



Subject:	All season road supplementary habitat information	
To:	David Harpley, Canadian Zinc Corp	
From:	John Wilcockson	
Date:	September 6, 2016	HCP Ref No.: CZN7932

The purpose of this memo is to provide supplementary habitat information specific to the proposed Prairie Creek all season road.

The supplementary habitat information was collected during a two-day field reconnaissance program completed in July 2016, as well as a re-evaluation of existing data.

#### July 2016 field program

On July 13 and 14, 2016, Dave Harpley (Canadian Zinc Corp (CZN)) and John Wilcockson (Hatfield Consultants) conducted habitat assessments at a number of sites along the proposed all season road alignment. Field habitat sheets are provided as Attachment 1. Locations included:

- 1. A new watercourse crossing of a Sundog Creek tributary at km 28.6;
- Specific locations on Sundog Creek where the road prism is proposed to encroach on aquatic habitat<sup>1</sup> (km 33-38.1);
- 3. The proposed Sundog Creek diversion (km 35.2-36.6);
- 4. Watercourse crossings along the new preferred alignment within the Unnamed Creek watershed and headwaters of Grainger River (between km 104 and 124) and
- 5. Watercourse crossings of the Grainger River tributaries (km 126 and 143).

In addition, potential sites suitable for habitat enhancement, for potential offsetting purposes, were evaluated.

Sundog Creek and Un-named Creek locations were assessed both from the air and on the ground (i.e., ground truthing). Locations on Grainger River tributaries were assessed from the air only since the purpose was to identify possible obstructions to fish passage, and this was best conducted from the air. Fish habitat field sheets were filled out at many of the locations; however, field notes and photographs were collected where a full habitat sheet was not warranted or possible.

<sup>&</sup>lt;sup>1</sup> In this memo aquatic habitat is considered to be any portion of a stream without mature vegetation. Due to the slow growth of plants in the poor soil and high elevation, combined with the short growing period of high latitudes, it is anticipated that mature vegetation coincides with a 1:10 year return.

### 1 - Crossing of a Sundog Creek tributary at km 28.6

The preferred road alignment between km 28 and 29 was changed after DAR submission. Consequently, two main stem crossings, at km 28.2 to 28.7, were avoided and a single tributary crossing was added at 28.6. The habitat reconnaissance conducted at km 28.6 in July 2016 identified habitat suitable for Arctic grayling for rearing and migration at the site of the crossing. Substrate tended to be coarse and flow was fast. There was negligible cover for fish. Approximately 180 m upstream of the crossing are a series of high gradient shoots and waterfalls preventing upstream fish migration. It is possible that fish spawning habitat exists upstream of the crossing; however, habitat at the crossing location only offers rearing or migration habitat. The intent of the open span bridge planned for the crossing is to avoid encroaching on instream aquatic habitat, thus we do not anticipate any permanent loss of alteration of habitat (Figure 1).

# Figure 1 New crossing at km 28.6 (Tributary of Sundog Creek, looking south, aerial shot).



### Figure 2 Habitat at new crossing location (km 28.6, tributary of Sundog Creek, looking south).



### 2 - Encroachment onto Sundog Creek

Between km 30-40, the proposed all season road encroached upon the Sundog Creek floodplain. Here the proposed alignment follows the south edge of the floodplain, thereby largely avoiding contact with aquatic habitat. However, between km 32 and 38, there are several locations where the road will encroach into aquatic habitat to some degree.

In order to maintain the all-season road on the south side and avoid creek crossings, limited portions of the active channel will need to be relocated further north. Sundog Creek has a large floodplain and the location of the active channels change from year to year. It is possible that natural changes to flow over time would redirect the current active channel away from the south bank.

The aquatic habitat in Sundog Creek between km 30 and 40 generally consists of fast riffle habitat (~80%) with associated cobble substrate (Figure 3, Figure 4). This habitat provides potential migratory habitat for Arctic grayling, and potential spawning and rearing habitat for slimy sculpin.





Figure 4 Sundog showing most common substrates (flow to the right).



Between 15 and 20% of habitat in this section of Sundog Creek consists of a slower riffle (Figure 5 and Figure 6). The habitat here is characterized by the presence of large gravel. These substrates are within the size range used by Arctic grayling for spawning<sup>2</sup>. However, Arctic grayling generally use tributaries for reproduction and it is uncertain whether they use the large gravels in the slower riffles found in the thalweg and secondary channels of Sundog creek. Slimy sculpin may use this habitat for rearing, but due to the smaller size of substrate, it would provide less cover and refuge from flow<sup>2</sup>.



### Figure 5 Sundog Creek, slow-riffle habitat occurring in 15 to 20% of the stream.

<sup>&</sup>lt;sup>2</sup> Minns CK, Resit JD, & CL Evans. 2002. Life History Characteristics of Freshwater Fishes Occurring In The Northwest Territories and Nunavut, With Major Emphasis on Riverine Habitat Requirements. Department of Fisheries and Oceans. Canada.



#### Figure 6 Sundog Creek, substrates common to the slow-riffle habitat.

Less than 5% of habitat by area in this section of Sundog Creek consists of pools and back-eddies typically located behind boulders and encroaching bedrock (Figure 7). Substrates vary from sand to small boulders. There are pockets of fine gravels which would appear to be good spawning habitat for Arctic grayling (Figure 8). The boulders also provide refuge to grayling and sculpin during freshet and periods of greater flows after large precipitation events. The diversity of substrate, depths and flows created by the boulders create good rearing habitat for both Arctic grayling and slimy sculpin. The deepest (and largest) of the pools observed was at km 35.3, which was 1.5 m deep and approximately 10 m long at the time of survey (Figure 9 and Figure 10). This pool is immediately upstream of the proposed diversion and outside of the road envelope and therefore would not be affected by the all-season road construction. This pool is not likely to provide overwintering refuge, as it is anticipated that the depth of water would decrease substantially in the fall and winter, and therefore it is likely the residual pool would freeze to bottom. Ice thickness in the Nahanni region is typically 1 m in winter. The remainder of pools observed were smaller and less than 70 cm deep, and would likely freeze to bottom in winter.





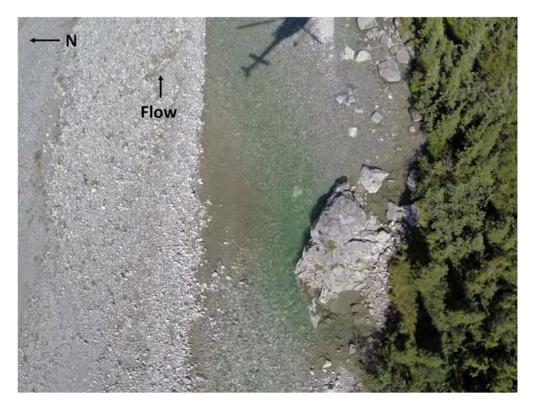
Figure 8 Sundog Creek - Pockets of smaller substrates often found downstream of boulders and pools.





Figure 9 Sundog Creek – largest pool observed adjacent to the all season road.

Figure 10 Sundog Creek – largest pool observed adjacent to the all season road – aerial view.



### 3 - Sundog Diversion

The proposed Sundog Diversion will re-direct the flow of Sundog Creek from the south side of the channel to a pre-existing dry channel further to the north. The purpose of the diversion is to allow the road to run along the south side of the channel between km 35.3 and 36.5, where the road will need to be built into what is currently normally wetted channel.

At the upstream extent of the diversion, there are currently two side channels from the existing main channel branching off the thalweg to the south. A diversion berm would be placed parallel to the thalweg upstream of the new channel to cut off the side channels and the thalweg as it takes a right hand turn to head east (Figure 11). A preliminary design of the diversion has been provided by Tetra Tech (2016). At the head of the new channel, substrates consist largely of cobble imbedded in sand (Figure 12). Fine material is generally deposited at the head of old channels as a stream begins to adopt a new channel (Bill Rozeboom, Tetra Tech, pers. comm.). Downstream of the head of the new channel, the morphology appears to be similar to the existing channel, having varying gradients and channel widths. There were several locations having accumulations of sand in the channel, which would have deposited as the thalweg was diverted away.

## Figure 11 Location or proposed diversion with estimated location of berm (in green), km 35.4, photo looking north-east.



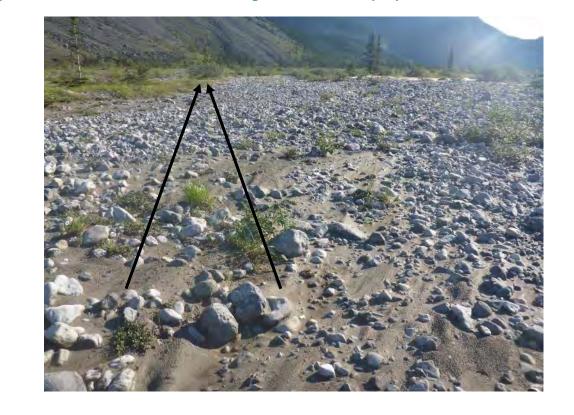


Figure 12 Ground-level shot looking downstream in proposed future wetted channel.

Figure 13 Ground level shot looking upstream showing connection to proposed future wetted channel.



#### 4 - New Alignment Watercourse Crossings

The new alignment crosses a north-flowing un-named creek. This creek consists of low-gradient meandering channels, having a high frequency of beaver dams. Observations suggest that this stream provides poor fish habitat. The site reconnaissance in July 14, 2016, found moderate dissolved oxygen concentrations (7.6mg/L), abundant instream vegetation, and swimming insects suggesting the absence of fish<sup>3</sup>.



