Environmental Monitoring Report for In-Stream Work

Prepared by: Olin Albertson, Avison Management Services Ltd.
December 21, 2015

Project Information

Project: Larson Road Culverts Replacement (Murray Creek KP10+000)

Project Proponents: Environment and Water Stewardship Society (NEWSS) and the BC Ministry of Transportation and Infrastructure (MOTI).

Location: This project is located approximately 10km upstream of the Murray Creek confluence with the Nechako River within the District of Vanderhoof, B.C.

Site GPS Location: 10U 429942 5992718

Elevation: 684 m

Activity: Culvert Removal and Replacement

Date of in-stream work: Nov 16 - Dec 14, 2015

Contractor: Van-Con Enterprises Ltd.

Environmental monitor: Olin Albertson, R.P.Bio.

Weather conditions: For the duration of the project, weather conditions ranged from clear to overcast with an approximate air temperature range of 2°C to -19 °C and events of wind and snow.

Background

Avison Management Services Ltd. was contracted by the Van-Con General Contractors to conduct environmental monitoring services for the above described culvert removal and replacement. The purpose of this environmental monitoring project was to have a registered professional biologist (RP Bio)oversee adherence to provincial and federal best management practices for routine culvert removal, erosion control, habitat enhancement activities and guidelines for in-stream work. This document reports on and is exclusive to the activities Nov 16 - Dec 14, 2015. Included in this report is an activity log and photos.

The worksite was on Murray Creek, roughly 10km upstream of its confluence with the Nechako River where it is crossed by Larson Road. Murray Creek at the worksite location is a 2nd order, S4 stream as defined by the Province of B.C. (1995) in the *Riparian Management Area Guidebook* with a magnitude of 2 at the project site and 29 near the confluence with the Nechako River.

Summary of Work

After equipment and necessary materials were on site, a diversion culvert was constructed north of the existing culverts to temporarily divert water around the work site. Once the work area was isolated, waste water was pumped out of the isolated area into riparian vegetation away from the stream channel while a fish salvage operation commenced to remove fish from inside the work area. Salvaged fish were released downstream of the work area in suitable the second newly constructed overwintering pond in the historic channel (Table 1).

Once the work area was water free, the three undersized culverts were excavated and hauled off site. Following the removal of the old culverts, preparation for the bed of the new culvert commenced, followed by the precast concrete box culvert installation, and armouring of the inlet and outlet of the culvert and road shoulder as specified in the MOTI engineered drawings found in the Site Assessment, Prescription and Proposed Works for the Larson Road Culvert Replacement.

