	100	66
15	3.2		OVER VEG		OTHER		-
20	3.8		CUTBANK				
25			DEEP POOL	5			
30					D90	50	
35			TOTAL	90	D50	nm	
40					(cm)		
					()		
	3.8						
AREA	73.7	MARGIN (M)	19.2				

HABITAT COMMENTS:	Several lamprey ammocoetes were observed.
	Sampled a very slow cobble/boulder section; shore drops off quickly so
	outside edge of site was quite deep.
	Surface velocity: ~0.055 m/s.

SITE: N3	REACH:		DATE: A	pr 15/98	рното:	B/3, 4
SITE LOCATION:	Margin site in proposed rip	rap section, ~30 m u/	s from Site N2.			
	ACCESS:	V2	EFFORT: (sec)	PASS 1 PASS 2	64	
MARGIN = 1 FULL=2				PASS 3		
S = SIDE / M = MAIN:	M	SLOPE (%):	<1	TEMP (C) TIME: COND.(uS	13:	:50
SAMPLING COMMENTS	S: Site was enclose	ed with rebar and stop	pnets.	00	2:	

POPULATION ESTIMATES:

		FL	FL	MEAN		PASS		EST.	95%	C.I.			B10-
SPECIES	AGE	" RANGE	MEAN	WT	1	2	3	NUMB	LCI	UCI	N/M*M	N/100M	MASS
				(g)									(g/m*m
Sthd	0+			<u> </u>									
Sthd	=>1+												
Chinook	0+												
Chinook	=>1+	42-60	60.0	nm	3	1	na	4.5	4	8	0.079	24.2	
Pink	0+	31-32	31.5	nm	2	0	na	2.0	2	2	0.035	10.8	
Cottid	=>1+												
											•		
FOTAL								7			0.113	34,9	

	WET	CHAN		SITE		SITE	DEPTH
DIST	WIDTH	WIDTH		COVER		WATER	(cm)
(m)	(m)	(m)		(%)	<u> </u>	TYPE (%)	
0	2.6		LOD		DOOL		
5		nm			POOL		
	3.4		COBBLE	100	RIFFLE		
10	4.2		IN VEG		RUN	100	57
15	3.3		OVER VEG		OTHER		
20	1.9		CUTBANK				
25			DEEP POOL				
30				·	D90	65	
35			TOTAL	70	D50	15	
40					(cm)	L	
	3.1	nm					
REA	57.3	MARGIN (M)	18.6				

COMMENTS.	Several lampley animococies were observed.	
	Fewer fish were caught at this site; may be due to a combination of	
	shallower water and smaller bed material.	
	Surface velocity: ~0.055 m/s.	

