STURGEON RIVER

2018 Watercourse Crossing Assessment

Prepared for: North Saskatchewan Watershed Alliance
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NSWA
NORTH SASKATCHEWAN
WATERSHED ALLIANCE

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Charette
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1.0 Introduction

The Sturgeon River is a tributary of the North Saskatchewan River that primarily flows west to east, from its headwaters near Hoople Lake to its confluence into the North Saskatchewan River near the City of Fort Saskatchewan, Alberta. The watershed has a gross drainage area of 3,301 km^2, which includes cities, smaller urban centers (towns, hamlets, summer villages), counties, and First Nation Communities. The main tributaries that flow into the Sturgeon River include Atim Creek, Carrot Creek, Kilini Creek, Little Egg Creek, Rivière Qui Barre, and Toad Creek (The City of St. Albert 2012). See **Appendix 2** for a map of the watershed.

The Sturgeon River and its tributaries are traversed by numerous watercourse crossings that require monitoring and maintenance to prevent watershed fragmentation and to ensure safety and performance. Watercourse crossings are defined as temporary or permanent structures, such as bridges and culverts that are constructed to provide access over a water body. Many potential risks are associated with watercourse crossings including safety, fish passage and erosion and sedimentation concerns. Hence, stream crossing assessments are an important tool for documenting crossing conditions and to determine whether the replacement and/or maintenance of a crossing are required. Any structure over or in a watercourse that limits the movement of fish, causes sedimentation and/or erosion, or creates risks to human safety can be an issue for the health of the Sturgeon River and its tributaries.

CPP Environmental (CPPENV) completed a Roadway Watercourse Crossing Assessment for the Sturgeon River watershed, on behalf of the North Saskatchewan Watershed Alliance (NSWA). The purpose of the watercourse crossing assessment was to document the current condition of all crossings in the Sturgeon River watershed. This report documents methods for assessing crossings and presents an overall risk condition (low, medium or high) for each crossing to prioritize locations for maintenance or replacement.

2.0 Methods

2.1 Field Assessment

Watercourse crossing assessments were completed from May 4th to May 18th 2018 at roadway intersections over the Sturgeon River and its 6 main tributaries (Atim Creek, Carrot Creek, Kilini Creek, Little Egg Creek, Rivière Qui Barre, and Toad Creek). Culvert inspections were completed as per the Government of Alberta's *Roadway Watercourse Crossing Inspection Manual* and bridge inspections were completed as per the Foothills Stream Crossing Steering Committee's *Stream Crossing Inspection Manual*. Inspections were completed by filling out digital forms to document the following parameters:

- General site information: Date, crossing number, GPS coordinates and watercourse name
- Stream classification: fluvial or non-fluvial and small permanent or large permanent and bankfull width (refer to glossary for definition)
- Crossing type: bridge or culvert(s)

- Erosion at site and type (fill slope, bank slumping etc.)
- Fish passage concerns
- Structural problems/conditions

2.2 Risk Assessment

CPPENV performed a risk assessment for each watercourse to determine the overall environmental and safety risks. Three categories were reviewed to determine the overall risk of each crossing which was documented as low, medium or high. The following sub-sections describe each category and the inspected components that created the overall risk.

2.2.1 Fish Passage Concerns

Roadway crossings have the potential to block fish passage, thus limiting access to the habitat necessary for different life stages. This is why maintaining fish passage at watercourse crossings is a priority for both land and fisheries managers. Given that all streams included in the watercourse crossing assessments are considered fish bearing, it is particularly important to document where fish passage issues may exist.

Numerous conditions can restrict the passage of fish, which affect weak (minnows, suckers and benthic fry) and strong (large bodied fish >10 cm including adult suckers) swimmers to different degrees. At culvert locations, the following factors are typically assessed:

- Culvert outlet gap – also known as “hanging culverts” where the vertical distance between the bottom of the culvert and the water surface creates an obstacle for fish passage (Photo 1). If a culvert gap is present, the outlet pool depth becomes an important factor in assessing fish passage since the pool provides a resting area and also space for fish to gain the strength to jump into the culvert. Fish passage concerns may become more serious if there is a combination of a culvert outlet gap entering a pool with shallow water depths.