## Figure 14 New crossing near km111.3 Unnamed Creek; photo looking south (upstream).

<sup>&</sup>lt;sup>3</sup> Swimming insects are readily eaten by fish, their presence can indicate the paucity of fish.

Schilling E.G, C.S. Loftin, and A.D. Huryn , 2009. Macroinvertebrates as indicators of fish absence in naturally fishless lakes Freshwater Biology 54:1, P181–202



### Figure 15 New crossing near km111.3 Unnamed Creek.

At km 119, the road crosses a large alluvial outwash fan. This outwash fan drains a mountainous watershed approximately 8 km long, and drains into the Grainger River as it exits Gap Lake. It was completely dry during field visits in July and September 2014 and July 2016. It is anticipated that the only time it is wetted is during large rainfall events coinciding with rapid melting of snow on adjacent mountains. Due to the highly ephemeral nature of this water feature, it is unlikely to provide aquatic habitat.

# Figure 16 km 119 – Crossing of alluvial outwash fan (near bottom of photo); photo looking South.



### 5 - Grainger Tributary Crossings

Between km 126 and 143 small tributaries flowing from the east side of the first Nahanni Range flow east towards progressively lower gradient slopes (Figure 17). These streams typically drain to wetlands or are beaver impounded (Figure 18). It is believed that these streams are not accessible to fish at the road crossings.

Figure 17 Tributary to Granger River showing decrease of gradient with distance from Nahanni Range (i.e., downstream of proposed road) ~km 128 – 139; photo looking west.

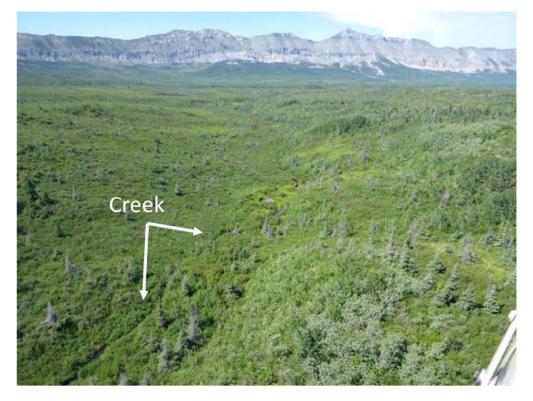


Figure 18 Beaver dam on tributary to Granger River ~km 136.



### Supplementary Habitat Information on the Liard Crossing

In September 2014, Hatfield and CZN staff visited the proposed Liard Crossing location. The purpose of this visit was to gather site bathymetric and hydrological data as well as some habitat information. The data from 2014 was used to retrospectively create a field habitat sheet for the proposed barge crossing. The bathymetry data was provided in Appendix 11 of the DAR. A field habitat sheet is provided as Attachment 2. Habitat consists of run morphology with predominantly sand/silt substrates. Based on available data, the habitat at the proposed Liard River crossing does not appear to be unique to the area. It is likely that this portion of the Liard River is used for fish migration purposes only.

### Figure 19 Liard River adjacent to crossing location example of bank substrate [photo 1].



Figure 20 Liard River adjacent to crossing location example of bank substrate [photo 2].



Attachment 1

**Habitat Sheets** 

		Stream Ha	bitat Information			
John W Dime	H Date	13 July 16	,		Time (24 H)	820
Site Sundag CK	Station		Sundag	(KP 35,2)	Project C	ZN 7932
UTM NAD	Upstre	am Northing	1	1	Upstream Ea	asting
Access 1		tream Northing		_	Downstream	Easting
Access	-					
Morphology			Sec. as	1		
Stream Morphology Types (%)		Length (m)				Velocity (60% depth
Run (Riffle)	Pool	Depth Transect (m)	@ 25% width	50%	75%	25% 50%
Fall Other:		1	0,22	0,21	0,19	0,32 0,70
Depth/Pool (m)		2	0.10	0,21	0,14	0.33 0.63
Channel Slope (°)	11	3	0,17	0.17	0,22	0,32 0167
Wetted Width /2 / 151 Meander Frequency / /	1 1200	m Channel Width (m) m Regular (Irregular n	1081 · 1 neanders		Unstable Ban Bank slope (5	
Instream Cover						
Instream Cover (Detritus)		% Instream Cover (Tw	igs/Sticks, etc)	- %	Substrate (as	cover) 100
Instream Cover (logs, etc)	-	% Instream vegetation			Undercut Ban	
Woody Debris Description (log	jams, fallen trees, I					
Substrate Composition (Sum	n 100%) Instrea	m Vegetaion (Sum 1009	%)	Riprian Zone	e (25 m Buffe	er) circle
	Embed. (%) Rooted	Emergent		Mixed Forest		Coniferous Forest
% Organics	- Rooted	Submergent	0 %	Grasses		Deciduous Forest -
% Clay	- Rooted	Floating	0 %	Re-growth for	rest	Shrubs
% Silt	- Free-flo	ating None	.6 %	Flooded		Sedges
% Sand 5	- Floating			Roads		Cutlines
% Gravel 1gonly 40	O Attache	d Algae	0 %		-	
% Cobble 40	0	Periphyton	0 %		scription/Not	tes/Drawing
% Boulder 15	0	Filamentous	0 %			
% Bedrock	- Aquatic		0 %		000	
	Flooded	d Terrestrial Plants	0 %	2 Stall	100	7 -
Overhead Cover NOW				5=25	5 01	2 100 - 1
Overhead Litter <150 mm		ad Litter >150 mm (%)	- %			50 0 20
Overhead Undercut Banks	% Overna	nging Trees	%		- 2	000.1.
Overhanging Grasses	% Overna	nging Shrubs	- %	- The	了.1年	markin
oremanging craceee			Weather	1/2 10/01	XIII K	100
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Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h <i>In situ</i> Water Parameters Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L) Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 m But Mixed Forest Coniferous Grasses Deciduous Re-growth forest Shrubs	) <u>2.8 mg/1</u> <u>7.6</u> <u>6.8</u> <u>8.4</u> <u>191</u> <u>19</u> <u>191</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u>	NO 1Z NWW FA SE SE SE AN SE SE AN SE SE AN Visible Disturbance Surface Debris Beaver Dam	m previous 24 H m MixXed (rain) a circle Culvert	MILLING WITH MILLING	150001/L	( 2- ~
Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h <i>In situ</i> Water Parameters Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L) Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 m Bu Mixed Forest Grasses Deciduous Re-growth forest Shrubs	) <u>2.8 mg/1</u> <u>7.6</u> <u>6.8</u> <u>8.4</u> <u>191</u> <u>19</u> <u>191</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u>	NO 1Z NWW FA SE SE SE AN SE SE AN SE SE AN Visible Disturbance Surface Debris Beaver Dam	m previous 24 H m MixXed (rain) a circle Culvert	Channel Fea	150001/L	A
Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h <i>In situ</i> Water Parameters Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L) Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 m Bu Mixed Forest Coniferous Grasses Deciduous Re-growth forest Shrubs Photos	) <u>2.8 mg/1</u> <u>7.6</u> <u>6.8</u> <u>8.4</u> <u>191</u> <u>19</u> <u>191</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u> <u>19</u>	NO 1Z NWW FA SE SE SE AN SE SE AN SE SE AN Visible Disturbance Surface Debris Beaver Dam	m previous 24 H m MixXed (rain) a circle Culvert	Channel Fea Islands	150001/L	A