Stree	am Name	- (ga	z) N	1or	ice R	liver - 1	rip rap s	ection				(local)	Morice Ri	ver						_ <u> </u> ^	ccess		Road	Met	hod
Nate	arshed Co	de	460-	600	600													ReachNo.		L.	ngth(kr	n)			
002	tion ;	Rip rap	edge	- u	pper	most s	ite, appr	ox. 100	m belo	ow top of	ſ		Map #					SiteNo.	RRI	Ц	thSurv	m)	22.8		T
		rip rap	secti) n.									U.T.M.					FishCard	Y			🎆 F	ield 🗶	Hi	ist. [
Jate	Y.M.D	. 9	8	0	3	2 6	Time	114	D	Agency	C87	Crew	DB/RI) Ph	otos	A4/4	-6	AirPhotos							
C		PA	RAM	ETI	ER		V/	LUE		METH				SPEC	IFIC	DATA						0	BSTRU	CTION	NS
1	Ave. Cha	n. Widt	h (m)				n/a		1	<u> </u>) Type	
	Ave. Wet	Width	(m)					3.3			3.1, 3	1.9, 3.9, 4	.2, 3.5, 3.1,	1.7 (m	argin	site wi	đth)						25. 5 5 5	1	T
1. P.	Ave.Max.	Riffle C	epth	(cr	m)		1	n/a		1													<u> </u>		Т
	Ave.Max.	Run De	pth	cm	1)			80			90, 8	0, 60, 75,	, 80									The second se		1	Т
	Gradient	%					<u> </u>	<1			C	BEC	D MATERI	AL		%	G	BAN	KS			損		1	T
	% Pool		Riffie		Т	Run	100	Other				Fines	clay,sit,sand	(<2mm))			Height(m)	20 %	Unsta	able	0		1	T
and the	Side Chan	.%	İΤ	1		0-10[] 10-4	0 >	40			Gravels	small (2-16n	nm)			ile and a second	Texture	FG	L	R			1	Т
設計		Area%	\square	1	X	0-5	5-1	5[] >	15	<u> </u>			large (16-64	mm)			嬔	Confinemen	ıt	Ē	EN C	xo (F	c) oc	UC	N/J
縧	Debris	Stable	%				Ţ÷	n/a	• .				sm. cobbie (54-128m	m)			Valley:Chan	nel Ratio		\odot	2-5	5-10	10+	N/A
黀	COVER	R: Total	%					95				Larges	ige, cobble (128-256n	(TTST)	70	纖	Stage	9	Tĩ	Dry	\bigcirc	MH	Fic	000
P X	Comp.	Dp.Pool	1.0.0	5.	Bo	ulder	InVeg	Over	/eg	Cutbank			boulder(>258	imm) rip	/rap	30	101	Flood Signs	Ht(m)		2.5	Braided		4	N
	sum 100%			┓	1	100		 				Bedrock						Bars (%)	<5		рН		02(ppm)	
	Crown Clo	sure %	T		0	ł	C	Aspe	:t			D90(cm)	100	Compa	ction	Д ин		WaterTemp	(C) 3	.0 T	Furb(c	m)	cl Con	d(25C)	1
1								DISC	HARG	E		/50	30			T			R	EAG	CHS	YMB	OL.		
	Paran	neter		Т	Va	lue	Met	nod			Spec	cific Data	a				1				(Fin	h)			
	Wetted Width (m)									loating o	hip m	ethod:					1								
Sec.	Mean De	oth (m)		1			1		1) 26 s	ec.							1				Τ				.
	Mean Vel	ocity (m	ı∕s)	1	0	.349	1	F	2) 39 :	iec.							1								
12	Discharge	(m3/s)	 	-1			1		3) 21 :	ec.			average =	20.67			(Mid	th:Valley/Chan	nel,Slope)		•			BedN	Materi

	an a		FISH SUMM	ARY -	1		STREAM/VALLEY CROSS-SECTION		
C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref	L (Looking Downstream)		R
	Pass 1 - F	FFO	RT: 650 sec.				PLANIMETRIC VIEW		
が	PL	1	рт	ammoc.	R	EF			
	SST	4	88-143	J	R	EF			
180	PK		34	F	R	EF			
al an	CAS	2	68, 86	J	R	EF			
國際	CCG	1	105	J	R	EF	-		
	Pass 2 - E	FFO	RT: 658 sec.		_				
	CC	1	nm	́ J	R	EF			
AN.	PL	1	. mm	ammoc.	<u> </u>	EF			
	PK	1	37	F	R	EF			
							COMMENTS		
	Channel	Stal	bility 🛄 D	ebris 🗌		Managemen	t Concerns 🕱 Obstructions 🗌 Riparian Zone 📓 Valley Wall Proces	ses 🗌	Etc.
	The pink	salm	ion fry were ju	st out of t	ne gi	ravel and were	not yet buttoned up.		
			at edge of rip						
	Rip rap i	s wet	ted but much o	of the site	is un	idisturbed col	bles with silt/algal cover.		
20.27	Sculpins	wеге	present in the	cobbles.					
					ere	dark in color	and appeared to be very inactive.		
	Site was	nclo	sed with rebar	and nets.					
14 8 (9): 8 (5): 92									
	<u> </u>						· · · · · · · · · · · · · · · · · · ·		
	<u> </u>							r	<u> </u>
新建	<u> </u>								CP
								Date Y M D	98/04/21