Photo 1: Culvert outlet gap at WC_0772 located on Highway 16 over Atim Creek.

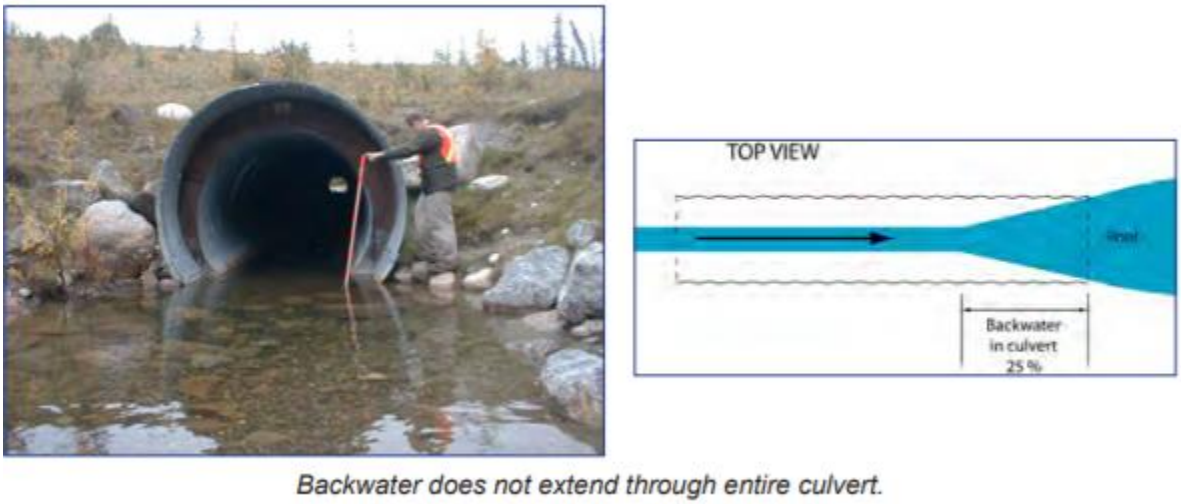
- Culvert backwater – the amount of water from the outlet pool that fills back into the culvert expressed as a percentage. The amount and velocity of water through the culvert indicates the degree of slope. If the slope exceeds the natural grade of the stream channel, it will usually create a lack of backwater. If backwater is not achieved for some portion within the culvert, fish passage becomes an obstacle due to higher velocity and

potentially shallow water depths. Therefore, this situation would be considered medium to high risk for the majority of swimmers.

- Blockage. Generally speaking, culverts pose higher risks to fish passage than bridges due to shorter life spans and altered fish passage routes. However both can create fish passage concerns due to blockage. If greater that 10% of a culvert diameter is blocked by debris or if the opening in a channel under a bridge is blocked, concerns for fish passage were documented. Fish passage concerns were document as green (good), yellow (some concerns) or red (major concerns) during the inspections (Table 1).

Table 1: Factors used to assess fish passage status.

Condition	High Risk	Medium Risk	Low Risk
Culvert Outlet Gap	Culvert gaps create serious fish passage concerns.	-	No outlet gap and culvert outlet is embedded into natural streambed.
Culvert Backwater (Figure 1)	Culvert slope is greater than that of the stream bed and contains no backwater (0%) or culvert is bent and not uniform	Culvert slope is level and uniform, contains some backwater (25%) and similar to stream bed and uniform	Backwater slope is level and uniform and contains backwater (50-100 %) throughout culvert
Blockage at culvert outlet/inlet or channel opening under bridges	> 25% blockage Serious fish passage concern	>10% to 25% Some fish concerns	Less than 10% blockage No fish passage concerns



Backwater does not extend through entire culvert.

Figure 1: Example of backwater inspection showing the outlet pool extending approximately 25% back into the culvert (McClearly et al. 2006).

2.2.2 Safety and Performance Concerns

Watercourse crossings have the potential to create public safety concerns and affect traffic. Issues were flagged if a crossing had structural problems such as channel blockage (which can lead to flooding risks), visible damage to infrastructure (holes in bridge deck, cracks in wingwalls or abutments) or grader markers/reflectors were missing (**Figure 1**). Evaluated bridge components are identified in **Figure 2** below.