		Stream H-	bitat Information		25 July	14	_			
Data Collectors	Date	Stream Ha		(A)	Time (24 H)	10/10				
John W Dave H		s Jung 16	(KP	36.35		1240	1			
site Charles	Station	neroache	AIVO	32)	Project	17977				
JWL COG			~ trp	201	Linstroom En	11104	-			
TIMINAD	INP 30 ± 20 m K					Upstream Easting				
Access 11-eli	Downstrea	m Northing			Downstream	Easting		-		
Morphology										
Stream Morphology Types (%)		Length (m)			1.	Velocity (	60% depth or	surface)		
Run Riffle Po	lool	Depth Transect (m)	@ 25% width	50%	75%	25%	50%	75%		
	(rapils)	1 2	.32	127	.31	. 81	.58	. 61		
Depth/Pool (m)		3	.7.4	120	.32	.49	1.08	1,26		
Vetted Width / / /	m	Channel Width (m)	1.1	1	Unstable Ban		1,081	.97		
Meander Frequency / / /		Regular / Irregular n	neanders		Bank slope (5		L	R		
nstream Cover										
nstream Cover (Detritus)		Instream Cover (Twi		- %	Substrate (as	cover)	160 %			
nstream Cover (logs, etc)	~ %	Instream vegetation			Undercut Ban		- %			
Noody Debris Description (log jams, fall	len trees, beau	er activity, etc)				-				
						-		_		
				-		-				
Substrate Composition (Sum 100%)	(A) Rooted Em	egetaion (Sum 100%			ne (25 m Buffe		circle			
% Organics O -	Rooted Em			Mixed Fore Grasses	SL	Coniferou Deciduou				
6 Clay	Rooted Floa		○ %	Re-growth t	forest	Shrubs	o i ulest			
% Silt O -	Free-floatin	9	6 %	Flooded		Sedges				
6 Sand O -	Floating Alg			Roads		Cutlines				
6 Gravel /0 O	Attached Al		6 %					_		
6 Cobble 60 0 6 Boulder 30 0	-	Periphyton Filamentous	0 %		escription/Not	es/Drawing				
6 Bedrock -	Aquatic Mo		0 %				N	- 1.0		
	and the second sec	rrestrial Plants	0 %		1.17	S.	JI	10		
Overhead Cover					1/-14	1 2	~~	09		
		itter >150 mm (%)	6 %		11-12	V /	15	00		
Overhead Undercut Banks	% Overhangin % Overhangin	g Trees	0 %		AL TI	S		70		
Overhanging Grasses	% Overhangin	g Shrubs	0 %	1-1	1-41	NY	m	La		
Miscellaneous			Weather	( )	IN	4		100		
High water mark			m previous 24 H		15-14	1	~	m 70		
Flood Evidence (Debris on plants, etc)			C YOUN/	-	1/ 1/	N		40		
Cloud Cover (5%)		50	Smshne		1 - AI	0-		65		
Wind Direction + speed (km/h)		0,	Thurder		1 01	1	$\sim$	00		
n situ Water Parameters	~ divers	in sheet	(KP35,2)		111	E A		70		
Sample Depth (m)	11 /	in the second	( STOOLET		inal-	2 1		(0)		
Dissolved Oxygen (%)		: /	/	h	7 600 K	NA A	00	×102		
Dissolved Oxygen (mg/L)				TT I	181			0 10		
Secchi Depth (m)	1/	/	/		X L	10 19		60		
Temperature (°C)	1/		/	-	1018	10/101	~~~~	Lac		
Turbidity (TCU)	/	/	1		121	10.01		698		
Conductivity (uS/cm)	1	/		1.1.	Y IOXY	2 1000	~	180		
andscape (Beyond 25 m Buffer)	circle	Visible Disturbance	circle	X	1 5021	1 ( Doi)		100		
Aixed Forest Coniferous Forest	Roads	Surface Debris	Culvert	-2	UY.	10 100	N.	1/09		
Grasses Deciduous Forest	Cutlines	Beaver Dam	Weir	z,	ILA	10/01		400		
Re-growth forest Shrubs	(Hills)	Collapsed Bank			1.1	00	~	100		
hotos				Channel Fe	atures	#	Dimensions	1		
yes			/	Islands/	/	1 /	1	1		
		/		Bars	/	/		1.		
		/		1			/			
lotes /					St. J	imat				
Ti 4.9m 1	wight			(D.)	5: de Cha 22 .39	159 /	DV .77	.35		
				UV	.22 .39	20	DI	10		
11 4,9 m	1							10		
TI II in Iflow.	aumast	gravel)		9						
TZ II m (flow) T3 0 (ho island possible span pool 73 Chi	aumast	gravel)		.9			2) V . 39			

C

Data Collectors				otream man	itat Information	1	and show the second second second		
Johnv	V Pavid	HP	ate /	3 Juhr	16	3	Time (24 H)	2 +7	40 130
Site Sunda	pg	S	tation K	123\$ Inve	r bridge	Xina	Project	ZNJ	2297
JTM NAD		U	pstream	Northing	KP 36.	3 91	Upstream Ea	sting	
Access He	1i	D	WF J	m Northing	(7/8)	(25 July)	Downstream	Easting	
1.0	[_]						P		
Morphology Stream Morpholog	gy Types (%)			Length (m)				Velocity (F	60% depth or surface
Run	Riffle	Pool		Depth Transect (m)	@ 25% width		75%	25%	50% 75%
Fall	Other: Slow	v hiftl	e	1	0,15	0,24	0.42	0,42	0.57 0.9
Depth/Pool (m)		-		2	0,21	0.28	0,20	0.17	0.62 0.4
Channel Slope (°) Wetted Width	) see lie	1	m	3 Channel Width (m)	0.31	0.35	0.33 Unstable Bank	0.47	0.64 0.7.
Meander Frequer	ncy / /	1 1		Regular / Irregular m		/	Bank slope (5		145 R 71
nstream Cover									
nstream Cover (I	Detritus)	T		Instream Cover (Twi	gs/Sticks, etc)	0 %	Substrate (as	cover)	100%
nstream Cover (I	ogs, etc)		A %	Instream vegetation	and the second second		Undercut Bank		0 %
Woody Debris De	escription (log jan	ns, fallen t							
	<i>w</i>							_	
Substrate Comp	osition (Sum 10			egetaion (Sum 100%			ne (25 m Buffe		circle
% Organics	Em	nbed. (%) R	cooted Em	omergent	0 %	Mixed Fore	si	Coniferous	
% Clay	0		ooted Floa		9/		forest	Shrubs	siolest
% Silt	0		ree-floatin			Flooded	(	Sedges	
6 Sand	0	- F	loating Alg	gae		Roads		Cutlines	
6 Gravel	60	O A	ttached Al	lgae	%				
6 Cobble	30	0		Periphyton	%	Channel De	escription/Note	es/Drawing	
6 Boulder	10	0		Filamentous	%		150	V V	
6 Bedrock	0		quatic Mo		%		0	1000	1
gravel	large	F	looded Te	rrestrial Plants	¥ %		14 5	A 41	()
Overhead Cover	the second s					1		000	)
Overhead Litter <	undu mmm				1 12	1 1	101	0 ~ 0	~~~ 1
Overhead Lindors				Litter >150 mm (%)	6 %		5 18	601-	/
	cut Banks	0 %0	verhangin	ig Trees	0 %		T Pale	601-	9
Overhanging Gra	cut Banks	0 %0		ig Trees	0 % 6 %		t los	601-	97.
Overhanging Gra Miscellaneous	cut Banks	0 %0	verhangin	ng Trees Ing Shrubs	O %	T	A lost	601-	2
Overhanging Gras <b>Miscellaneous</b> High water mark	cut Banks sses	<u>%</u> 0 %0	verhangin	ng Trees Ing Shrubs	Weather previous 24 H	T	t t	00/-	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I	cut Banks sses	<u>%</u> 0 %0	verhangin	ng Trees ng Shrubs	Weather previous 24 H roym	T		201	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature	Cut Banks sses	<u>%</u> 0 %0	verhangin	ng Trees Ing Shrubs	Weather n previous 24 H n ram + hudes	T			97.
Overhanging Gras Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%)	Debris on plants,	<u>%</u> 0 %0	verhangin	ng Trees ng Shrubs	Weather previous 24 H roym	T	- 20	201	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s	Debris on plants,	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s n situ Water Par	Debris on plants, speed (km/h) rameters	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + 1 n situ Water Par Sample Depth (m	Debris on plants, speed (km/h) rameters	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Nir Temperature Cloud Cover (5%) Wind Direction + s n situ Water Par Sample Depth (m Dissolved Oxyger	Debris on plants, peed (km/h) rameters S (%)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s In situ Water Par Bample Depth (m Dissolved Oxyger Dissolved Oxyger	Debris on plants, pebris on plants, peed (km/h) rameters S n (%) n (mg/L)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s In situ Water Par Sample Depth (m Dissolved Oxyger Dissolved Oxyger Secchi Depth (m)	Debris on plants, pebris on plants, peed (km/h) rameters S (%) n (%) n (mg/L)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Nir Temperature Cloud Cover (5%) Mind Direction + s <i>n situ</i> Water Par Sample Depth (m Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) oH	Debris on plants, pebris on plants, peed (km/h) rameters S (%) n (%) n (mg/L)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gran <b>Aliscellaneous</b> <b>digh water mark</b> Flood Evidence (I Nir Temperature Cloud Cover (5%) Wind Direction + sin <b>n situ Water Par</b> Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) H Turbidity (TCU)	cut Banks       sses       Debris on plants,       )       speed (km/h)       rameters       >)       n (%)       n (mg/L)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Mind Direction + s <i>n situ</i> Water Par Sample Depth (m Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) H Turbidity (TCU)	cut Banks       sses       Debris on plants,       )       speed (km/h)       rameters       >)       n (%)       n (mg/L)	<pre>% 0 % 0 etc)</pre>	overhangin overhangin	ng Trees ng Shrubs	Weather n previous 24 H ray thules SM	T	- 20	00/	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s In situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) DH Furbidity (TCU) Conductivity (uS/c	cut Banks       sses       Debris on plants,       )       speed (km/h)       rameters       >)       n (%)       n (mg/L)       cm)	etc)	overhangin overhangin	ng Trees ng Shrubs	Veather previous 24 H ram thuder SM (P35,2)	T	- 20	00/	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + 19 <i>n situ</i> Water Par Sample Depth (m) Dissolved Oxyger Dissolved Dissolved Dissolved Dissolved Dissolv	cut Banks       sses       Debris on plants,       )       speed (km/h)       rameters       >)       n (%)       n (mg/L)       cm)	etc) etc) r) ci	Verhangin Verhangin	ng Trees ng Shrubs	Veather previous 24 H ram thuder SM (P35,2)	T	- 20	00/	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + 1 an situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (*C) H Turbidity (TCU) Conductivity (uStor Landscape (Beyon Brasses	Coniferous For Deciduous For	etc) etc) r) ci rest R	ircle	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder SM LP35,2)	T	- 20	00/	97.
Aliscellaneous Aliscellaneous Aligh water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Vind Direction + 1 an situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxy	Coniferous For Deciduous For	etc) etc) r) ci rest R rest C	ircle	Ing Trees Ing Shrubs Ing Shrubs	Veather previous 24 H ram thuder SM LP35,2) circle Culvert	T	- 20	00/	97.
Aliscellaneous digh water mark ligh water mark lood Evidence (I ir Temperature Cloud Cover (5%) Vind Direction + s an situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyge	Coniferous For Deciduous For	etc) etc) r) ci rest R rest C	incle oads utlines	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder SM LP35,2) circle Culvert	Channel Fe	- + + + + + + + + + + + + + + + + + + +	00/	97.
Overhanging Gran Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s an situ Water Par Sample Depth (m Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) H Turbidity (TCU) Conductivity (uS/c Aixed Forest Grasses Re-growth forest	Coniferous For Deciduous For	etc) etc) r) ci rest R rest C	incle oads utlines	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder SM LP35,2) circle Culvert	Channel Fe	- + + + + + + + + + + + + + + + + + + +		and with a with
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + 1 an situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyg	Coniferous For Deciduous For	etc) etc) r) ci rest R rest C	incle oads utlines	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder SM LP35,2) circle Culvert	Channel Fe	- + + + + + + + + + + + + + + + + + + +		and with a with
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Mind Direction + 1 <i>in situ</i> Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Conductive (C) H Turbidity (TCU) Conductivity (uS/o Conductivity (uS/o Mixed Forest Grasses Re-growth forest Photos	Coniferous For Deciduous For	etc) etc) r) ci rest R rest C	incle oads utlines	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder SM LP35,2) circle Culvert	Channel Fe	- + + + + + + + + + + + + + + + + + + +		and with a with
	Cut Banks Sses Debris on plants, pred (km/h) rameters n (%) n (%) n (mg/L) cm) ond 25 m Buffer Coniferous For Deciduous For Shrubs	etc) etc) r) ci rest R est C H	ircle oads utlines	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank	Veather previous 24 H ram thudes Sum 2P35:2) circle Culvert Weir	Channel Fe Islands Bars	- + + + + + + + + + + + + + + + + + + +		and with a with
Overhanging Gra Miscellaneous High water mark Flood Evidence (I Air Temperature Cloud Cover (5%) Wind Direction + s In situ Water Par Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Dissolved Oxyger Conductive (C) DH Turbidity (TCU) Conductivity (uS/c Landscape (Beyr Mixed Forest Grasses Re-growth forest Dissolved Sample Photos Secch	Cut Banks Sses Debris on plants, pred (km/h) rameters n (%) n (%) n (mg/L) cm) ond 25 m Buffer Coniferous For Deciduous For Shrubs	etc) etc) r) ci rest R est C H	ircle oads utlines	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank	Veather previous 24 H ram thudes Sum 2P35:2) circle Culvert Weir	Channel Fe Islands Bars	- + + + + + + + + + + + + + + + + + + +		and with a with
Dverhanging Gram Miscellaneous High water mark Flood Evidence (II Air Temperature Cloud Cover (5%) Wind Direction + sin m situ Water Pan Sample Depth (m) Dissolved Oxyger Dissolved Oxyger Secchi Depth (m) Temperature (°C) DH Conductivity (US/C andscape (Beyr Mixed Forest Brasses Re-growth forest Chotos Secs Motes Solvet Solve	Coniferous For Deciduous For Shrubs	etc) etc) r) ci rest R est C H	ircle oads utlines	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank	Veather previous 24 H ram thudes Sum 2P35:2) circle Culvert Weir	Channel Fe Islands Bars	- + + + + + + + + + + + + + + + + + + +		and with a with
Averhanging Gram <b>liscellaneous</b> <b>ligh water mark</b> lood Evidence (II ir Temperature Cloud Cover (5%) Vind Direction + sin <b>ample Depth</b> (m) issolved Oxyger issolved Oxyger eecchi Depth (m) emperature (°C) H urbidity (TCU) conductivity (uS/co <b>andscape (Beyr</b> isses te-growth forest te-growth forest <b>botos</b> <u>yes</u>	Conferous For Debris on plants, page (km/h) rameters S (km/h) m (%) m (%) m (mg/L) cm) ond 25 m Buffer Conferous For Deciduous For Shrubs	etc) etc) rest R rest C H	ircle oads utlines ills	Ing Trees Ing Shrubs Instant of the second	Veather previous 24 H ram thuder sun 2P35.2) 2P35.2) circle Culvert Weir 3 9m(25. /(5)	Channel Fe Islands Bars	atures	*	and with a with

