Appendix 4.6-C

Stream Assessment Report, Feasibility Road Design Phase 2, Telkwa Metallurgical Coal Project, prepared by DWB Consulting Services Ltd., 2020

TELKWA COAL
LIMITED

DWB Consulting Services Ltd.

Stream Assessment Report

Feasibility Road Design Phase 2
Telkwa Metallurgical Coal Project

Engineering | Environmental | Forestry

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OQM | Organizational Quality Management Program

Signature Page

DWB Consulting Services Ltd. is pleased to submit this report for your review. This report has been prepared using sound technical and professional judgement, based on our knowledge and experience, applicable regulatory framework, industry best management practices, and current understanding of project conditions, design, and project setting.

REPORT TITLE:	Stream Assessment Report – Feasibility Road Design Phase 2 Telkwa Metallurgical Coal Project
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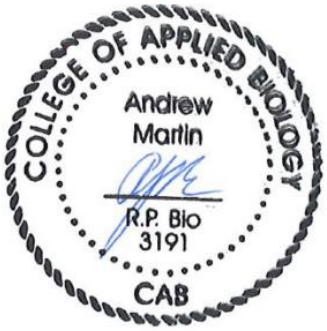

REVISION HISTORY			
DATE	**VERSION**	**REVIEW TYPE**[1]	**REVIEWED BY** (NAME, COMPANY)
27.08.2018	DRAFT	EDITORIAL	ERIN MINOR, DWB
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[1] Editorial Review: Reviewed for formatting, grammar, spelling, etc.
Professional Review: Reviewed for content and professional signoff
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Regulatory Review: Reviewed by regulatory agency (i.e. DFO) if necessary
Peer Review: Reviewed for content and errors by peer

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We do not represent, warrant, undertake or guarantee:

- That all project environmental-related information has been received.
- That regulations and standards of practices shall remain constant through the duration of the project.
- That the use of guidance in the report will lead to any particular outcome or result; or, in particular,
- That by using the guidance in the report, the client will be approved by the contract holder for the applied works.

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1.0 INTRODUCTION

1.1 PROJECT SCOPE

DWB Consulting Services Ltd. (DWB) was retained by Allegiance Coal Ltd. (Allegiance) to classify 12 initially specified watercourses plus additional sites identified during the assessment which resulted in 22 sites along a proposed access road between Coalmine road and Lawson road near Telkwa, BC as part of feasibility road design for the Telkwa Metallurgical Coal project. This report describes and provides an appropriate classification of the watercourses surveyed.

In 2020 DWB was retained by Allegiance to revisit the sites that could merit downgrading with additional sampling.

1.2 PROJECT OBJECTIVE

The primary objective of this report is to classify, as per current legislated regulations and recommended guidelines, all watercourses identified on the Coalmine Access Road. The primary characteristics used to determine stream classifications include: fish presence/absence, stream gradient and stream width. Additional information, including biophysical descriptions of non-fish bearing reaches, were also recorded to provide resource managers with a complete overview of existing riparian values.

1.3 PROJECT LOCATIONS

The proposed road is located south of Telkwa BC between Lawson Road and Coalmine Road. This sites are accessed by travelling west on Highway 16 from Prince George to Telkwa. Turn left off the highway onto Hankin Avenue and continue straight onto Riverside Street and cross the Bulkley River. Continue straight onto Telkwa Coalmine Road. You can also turn left onto Birch St after the bridge, and continue straight onto Lawson Rd. The proposed road with stream crossings is located between 9U 629837 6057686 on Lawson road and 9U 620428 6055216 on Coalmine Road.

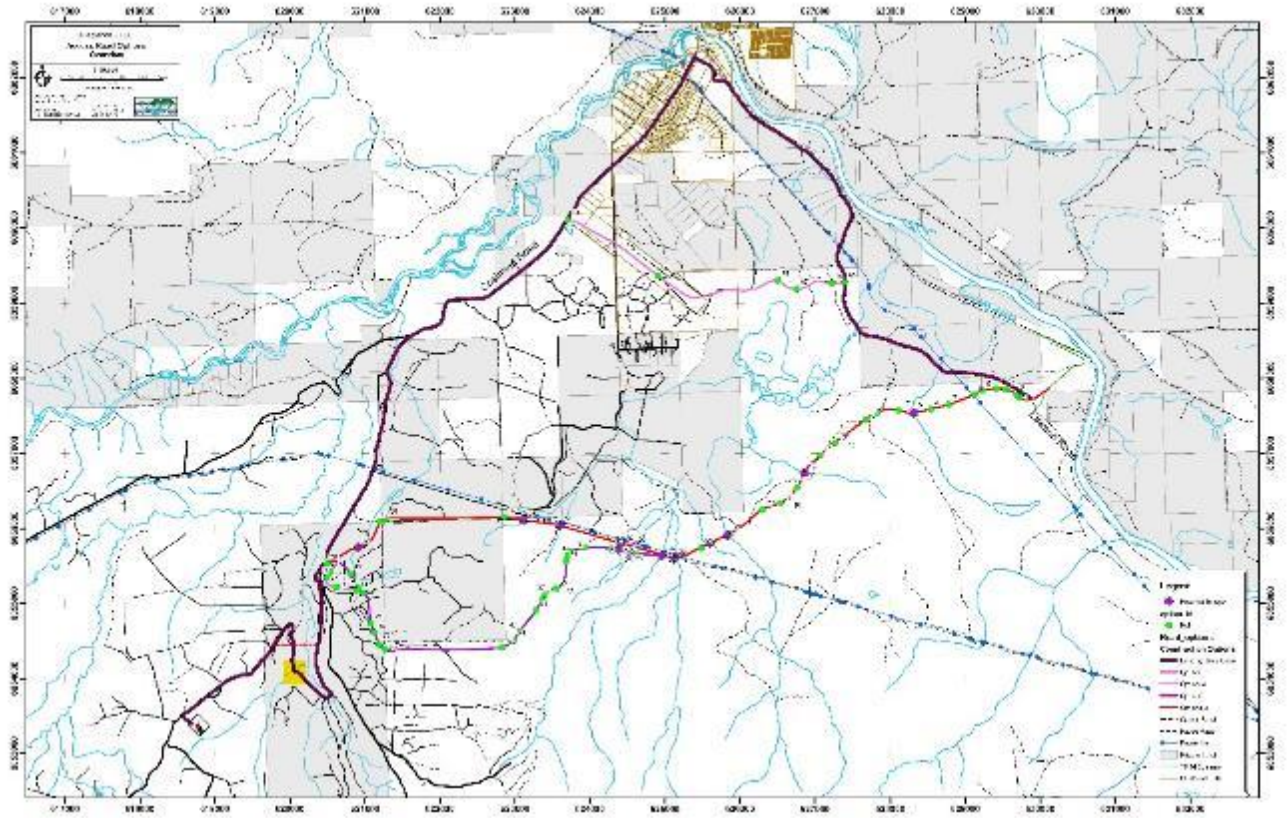

Figure 1 – Location of proposed road and stream assessments. Stream assessed are located along the Option 1+2 route in red and includes the steam crossing the yellow polygon in the south west corner.