Bridge structural problems were recorded as codes to represent the following bridge conditions:

- D – Damaged
- C – Collapsing
- BA – Broken/separated/damaged abutments
- RA – Rotten abutments
- SA – Sunken deck abutments
- DG – damaged guard rail
- GM – Grout missing or requires replacement
- SL – slumping
- V – Vegetation protruding
- N – None
- O – Other (such as high water levels)

Other bridge structural problems including the presence of signs, which were evaluated at two locations:

- bridge signs located prior to bridge entrance indicating narrow structure ahead, which will only be present on roads with reduced lane width, and
- hazard markers located at the bridge entrance and reflectors located along the guardrail for night visibility.

If bridge signs or hazard and reflector signs were missing or damaged it was documented as a safety concern and depending on site conditions, the issue was noted as low, medium or high risk.

Flooding risks were also documented as safety and performance concerns for both bridges and culverts. Issues associated with flooding concerns include the following conditions:

- undersized culvert can create flooding risks especially if the culvert becomes completely submerged under water (high risk) indicating an insufficient culvert size. Since water levels fluctuate throughout the year it is important that the culvert size is larger or meets the bankfull width of the stream. Depending on site conditions, undersized culverts were identified as low risk if the bankfull width was slightly larger and surround banks and fill slope were un-armoured and medium if the bankfull width was significantly larger than the culvert size and high risk if the culvert posed immediate flooding risk due to a submerged culvert and back pooling at the culvert inlet.
- Blockage, which is also considered a fish passage concern except in the case of log jams at bridges. Depending on the blockage percentage, the same risk categories identified in **Table 1** apply to blockage concerns.

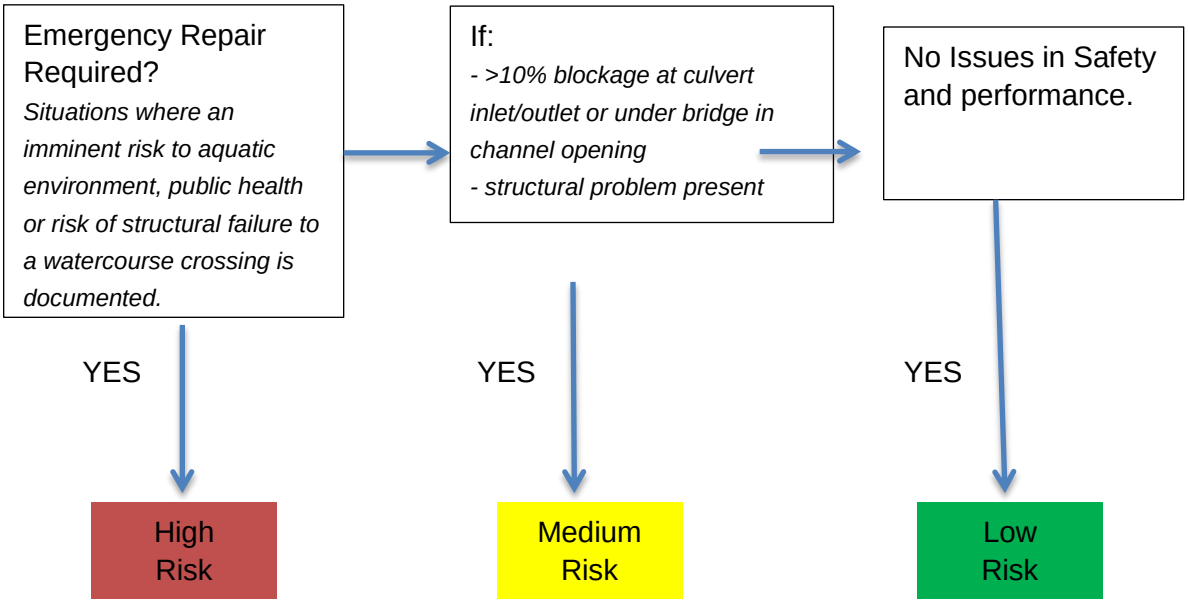


Figure 2: Safety and performance evaluation flow (McCleary et al. 2007).