		Stream Ha	bitat Information	1				
Data Collectors	et Dat	e 13 Tehr	13 Toly"16			1628		
Site Sundag	Sta	tion Crosswy @K	p28.6		Project CZ	N 73	72	
UTM NAD	Ups	wpull			Upstream Eas			
Access Heli	Dov	wnstream Northing				Downstream Easting		
72.000								
Morphology				1	-	h		
Stream Morphology Types (% Run (Siffle)	teep) Pool	Length (m) Depth Transect (m)	@ 25% width	50%	75%	25%	% depth or surfac	
Fall Other:	Cascade					002	50% 75	
Depth/Pool (m)	ascare	2	1.04	-31	·20	0.09	e23 0	
Channel Slope (°)		3	1.21	024	=15	1.37	042 ,2	
Wetted Width / /147/	612,0	15 m Channel Width (m)	101715		Unstable Bank			
Meander Frequency - / - /	-1-1	- m Regular / Irregular n	neanders —		Bank slope (5°		L R	
Instream Cover								
Instream Cover (Detritus)	10	> % Instream Cover (Tw	igs/Sticks*etc)	0 %	Substrate (as c	cover)	100%	
Instream Cover (logs, etc)		% Instream vegetation			Undercut Bank		0 %	
Woody Debris Description (log	jams, fallen trei				under out ourn		10	
						1000		
Substrate Composition (Sun	n 100%) Inst	tream Vegetaion (Sum 100	(4)	Riprian Zon	e (25 m Buffer	4	circle	
Case and Composition (Our		ted Emergent		Mixed Forest		Coniferous		
% Organics		oted Submergent	1 %			Deciduous		
% Clay		ted Floating		Re-growth fo		Shrubs	Current	
% Silt	- Fre	e-floating	%		1	Sedges		
% Sand	- Floa	ating Algae	%	Roads		Cutlines		
% Gravel 20	— Atta	ched Algae	%					
% Cobble 70	-	Periphyton	%		scription/Note	s/Drawing	1	
% Boulder 10		Filamentous	%					
% Bedrock		atic Moss	%					
	Floo	oded Terrestrial Plants	%			, V	K ~ X	
Overhead Cover			1	-	> 1	7 de	A. Ja	
Overhead Litter <150 mm		erhead Litter >150 mm (%)	0 %		>+ .	~ 11	1 10	
Overhead Undercut Banks Overhanging Grasses		erhanging Trees erhanging Shrubs	0 %		1)-	-9-5	1-19 1	
Miscellaneous			Weather		. 1	12 13	10	
High water mark		.40	m previous 24 H		416	10-19	- 19	
Flood Evidence (Debris on pla	nts etc)		m raw	N	.) (	18 13	(03)	
Air Temperature	1103, 610)		C throler	44	KK	59 10-	Q 3	
Cloud Cover (5%)		15%	SW	brd	2421	101-51	Druce	
Wind Direction + speed (km/h	)	Slight breeze	e Sur	N	\$ 15	· 19 TO	1 15	
In alter Mater Deservations				+		12 12-	41 23	
In situ Water Parameters		21		ock	>1	19 62	CCK CCK	
Sample Depth (m) Dissolved Oxygen (%)		-//	1	0	w ( ~	1 16	4 0	
Dissolved Oxygen (mg/L)	6,4	1 /	1 /	-	EK	1 47-1	1 -	
Secchi Depth (m)	-	/ /	1	1	TV	(~ g)	9.1	
Temperature (°C)	13,9	/ /	1 /	1	Nue	L. H.	X	
pH	8,5 /				M	D. A	1	
Turbidity (TCU)	- //	/		1		1	14	
Conductivity (uS/cm)	151 /	1	1	]	× 1	1 de	-()	
Landscape (Beyond 25 m Bu	uffer) circl	e Visible Disturbance	circle			. 0	1	
Mixed Forest (Coniferous			Culvert					
Grasses Deciduous		ines Beaver Dam	Weir	U	4	-1 -	-15m V	
Re-growth forest Shrubs	Hills			2	Jun	dog	North	
NO. A.		In succession in succession.			2.00.00	()	and the second second	
Photos				Channel Fea	itures	#	Dimensions	
yes				Islands	/	/	/	
A				Bars		/	-/	
							/	
Notas	10 - 1	Min o Antin 1	-l.a.La	4 011	7		to P nt	
Notes Forest to	west.	, more open + * mid	Sumo	TU Cas	1 - La	rge w	anertall	
~ 200-30	on US.	14 14. 2.1	Dout	of wood	1	-		
		* mio	point c	1 real	n			