2.0 METHODOLOGY

2.1 DEFINITIONS

The following definitions were obtained from the Fish-stream Identification Guidebook (Province of British Columbia, 1998), the Riparian Management Area Guidebook (Province of British Columbia, 1995), and the Forest and Range Practices Act (FRPA) Regulation 2004 (Quickscribe Services Ltd., 2007).

2.1.1 Classifiable Watercourses

Classifiable stream: A watercourse that has a continuous channel bed (is scoured by water, and/or contains deposits of mineral alluvium) and is at least 100 m in length, or has a continuous channel bed but is less than 100 m in length but has been confirmed to contain fish or flows into a known fish stream or lake, or a watercourse located in a community watershed.

Non-fish bearing reach: A watercourse that meets the classifiable stream definition and has been confirmed to have no fish presence. The reach is either disconnected from another watercourse, has poor fish habitat, or contains a hard barrier to fish migration that would prevent fish ascent into the reach. If the lack of fish presence cannot be confirmed, then the reach must be defaulted fish bearing until such time that additional sampling can be undertaken to confirm its status.

These features are classified by the presence or absence of fish, their average channel width, and whether or not the feature is located in a community watershed (Table 1).

Table 1. Stream Classification

THE REACH IS A FISH STREAM OR LOCATED IN A COMMUNITY WATERSHED		THE REACH IS NON-FISH BEARING AND IS NOT LOCATED IN A COMMUNITY WATERSHED	
Stream Classification	**Stream width**	**Stream Classification**	**Stream Width**
S1	>20 m	S5	>3 m
S2	5-20 m	S6	≤3 m
S3	1.5-5 m		
S4	<1.5 m		

2.1.2 Non-Classifiable Watercourses

Non-Classifiable Drainage (NCD): A watercourse that does not meet the FRPA definition of a stream (i.e. continuously defined streambed with presence of alluvium), yet shows signs of significant water flow and therefore has some ability to transport materials downstream. These typically include continuous organic channels, defined non-fish bearing drainages less than 100 m long and other non-classifiable watercourses with year-round flow.

Non-visible Channel (NVC): Features shown on TRIM as watercourses that, when field verified, show complete absence of channel definition. These features are typically found in the bottom of dry draws or depressions, consisting entirely of terrestrial, upland vegetation. Under typical circumstances, evidence of flow is absent; however some flow during spring melt may be expected. Any such flow is small in volume and short in duration such that no sign of water flow (i.e. scour/deposition) remains after spring melt subsides.

2.1.3 Riparian Buffers

Riparian Management Area (RMA): This area directly borders the stream, consists of the Riparian Reserve Zone (RRZ) where applicable and the Riparian Management Zone (RMZ) and is outlined in the Forest Planning and Practices Regulation.

Riparian Reserve Zone (RRZ): This area directly borders the stream and the width is dependent on the stream classification. The RRZ is a no-harvest and no-disturbance zone with few exceptions, as outlined in the Forest Planning and Practices Regulation.

Riparian Management Zone (RMZ): This area directly border the RRZ (or the stream if no RRZ is present) and the width is dependent on the stream classification. The RMZ has limitations on disturbance that are outlined in the Forest Planning and Practices Regulation.

2.2 SURVEY TECHNIQUES

All fieldwork was conducted in accordance with DWB's operating standards. All watercourses were classified using procedures recommended in the Riparian Management Area Guidebook (Province of British Columbia, 1995), the Fish-stream Identification Guidebook (Province of British Columbia, 1998), and the Fish-stream Crossing Guidebook (Province of British Columbia, 2012). All measurements were taken in such a fashion as to comply with Resource Information Standards Committee (RISC 2001).

2.2.1 Watercourses

Field investigations were conducted by qualified fisheries personnel (MWLAP, 2004) consisting of a two-person crew outfitted with forest survey and fish sampling equipment. Stream classification and fish sampling was conducted using a Smith-Root Model 12B backpack electrofisher. Stream channel and wetted widths were measured using a meter tape and multiple channel width measurements were made along each reach. Stream bank heights measurements were also determined using a meter tape and stream gradients were determined using a clinometer along several sections of each reach. Stream channel widths and gradients were averaged for stream classification purposes. Site lengths were

determined either by hip chain, map estimates, or with a GPS unit. Barriers to fish passage were quantified where possible; however, when unable due to safety concerns, ground estimates were utilized. Stream water temperatures were obtained using an alcohol thermometer. All survey information was recorded on RISC Stream Site Cards.

All fish sampling was conducted under valid Fish Collection Permits obtained from the Ministry of Forests, Lands Natural Resource Operations and Rural Development (MFLNRORD) and Scientific Licences acquired from the Department of Fisheries and Oceans (DFO). These fish permits are required to conduct any fish sampling in the province of British Columbia and copies of these fish permits were brought to the field. Only individuals with a valid electrofishing certificate conducted fish sampling on any watercourse. During fish sampling, any fish captured was identified using RISC's Field Key to the Freshwater Fishes of British Columbia (McPhail and Carveth, 1993), a photograph was taken, and all information was recorded on RISC Fish Collection Forms. Any species at risk found in the area was reported to DWB supervisors and to Coalsense as soon as possible. All of the fish sampling results will be submitted to the MFLNRORD and DFO at the end of the field season as required under the permits.

2.2.2 Fish Habitat Rating

For all stream reaches assessed, fish habitat was also rated in order to help determine potential fish use and support the stream classification assigned. Fish habitat values assessed included rearing, spawning and over-wintering habitats with a ranking of nil, poor, moderate or good assigned and a brief rationale provided on site cards. Considerations for downstream and upstream habitats were also described at the reporting stage which provided information on stream linkages and the amount of fish habitat potentially available.

For any defaulted or confirmed fish-bearing stream, the assessed fish habitat values were used to assign an overall fish habitat rating (Marginal, Important, or Critical) based on criteria provided in the Fish-stream Crossing Guidebook (Province of BC, 2012). This information allows increased choice and direction on appropriate stream crossing structures during road layout and design.

2.2.3 Determination of Barriers to Fish Passage

If fish were not captured during the initial assessment or if site conditions did not allow sampling to occur (i.e. low flows, dry stream or temperatures below fish permit tolerance), our field effort was focused on finding rationale why fish were not present. If a downstream natural barrier was found to support the field findings (as is often the case with small streams), the stream was classified non-fish bearing with a single sample event. A natural barrier may consist of waterfalls and cascades over bedrock that were impassable to fish (generally minimum of 1 m vertical height with less than 1.5 m deep pool present below), sustained gradients over 20%, or lost channel definition accompanied by flow infiltration creating an overland barrier.

If a fish barrier could not be confirmed and fish habitat was available, the stream was defaulted to fish-bearing and a second season of sampling was recommended.

3.0 RESULTS

3.1 General Fisheries Information

The stream reaches assessed on the proposed road are tributaries of the Bulkley and Telkwa Rivers and include named streams Four Creek (WSC: 460-422700-09600-25600) and Helps Creek (WSC: 460-437000).

Table 2: List of all species known to inhabit the Telkwa River, Four Creek and Helps Creek.