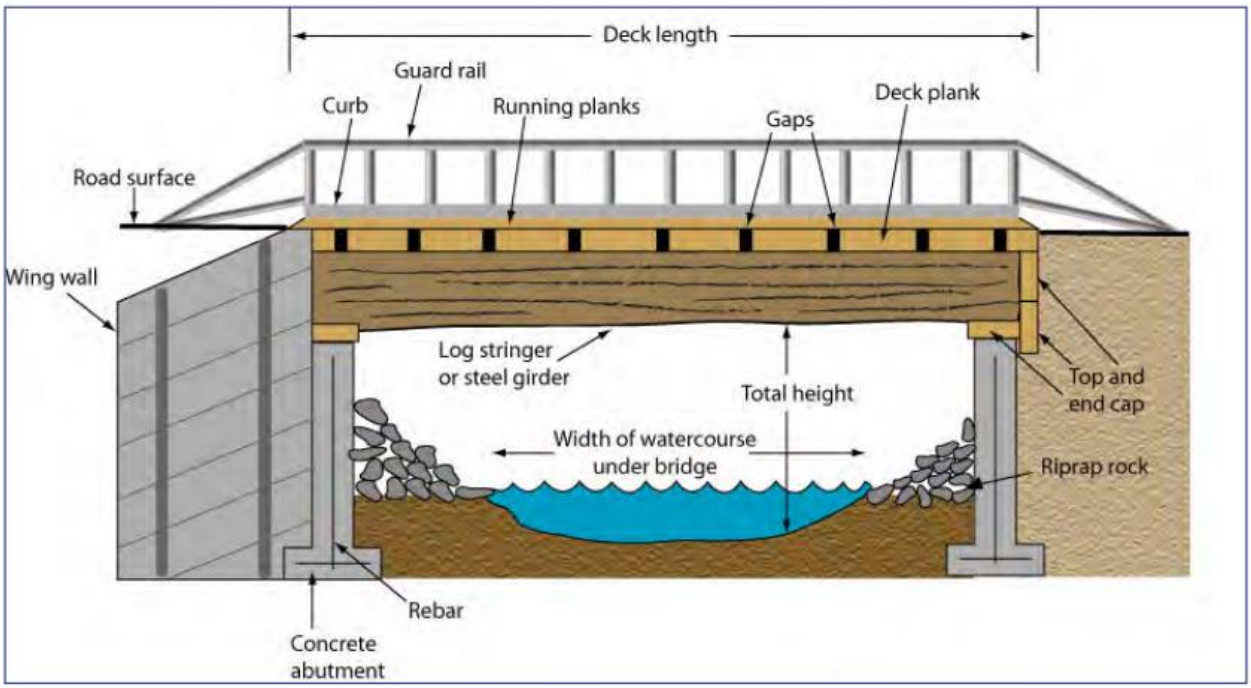


Figure 2: Bridge components evaluated for safety and performance (McClearly et al. 2006).

2.2.3 Erosion and Sedimentation

Watercourse crossings have the potential to create erosion and sedimentation concerns for water quality, fish habitat, and riparian intactness, which can also potentially create structural problems and safety concerns. CPPENV completed an evaluation for erosion and sedimentation at the following locations:

- Ditches – presence of ditch gullies creating conditions of sediment runoff into the stream.
- Banks – unvegetated stream banks caused by erosion and/or flooding.
- Fill slope – evidence of erosion centered under the crossing right-of-way including the area immediately under the bridge or directly above the culvert.
- Bridge deck – large gaps and damaged decking creating areas where sediment can enter the stream.
- Other – other forms of sedimentation or erosion observations that sometime included beaver activity or cattle accessing the rivers and creating eroded banks.

The extent of erosion was assessed in m^2 and the overall extent was documented as low, medium, or high (**Table 2**).

Table 2: Factors used to assess erosion and sedimentation.

Erosion and Sedimentation Condition	High Risk	Medium Risk	Low Risk
Erosion at site	• Exposed earth and indications of earth movement into the stream • Active erosion zone present	• Fill slopes not vegetated and slumping, riprap or armor absent • Small areas affected • Indications of earth movement	• None: vegetated slopes, riprap or armor present and working • No evidence of earth movement towards stream • Some crossings may have the potential for fill slope erosion due to un-armored slopes.*

*** Armour types include rip-rap, gabions, geotextile and vegetation. In some cases vegetation is not dense enough to provide soil stabilization due to fluctuating water levels that expose soil and cause sedimentation. Hence, in some cases other armour types are recommended if vegetation was sparse and posing a potential erosion source, especially on fill slopes.*

3.0 Results

A total of 135 watercourse crossing sites were inspected, including 83 bridges and 52 culverts.