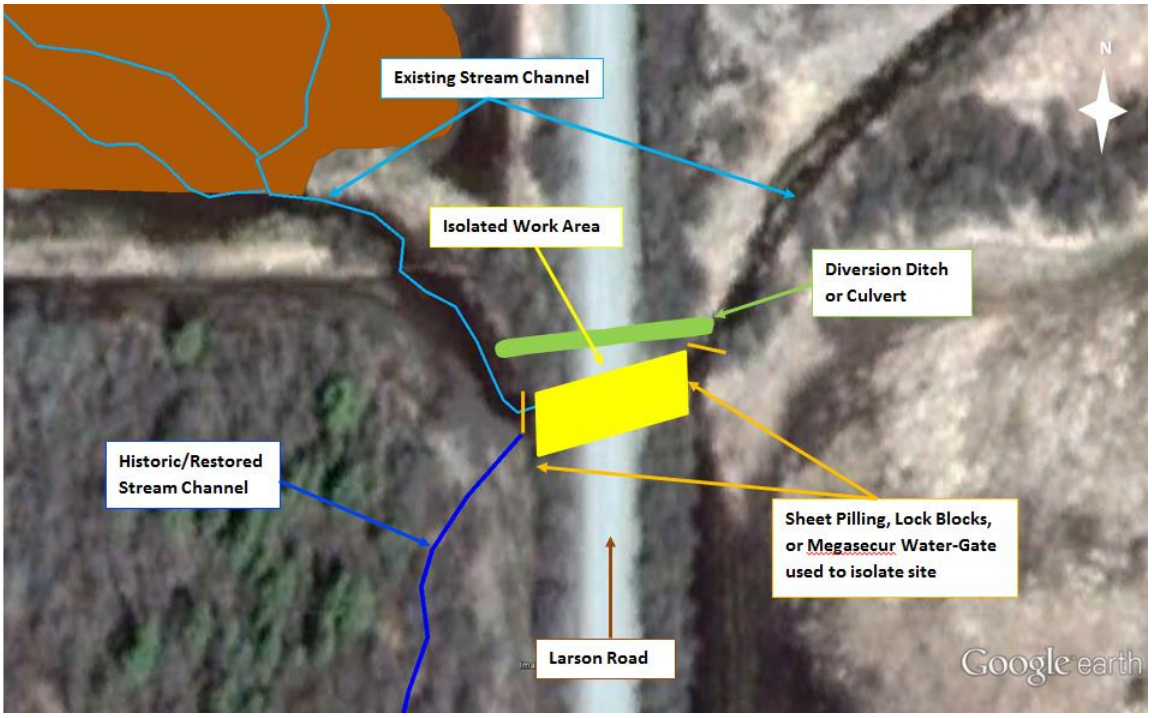

Figure 1. Diagram of Work Site Isolation Plan

Table 1. Total fish salvaged at the isolated work area in Murray Creek at Larson Road.

Common Name	Scientific Name	Number Salvaged	Size Range in mm
Lake Chub	*Couesius plumbeus*	20	41 to 85mm
Chinook Salmon	*Oncorhynchus tshawytscha*	49	98 to 149mm
Rainbow Trout	*Oncorhynchus mykiss*	20	90 to 221mm

Results

Was this work in compliance/conformance? YES

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References

Albertson, O.A. 2015. Site Assessment, Prescription and Proposed Works for the Larson Road Culvert Replacement on Murray Creek. Prepared for the Ministry of Transportation and Infrastructure (MOTI).

Albertson, O.A. 2015. Construction Environmental Management Plan (CEMP) for the Larson Road Culvert Replacement on Murray Creek. Prepared for the Ministry of Transportation and Infrastructure (MOTI).

Appendices

Appendix I – Activity Log

November 16, 2015

9:45 – Arrived on site and started assembling pump to begin fish salvage. Both pumps on hand were frozen, so had to unthaw them in the vehicle.

11:00 – The 3" pump started, finished assembling and began to pump with fish friendly intake.

11:15 – Salvaged 15 Lake Chub out of isolated area, took pictures.

11:45 – Released fish into stream, cleaned up pump and left for the office.

November 30, 2015 **-18°C**

08:10 – Onsite meeting with Paul Blattner, owner of Van-Con to discuss the best diversion strategy to utilize. It was decided to relieve some water pressure by diverting some of the flow into the new channel.

08:30 – Excavator started constructing the diversion ditch.

08:45 – Drain rock added to the new diversion ditch to help minimize sediment transport.

09:00 – Last bit of diversion ditch remove as water began flowing into the new channel. Sediment suspension estimated at approximately 40 NTU for about 3 minutes.

09:10 – Excavator started digging out the diversion culvert placement area through Larson Road.

12:30 – Placing of diversion culverts and filling of diversion culverts commenced.

13:20 – Turbidity measured in new channel.

13:45 – Stream diverted through the diversion culvert. Turbidity measured 80 NTU.

14:00 – Turbidity 25.6 NTU.

14:20 – Van-Con commenced placing sheet piling to isolate work site on the East or upstream of the work site.

15:10 - Van-Con commenced placing sheet piling to isolate work site on the West or downstream of the work site.

16:16 – Sheet piling finished being installed. Site is now completely isolated. Turbidity measurement recorded.

December 1, 2015 -12°C

08:00 – EM arrived on site and had pre-work meeting with Van-Con, and set up for the fish salvage.