COMMON NAME	SCIENTIFIC NAME	SPECIES ABBREVIATION	TELKWA RIVER	FOUR CREEK	HELPS CREEK
Burbot	*Lota lota*	BB			✓
Chinook Salmon	*Oncorhynchus tshawytscha*	CH	✓		✓
Coho Salmon	*Oncorhynchus kisutch*	CO	✓		✓
Cutthroat Trout	*Oncorhynchus clarki*	CT			✓
Dolly Varden	*Salvelinus malma*	DV	✓	✓	✓
Longnose Dace	*Rhynichthys cataractae*	LNC			✓
Longnose Sucker	*Catostomus catostomus*	LSU			✓
Mountain Whitefish	*Prosopium williamsoni*	MW	✓		
Peamouth Chub	*Mylocheilus caurinus*	PCC	✓		
Pink Salmon	*Oncorhynchus gorbuscha*	PK	✓		
Rainbow Trout	*Oncorhynchus mykiss*	RB	✓		✓
Steelhead	*Oncorhynchus mykiss*	ST	✓		✓

3.2 SUMMARY OF RESULTS

Twelve TRIM stream reaches were assessed along the proposed road and ten others were encountered during the initial survey. After the second survey, seven reaches were confirmed fish-bearing, three were defaulted to fish-bearing, and twelve features were assessed as non-classifiable drainages (NCD or NVC). A summary of all the sites and their locations is included in Table 3, with a detailed site description and photos of each site located in Section 4 and site maps in Appendix A.

Table 3. Summary of reaches assessed along the Proposed Coalmine Access Road.

SITE #	CLASS	CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING	RIPARIAN RESERVE ZONE (M)	RIPARIAN MANAGEMENT ZONE (M)
1-1	NCD	N/A	N/A	09U 0628307 6057533	N/A	N/A	N/A
2-1	NVC	N/A	N/A	09U 0626791 6056763	N/A	N/A	N/A
3-1	S2	5.6	3	09U 0625849 6055932	Important	30	20
4-1	NCD	N/A	N/A	09U 0625652 6055788	N/A	N/A	N/A
5-1	DS3	2.2	7	09U 0623175 6056159	Marginal	20	20
6-1	DS4	1.36	10	09U 0623599 6056034	Marginal	N/A	30
7-1	S4	1.42	12	09U 0624410 6055812	Marginal	N/A	30
8-1	S3	1.67	13	09U 0624584 6055760	Marginal	20	20
9-1	DS4	1.28	5	09U 0624952 6055657	Marginal	N/A	30
10-1	S4	1.2	10	09U 0625115 6055604	Marginal	N/A	30
11-1	S3	4.8	9	09U 0620053 6054108	Important	20	20
12-1	NCD	N/A	N/A	09U 0621086 6056082	N/A	N/A	N/A
20-1	NCD	N/A	N/A	09U 0627427 6057230	N/A	N/A	N/A
22-1	S3	2.22	4	09U 0625277 6055578	Marginal	20	20
23-1	NVC	N/A	N/A	09U 0625191 6055583	N/A	N/A	N/A
24-1	NCD	N/A	N/A	09U 0625044 6055626	N/A	N/A	N/A
25-1	NCD	N/A	N/A	09U 0624786 6055702	N/A	N/A	N/A
26-1	NCD	N/A	N/A	09U 0624356 6055822	N/A	N/A	N/A
27-1	NCD	N/A	N/A	09U 0623896 6055956	N/A	N/A	N/A
28-1	NCD	N/A	N/A	09U 0623668 6056021	N/A	N/A	N/A
29-1	NCD	N/A	N/A	09U 0621868 6056113	N/A	N/A	N/A
30-1	S3	2.58	3	09U 0620427 6053768	Important	20	20

4.0 DETAILED SITE DESCRIPTIONS

4.1 SITE 1-1-NCD

Table 4: Summary of biophysical stream attributes for Site 1 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
1-1	NCD	N/A	N/A	09U 0628307 6057533	N/A

Assessment Summary

Watershed Code: N/A

Site 1-1, located at approximately 3+500 on the proposed road, was assessed on August 7th, 2018 and is a tributary of Helps Creek (WSC: 460-437000). The substrates in this drainage are highly organic with only small sections (< 10 m) of alluvium or scour. The channel is reasonably well defined due to a consistent and distinct draw that is present downstream of the crossing but rapidly degrades above the crossing. There is no structure present at the crossing currently. The riparian area at the proposed crossing consists mostly of dense shrubs with some mature coniferous trees.

Justification for Classification

Site 1-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have a continuous or defined channel for > 100 m and has a predominantly organic bed, which was dry on the day of the assessment. There are small sections of discontinuous scour and alluvium < 10 m long.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 1. Highly vegetated area.

Photo 2. Lack of defined channel and presence of water.

Photo 3. No consistent scour or alluvium.

Photo 4. Predominantly organic substrate.

4.2 SITE 2-1-NVC

Table 5: Summary of biophysical stream attributes for Site 2 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
2-1	NVC	N/A	N/A	09U 0626791 6056763	N/A

Assessment Summary

Watershed Code: N/A

Site 2-1 is located at approximately 4+600 on the proposed road, and was assessed on August 7th, 2018. The TRIM feature is located in a low gradient area. Several small, vegetated draws were observed in the area but there was no evidence of historical or present water flow. The riparian area at the proposed crossing consists mostly of dense shrubs with some mature coniferous trees.

Justification for Classification

Site 2-1 has several draws that are reasonably defined for up to 50 m but there is no evidence of water having flowed at any time through them. There is no exposed alluvium or scour and no evidence of a channel.

Recommendations

The lack of a feature in this area indicates that a crossing structure will not be required.

Site Photos

Photo 5. No defined channel or water present.

Photo 6. No vegetation change or scouring present.

4.3 SITE 3-1-S2

Table 6: Summary of biophysical stream attributes for Site 3 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
3-1	S2	5.6	3	09U 0625849 6055932	Important

Assessment Summary

Watershed Code: 460-437000

Site 3-1 is Helps Creek and is located at approximately 5+940 on the proposed road. The stream was assessed on August 8th, 2018, and flows into the Bulkley River approximately 6 km downstream. A Dolly Varden and several more unidentified juvenile salmonids were observed in this reach in isolated pools of water. The overall habitat was assessed as IMPORTANT, as per the criteria provided in the Fish-Stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for spawning and rearing, while overwintering appears limited. Flows appear seasonal along the reach as there were some dewatered sections with gentle gradients <5%. Bed substrates are mostly gravels and cobbles which provides spawning opportunities. There were few deep pools present along the assessed reach (approximately 600 m) with an average residual pool depth of 0.22 m. Moderate total cover for fish were provided mostly by small woody debris (SWD), large woody debris (LWD), overhanging vegetation, undercut banks, as well as some boulders and a few deep pools. The reach was mostly dry at the time of the assessment and will likely be dry for most of the fall and winter. The riparian area at the proposed crossing consists mostly of dense shrubs with several large alders and some smaller deciduous trees.

Table 5: Summary of values of various fish habitat types for Site 3 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Moderate	Un-embedded gravels and cobbles.
Rearing	Moderate	Moderate cover, some pools and low gradient.
Over-Wintering	Poor	Few deep pools, seasonal flow.

Sampling Summary

The channel was not electrofished due to there being an overall lack of water, but a Dolly Varden and several other salmonids were observed in a small pool that was being fed via sub-surface flows.

Justification for Classification

Site 3-1 is classified as fish-bearing (S2) due to historical fish observations and observations made during the survey.