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Stre	am Name	(ga	z) M	orice	River	rip r	ap se	ection				(iocai)	Morice R	iver						Acce	\$ \$	Ro	ad	Meth	od
Wat	ershed Co	de	460-6	00600)													ReachNo,		Lngth((km)				
Lốci	ation :	Rip rap	margi	ìn site	e, 15 m	d/s fre	om S	ite RR	1.				Map #					SiteNo.	RR2	LthSu		21	.2		T
													U.T.M.					FishCard	Υ	N)	C	Field	X	His	st. 🗌
Date	Y.M.D	9	8 0	3	2 6	Tim) D	1230)	Agency	C87	Crew	DB/RI	Photo	s	A4⁄7,	8	AirPhotos							
C		PA	RAME	TER			VA	LUE		METH				SPECIF	IC D	ATA						OBS1	RUC	TION	s
	Ave, Cha	n. Wldtl	1 (m)					n/a														C	Ht(m)	Туре	Loc'n
	Ave. Wet	Width	(m)					2.9			1.1, 2	2.7, 3.6, 3	3.7, 3.4, 3.0	(margin s	ite w	idth)						的现在			
	Ave.Max.	Riffle D	epth (cm)		_		n/a										· · ·							
	Ave.Max.	Run De	pth (c	m)				51			60, 5	5, 55, 50	, 35												
	Gradlent	%						<1			C	BE	D MATERI	AL		%	C	BAN	KS						
	% Pool		Riffie		Run	10	00	Other				Fines	clay,sill,sand	l (<2mm)				Height(m)	20 %Un	stable	0	地方公			·
	Side Chan	.%		0	0-10	1	0-40) ~	40			Gravels	smail (2-16r	nm)				Texture	FG	LR)		~		
		Алеа%		0	0-5		5 -15	5 >	15				large (16-64	mm)				Confinement	t	EN	\odot	FC	oc i	UC	N/A
	Debris	Stable	6					n/a					sm. cobbie (64-128mm)		5		Valley;Chan	nel Ratio	2	2-5	5-1	0 10	+ 1	I/A
	COVE	र: Total	%					95			tines.	Larges	ige. cobble (128-256mm)		20		Stage)	Dry	C	М	н	Flo	od
	Comp.	Dp.Pool	L.O.D.	В	oulder	înVe	eg	OverV	eg	Culbank	die 1		boulder(>256	3mm) rip/rap		75		Flood Signs	Ht(m)	2.5	Braid	ed	Y		\odot
	sum 100%				100							Bedrock						Bars (%)	<5	pН			O ₂ (pp	m)	-
	Crown Clos	sure %			0	C	al Antos	Aspec	t		197,000	D90(cm)	70 C	Compaction		мн	影	WaterTemp	(C) 3.0	Turb	(crin)	cl	Cond(2	25C)	30
								DISCH	ARG	E		/50	30						RE	ACH		BOL			
	Paran	Parameter Value Method									Spe	cific Dat	a							0	Fish)				1
	Wetted W						10 m f	loating o	hip n	ethod:									_		_		_		
	Mean Dep	oth (m)							1) 22 s	ec.				-											
	Mean Vel	ocity (m	/s)		0.349		F		2) 17 s	iec.											Ľ				
	Discharge	e (m3/s)							3) 23 s	iec.			average =	20.67			(Wid	th:Valley/Chann	el,Siope)					BedMa	lenet

			FISH SUMM	ARY			STREAM/VALLEY CROSS-SECTION
C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref	L (Looking Downstream)
	Pass 1 - F	FFO	RT: 525 sec.	1	ģ¢.		PLANIMETRIC VIEW
	PL.	3	nm	ammoc.	R	EF	
	SST	5	77-168	J	R	EF	
10							
	Pass 2 - F	FFO	RT: 512 sec.				
	SST	1	100	J	R	EF	
	СН	1	76	J	R	EF	
						l	
影							COMMENTS
	Channel	Stat	oility 🗍 C)ebris 🗌		Managemer	ent Concerns 📄 Obstructions 🗌 Riparian Zone 🗌 Valley Wall Processes 📄 Et
TT CARLON			rainbow juve				·
	Site veloc	ity w	as slightly fast	er and dep	pth w	as shallower	r than Site RR1.
经							
	-						an and an an an and an an an and an
際に通							
際協調	4			-			Estred by: CP Date Y M D 98/0