09:00 – Fish salvage commenced, while excavator with ripper started to rip the frozen road above the culvert.

12:00 – Fish salvage completed, fish were counted, measured, and photo graphed see Table 1 for results. Site is now dry and fish free.

13:00 – Excavator continuing to excavate road.

13:49 – Excavator excavating the new culvert bed in the dry isolated area.

16:45 – Works finished for the day.

December 2, 2015 -4°C

08:00 – EM arrived on site for pre-work meeting. Excavator finishing excavating new culvert bed.

10:45 – MOTI Engineer on site to test soil base for culvert bed. All is a go to proceed with culvert installation.

11:45 – EM off site for the day as the site is isolated and no works to be performed instream outside of the isolated area.

December 3, 2015 -10°C

09:00 – EM arrived on site, meeting with Van-Con. Culvert installation continuing.

09:18 – Turbidity measured in new channel. Site inspected, all is good.

15:40 – Turbidity measured in new channel. Site inspected, all is good.

December 4 2015 -3°C

08:30 – Site inspection. Diversion, site isolation and equipment are all good, no concerns. Turbidity measured.

08:45 – Van-Con started placing culvert sections.

10:50 – EM left site.

16:00 – EM onsite for site inspection, culvert sections still being placed. Turbidity measured.

16:30 – Van-Con cleaning up for the day. EM left site.

December 7, 2015 -9°C

09:00 – EM arrived on site. Onsite Inspection, No works instream. Turbidity measured. No environmental concerns.

10:00 – EM left site.

December 8, 2015 – Snowing, -1°C

08:45 – EM arrived on site. On-site inspection. No works instream outside of the isolated area. Turbidity measured. No environmental concerns. Culvert sections in place, Van-Con placing fill around culvert.

09:30 – EM left site.

14:25 – EM arrived on site. On-site inspection. No works instream. Turbidity measured. No environmental concerns. Van-Con still placing fill around culvert.

December 9, 2015 – Overcast, -2°C

9:15 – EM arrived on site. On-site inspection, with no one on site. Ramp built down to culvert to assist in placing embedded drain rock. Turbidity measured. No environmental concerns.

10:15 – EM left site.

December 10, 2015 -8°C

08:00 – EM arrived on site. Met with Paul, Shawn, and Brian.

10:45 – Onsite inspection of erosion and sediment protection features and environmental aspects of the project. Turbidity measured. No environmental concerns.

12:00 – Talked to Shawn about tomorrow's plan.

12:15 – EM left site.

15:50 – Onsite inspection of erosion and sediment protection features and environmental aspects of the project. Turbidity measured. No environmental concerns.

December 11, 2015 -2°C

08:10 – EM Arrived on site. Water in the newly placed culvert about 18 inches deep as a result of water weeping through the sheet piling. The EM installed a 3 inch pump and pumped the water out of the culvert so works can continue in the dry.

09:10 – Most of the water pumped out and placing of rip-rap continued in the outlet. Turbidity in the new channel measured.

10:00 – Rip-rap continued to be placed while EM washes the rock and pumps out the waste water into the riparian vegetation.

13:30 - Rip-rap continued to be placed while EM washes the rock and pumps out the waste water into the riparian vegetation. The diversion channel is blocked using sandbags while water is pumped around the diversion blockage into the new channel. Pump has fish friendly intake.

14:05 – as water in diversion channel dries up. 2 Lake Chub and a Rainbow trout is salvaged and returned to the stream where water is replenished by the pump. The culvert outlet and the new channel are connected as the channel is excavated and completed.

15:30 – The sheet piling upstream is slowly pulled to allow water to start washing and cleaning gravels. A third pump is used to pump out turbid water as gravels are washed and cleaned. Some water is still flowing through the diversion culvert simultaneously.

17:00 – The sheet piling upstream is pulled to allow water to start filling the newly installed culvert. The third pump continues to be used to pump out turbid water as gravels are washed and cleaned. Some water is still flowing through the diversion culvert simultaneously.