Recommendation

Based on information provided (important habitat rating and size of existing channel), it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012). The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 7. Dolly Varden caught along reach.

Photo 8. Deep pool with fish present.

Photo 9. Gravel and cobble substrate. Dry at time of survey.

Photo 10. Moderate cover with SWD and over-hanging vegetation.

4.4 SITE 4-1-NCD

Table 8: Summary of biophysical stream attributes for Site 4 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
4-1	NCD	N/A	N/A	09U 0625652 6055788	N/A

Assessment Summary

Watershed Code: N/A

Site 4-1 is located at approximately 6+180 on the proposed road, was assessed on August 8th, 2018 and is a tributary of Helps Creek (WSC: 460-437000). The area is quite flat with no defined draw. The reach itself is braided and stream-like in places but cannot maintain consistent scour/alluvium and channel for more than a few meters per section. The drainage was dry on the date of the assessment. The riparian area at the proposed crossing consists mostly of smaller shrubs with sporadic coniferous trees.

Justification for Classification

Site 4-1 is a non-classifiable drainage (NCD) due to the lack of a continuous or defined channel for >100 m, a predominantly organic substrate, and discontinuous stretches of scour /alluvium (<1 m in length).

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 11. Highly organic substrate.

Photo 12. Small section of scour and alluvium (< 1m).

4.5 SITE 5-1-DS3

Table 9: Summary of biophysical stream attributes for Site 5 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
5-1	DS3	2.2	7	09U 0623175 6056159	Marginal

Assessment Summary

Watershed Code: N/A

Site 5-1 is located at approximately 8+660 on the proposed road, was assessed on August 8th, 2018 and is a tributary of Helps Creek (WSC: 460-437000) located approximate 5 km downstream. It was also reassessed on July 21, 2020. There is a culvert present at proposed crossing location and potential for others downstream that may be barriers to fish. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear limited. The stream was dry on both days of assessment. The channel has low gradients, and bed substrate is mostly cobbles with some gravels which are not ideal for spawning habitat. There are few deep pools along the assessed reach (approximately 400 m) with an average residual pool depth of 0.23 m. Abundant total cover for fish was provided mostly by SWD, LWD, overhanging vegetation, undercut banks, boulders, and a few deep pools. While there was no water at both times of survey, the channel and scour indicate that there is significant flow during peak seasons when fish are seeking spawning/rearing habitat. The riparian vegetation at the crossing is mostly small shrubs but there are some larger alder and the occasional deciduous tree.

Table 10: Summary of values of various fish habitat types for Site 5 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Substrate cobbles and some gravels.
Rearing	Moderate	Abundant cover, gentle gradients.
Over-Wintering	Poor	Few deep pools, seasonal flow.

Sampling Summary

DWB did not electrofish this reach because there was no water present at the time of the first survey. On the second visit, DWB employed the use of minnow traps in the few pools that contained water. No fish were found.

Justification for Classification

Site 3-1 is classified as default fish-bearing (DS3) due to its potential rearing habitat, and connection to Helps Creek with no natural barriers present. Culverts present, including a 900 mm culvert at the crossing may impact fish migration during wetted periods.

Recommendation

Based on information provided it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012). The structure size should be confirmed with hydrotechnical analysis. Recommend resampling this feature during times of flow to determine if fish are utilizing this reach.

Site Photos

Photo 13. Pond downstream of proposed road crossing.

Photo 14. 900 mm culvert downstream of the proposed crossing.

Photo 15. Deactivation at crossing.

Photo 16. Deactivation at crossing from road side.

Photo 17. Cobble and gravel substrate with overhanging vegetation.

Photo 18. Well scoured reach (July 2020).

4.6 SITE 6-1-DS4

Table 11: Summary of biophysical stream attributes for Site 6 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
6-1	DS4	1.36	10	09U 0623599 6056034	Marginal

Assessment Summary

Watershed Code: N/A

Site 6-1 is located at approximately 8+320 on the proposed road, was assessed on August 9th, 2018 and is a tributary of Helps Creek (WSC: 460-437000) located approximately 5 km downstream. It was also reassessed on July 21, 2020. Before reaching Helps Creek Site 6-1 connects to Site 5-1 approximately 450 m downstream of the road. The proposed crossing currently has a 900 mm culvert in place and the stream was dry on the date of the assessment. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-Stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear limited as the stream is seasonal (mostly dry during both assessments). Bed substrate is mostly embedded gravels and cobbles which are not ideal for spawning habitat. There are no deep pools present along the assessed reach with an average residual pool depth of 0.16 m. Moderate total cover for fish was provided mostly by SWD, overhanging vegetation, boulders, undercut banks, instream vegetation, and LWD. While there was no water present at the time of the first survey, the channel and scour are evidence of significant flow during peak seasons when younger fish would be seeking rearing habitat. During the second survey there was a small amount of water in the feature with a couple isolated pools. The riparian vegetation at the crossing is mostly small shrubs but there are some larger alder and the occasional deciduous tree.

Table 12: Summary of values of various fish habitat types for Site 6 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Substrate cobbles and some gravels.
Rearing	Moderate	Abundant cover, gentle gradients.
Over-Wintering	Poor	Few deep pools, seasonal flow.

Sampling Summary

DWB did not electrofish this reach due to the lack of water in the channel at the time of the first survey. During the second survey DWB was able to electrofish a couple isolated pools for 86 seconds at 300 volts but did not locate any fish.

Justification for Classification

Site 6-1 is classified as default fish-bearing (DS4) due to its potential rearing habitat, and connection to Helps Creek with no barriers present.

Recommendation

Based on information provided it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis. This site should be revisited during times of flow to verify if fish are utilizing the habitat.

Site Photos

Photo 19. Downstream view of 900 mm culvert with small plunge pool and cobbles.

Photo 20. Mostly dry, cobble substrate (July 2020).

Photo 21. Substrate mostly cobbles with some gravels.

Photo 22. Site location along road from high chain approach.

4.7 SITE 7-1-S4

Table 13: Summary of biophysical stream attributes for Site 7 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
7-1	S4	1.42	12	09U 0624410 6055812	Marginal

Assessment Summary

Watershed Code: N/A

Site 7-1 is located at approximately 7+480 on the proposed road, and was assessed on August 9th, 2018. Site 7-1 is a tributary of Helps Creek (WSC: 460-437000) located approximately 5 km downstream. The overall habitat value was assessed as MARGINAL, as per the criteria provided in the Fish-stream Crossing Guidebook. Habitat Wizard has a historical record of Rainbow Trout near the proposed crossing. A 900 mm perched culvert is present at the proposed crossing location.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering habitat appears limited as the stream has seasonal flow (isolated pools present during assessment). Bed substrate is slightly embedded gravels and cobbles. There are a few deep pools along the assessed reach with an average residual pool depth of 0.33 m. Moderate total cover for fish was provided by overhanging vegetation, undercut banks, LWD, SWD, boulders, instream vegetation, and a few deep pools. The culvert at the crossing appears to be damaged and is perched which result in a barrier to fish migration. The riparian vegetation at the crossing is mostly small shrubs but there is also the occasional deciduous tree.

Table 14: Summary of values of various fish habitat types for Site 7 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Slightly embedded gravels and cobbles. Seasonal flows.
Rearing	Moderate	Moderate cover. Seasonal flows.
Over-Wintering	Poor	Few deep pools and seasonal flow.