<del></del>		Stream Hat	itat Information	1				
John M Dave 7	Date /	3. Tuly 16			Time (24 H)	17/10		
Site Sun 409	Station		croachn	net)	Project	ZN 79	32	
	Upstream		P36.0)		Upstream Ea			
Access Heli	Downstre	am Northing	)	Downstream Easting				
Construction of the second	1001	00 (1)=	1		1			
Morphology		11		_		N. (		
Stream Morphology Types (%) Run Riffle	Pool	Length (m) Depth Transect (m)	@ 25% width	50%	75%	25%	0% depth or surface	
Fall Other:	1001	1	23% Widdi	1.26	1.18	1.67	50% 75%	
Depth/Pool (m)	-	2	19	,56	.72	19	.56 .77	
Channel Slope (°)		3	. 26	.35	.27	.57	1,02 ,53	
Wetted Width / /	-1 bottom r	m Channel Width (m)			Unstable Ban			
Meander Frequency / / /	-1 bottom r	m Regular / (rregular m	eanders		Bank slope (5	°) .	L 45 R 60	
Instream Cover								
Instream Cover (Detritus)	0 9	% Instream Cover (Twi	gs/Sticks,* etc)	0 %	Substrate (as	cover)	100%	
Instream Cover (logs, etc)		% Instream vegetation			Undercut Ban		0 %	
Woody Debris Description (log jams	, fallen trees, bea	aver activity, etc)						
Substrate Composition (Sum 100		Vegetaion (Sum 100%			ne (25 m Buffe		circle	
	d. (%) Rooted Er			Mixed Fore	est	Coniferous		
		ubmergent	%			Deciduous	Forest	
% Clay % Silt	- Rooted Flo - Free-floati		%	Re-growth Flooded	torest	Shrubs		
	- Free-floati - Floating A		%			Sedges Cutlines		
% Sand <u>10</u> % Gravel <u>50</u> &			%	the second s		Cutimes		
% Cobble 30 C		Periphyton	%		escription/Not	es/Drawing		
% Boulder 20 5		Filamentous	%		1 0	/		
	- Aquatic M	oss	%		VIA	100	X1000	
and the second sec	Flooded T	errestrial Plants	V %	$\rightarrow$	4)'	~7 6	Supp E	
Overhead Cover				1 5	TALE	500	40 -15	
Overhead Litter <150 mm		Litter >150 mm (%)	0 %		- 117	1	1 -100	
Overhead Undercut Banks	% Overhang		6 %		. USIN	240%	0 94 -1	
Overhanging Grasses	% Overhang	ing Shrubs	<5 %	-	AIN	~30	000	
Miscellaneous			Weather	2	- A Bur	50	and	
High water mark	11 - 11 - 11 - 11 - 11 - 11 - 11 - 11	"40 I	n previous 24 H		- Malv	- 51	the 1 5	
Flood Evidence (Debris on plants, et	c)		thinder	3	J 0199 X	al	908-	
Air Temperature		25 .	Sun	5	10/4	2	1001	
Cloud Cover (5%) Wind Direction + speed (km/h)		5% Slight herez	Su	1-	10/10	$\sim$	5901	
			4		911/10	1	297	
In situ Water Parameters See	diversiv	m Sheel		1	201 14	1	0 501	
Sample Depth (m)	/	. /	1		51 1		(A -	
Dissolved Oxygen (%)	/		/	$\rightarrow$	At V	da	-10	
Dissolved Oxygen (mg/L) Secchi Depth (m)		/ /	/	+:	2.10	i ž	-10	
Temperature (°C)		/	1/	12	1118	10	)00-1	
pH	11/	/	1				101	
Turbidity (TCU)		/	/	1	UN	7-5	1.01	
Conductivity (uS/cm)		1/	X	-ty		1 G	1.00-1	
Landscape (Beyond 25 m Buffer)	circle	Visible Disturbance	circle	1	- (	, 2	100-1	
Mixed Forest Coniferous Fores		Surface Debris	Culvert	1	X	1 -	1000=	
Grasses Deciduous Fores		Beaver Dam	Weir	+.	_	N	1 1	
Re-growth forest Shrubs	Hills	Collapsed Bank				V		
				Charnel	a aturaa		Dimension	
Photos	-		/	Channel Fo	eatures	#	Dimensions	
	-	/		Bars	/	/	/ .	
		/					/	
	-					4		
Notes WW	1 22	2 19	2	13	0.	1 1	171	
*	-	~ 1)	3	1.000	Veed	ch L	ISOM	
BW	26	24		22				
	- 1 -							

C

		Stream Hab	oitat Informatio	n	N.S. 1.		
Data Collectors David	1/ Date	17 6.1.	16/10	x1211	Time (24 H)	18/10/	07115
Site _ 7	Station	15 Juny	10/14	Jun 10	Project	oqu l	2745
Sundag	Station	P 35.9		0	CE	N 793	32
UTM NAD	Upstream	Northing Fromsect WF	251		Upstream Ea	sting	
Access // /		am Northing	P51		Downstream	Easting	
Heli-	Downstre				Downstream	Lasting	-
Morphology		A second			1		
Stream Morphology Types (%)		Length (m)	0.050/ 1.1/1	500/	7501		depth or surfa
Run Riffle Fall Other:	Pool	Depth Transect (m)	@ 25% width	h 50%	75%	25%	50% 7
Depth/Pool (m) 0,47		25	0.21	012	0,22		0,14 0,
Channel Slope (°)		35	0,15	0,27	0.24		0,21 0
Wetted Width / /	/ n	n Channel Width (m)	1.1		Unstable Banl		
Meander Frequency / / /	/ n	n Regular / Irregular m	eanders		Bank slope (5		R
Instream Cover							
Instream Cover (Detritus)	109	Instream Cover (Twig	gs/Sticks, etc)	2 %	Substrate (as	cover)	100 %
Instream Cover (logs, etc)		6 Instream vegetation			Undercut Ban		0 %
Woody Debris Description (log jam							
Substrate Composition (Sum 100	0%) Instream	Vegetaion (Sum 100%	()	Piprian Zon	e (25 m Buffe	ar) oir	rcle
	bed. (%) Rooted En			Mixed Fores		Coniferous Fo	
% Organics	- Rooted Su	hannant		% Grasses		Deciduous Fo	
% Clay	- Rooted Flo			Re-growth fo	rect	Shrubs	rest
% Silt	- Free-floatin			Flooded	lest	Sedges	
% Sand	- Floating Al	0		% Roads		Cutlines	
	<ul> <li>Attached A</li> </ul>			%		Cutimes	
	0 Maderieu /	Periphyton		Channel De	scription/Not	es/Drawing	
	50	Filamentous		% <del>Q</del>	10	conditing	1 0
% Bedrock	- Aquatic Mo			de consist	IN La	O C/CM	1 -9
70 Dedibor	and the second sec	errestrial Plants	9		12000	ol woh	401.
Overhead Cover	1 looded 1	Shootharrianto	1 1 '	2 - 7	-11 0	01/001	2-1-
Overhead Litter <150 mm	% Overhead	Litter >150 mm (%)	1 0 0	1-1	Sh	om j	870
Overhead Undercut Banks	200 100 MARK		0 9	1. 5	- Elvie	1 19	LAMERO
Overhanging Grasses	> % Overhangi		0 9	10 3		16/0-01	11-1
Overhanging Grasses	2 /of Childing	ing officios		e de	~ 1.16	92091	
Miscellaneous	-		Weather	35 .	1 4 6	1005	10
High water mark	2	0,40 n	m previous 24 H	- og	~ 1 17	100 01	1-1.
Flood Evidence (Debris on plants,	etc)	- n	n rain	wr_	- Iv	10 0 90	-/ 0
Air Temperature		~20 °(	c thurder	20 -	1	100 D/	10
Cloud Cover (5%)		0	sun	pa	re-	110	1-1-
Wind Direction + speed (km/h)		Slight			1	600	10
In situ Water Parameters	SAP NAPA	sion sheet (	KP35.21	1 64	· vt	- 0/-	101
the second	Jul and.	The Shader Ch	7 -0.5	2	The	10016	6-6
Sample Depth (m) Dissolved Oxygen (%)	1 1		1	3-1	-	Mal	79 1
	/ /				A	10 ~	0
Dissolved Oxygen (mg/L) Secchi Depth (m)	/ /	/	1/		8	107	
Temperature (°C)	/ /	/	1/		-	3/1~	10
pH	1	/	1/		~ 410	- LA	
Turbidity (TCU)	/	1	1/	m	~ 100	pz	1 -1
Conductivity (uS/cm)	1	/	1	-	09	10/ Z	0 91
			1	1.0.	NUM	la h	4 - 1
Landscape (Beyond 25 m Buffer)		Visible Disturbance	circle		12	-	
Mixed Forest Coniferous Fore		Surface Debris	Culvert	1	- HO	y L	0
Grasses Deciduous Fore	and the second se	Beaver Dam	Weir	rJ1	E U	X A	121
Re-growth forest Shrubs	Hills	Collapsed Bank		-	A'BH		0
Photos			-	Channel Fea	tures	# Dir	mensions
yes				Islands	1		menalons
		/		Bars	/	//	2
100		/				1	/
		-					
<i>J</i> ~0							
	0.15	a lan a c	25 91-		10		10 20
Notes WW IN	1812	9 20 8 3	259 R.	each	95	5m 31	VG 35
	25	9 21 8 30	259 R.	each 1	95	5m 31	NG 35 36