17:30 - Turbidity has decreased from an estimated 200-300 NTU to 80.1 NTU. Some water is allowed to begin flowing into the new channel at 80.1 NTU. Turbidity continues to decrease rapidly.

6:00 – Turbidity measured at 48.5 NTU.

6:15 Turbidity measured at 18.23 NTU. EM leaves site for the day.

December 14, 2015 -8°C

08:30 - EM on site for inspection. Diversion culvert blocked on the upper end with drain rock and the fill. Turbidity measured in new channel.

10:07 – The old channel is pumped down and any remaining fish are salvaged. Only one Lake Chub salvaged.

10:40 – Fish salvage completed. Berm is finished being rip-rapped.

11:00 – Clean-up of site commenced.

13:42 – Turbidity measured in new channel.

15:00 – MOTI engineers, YRB, NEWSS, Van-Con, and Avison all on site for MOTI inspection. Everything checks out okay. Seeding and placement of straw for erosion protection recommended.

16:00 – Seeding completed by EM, Van-Con to lay down straw over top.

16:30 – EM work is completed.

Appendix II – Table 1. Turbidity measurements of Murray Creek at Larson Road.

Time	Turbidity (NTU)	Water Temperature (^{o}C)	Conductivity (µS/cm)	pH	Comment
Nov 30, 2015					
08:30	15				Estimated at outlet
09:00	45				Estimated Downstream of Diversion
09:05	18				Estimated Downstream of Diversion
13:20	11.2				Measured Downstream of Diversion
13:45	80.1				Measured Downstream of Diversion
14:00	25.6				Measured Downstream of Diversion
15:10	36.4				Measured Downstream of Diversion
16:16	29.2				Measured Downstream of Diversion
Dec 1, 2015					
15:49	9.75				Measured Downstream of Diversion
Dec 3, 2015					
09:18	9.88				Measured Downstream of Diversion
15:40	15.41				Measured Downstream of Diversion
Dec 4, 2015					
08:30	5.80				Measured Downstream of Diversion
16:00	4.73				Measured Downstream of Diversion
Dec 7, 2015					
09:00	6.22				Measured Downstream of Diversion
Dec 9, 2015					
09:15	4.70				Measured Downstream of Diversion
Dec 10, 2015					
10:45	2.27				Measured Downstream of Diversion
15:50	7.9				Measured Downstream of Diversion
Dec 11, 2015					
09:10	0.71				Measured Downstream of Diversion
17:30	80.1				Measured Downstream of Diversion
18:00	48.5				Measured Downstream of Diversion
18:15	18.23				Measured Downstream of Diversion
Dec 14, 2015					
08:30	4.35				Measured Downstream of Diversion
13:42	2.88				Measured Downstream of Diversion

Appendix III – Photos

Pre and Post Work Site Photos

Pre-work photo of outlet looking upstream.

Post-work photo of outlet facing upstream.

Pre-work photo of outlet looking downstream.

Post-work photo of outlet looking downstream.

Pre-work photo of the inlet.

Post-work photo of the inlet.

Construction Phase Photos

Partial diversion of existing stream into new channel.

Placement of sheet piling for site isolation.

Commencement of culvert excavation following fish salvage.

Nearing completion of new culvert bed.

Placement of new culvert.

Nearing completion of new culvert placement.

Placing and compacting culvert fill.

Placing specified substrate in culvert.

Placing and washing of riprap (outlet).

Final placement of riprap at inlet.

Release of water through the culvert when clean.

MOTI inspection of works.

Fish Salvage Photos

First salvage Nov 26th at the outlets of the two southern culverts (15 Lake Chub were salvaged).

Fish salvage Dec 1st of isolated area between sheet piling prior to excavation. A total of 49 Chinook, 18 Rainbow, and 3 Lake Chub we salvaged at this time.

Photo comparing Chinook and Rainbow.

Photo of a salvaged Lake Chub.

Photo of one of the larger Rainbow Trout.