Sampling Summary

DWB did not electrofish this reach since the channel was almost entirely dry at the time of the survey and there are historical records of fish presence.

Justification for Classification

Site 7-1 is classified as fish-bearing (S4) due to its potential rearing habitat, lack of natural barriers down to Helps Creek, and a historical record of Rainbow Trout being present in this reach.

Recommendation

Based on information provided (important habitat rating and size of existing channel), it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 23. Outlet of 900 mm culvert showing perched outlet.

Photo 24. Inlet habitat at 900 mm culvert.

Photo 25. Deep pool upstream from crossing.

Photo 26. Gravel and cobble substrate with overhanging vegetation and undercut banks.

4.8 SITE 8-1-S3

Table 15: Summary of biophysical stream attributes for Site 8 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
8-1	S3	1.67	13	09U 0624584 6055760	Marginal

Assessment Summary

Watershed Code: N/A

Site 8-1 is located at approximately 7+300 on the proposed road, was assessed on August 9th, 2018 and is a tributary of Helps Creek (WSC: 460-437000) located approximate 5 km downstream. It was reassessed on July 22, 2020. Site 8-1 connects to Site 7-1 approximately 600 m downstream. There are perched culverts at the proposed crossing and on the powerline road located immediately downstream. The stream was dry on the day of the assessment. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear limited due to the lack of water in the summer and fall. Flows appear seasonal and bed substrate is mostly cobbles and boulders with few gravels which is not ideal for spawning habitat. There are few deep pools along the assessed reach with an average residual pool depth of 0.28 m. Moderate total cover for fish was provided mostly by overhanging vegetation, boulders, SWD, undercut banks, and some deep pools. During the second survey there was water present but the level was insufficient to allow for fish passage.

There is a 0.60 m perched 900 mm culvert at the powerline crossing and a 0.70 m perched culvert at the proposed culvert that considered unnatural barriers to fish migration. The riparian vegetation at the crossing is mostly small shrubs but there are also some immature deciduous trees.

Table 16: Summary of values of various fish habitat types for Site 8 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Substrate cobbles and some gravels.
Rearing	Moderate	Abundant cover, gentle gradients.
Over-Wintering	Poor	Few deep pools, seasonal flow.

Sampling Summary

DWB did not electrofish this reach due to the lack of water at the time of the first survey. Perched culverts present and downstream of the crossing will also affect fish access. During the second survey DWB was able to deploy the electrofisher and a minnow trap to sample for fish in some of the pools. No fish were located.

Justification for Classification

Site 8-1 was previously classified as default fish-bearing (DS3) due to its potential rearing habitat, and connection with no natural barriers to 7-1-S4 within 500 m, which is historically fish-bearing. This site eventually drains into Helps Creek. Given its proximity to 7-1-S4 and the lack of barriers located, DWB believes it reasonable to assume that there would be fish here under normal circumstances and has changed the designation to **S3**, fish-bearing.

Recommendation

Based on information provided it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 27. Downstream view of 900 mm culvert with 0.60 m perch at powerline access crossing.

Photo 28. Outlet of 900 mm culvert at proposed road crossing.

Photo 29. Electrofishing an isolated pool (July 2020).

Photo 30. Upstream 900 mm culvert at proposed access crossing with log bundle on top.

4.9 SITE 9-1-DS4

Table 17: Summary of biophysical stream attributes for Site 9 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
9-1	DS4	1.28	5	09U 0624952 6055657	Marginal

Assessment Summary

Watershed Code: N/A

Site 9-1 is located at approximately 6+900 on the proposed road, was assessed on August 9th, 2018 and is a tributary of Helps Creek (WSC: 460-437000). It was reassessed on July 21, 2020. Before connecting with Helps Creek, Site 9-1 connects to Site 7-1 approximately 700 m downstream which is a known fish bearing stream. A 450 mm culvert is present at the proposed crossing and the stream was dry on the date of the assessment. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-Stream Crossing Guidebook. A second season of sampling is recommended.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear limited due to the seasonal nature of the stream (dry on the first day of assessment). During the second assessment there was a trickle of water present but it was too low to allow for fish passage. Bed substrate is mostly sands and cobbles with very limited gravels which is not ideal for spawning habitat. There are no deep pools with an average residual pool depth of 0.23 m. Moderate total cover for fish was provided mostly by undercut banks, overhanging vegetation, and SWD. The 450 mm culvert at the crossing is perched nearly 70 cm which would prevent fish passage. The riparian vegetation at the crossing is mostly small shrubs and the occasional deciduous tree.

Table 18: Summary of values of various fish habitat types for Site 9 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Sands and cobbles with very few gravels.
Rearing	Poor	Moderate cover with undercut banks and vegetation, no pools.
Over-Wintering	Nil	No deep pools, seasonal flow.

Sampling Summary

DWB did not electrofish this reach due to a lack of water in the channel at the time of the first survey. During the second survey an electrofisher was briefly deployed (84 seconds at 300 volts) but the flow was generally too low assess properly.

Justification for Classification

Site 9-1 is classified as default fish-bearing (DS4) due to its potential for rearing habitat, and connection to Site 7-1 with no natural barriers present.

Recommendation

Based on information provided it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis. This site should be revisited during times of flow so that a more accurate assessment can occur.

Site Photos

Photo 31. Downstream view of 450 mm culvert with 0.70 m perch.

Photo 32. Upstream view of 450 mm culvert. Abundant SWD.

Photo 33. Sandy substrate.

Photo 34. Very shallow flows within this reach (July 2020).

4.10 SITE 10-1-S4

Table 19: Summary of biophysical stream attributes for Site 10 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
10-1	S4	1.2	10	09U 0625115 6055604	Marginal

Assessment Summary

Watershed Code: N/A

Site 10-1 is located at approximately 6+680 on the proposed road, was assessed on August 9th, 2018 and is a tributary of Helps Creek (WSC: 460-437000). It was reassessed on July 21, 2020. Before connecting with Helps Creek Site 10-1 connects to Site 7-1 approximately 700 m downstream which is a known fish bearing stream. A 500 m culvert is present at the proposed crossing and the stream was dry on both days of assessment. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-Stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear limited due the seasonal nature of the stream. Bed substrate is mostly sands and cobbles with very limited gravels which is not ideal for spawning habitat. There are no deep pools with an average residual pool depth of 0.23 m. Moderate total cover for fish was provided mostly by undercut banks, overhanging vegetation, and SWD. A 500 mm culvert is present at the crossing that appears functional but is likely not suitable to pass fish. The riparian vegetation at the crossing is mostly small shrubs and the occasional deciduous tree.

Table 20: Summary of values of various fish habitat types for Site 10 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Seasonal flow. Shallow. Embedded gravels. Width <3m.
Rearing	Poor	Moderate cover with undercut banks and vegetation, very few pools.
Over-Wintering	Nil	No deep pools, seasonal flow.

Sampling Summary

DWB did not electrofish this reach due to a lack of water in the channel at both times of survey.

Justification for Classification

Site 10-1 was initially classified as default fish-bearing (DS4) due to its potential ability to support fish, and connection to Site 7-1 with no known natural barriers present. However, due to this reach's proximity to site 7-1 and the confirmed presence of fish therein, DWB has determined that this site merits full **S4**, fish-bearing classification.