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Data Collectors	Jave H	Date	1900 11	16		Time (24 H)	094	12	
Site Sundo	7	Station	034.6) UIS ;	crossince alt to dis	persion)	Project	ZN	7932	1
UTM NAD	/	Upstream	Northing	102 2101-1	Upstream Ea	sting	1.16		
		Downstream Northing							
Access Hali						Downstream	Easting		
Heli		-							_
Morphology					4		1.1		
Stream Morphology Type	¥S (%)		Length (m)	-				60% depth o	
Run Riffle		ol	Depth Transect (m)	@ 25% width		75%	25%	50%	75%
Fall Other	: Tastlvc	sypies?	1 2	.34	-30	.24	:74	1.6	123
Depth/Pool (m)			3	125	:79	,23	077	.63	-60
Wetted Width /		below	m Channel Width (m) -	1.1	- below			- 61	10P
Meander Frequency /-		below 1	m Regular / Irregular me	eanders		Bank slope (5	°) ,	. L —	R
Instream Cover									
Instream Cover (Detritus	)		Instream Cover (Twig	s/Sticks, etc)		Substrate (as		100 %	
instream Cover (logs, etc			% Instream vegetation		0 %	Undercut Ban	k,	0 %	1
Woody Debris Descriptio	n (log jams, fall	en trees, be	aver activity, etc)						
			The second second						
	-					-			
Substrate Composition			Vegetaion (Sum 100%			ne (25 m Buffe		circle	
		) Rooted E			Mixed Fore	st	Coniferou		
% Organics	-		ubmergent NO		6 Grasses	(a sea of	Deciduou	is Forest	
% Clay		Rooted Fl Free-float			& Re-growth	lorest	Shrubs Sedges		
% Silt % Sand	-	Floating A			% Roads		Cutlines		
% Gravel	10 0	Attached	Algae	9	6 Rbark	then Strip	0		
	20 0	10001000	Periphyton	9	Channel D	escription/Not	es/Drawing	9	_
	0 0	1	Filamentous	9	6 F				
% Bedrock	-	Aquatic M		9		1 .	1	10	
		Flooded 1	Ferrestrial Plants	9	6	Jul 1	16	1	1
Overhead Cover						171-	210	~ 7.4	1
Overhead Litter <150 mr			Litter >150 mm (%)	6 9			5	12	1
Overhead Undercut Ban		% Overhang		0 9		. (  -	0/	500	1 -
Overhanging Grasses	0	% Overhang	ing Shrubs	0 9	-	-) . / !	1 /	100	4
Miscellaneous				Weather	N	171	25	- 50	-
High water mark			.5 m	previous 24 H	4	(10	\$4	101	
Flood Evidence (Debris of	on plants, etc)		m			/) [-		101	
Air Temperature	2-10		20(shade) °C	thurder	/	40		10-1	
Cloud Cover (5%)	(km/h)		SW breeze	Sun	12-	1810	"/	-7.0	
			,	1	1	51-	0 / 0	101	11
Wind Direction + speed	rs Seo	2/5 cr	ossing data			. /   Q	54	501	-
Wind Direction + speed In situ Water Paramete	Dee	1.5		1			3	9	75
Wind Direction + speed In situ Water Paramete Sample Depth (m)	- J	-				0 1	91	40/	0
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%)		-			5	0	0 2	1	A
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L					12.	./ 4 -	9 3-	10	6
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%)			r		[a]	. 4 -	-90%-	400	4
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH					[Ja]	. { x ] -	- 25	100	9
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbid ity (TCU)					). ( Ta)	- X	200	100	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH					1. [ Ta]	Amy r	020	201010	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbid ity (TCU)		bane on circle		circle	( ), [Ta]	Kank K	2000	0000	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif	m Buffer)	Roads	Visible Disturbance Surface Debris	Culvert	· ( ) · [ Ta)	K X X O	2000	201010	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decid	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	and a start of the	( ), [Ta]	K X X OLO	20000	0101010	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif	m Buffer)	Roads	Visible Disturbance Surface Debris	Culvert	( ). 1 Ta)	K K K	200000000000000000000000000000000000000	0101010	5
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decid	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	(b) () Channel F	A X E A	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decirc Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	A X A A		Dimension	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decid Re-growth forest Shrub	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel F	atures	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decirc Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	eatures	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decic Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	/	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decirc Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	eatures	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decic Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	3 19	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decic Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	/	*	20101010	
Wind Direction + speed In situ Water Paramete Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L Secchi Depth (m) Temperature (°C) pH Turbidity (TCU) Conductivity (uS/cm) Landscape (Beyond 25 Mixed Forest Conif Grasses Decic Re-growth forest Shrut Photos	m Buffer)	Roads Cutlines	Visible Disturbance Surface Debris Beaver Dam	Culvert	Channel Fe Islands	3 19	6 07 07 ×	20101010	

		Stream Hab	itat Information	1		
Data Collectors John W Dave	H Date	14 July	16		(24 H) //40	
Site	Station	- Juny	rl. n.	Proje	ct	7
Unnamed Ck	(	Northing	CK Cro	55mg linet	CEN 7932	0
	opstream	WP71		Upst	ream Easting	-
Access	Downstre	am Northing		Dowr	nstream Easting	_
Morphology	- riffle	hebitat uncom	unon, ont	Tot liffle on	is observed @ st	udy re
Stream Morphology Types (%)	/	Length (m)	- A -		Velocity (60%	
Run Riffle 20	PoolSD	Depth Transect (m)	@ 25% width		75% 25%	50%
Fall Other: Depth/Pool (m)	14	1 2	139	13 .	29 .01	04
Channel Slope (°)	_	3	122			04
Wetted Width /		m Channel Width (m)			ble Banks (5%)	0-
Meander Frequency / /	_/_/ r	m Regular / (rregular me	eanders	Bank	slope (5°) , L	90.
Instream Cover	0	Ulastroom Cours /Tuis	Cticket ata)	1 - WICuba		0/1
Instream Cover (Detritus) Instream Cover (logs, etc)		6 Instream Cover (Twig 6 Instream vegetation	js/Sucks; etc)		trate (as cover)	0%
Woody Debris Description (log)	jams, fallen trees, bea	aver activity, etc)	an ul-	< notice		22 10
			un-			
				12.2012		-
Substrate Composition (Sum		Vegetaion (Sum 100%		Riprian Zone (25		cle
% Organics	Embed. (%) Rooted En	nergent)		Mixed Forest Grasses	Coniferous Fo Deciduous For	
% Clay	- Rooted Fl			Re-growth forest	Shrubs	031
% Silt (1) 70100	- Free-floati	ing /	0 %	Flooded	Sedges	
% Sand	- Floating A			Roads	Cutlines	
% Gravel 30+	O Attached		0 %			
% Cobble	1	Periphyton	0 %		tion/Notes/Drawing	
% Boulder @ % Bedrock 0	- Aquatic M	Filamentous	0 %			
% Bedrock	and the second se	errestrial Plants	10 %		1	YC
Overhead Cover	Flooded	circathar rianta	1,0 1	4	Tana	1 × 2
Overhead Litter <150 mm	% Overhead	Litter >150 mm (%)	6 %	1	Aria DA	SE
Overhead Undercut Banks	70 % Overhang	ing Trees	0 %		MAX XLES	8/2
Overhead Undercut Banks Overhanging Grasses	70 % Overhang		0 %	5	ander	2/2
Overhanging Grasses				5	Carles C	A XO
		ing Shrubs	10 %	k j	1) 31	A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan	2_0 % Overhang	ing Shrubs (0 (2) n ∂ (2) n	Weather previous 24 H	u V	A Deres	A XX
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature	2_0 % Overhang	*10 (2) n	Weather previous 24 H	k j	A Strange	A the
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%)	Ó_ᢕ % Overhang	ing Shrubs (0 (2) n ∂ (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	k j	Contract (	A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h)	Ó_ᢕ % Overhang	ing Shrubs (0 (2) n ∂ (2) n	Weather previous 24 H	k j	A Carden (+	A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters	Ó_ᢕ % Overhang	ing Shrubs (0 (2) n ∂ (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	k j		A X X
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters Sample Depth (m)	Ó_ᢕ % Overhang	ing Shrubs (0 (2) n ∂ (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		A + + + + + + + + + + + + + + + + + + +
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters Sample Depth (m) Dissolved Oxygen (%)	Derhang	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		A A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L)	Ó_ᢕ % Overhang	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	k j		A A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters Sample Depth (m) Dissolved Oxygen (%)	Derhang	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		A A A A
Overhanging Grasses Miscellaneous High water mark Flood Evidence (Debris on plan Air Temperature Cloud Cover (5%) Wind Direction + speed (km/h) In situ Water Parameters Sample Depth (m) Dissolved Oxygen (%) Dissolved Oxygen (mg/L) Secchi Depth (m) Temperature (°C) pH	20 % Overhang	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		X X X X
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)	2_0 % Overhang its, etc) 7,6 7,7 7 7	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		A A A A
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)	20 % Overhang	* 10 (2) n (3) n 25 °C	UO % Weather previous 24 H Ram Thunder	Channels		A X X X
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But	20 % Overhang its, etc) 7.6	Visible Disturbance	Veather previous 24 H Ram Thunder Sum	Channels		A X X X
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (*C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous 1	2.0 %     Overhang       nts, etc)     7       7.6     7       7.6     7       7.4     7       4.65     7       4.65     7       Forèst     Roads	Visible Disturbance Surface Debris	Veather previous 24 H Ram Thunder Sum circle Culvert	Channels		A A A A
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (*C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F	2.0 %     Overhang       nts, etc)     7       7.6     7	visible Disturbance Surface Debris Beaver Dam	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	Channels		A X X X X
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F         Deciduous F       Coniferous I         Grasses       Deciduous F         Re-growth forest       Shrubs	12,0 % Overhang its, etc) 7,6 7,6 7,7 7 7 4,65 Forest Roads Forest Cutlines Hills	Visible Disturbance Surface Debris	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	side Channels	K K K K K K	A X X X X
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F         Re-growth forest       Shrubs         Photos       Cureation	12,0 % Overhang its, etc) 7,6 7,6 7,7 7 4,65 Forest Roads Forest Cutlines Hills	visible Disturbance Surface Debris Beaver Dam	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	Slaunet apis	K K K K K K	
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F         Deciduous F       Coniferous I         Grasses       Deciduous F         Re-growth forest       Shrubs	12,0 % Overhang its, etc) 7,6 7,6 7,7 7 4,65 Forest Roads Forest Cutlines Hills	visible Disturbance Surface Debris Beaver Dam	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	Channel Features	K K K K K K	A A A A A A A A A A A A A A A A A A A
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         PH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F         Re-growth forest       Shrubs         Photos       Cureation	12,0 % Overhang its, etc) 7,6 7,6 7,7 7 4,65 Forest Roads Forest Cutlines Hills	visible Disturbance Surface Debris Beaver Dam	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	Slaunet apis	K K K K K K	A A A A A A A A A A A A A A A A A A A
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest       Coniferous I         Grasses       Deciduous F         Re-growth forest       Shrubs         Photos       Cureation	12,0 % Overhang its, etc) 7,6 7,6 7,7 7 4,65 Forest Roads Forest Cutlines Hills	visible Disturbance Surface Debris Beaver Dam	Veather previous 24 H Ram Thunder Sum circle Culvert Weig	Channel Features	K K K K K K	
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         PH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest         Grasses         Photos         Yes	2.0 % Overhang its, etc) 7.6 7.6 7.6 7.6 7.6 7.6 7.6 7.6	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank (S I	Veather previous 24 H Ram Thunder Sum circle Culvert Weir Sum	Channel Features	X X SUGOD SUGOD X X X X X X X X X X X X X X X X X X X	
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (°C)         PH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest         Grasses         Photos         Yes	2.0 % Overhang its, etc) 7.6 7.6 7.6 7.6 7.6 7.6 7.6 7.6	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank (S I	Veather previous 24 H Ram Thunder Sum circle Culvert Weir Sum	Channel Features	K K K K K K	A A A A A A A A A A A A A A A A A A A
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (*C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest         Grasses         Deciduous F         Re-growth forest         Shrubs         Photos         Www +         Www +         Wotes	20% Overhang its, etc) 7.6 7.6 7.6 7.4 7.4 7.4 7.4 7.6 7.4 7.6 7	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank (SI	Weather previous 24 H Ram Thunder 5000 circle Culvert Weir Synt)	Channel Features	x suggest suggest y y y y y y y y y y y y y	
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (*C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest         Grasses         Deciduous F         Re-growth forest         Shrubs         Photos         Www +         Www +         Wotes	20% Overhang its, etc) 7.6 7.6 7.6 7.4 7.4 7.4 7.4 7.6 7.4 7.6 7	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank (SI	Weather previous 24 H Ram Thunder 5000 circle Culvert Weir Synt)	Channel Features	x suggest suggest y y y y y y y y y y y y y	/
Overhanging Grasses         Miscellaneous         High water mark         Flood Evidence (Debris on plan         Air Temperature         Cloud Cover (5%)         Wind Direction + speed (km/h)         In situ Water Parameters         Sample Depth (m)         Dissolved Oxygen (%)         Dissolved Oxygen (mg/L)         Secchi Depth (m)         Temperature (*C)         pH         Turbidity (TCU)         Conductivity (uS/cm)         Landscape (Beyond 25 m But         Mixed Forest         Grasses         Deciduous F         Re-growth forest         Shrubs         Photos         Www +         Www +         Wotes	20% Overhang its, etc) 7.6 7	Visible Disturbance Surface Debris Beaver Dam Collapsed Bank (S I	Weather previous 24 H Ram Thunder 5000 circle Culvert Weir Synt)	Channel Features	x suggest suggest y y y y y y y y y y y y y	nensions <i>F fin</i>