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Strea	am Name		(gaz	:) N	101	rice]	Rive	er – r	ip rap s	ection				(locai)	Morice Ri	ver							Acce	ss	Ro	bad	Metho	bc
Wate	ershed Co	de		460-	600)600															ReachNo.		Lingth	(km)				
Loca	tion	Rip	rap	mar	gin	site	, ~51	Ошо	l/s from	Site R	R2.				Map #						SiteNo.	RR3	LthSu	rv(m)	18	3.7	1	Г
															U.T.M.						FishCard	Y	\mathbb{N}	C	Field	d X	His	t 🗌
Date	Y.M.D		9	8	0	3	2	6	Time	150	0	Agency	C87	Crew	DB/RI		Photos	A	4/9, 1	0	AirPhotos							
C-			PAF	MAS	EΤ	ËR			V/	LUE		METH				SPE	CIFIC	DA	TA						08\$	TRUC	TION	ŝ
	Ave. Cha	n. W	Adth) (m))					n/a															C	Hit(m)	Туре	Loc'n
98.	Ave: Wet	. WI	dth ((m)						2.7			2.4, 2	2.8, 3.3, 3	3.0, 3.2, 1.5	(mar	gin sit	e wie	lth)									
	Ave.Max.	Riff	le De	epth	(c	m)				n/a				•														
	Ave.Max.	Rur	De	oth (сп	n)				71			75, 8	5, 75, 80	, 60, 50							•						
	Gradient	%			-					<1			C	BE	D MATERI	AL		9	6	C	BAN	KS			编辑			
	% Pool			Riffie			F	ดมร	100	Other				Fines	clay,silt,sand	l (<2m	m)			龖	Height(m)	20 %	instable	0				
뾇	Side Char	de Chan.% 0 🕱 0-10 🗌 10-40												Gravels	small (2-16r	nm)				驟	Texture	FG	LR)				
2		Area% 0 X 0-5 5-15													large (16-64	ເດເລາ)				總	Confinement	ŧ	EN	60	FC	oc	υç	N/A
	Debris	Sta	ble%							n/a		T			sm, cobbie (64-128	nuu)	Γ		1000	Valley:Chan	nel Ratio	62	2-9	5 5-1	0 1	0+ N	/A
	COVE	R: T	otal	/•						95			The second	Larges	ige, cobble (128-25	6mm)		20		Stage)	Dry	() M	н	Flo	DO
197.	Comp.	Dp.F	,00I	L.O.C		Bo	oulde	er	tnVeg	Over	Veg	Cutbank			bouider(>25	ງແໜ່) ເ	ip/rap		80	W	Flood Signs	Htt(m)	2.5	Brai	ded	Υ		D ·
	sum 100%			5	Т		95							Bedrock							Bars (%)	<	pН	Γ		0 ₂ (p	pm)	
	Crown Clo	sure	%	T		(0		C	Aspec	:t			D90(cm)	120 C	Com	paction	Ø	н	18. 19. 19.	WaterTemp	(C) 3	0 Turt	(cm)	ci	Cond	(25C)	30
										DISC	HARG	E		/50	25							R	EACH	SYN	BOL			
蘂	Parar	nete	r			Va	alue		Met	nod			Spe	cific Dat	a									Fish)				
	Wetted V	lidth	(m)								10 m	floating c	hip n	ethod:	•													
	Mean De	pth ((m)		Τ				-		1) 19	sec.												Γ				-
	Mean Velocity (m/s) 0.566 F									F	2) 18	sec.																
	Discharge (m3/s)										3) 16	sec.			average =	17.6	7			(Wid	h:Valley/Chann	wi.Siope}		-			BedMa	terial
_							_	_																				
274 794		· ·	<u> </u>								-				ST	REA			CR wnstr		S-SECTIO	NC]				
	Species	No.		Rang	-	<u></u>		hase	Use Me	thod/Ref	Ц	L					•			can	/				-		R	
	Pass 1 - E	FFO	RT:	not	me	2501	ređ				· •	_			PL	ANIN	IETRI	C VI	EW				Ľ.,]				