Recommendation

Based on information provided it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 35. Abundant overhanging vegetation obscuring the 500 mm culvert present at the crossing. Downstream view.

Photo 36. Upstream view of 500 mm culvert. Abundant fines.

Photo 37. Sandy and gravel substrate.

Photo 38. Site center from high chain along proposed road (old road present in this location).

4.11 SITE 11-1-S3

Table 21: Summary of biophysical stream attributes for Site 11 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
11-1	S3	4.8	9	09U 0620053 6054108	Important

Assessment Summary

Watershed Code: 460-422700-09600-25600

Site 11-1 is a named Four Creek and is located approximately 12 km south along the Coalmine Road from the center of Telkwa. Four Creek was assessed on August 9th, 2018 and flows directly into Goathorn Creek (WSC: 460-422700-09600) 230 m downstream, then into the Telkwa River. The crossing consists of an 1800 mm non-embedded culvert which is perched at low flow. The overall habitat was assessed as IMPORTANT, as per the criteria provided in the Fish-Stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning and overwintering appear to be adequate as well. Flows appears perennial and bed substrate is mostly gravels and cobbles with some sands which is adequate spawning habitat. There are several deep pools with an average residual pool depth of 0.38 m. Abundant cover for fish was provided mostly by deep pools and boulders as well as some overhanging vegetation and undercut banks. The perennial flow and presence of deep pools make this important fish habitat. The culvert at the crossing is perched approximately 50 cm at the low flow conditions observed and likely constitutes at least a partial barrier to fish. The riparian vegetation at the crossing is mostly dense shrubs but there are some larger alder and some mature trees within 20 m.

Table 22: Summary of values of various fish habitat types for Site 11 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Moderate	Gravels present throughout with perennial flow.
Rearing	Good	Abundant cover with undercut banks and vegetation.
Over-Wintering	Moderate	Moderate amount of deep pools with perennial flow.

Sampling Summary

DWB did not electrofish this reach as there was an unidentified salmonid (approximately 4-6 cm in length) observed downstream of the crossing and within 50 m of the confluence with Goathorn Creek. The site has historical records of fish.

Justification for Classification

Site 11-1 is classified as fish-bearing (S3) due to confirmed fish presence and important fish habitat rating.

Recommendation

Based on information provided (important habitat rating and size of existing channel), it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) should a replacement be required. The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 39. Downstream view of 1800 mm culvert present at the crossing. Nice pool located in foreground with human for scale.

Photo 40. Upstream view of 1800 mm culvert.

Photo 41. Site center from high chain along existing Coalmine Road.

4.12 SITE 12-1-NCD

Table 23: Summary of biophysical stream attributes for Site 12 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
12-1	NCD	N/A	N/A	09U 0621086 6056082	N/A

Assessment Summary

Watershed Code: N/A

Site 12-1 is located at approximately 10+860 on the proposed road, was assessed on August 10th, 2018 and is a tributary of the Telkwa River (WSC: 460-422700), located 2.7 km downstream. The substrates in this drainage are almost entirely organic with no visible alluvium/scour or channel. There is very little evidence of water in this area besides some matted leaf litter from old puddles. There is no structure present at the crossing currently. The riparian vegetation at the proposed crossing is mostly small shrubs but there are some deciduous trees present as well.

Justification for Classification

Site 12-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 10 m long. This NCD shows no signs of having any consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 42. Matted leaf litter layer at the site center. Little evidence of historic water presence.

4.13 SITE 20-1-NCD

Table 24: Summary of biophysical stream attributes for Site 20 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
20-1	NCD	N/A	N/A	09U 0627427 6057230	N/A

Assessment Summary

Watershed Code: N/A

Site 20-1 is located at approximately 4+080 on the proposed road, was assessed on October 23rd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located 300 m downstream. The substrates in this drainage are almost entirely organic with only small, isolated pockets of visible alluvium/scour and short (<50 m), discontinuous stretches of channel. Water flow appears to be very seasonal. There is no structure present at the crossing currently. The riparian vegetation at the crossing is mostly small shrubs with several deciduous trees also present.

Justification for Classification

Site 20-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 5 m long. This NCD shows no signs of having any consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 43: Some scour in a small patch where the tree root provided an obstacle to flow.

Photo 44: Ill-defined channel with highly organic substrate.

4.14 SITE 22-1-S3

Table 25: Summary of biophysical stream attributes for Site 22 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
22-1	S3	2.22	4	09U 0625277 6055578	Marginal

Assessment Summary

Watershed Code: N/A

Site 22-1 is located at approximately 6+780 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located approximately 1.5 km downstream. It was reassessed on July 21, 2020. The crossing has no structure at present but there is a 600 mm culvert downstream where the powerline road crosses this feature. The overall habitat was assessed as MARGINAL, as per the criteria provided in the Fish-Stream Crossing Guidebook. Site 21-1 was removed after it was found to be one of the channel braids from this reach.

Habitat Observations

The habitat potential in this reach is primarily for rearing, while spawning appears quite limited and overwintering is non-existent. Flows appears seasonal and bed substrate is mostly fines with some sands and gravels, which is poor spawning habitat. There are no deep pools, which severely limits rearing and overwintering opportunities. Adequate cover for fish was provided mostly by overhanging vegetation during summer months and undercut banks. The seasonal flow and absence of deep pools make this marginal fish habitat. The excessive braiding of the channel near the crossing makes it more difficult for fish passage due to a lack of depth, but not impossible. The riparian vegetation at the crossing is mostly grasses and a dense patch of shrubs.

Table 26: Summary of values of various fish habitat types for Site 22 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Poor	Very seasonal flow. High amount of fine substrates.
Rearing	Poor	Very seasonal flow. Few pools. Adequate cover.
Over-Wintering	Nil	Seasonal flow with no deep pools.

Sampling Summary

DWB did not electrofish this reach on the first day as it was both too cold to sample and the reach was mostly dry. During the second assessment, DWB deployed an electrofisher for 9 seconds at 300 volts at the proposed crossing and found an 8 cm Rainbow trout (*Oncorhynchus mykiss*).

Justification for Classification

Site 22-1 was initially classified as default fish-bearing (DS3) due to its proximity to a fish-bearing waterway (<300 m to 7-1-S4) and the low gradient reducing the difficulty of fish passage. However, after the second survey a fish was located which merits a classification upgrade to fish-bearing (S3).

Recommendation

Based on information provided (marginal habitat rating and size of existing channel), an appropriately-sized close-bottomed structure can be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012). The structure should be embedded to allow for fish passage. A hydrotechnical analysis is highly recommended to determine the structure size and whether or not a channel should be constructed through the access corridor to prevent further braiding and erosion.

Site Photos

Photo 45: Defined channel/scour upstream of crossing with abundant LWD.

Photo 46: The channel braids excessively throughout the access corridor.

Photo 47: Built BC Hydro road along access corridor is being eroded by excessive braiding.

Photo 48: Fish caught at proposed crossing (July 2020).

4.15 SITE 23-1-NVC

Table 27: Summary of biophysical stream attributes for Site 23 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
23-1	NVC	N/A	N/A	09U 0625191 6055583	N/A

Assessment Summary

Watershed Code: N/A

Site 23-1 is located at approximately 6+730 on the proposed road, was assessed on October 22nd, 2018. While this appears to be an NCD at first glance, there is only ditch runoff that is poorly managed and crossing a low part of the road. The riparian vegetation at the proposed crossing is mostly small shrubs and grasses.