Attachment 2

Liard Crossing Habitat

			Stream Hat	bitat Information	n			
Data Collectors	11	Date	1 + F + 11	11		Time (24 H)		
Chris Jaecale, Da	ve H		25 SEPT 1		1	030		
Site	ossing	Station	same			Project	N6788	
UTM NAD		Upstream		70339		Upstream Ea	asting 486	1221
Access 1101 - P.	pat	Downstre		70067		Downstream Easting 484167		
THEIT DO	jan		64-			48	4167	
Morphology		_			4		and the second	
Stream Morphology Types (%)			Length (m)				Velocity (60%	depth or surface)
Run > 100 Riffle	Pool		Depth Transect (m)	50%	50% / 75%			
Fall Other:	_		1(mid.	11	5		/ /	
Depth/Pool (m)			2/0/5		7	75		/ /
Channel Slope (°)			3 (4/5	1 13	10	7	/ /	
			n Channel Width (m)	- lo l	+550	Unstable Ban		
Meander Frequency / /	1 1	r	n Regular / Irregular m	leanders		Bank slope (5	5°) —, L	- R -
Instream Cover					Concernance of			
Instream Cover (Detritus)		09	6 Instream Cover (Twi	gs/Sticks*etc)		Substrate (as		6 %
Instream Cover (logs, etc)	1.1.1	0 %	6 Instream vegetation		0%	Undercut Bar	ık .	0 %
Woody Debris Description (log	jams, faller	n trees, bea	aver activity, etc)					
Substrate Composition (Sum	100%)	Instream	Vegetaion (Sum 100%	(4)	Riprian Zor	ne (25 m Buffe	er) cir	cle
	Embed. (%)	Rooted Er			Mixed Fores		Coniferous Fo	
% Organics	-		bmergent		Grasses		Deciduous Fo	7,717,0
% Clay	-	Rooted Flo			Re-growth f	orest	Shrubs	
% Silt 45		Free-floati			Flooded		Sedges	
% Sand 45		Floating A	•		Roads		Cutlines	
% Gravel	-	Attached A		%	6			
% Cobble 10	2		Periphyton	%	Channel De	escription/Not	es/Drawing	
% Bouider 👌	-		Filamentous	6				
% Bedrock		Aquatic M	OSS	%	14		1	
		Flooded T	errestrial Plants	¥ %				1
Overhead Cover							2. 4	1
Overhead Litter <150 mm	0 %	Overhead	Litter >150 mm (%)	0 %	b	~	Nº N	17
Overhead Undercut Banks	%	Overhangi	ing Trees	9/	ò		1 84	100
Overhanging Grasses	V %	Overhang	ing Shrubs	1 %	b	A A.	NA /	110
Miscellaneous				Weather	A.	XX	V UZZI	0
High water mark			5.0	m previous 24 H	I AU	ALA	11	~
Flood Evidence (Debris on plan	nts, etc)			m overcast	1 1	14	/ 1	× A
Air Temperature			~0 .	rain	A	-1	1 1	SV.
Cloud Cover (5%)			100	11	-1	1 1 1		
Wind Direction + speed (km/h)			Na		1 /	ander!	: 1	
In situ Water Parameters					1 50	anks )	+ A1	11
Sample Depth (m)			1		h h	and Y	+151	AL
Dissolved Oxygen (%)		-	1	-		11	VAA	AV 1
Dissolved Oxygen (mg/L)			/		1.	1AAV	RITI	
Secchi Depth (m)					1	1 . Wa	1	
Temperature (°C)		/			1	An		~
pH	/				IN 1	1.1		
Turbidity (TCU)	/				11	1		
Conductivity (uS/cm)					1.1	1		
Landscape (Beyond 25 m Bu	ffer)	circle	Visible Disturbance	e circle	. /			
Mixed Forest Coniferous	and the second	Roads	Surface Debris	Culvert				
Grasses Deciduous		Cutlines	Beaver Dam	Weir				
Re-growth forest Shrubs		Hills	Collapsed Bank)		1	1		
Photos					Channel Fe	atures	# Di	mensions
Filotos	1				Islands			
					Bars		1	/
			/				1	
Notes Data she	+	otad	from bath	ulmaterit.	10 Agant	and	Lipin 1	tor fina
· Vara shee	1 Cre	anes	hom barn	mentic	ique!	Carlot 1	rivio not	ES TYONY

September 2014.

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**Attachment 3** 

**Field Notebook** 

(30) 12 July'16 CZW. 7932 CZN 7932 12 July 16 John Wilcockson Notes for go pro use barid Harpley Power button (front) Propose: trop up to mme 730 AM from Vancounty 2 WIFI (side) 3 Shuffer for menn (top) appre a annive a mine -Bress Juntil Go Bro App (Front) @ 1330 ish via PG and -5 shulter to accept Fort Nelson, Flew along Should work if not 5otton of cumulus clouds press power button to cycle from FN. -Phone call w/ Garry Sningeour (Parks) to fill him in on to exit then shuffer to exit from WIFI objectives. will likely go to - IPAD unlock 3261 - All north Logn first crossing tonight (28,6 -Allnorth Field Calibration - 02-1560 AN Allnorth @ 2015 Post Hiland - Hil 1 me 1546 1406 1413 693 WH7 3,29 PH4, 23.9°C Temp UZ-3390-BA Post pre 1413 1410 1860 PHZ 7.01 7,01 PHU 4.14 3,99 22.9 Temp Rite in the Ko

32 CZN 7932 13 July 16 purpose: Sundag Ck 33-38 hab assessments 6 crew: John W, Dave H weather: Sunny no clouds slight tor wind. ~ 16°C on site @ 755, safety talk. Starting @ top of Se- allignment, Braded channel 13) largest on left (N) bank all rittle copple of gravel - 100m U/s viffle slower **C** and now higher gravel content (Kp35.3) up OII + DIVERSION - D/S higher gradient more rapids/ higher gradient riffle Eller a 905 - photos of sunday diversion top - mostly san copple w/ sand Witness II. some small plants starting to Street, 10 grow current gradient is less Pilet I than Sindog Loft channel (wetted 1044) photos from back photo Uls 67m - 9m

CEN 7932 13 July 16 0917 centre chamel 1.7 m www. riffle Gobble 85, 19 Gravel 15 V .21/.92/,76 m/sec 25/50/75 D 15/14/14 cm deep no periphyton wP12 (Kp35H) 0940 walking ofs on proposed reallignment channel, cobble + gravel less sand here. (Kp35:4) d/s slightly higher gradient 0946 further 2/5 vegetation in mille of chamel, up 14 (KP 35,4) 4052 WP15 confluence of two dry chamels more sand but also coloble/sand Little fourther 2/5 - Sand wP16 grassy bank (KP 35,5) +958 band WP17 (KP35.5) bank @ wP18 (1-2m high)

CEN 7932 13 July 16 - CEN 7932 1003 wp/9 standing water ~5cm deep. (KP 35,6) (KP 35,7) 1006 up 20 detmed bank on L (North) side only. (photos before bere) -(KP35,9) 1011 WPZI wide chamel, dep on right (3) back some areas of interfect gravels. (KP36) 1017 WPZZ Area where dry chamil used to come back to curvet wet chamel, however return braid is less deep than man dig chamel, short break for water + washroon 6 break, discussed plan. 1032 @ WP 23 @ location of 0 possible culvert if 2 bridge alternative is used Philadel - 1 P Sankfull width 13,15,9m -11 depth 66, 72,46 (from bottom of dry channel to pop of bank).