	Pass 1 - E	FFO	RT: not measu	red .	14 g	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -			PLANI	METRIC VIEW				
휋	CAS	1	107	J	R	EF								
3	SST	2	51-113	J	R	EF								
144														
and the				_										
龖														·
and the second second	Pass 2 - E	FFO	RT: not measu	red										
	SST	2	83, 85 -	J	R	EF								
虦	PL	1	. DM	акатос.	R	EF								
雑														
								cc	OMMENTS					
꽱	Channel	Stat	oility 🗌 De	ebris 🗌		Managemen	t Concerns		Obstructions	Riparian Zone	Valley Wall Process	ses 🗌	Etc.	
	Water vel	ocity	is faster in thi	s site thar	the	other two rip	rap sites.						,	
	15 traps w	ere	set overnight al	long deep	, slov	w margin area	s of the exis	ting rip r	rap section; 2 SST w	ith fork lengths of 92	mm and 109 mm			
	were caug	ht.	Velocíties were	very low	in th	ese sections:		10 m flo	ating chip method:					
								1) 114 se	±C.					
※ ※								2) 109 se	ec.					
纏								3) 122 se	ec. average = 115	sec.				
								surface	velocity = 0.087 m/s	-				
るない。														
×												Edited by:	СР	
												Date Y M D	98/04/.	21

Str	eam Name	7	(gaa	z)	Mo	rice)	River - 1	atural	site				(local)	Morice R	iver - nati	ıral	site					Acce	ss	R	oad	Meth	od
Wa	tershed Co	de	<u> </u>			0600													ReachNo.		_	Lngth					
LOO	ation	Ma	rgin	site	in	prop	sed rip	rap se	tion;	along f	orested			Map #					SiteNo.	N		LthSu		2	1.9		г
		edg	e at]	Km	25.	_	· .							U.T.M:					FishCard	Y	6	5	CHES		dX	His	
Dat	Y.M.D		9	8	0	3	2 7	Time	9	00	Agency	C87	Crew	RD/C	P Photo	s .	A4/11,	12	AirPhotos								
C			PA	RAI	MEI	TER		V	ALUE		MET	-			SPECIF	ЮĽ	DATA							OBS	TRUC	TION	S
1.14	Ave. Cha	n. V	Vidtl	n (n	n)				n/a		1										_				Htt(m)		_
100	Ave. Wet	W	dth	(m)	1				5,6			4.8,	6.5, 7.0,	5.7, 4.2 (ma	rgin site v	vidt	h)										_
	Ave.Max.	Riff	le D	ept	h (c	:m)			n/a														_				
	Ave.Max.	Rur	ı De	pth	(сп	n)			64		1	42,	67, 84, 6	2			·										
WAR AN	Gradient	idient %										C	BE	D MATER	AL		%	C	BAN	KŞ							
	% Pool	Riffie Run 100 o										12.4	Fines	clay,silt,sand	(<2mm)	T	15		Height(m)	10	%Uns	stable	100	42.0			
	Side Chan	.%				٥Х	0-10] 10-4	0	>40			Gravela	smali (2-16;	тлт)	Τ		100	Texture	F	GI	LR		- (a.)			
22		Area	1%			0	0-5	5-	5	>15				large (16-64	ະກາກ)	+	5	No.	Confinemen	1		EN (60	FC	oc	υc	N/A
2000	Debris	Sta	ible%	,					0		1		1	sm. cobble (64~128mm)	T	5	N	Valley:Chan	nel Rat	io	6.3	2-5	5-1	0 10)+ N	/A
	COVER	₹: T	otal	6					70				Larges	ige. cobble (128-256mm)		35		Stage	•		Dry	C	Л	н	Flor	bd
液	Comp.	Dp.F	Pool	L.O.	D.	Во	ulder	InVeg	04	erVeg	Cutban	k sin		bouider(>25	ômm) rìp/rap	, [40		Flood Signs	Ht(m)		2.5	Braide	d	Y	(A
15	sum 100%			5			95						Bedroci						Bars (%)	10		рН			O ₂ (P	pm)	
and the second	Crown Clos	sure	%			<	5	C.	Aspe	ect		and the second	D90(cm)	45	Compaction	1 2	æ		WaterTemp	(C)	1.5	Turb((cm)	cl	Cond	25C)	40
		Exercite Analysis								HARG	Е.		/50	25							RE/	CH	SYM	BOL			
S E	Paran	arameter Value Met							nod			Spe	cific Da	ta								(F	Fish)				
	Wetted W	d Width (m)								10 m	floating	chip r	nethod:		-			1									
	Mean Dep	an Depth (m)									ge == 15) sec.										T					
	Mean Vel	n Velocity (m/s) 0.06 F																						•			
and the	Discharge	(m	3/s)							Surfa	ce wate	r veloc	ity near	zero.				(Mid	h:Velley/Chann	el,Slope)						BedMat	erial