Justification for Classification

Site 23-1 is not a drainage of the surrounding area, it's simply a mismanaged ditchline. There are no features or draws feeding this site, it is fed by seepage into the ditches of the existing road. Therefore it is a non-visible channel (NVC).

Recommendations

Since this is a low spot in the road, it will likely need a close-bottomed culvert of appropriate size depending on the drainage needs of the upgraded road.

Site Photos

Photo 49: Crossditch at road crossing.

Photo 50: Ditch-water/drainage above the road crossing along the ditch.

Photo 51: Overland flow onto powerline road (~50 m downslope from crossing).

Photo 52: Overland flow through tall grass roughly 75 m downslope of crossing.

4.16 SITE 24-1-NCD

Table 28: Summary of biophysical stream attributes for Site 24 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
24-1	NCD	N/A	N/A	09U 0625044 6055626	N/A

Assessment Summary

Watershed Code: N/A

Site 24-1 is located at approximately 6+850 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located 500 m downstream. The substrates in this drainage are almost entirely organic with very little visible alluvium/scour or channel. There is only slight evidence of water in this area. There is a functional 600 mm culvert at the crossing. The riparian vegetation at the crossing is mostly thicker shrubs.

Justification for Classification

Site 24-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 5 m long. This NCD shows no signs of having consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 53: Upslope from road. Discontinues section of channel.

Photo 54: Some discontinues scour/channel in an isolated area upslope from the road.

Photo 55: Functional 500 mm culvert (from upstream). Approximately 1 m fill.

Photo 56: Downslope from road. Small isolated pocket of scour. Channel inconsistent.

4.17 SITE 25-1-NCD

Table 29: Summary of biophysical stream attributes for Site 25 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
25-1	NCD	N/A	N/A	09U 0624786 6055702	N/A

Assessment Summary

Watershed Code: N/A

Site 25-1 is located at approximately 7+020 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located 500 m downstream. The substrates in this drainage are highly organic with some visible but discontinuous alluvium/scour or channel. The flow in this reach is very ephemeral and seasonal. There is a newer, functional 500 mm culvert at the built road crossing. The riparian vegetation at the crossing is mostly small shrubs with the occasional young tree.

Justification for Classification

Site 25-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 25 m long. This NCD shows few signs of having any consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 57: Lack of channel/scour located approximately 50 m downslope of crossing.

Photo 58: Downslope approximately 50 m of crossing. Small, fully vegetated draw.

Photo 59: Newer, functional 500 mm culvert at crossing with a 1 m fill.

Photo 60: Upslope approximately 10 m from the crossing. Discontinuous section of scour.

4.18 SITE 26-1-NCD

Table 30: Summary of biophysical stream attributes for Site 26 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
26-1	NCD	N/A	N/A	09U 0624356 6055822	N/A

Assessment Summary

Watershed Code: N/A

Site 26-1 is located at approximately 7+560 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located 700 m downstream. The substrates in this drainage are quite organic with several discontinues sections of alluvium/scour or channel. There is evidence of water flow, but it is inconsistent and seasonal. Currently, a functional 700 mm culvert is located at the crossing. The riparian vegetation at the crossing is mostly small shrubs and the occasional young deciduous tree.

Justification for Classification

Site 26-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are some sections of scouring and alluvium < 75 m long but they are discontinuous.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 61: Scoured bowl but organic/discontinuous above the drop.

Photo 62: Lack of channel roughly 60 m below the crossing.

Photo 63: Crossing with functional 700 mm culvert and roughly 2.5-3 m of gravel fill.

4.19 SITE 27-1-NCD

Table 31: Summary of biophysical stream attributes for Site 27 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
27-1	NCD	N/A	N/A	09U 0623896 6055956	N/A

Assessment Summary

Watershed Code: N/A

Site 27-1 is located at approximately 7+840 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located approximately 500 m downstream. The substrates in this drainage are almost entirely organic with no visible alluvium/scour or channel. There is very little evidence of water in this area besides some matted leaf litter from old puddles. There is a functional but dilapidated 500 mm culvert located at the crossing currently. The riparian vegetation at the crossing is mostly grass with the odd small shrub but there are some larger alder and the occasional deciduous tree.

Justification for Classification

Site 27-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 5 m long. This NCD shows no signs of having any consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 64: Damp area below the road crossing with some sedges. No evidence of flow.

Photo 65: Dilapidated 500 mm culvert below the road. Approximately 1.5 m fill.

4.20 SITE 28-1-NCD

Table 32: Summary of biophysical stream attributes for Site 28 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
28-1	NCD	N/A	N/A	09U 0623668 6056021	N/A

Assessment Summary

Watershed Code: N/A

Site 28-1 is located at approximately 10+860 on the proposed road, was assessed on October 22nd, 2018 and is a tributary of Helps Creek (WSC: 460-437000), located approximately 500 m downstream. The substrates in this drainage are almost entirely organic with very little visible alluvium/scour and no channel. There is scant evidence of water in this area besides some small scour pools. There is a functional 600 mm culvert at the crossing. The riparian vegetation at the crossing is mostly dense shrubs and several immature deciduous trees.

Justification for Classification

Site 28-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 5 m long that indicate periodic but ephemeral flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 66: Small draw with no scour located above the road approximately 30 m.

Photo 67: Upslope side of 600 mm culvert.

Photo 68: Facing upslope from below road. Culvert is half clogged. Fill over culvert is roughly 1 m.

Photo 69: Wetted (seasonally/ephemerally) area below the road. No channel.

4.21 SITE 29-1-NCD

Table 33: Summary of biophysical stream attributes for Site 29 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
29-1	NCD	N/A	N/A	09U 0621868 6056113	N/A

Assessment Summary

Watershed Code: N/A

Site 29-1 is located at approximately 9+600 on the proposed road, was assessed on October 23rd, 2018 and is a tributary of the Telkwa River (WSC: 460-422700), located 2.3 km downstream. The substrates in this drainage are almost entirely organic with little visible alluvium/scour or channel. There is almost no evidence of water flow above the road but the gradient increases below the road and small sections of channel/scour appear further downslope. There is no structure present at the crossing currently. The riparian vegetation at the proposed crossing is mostly small shrubs but there are some smaller deciduous trees also.

Justification for Classification

Site 29-1 is an NCD as it does not meet the minimum requirements of a stream as detailed in the Fish-Stream Identification Guidebook. This site does not have continuous or defined channel for > 100 m and has a highly organic bed. There are small sections of scouring and alluvium < 5 m long below the road but nothing above the road. This NCD shows no signs of having any consistent flow.

Recommendations

As this watercourse is not considered fish-bearing, an appropriately sized closed bottom structure can be installed at this location.

Site Photos

Photo 70: Very shallow/vegetated draw below proposed crossing.

Photo 71: Overall lack of defined channel. Minimal and discontinuous scour.

4.22 SITE 30-1-S3

Table 34: Summary of biophysical stream attributes for Site 30 Reach 1.