35 13July 16 riparm veg includes shrubs grass ; spruce + moss. substrate Cobble + Gravel ~ 50/50 except higher areas have more gravel. All imbedded in Sand. (KP36,2) 1100 wp 24 - area of standing water. Bubbles coming from bottom ( displaced air from rain last couple of days? - also trib comp in trom North 7.3pH Temp 9, 210 ms 230 ms no observable flow. Algae on bottom where see photos, DO S.Omg/L\_ (KP36,2) 1110 wp 25 Tributary on Nside Pool > Im deep water clear thick moss of s of pool ( possible high flows because of rains?) channel - 4m wide - bad flies, some chean looking gravel, but sound too of some imbedded gravels 1/20 wp 26 location of two Smaller tribs commy M. Gulkete in the Rain

(36) CZN7932 bettom silty w/ animal tracks algare on bottom marcas. 10 m us both channels go to groud 1135 wp 27 - man Frib us ~ 20m n/m wide 35 cm deepest = Rock near centre have at gas ----moss + lichen Suggesting streen may go any in fall or low precipi periods. 193ms 5100 PH7, 27 (KP36,3) 1150 up 28 confluence of this and diversion chamel Is bank is high, so water will likely be re-directed back to Sundag, Thinder to SE Jark clouds. (KP36.5) -1200 wp 29 close to where major trib and diversion chamed will meet (KP363) up 30 intercepted 1207 WP31 Possible location for off set - lover, more likely to have water from Sub surface

37 13 July 16 CZN 7932 13 July 16 deepest 45cm chame 1 15m wite (KP36,3) 1216 @ WP 32 adjacent rapids. 1220@ WP 33 (KP36.2) of Coarse grovel, slower offle. wp 34 topend of gravel, becomes faster flow more coloble 1226 @ area where road will encroach into active chamel (below HWM) WP35, Will do a habitat sheet here as well on ~ 20 m d/s where Ke bridge would cross back 36,39 thurler Storm closer. KP33 (Encroachunt) Side Chamel volocity . 81 , 58 . 61 . 22 . 39 . 59 Jepth 32 27 31 8 17 30 73 .73 1,26 ,27 ,35 ,81 24 30 32 7 10 16 3 49 1,08 .97 .39 .60 .13 41 26 11 16 11 Rite in the Rai

13 July 16 CZN 7932 (KP36.3) KP 23 (encroachment) 11:10 igm Franzect 3 2 Transert WW BW 13 5 15 (KP36,2) KP3+ 1 lower bridge alternative Farsect WW 22 13 BW 27 25 22 1455 back @ mine w/ helicopter to refuel - Bickup batting for go pro ALC: NO. 1600 finished gopro work stopped @ Sunday trib @ To 39,4 crossing already (KP39.2) assessed by chris wp 43 wp49 further U/3@ pool visited by Chris that went dry dwgig twee visit, -Then stopped @ bluffs to take photos while Heli under power (KP47.7).

13 July 16 CZW 7932 1630 arrives at Kp \$28.7 crossing do full babital assessment here 1642 lost all percells, mid point of reach wP 47 Transect#1 1.46ww 10 an velocity .02/1.22/,07 Jepth 16cm/ 31 /20 #2 6 WW 7 velocity, 09 23 .7 Fib depth 4cm/ 9cm/7.212 chamel split, moved scuplig locations sightly to get water Flow + depth #3 2.45 8 bw V . 37 .42 .21 21cm 24cm 15cm D -15cm total reach 35m long. photo upstream (large water fall) (180m U/S) Rhoto Confluence. 1720 learning site. 1740 Starting @KP36.2 (WP48) Cencrachent], Rite in the Rei

00 CZN 7932 Transect 1 67 58 52 vel depth 22cm 26cm 18cm Tran # 2 11 -56 72 30em 43em 44cm mice backeddy @ bottom of rapids, small gravels Succession in the (up 49) water 30 - 35 an (Rbark) water flowing out of I Benke tran #3 V.57 1.02 ,53 2 26em 35cm 27cm Colorest on 12 creek flowing out of R. bank 20048 (KP 36.0) fin; sh @ 1825 1840 @ 35.9 dane est 95m Story based on range fuller for encroachentig) WP5/ Bott Transect 1 depths @Im here for Bill 15 28 36 39 23 14 im 2m 3m 4m 5m 6m Helicopter coming, will have

13 July 16 - CZN 7932 13 July 16 to continue tomorrow, Back @ Camp at 1915 - dinner + then down loady data Calcheck - 02-3390BA pre post new 143/5 1479 1258 solu 4.0 4.11 3.97 7.04 7.01 7.02 7.0 me 2-1560AN 1473,15 3,54 4,0 22.90 6.57 7,0 1195 1411 1413 Try agan new solution 40 7.0 5,53 5,55 Rite in the Ray

- 14 July 16 (42) 14 July 16 CZN 7932 EN 7932 3rd Fransect purpose: finish off Sunday habitat transects, then 5 6 7 8-15 1 2 4 3 Visit unnamed ck for habitat 0,40 0,33 0,20 0,16 0,09 0,05 0,03 followed by a few IF Tribs 16 17 18 19 20 21 22 23 24-27 to Granger that may have ds 0,03 0,02 0,02 0,03 0,03 0,01 0,13 0,10 0 obstructions. 28 29 30 31 32 0.02 0.11 0,17 0,09 0 Crew! John W, Dave H leaving site @ 822 weather: clear ~ 17°C KP35,5 @ 840 road will come out ~ 4m from bank here returns 10 m d/s. Dave Hunch's might Arrive on site @ 732 - finsh be above HINM. WP53 (\$P35,5) where left off yesterday @ WP54 dame feels Zm of habitat 1053 US remander of first traveet US End wp 55. 7m 8m 9 10 11 12 13 74 WP57 dave in pool not deep 0 0 9 7 8 0 2 10 enough for overintery ImxIm 15 16 17 18 19 gravel, but shallow 0-40 cm 42201018156 0855 wp 58 Kp 35.3 #2#transect encroachent on chamel, but cross(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 above HWM, (14835,2) depth 233219121212500006 900 wp 60 L10-15m long pool up 61 d/s end of slower 14 15 16 17 18 19 20 21 22 23 24 25 26 n file = gravels, most 1g. 00001021 11715129100 And Rite in the Rain 9h

.

CZW 7932 pool 15 M deep likely dag over un tin wp62 above HWM (KP35) up 63 Encroachent anto below HWM 12-3M 0972 kp35.1 pockets of possible spanning habital ~1×14m (rangfinder and the second s up 65 Ohre not stopping - assul = road above HWM up 685.35me (KP34,5) 0942 @ U/S crossing alternative to diversion WP66 (KP34,5) Flows TI V ,74 1,6 ,23 24 31 34 D .49 63 33 38 23 ,29 .61 .77 TZV 23 Berlin and 1020 finished wr67 1030 -WPGF 1030 -old road allignment wpG8 KP3H32 Ing chamel shown and summer and solute npan that vord will pass though. 9m

(KP111.6) 14 July 16 14 July 16 CZN 7932 1140 Q WP 71 Llocation o unnamed creek crossny Trees encroach on Ck, likely place for the crossing lindicates more solid ground, 10 m 2/5 of beaver pond ~ 15m of riffle, not typical as seen from air. V0.04 ,62 2 39cm 42cm 44 72 V 0.01 0 0,13 7cm 13cm 29cm 0.04 0,06 0 of 22cm 49cm 74 cm water strider noted Fmishry @ 1210 - no fish observed, WP 72 Landing spat, tim 50m U/s of site, U/s of bearer dan. Most of botton stand substrate has no veg just mud , chear. water, can be bottom easity Reten Stren

(46) 14 July 16 - CEN 7932 14 July 16 CZN 7932 up 79 mother beaver dan ' even u/s of beaver pond ~1m wp 80 location to pickup deep in spots no life seen in veg & wild life team pond next to drop off. 1227 in heli learny Site Back @ Mine @ 1500 Manto be on fight out of, noted two addul beaver dams mme at 1830. overnight as we were exiting to south, @ Simpson + catch early - Dave comerted flight to yk then Home . Kp 126,2 @ 1307 small convectume w/ survey, but appears to Cal check peter-out after 100m or SD 02-3390-BA KP 1329 KP 130 chamel peters. Rre 1413,5 1443 out up + down 22.0°C Kp 132 good chand but pH4 4,08 PH7 peters out dis noto wetland 7.10 Siles and no apparent comector Kp134,5 1317 3 beaver dans @ WP73 (ds of road) States in House, States Kp135,5 up 74 another ck ending in beaver dam. up 75 another beaver daw on a larger chamel. Rite in the Rai