÷			FISH SUMMA	ARY				STREAM/VALLEY CROSS-SECTION	
C.	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref	L	(Looking Downstream)	· R
	Pass 1 - E	FFO	RT: 785 sec.			and a strength of the		PLANIMETRIC VIEW	
- 23	CCG	3	65-128	J	R	EF		· · · ·	
	SST	1	39	F	R	EF			
	СН	8	50-68	J	R	EF			
Contraction of the second	PK	1	34	F	R	EF			
					L				
認能	Pass 2 - E	FFO	RT: 589 sec.					v	
	PK	1	36	F	R	EF			
Sec.	СН	1	38	F	R	EF		·	
	СН	1	61	J	R	EF			
212								COMMENTS	
32	Channel	Stat	ollity 🗌 D	ebris 🗌		Managemen	t Concern	s 📋 Obstructions 📋 Riparian Zone 📋 Valley Wall Process	es 🗌 Etc.
17			w cobble/silt ba	·····					
and the second	No fish w	ere c	aught in the sa	ndy areas	; all	chinook were	caught in	the cobble sections of the site; see photo A4/14 looking u/s.	
	The chino	ok fi	ry caught was j	ust out of	the	gravel - it was	not yet bu	attoned up.	
	15 traps w	ere	set overnight a	long slow,	cob	ble natural m	argin area	s of the proposed rip rap section; 2 slimy cottid sculpins with fork	
	lengths of	103	mm and 111 m	nm were c	aug	ht. Velocities	were very	low in these sections: 10 m floating chip method:	
1.50								1) 235 sec.	
A CONTRACTOR								2) 210 sec.	
						·		3) 102 sec. average = 182 s	iec.
								surface velocity = 0.055 m/s	
1								E	dited by: CP
								D	ate Y M D 98/04/21

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DFO / MOE STREAM SURVEY FORM