SITE #	CLASSIFICATION	AVERAGE CHANNEL WIDTH (M)	GRADIENT (%)	UTM	HABITAT RATING
30-1	S3	2.58	3	09U 0620427 6053768	Important

Assessment Summary

Watershed Code: N/A

Site 30-1 is located at approximately 11.5 km on the proposed road, was assessed on October 23rd, 2018 and is a tributary of Goathorn Creek (WSC: 460-422700-09600), located within 100 m downstream of the crossing. It was reassessed on July 20, 2020. The crossing consists of two 600 mm non-embedded culverts which are perched at low flow and poorly oriented. The overall habitat was assessed as IMPORTANT, as per the criteria provided in the Fish-Stream Crossing Guidebook.

Habitat Observations

The habitat potential in this reach is primarily for rearing and spawning, while overwintering appears to be relatively limited. Flows appears seasonal but bed substrate is mostly gravels and cobbles with some sands which is adequate spawning habitat. There are several pools available along this reach but not many of them are very deep. Adequate cover for fish is provided mostly by overhanging vegetation and undercut banks. Despite the seasonal flow, the presence of several pools, good spawning substrates, and adequate cover make this IMPORTANT habitat. The culverts at the crossing are poorly oriented, causing much erosion which is consequently creating blockages in the pipes themselves. The riparian vegetation at the crossing is mostly small shrubs and grasses.

Table 35: Summary of values of various fish habitat types for Site 30 Reach 1.

HABITAT TYPE	VALUE RATING (NIL, POOR, MODERATE, GOOD)	COMMENTS
Spawning	Moderate	Seasonal flow. Abundant gravels with adequate depth.
Rearing	Moderate	Seasonal flow. Many pools with adequate cover.
Over-Wintering	Poor	Seasonal flow. Very few deep pools.

Sampling Summary

DWB did not sample this reach in 2018 due to the lack of water in the system. During the 2020 assessment three minnow traps were deployed but no fish were caught. Water levels were still low but passable for fish.

Justification for Classification

Site 30-1 was initially classified as default-fish-bearing (DS3) due to its proximity to a fish-bearing feature and lack of prohibitive gradient or barriers, combined with an important fish habitat rating. During the 2020 assessment crews noted that fish passage could be temporarily impeded by the short perch at the confluence of this site with Goathorn Creek, but it appears that it will eventually erode, allowing fish passage. Therefore, DWB believes this site merits fish-bearing status (S3).

Recommendation

Based on information provided (important habitat rating and size of existing channel), it is recommended that an appropriate size open-bottom structure be installed at the crossing as per the Fish-stream Crossing Guidebook (MoF 2012) replacing the current, partially functional structure. The current structure has become clogged due to the erosion caused by its poor orientation, resulting in most of the water in this system being diverted down the ditch, causing erosion elsewhere. The structure size should be confirmed with hydrotechnical analysis.

Site Photos

Photo 72: Dry stream channel with gravels visible under leaves.

Photo 73: Two plugged 600 mm culverts at the crossing.

Photo 74: Poorly oriented culverts have been clogged by erosion, directing water down ditch.

Photo 75: Confluence with Goathorn Creek is perched but materials are highly erodible.

5.0 CLOSURE

This report was prepared for the exclusive use of Allegiance Coal Ltd. The observations and recommendations presented in this report were based on biological data, observations, and a review of background information. This report was prepared in accordance with generally accepted biological principals and practice. No other warranty, expressed or implied, is made.

6.0 REFERENCES

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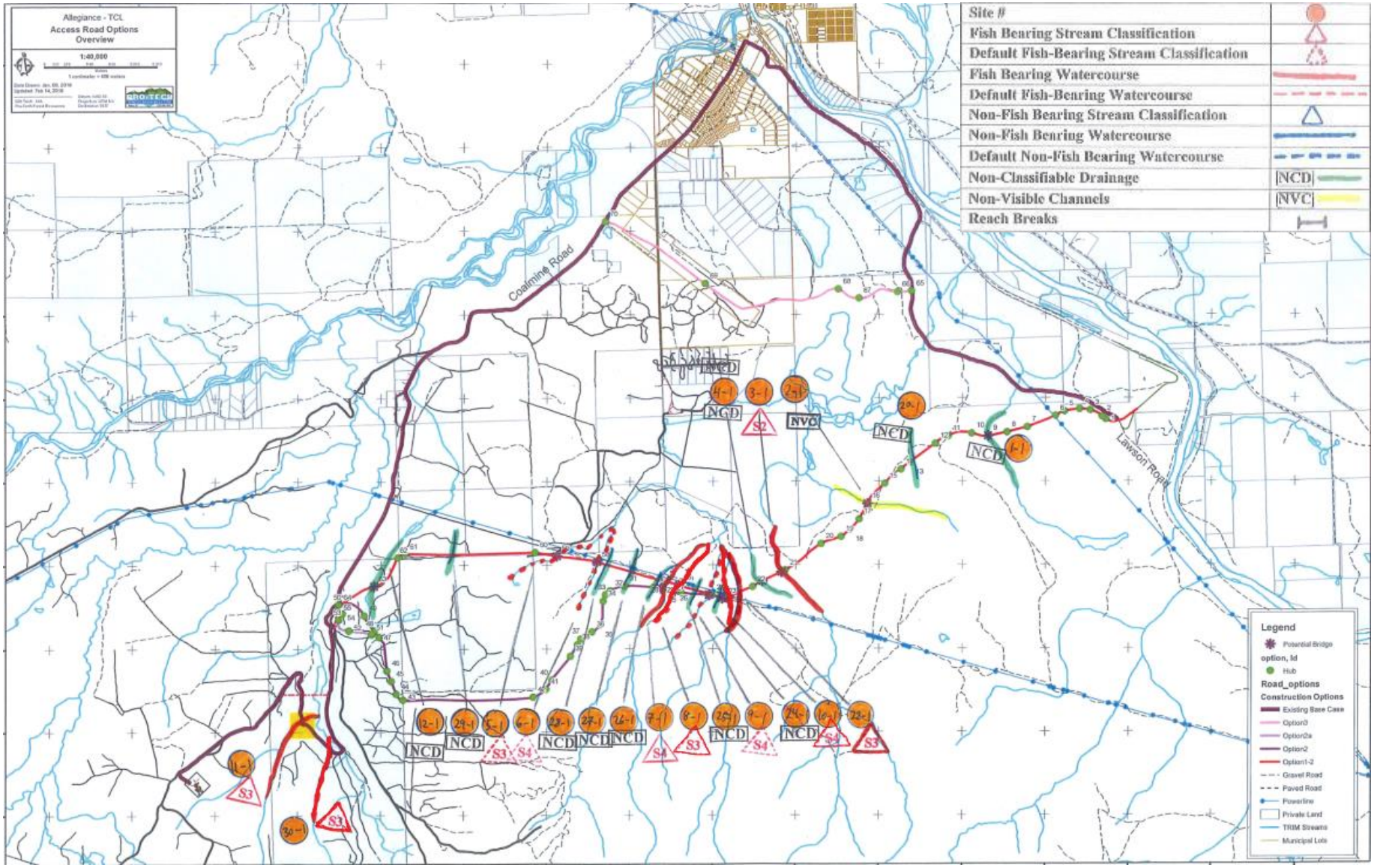
Appendix A
Map



Stream classification map for sites along the proposed Coalmine Access Road.