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										STR	EAM	SURV	EY FORM	n											
Strea	am Name	(ga	z)]	Mo	rice Ri	ver - n	atural s	site				(local)	Moric e Ri	ver - natu	ral sit	e				Acce	ess	Ro	ad	Metho	bd
Wate	orshed Co	de	460	-60	0600													ReachNo.		Lngth	u(km)				
Loca	tion 🔬	Margin	site	ìn, j	propos	ed rip	гар зес	tion, ~1	0 m u/s	s from			Map #					SiteNo.	N2	LthSi	JIV(M)	19	9.2	7	
		Site N1											U.T.M.					FishCard	Y (N)		Field	1X	Hist	L 🗌
Date	Y.M.D	-: 9	8	0	4 1	5	Time	114	5	Agency	C87	Crew	RD/CI	P Photos	1	3/1, 2		AirPhotos							
G		· PA	RAN	/ET	ΓER		V	ALUE		METH				SPECIFI	C DA	TA						OBS	TRUC	TIONS	5
	Áve. Cha	n. Widt	h (m	1)				n/a														C	Ht(m)	Туре	Loc'n
8	Ave. Wet	. Width	(m)					3.8			3.0, 4	.8, 4.4, 3	.2, 3.8 (ma	rgin site w	idth)										
讔	Ave.Max.	Riffle I)eptl	h (c	:m)			n/a																	
	Ave.Max.	Run De	pth	(сп	n)			66			48, 6	5, 85													
200 C	Gradient	%						_<1			C	BEI	D MATERI	AL	9	6	C	BAN	KS						
	% Pool		Riff	_		Run	1	Other			资 约	Fines	clay,silt,sand	(<2mm)				Height(m)	10 %ur	istable	75	彩			
	Side Chan	.%	Π		۵ 🗙	0-10[] 10-4	0[] >	40			Gravels	small (2-16r	(สาก				Texture	FG	LF	2				
		Алеа%		-	0 🗙	0-5[] 5-1	5	15		新 成2		large (16-64	mm)		5	数	Confinemen	t	EN	60	FC	°C	UC 1	N/A
	Debris	Stable	%					n/a					sm. cobble (64-128mm)		20	羅	Valley:Char	nel Ratio	E	2-5	5-1	0 10)+ N	/Α
33L	COVE	R: Tota	%					90				Larges	kge. cobbie (128-256mm)		35	察 控制	Stage	9	Dr	/ C	5 м	н	Floc	bd
	Comp.	Dp.Pool	L.O.	D.	Вои	lder	inVeg	Over	Veg	Cutbank			bouldes(>25	6mm) rip/rap		40		Flood Signs	Ht(m)	3.0	Braide	d	Y	(
	sum 100%	5			5	5					1.2	Bedrock					影	Bars (%)	n/a	pН	10).4	O ₂ (p	om)	
14.54 14.54	Crown Clo		0		C S	Aspe	at			D90(cm)	50 C	Compaction	0	н	教室	WaterTemp	(C) 4.0	Turt	c(cm)	cl	Cond(25C)	40		
								DISC	HARG	E	-	/50							RE	ACH	SYM	BOL			
	Parar	Parameter Value Meth									Spec	ific Data	3								(Fish)				
藏	Wetted W	/idth (m)						Veloci	ty near 2	ero, s	omewha	t of a back	eddy - no	ł										
	Mean De	pth (m)							measu	rable.															
	Mean Vel	ocity (m	n/s)																						
	Discharge	e (m3/s))	,													(Widt	th:Valley/Chan	nel,Siope)					BedMat	lane

	- <u></u>	·	FISH SUMMA	NRY .				STREAM/VALLEY CROSS-SECTION]		
C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref	1	L (Looking Downstream)		5	R
	Pass 1 - El	FO	RT: 500 sec.					PLANIMETRIC VIEW]		
湖 路	CCG	1	86	J	R	ĔF		· · · · · · · · · · · · · · · · · · ·			
戀	SST	4	~85-102	F	R	EF					
	СН	9	57-78	J	R	EF					
	СН	1	38	F	R	EF					
	PK	1	35	F	R	EF	Γ				
	Pass 2 - El	FO	RT: 410 sec.					· · ·			
10	CCG	Ì	88	J	R	EF					
讔	SST	1	~85(escapee)	J	R	EF					
	СН	1	68	J	R	EF		· ·			
								COMMENTS			
纖	Channel	Stat	oility 🗌 D	ebris 🗌		Managemer	nt Co	oncerns 🗌 Obstructions 🗌 Riparian Zone 📋 Valley Wall Proce	sses []	Etc.
1	Sampled a	ver	y slow cobble/l	boulder se	ctio	a; shore drog	os of	f quickly so outside edge of site was quite deep.			
	Several la	mpr	ey ammocoetes	s were obs	erve	d throughout	the	site.			
虁											
調査											
靈											
徽											
	-	·							Edited by:	СР	•
									Date YM D	9	8/04/21

Stre	am Name	·	(ga	z)	Mo	rice	River	r - n	atural	site					(local)	Morice Ri	veг - г	atura	lsite				Acce	9\$5	Ro	ad	Meth	bd
Wat	Watershed Code 460-600600																		ReachNo.		Lngth	(km)						
Loc	Location 12 Margin site in proposed rip rap section, ~30 m u/s from													Map #					SiteNo,	N3	LthSu	яv(m)	18	3.6		Г		
· .			e N2.													U.T.M.					FishCard	Y (N)	Cash	Field	⊧X i	His	t. 🗌
Dat	Date Y.M.D 9 8 0 4 1 5 Time 1350									Agency	C87	Crew	RD/CI	> PI	hotos	B/3,	4	AirPhotos										
C	C PARAMETER VALUE										METH				SPEC	CIFIC	DATA						OBSTRUCTIONS					
	Ave: Chan. Width (m) n/a																					C	Ht(m)	Туре	Loc'n			
	Ave: Wet. Width (m) 3.1										2.6, 3	3.4, 4.2, 3	3.3, 1.9 (ma	rgin si	te wid	th)												
	Ave.Max.Riffle Depth (cm) n/a																											
	Ave.Max.Run Depth (cm) 5							57				60, 5	5, 55												•			
	Gradient	Gradient %							<1				·C ·	BE		%	C	BAN	NKS			10.24 25 40 25 40						
の語言	% Pool	•		RHT	3		R	រោ	100	Other				and the second	Fines	clay,silt,sand	(<2mm	n)		の上述	Height(m)	10 %Un	stable	75				
總統	Side Chan	Side Chan.% 0 🔀 0-10 🗌				0[10-40 >40				2.1	Gravela	small (2-16n	small (2-16mm)				Texture	FGLR									
f_{SS}		Area% 0			٥Х	0-	5	5 - 15 > 15							large (16-64	ന ்ள)		5		Confinemen	t	EN	\odot	FC	oc	UC	N/A	
	Debris	Debris Stable%					n/a				ALC: NO	· .	sm. cobble (64-128mm) 20				Valley:Chan	Channel Ratio 2-		2-5	5 5-10 10+)+ N	N/A				
	COVER	COVER: Total%					. 70						Larges	ige, cobbie (*	ige. cobble (128-256mm) 35				Stage			Dry 🕒 M H		Flood				
1000	Comp.	Comp. Dp.Pool L.O.D.			Dp.Pool L.O.D. Boulder		r	InVeg OverVeg			Culbank		bouider(>256	imm) rip	deu/c	40		Flood Signs	s Ht(m) 3		3.0 Braided		Y					
	sum 100%						100							P. ernatur	Bedrock						Bars (%)	n/a	pН	10	.4	O ₂ (p))	-
Constant of the second	Crown Clos	sure	* %				0		¢	Asp	ect				D90(cm)	65 ^C	Compa	iction	® [⊨]		WaterTemp	(C) 4.0	Turb	(cm)	cl	Cond(25C)	40
	DISCHARGE									/50 15							REACH SYMBOL											
	Param	Parameter Value				Method					Specific Data							(Fish)										
	Wetted Width (m)					Velocity near 2					ero, unable to measure by														1			
	Mean Depth (m)						floating chip m					ethod due to wind.																
and the second s	Mean Velocity (m/s)																											
	Discharge (m3/s)																	(WAd	th:Valley/Chanr	ei,Siope)					BedMat	erial		

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1	1. e		FISH SUMM	ARY					STREAM/VALLEY CROSS-SECTION					
C.	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref	1	L	(Looking Downstream)			R		
	Pass 1 - E	FFO	RT: 640 sec.						PLANIMETRIC VIEW					
	СН	3	42-60	J	R	EF	Γ	_						
	PK	2	31, 32	F	R	EF								
190														
[]	Pass 2 - E	FFO	RT: 450 sec.						· · · · ·					
	СН	1	78	J	R	EF			•		•			
							L							
ar an Fariar				L										
									COMMENTS					
10-0-22	Channel			ebris 🗌		Managemer				ses 🗌) E	tc.		
	ewer fis	h wei	e caught at th	is site; ma	y be	due to a con	bin	ation	of shallower water and smaller bed material.					
and the second second	Site appears to contain good fish habitat despite low catches.													
IN A REPORT	No other suitable site was present in the proposed rip rap section.													
2	everal la	mpr	ey ammocoete:	s were obs	erve	d throughout	the	site.	the state of the s					
12														
									······································		·			
			····											
0 2										Edited by;	СР			
No.										Date Y M D	98/	04/21		

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