3.1 Low Risk Crossings

A total of 49 crossings (36% of 135) sites were identified as low risk. Of this number, 35 crossings were bridges and 13 were culverts. These structures are in good working condition and had some minor concerns regarding safety or erosion. The proportion of low risk crossings by watercourse is as follows: Atim Creek (9 total = 18%), Sturgeon River (29 total = 59%), Rivière Qui Barre (4 total = 8%), Little Egg Creek (4 total = 8%), Carrot Creek (1 total = 2%), Kilini Creek (1 total = 2%), and Toad Creek (1 total = 2%). See **Appendix 3** for all low risk watercourse crossing summaries and photos.

3.2 Medium Risk Crossings

A total of 66 crossings (49% of 135) sites were identified as medium risk. Of this number, 40 crossings were bridges and 26 crossings were culverts. The proportion of medium risk crossings by watercourse is as follows: Sturgeon River (23 total = 35%), Rivière Qui Barre Creek (8 total = 12%), Atim Creek (8 total = 12%), Little Egg Creek (8 total = 12%), Carrot Creek (7 total = 11%), Toad Creek (6 total = 9%), and Kilini Creek (6 total = 9%). See **Appendix 4** for all medium risk watercourse crossing summaries and photos.

3.3 High Risk Crossings

A total of 21 crossings (15% of 135) were identified as high risk. Of this number, 8 crossings were bridges, 13 crossings were culverts and 1 was absent/missing. The proportion of high risk crossings by watercourse is as follows: Atim Creek (6 total = 29%), Sturgeon River (5 total = 24%), Rivière Qui Barre (3 total = 14%), Kilini Creek (3 total = 14%), Little Egg Creek (2 total = 10%), Carrot Creek (1 total = 5%), and Toad Creek (1 total = 5%). See **Appendix 5** for all high risk watercourse crossing summaries and photos.

4.0 Recommendations

A total of 135 watercourse crossings were inspected within the Sturgeon River watershed. The majority of watercourse crossings are classified as medium (50%) and high (15%) risk, requiring some maintenance or further inspection by an engineer. A total of 35% were identified as low risk. See **Tables 3 to 5** for recommendations with respect to issues that require maintenance action or possible replacement.

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0036	Riviere Qui Barre	UTM: 12 Easting: 305114 Northing: 5977877	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	No major concerns as rip-rap is preventing erosion around inlet and outlet pools.
WC_0060	Little Egg	UTM: 12 Easting: 327675 Northing: 5971323	Culvert - Multiple	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Fill slope is very shallow and culvert edge is very close to road creating a higher potential for sedimentation. Pooling at inlet and outlet however no active erosion. Recommend engineer inspection.
WC_0072	Riviere Qui Barre	UTM: 12 Easting: 306425 Northing: 5972181	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location (Inlet or Outlet): Outlet Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 2 m^2	Most of fill slope contains amour, except small area along bank that is unvegetated. Recommend seeding for continued armour.
WC_0084	Sturgeon	UTM: 12 Easting: 346341 Northing: 5967128	Bridge - Permanent	Fish Passage: None Safety/Performance: bridge reflectors missing Erosion/Sedimentation: None	Recommend installing bridge reflector signs for night visibility.
WC_0090	Little Egg	UTM: 12 Easting: 327614 Northing: 5969020	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Potential for erosion and structural problems due to undersized culvert. Recommend engineer inspection.
WC_0153	Riviere Qui Barre	UTM: 12 Easting: 307789 Northing: 5965214	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Inlet and outlet pool were documented, currently no active erosion but recommend armour around inlet/outlet to protect banks.
WC_0176	Little Egg	UTM: 12 Easting: 332124 Northing: 5961441	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: None	-
WC_0195	Sturgeon	UTM: 12 Easting: 338595 Northing: 5960027	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	Armour present on west side only. Recommend armour on both sides.

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0205	Little Egg	UTM: 12 Easting: 332166 Northing: 5959330	Culvert-Single	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential	Bank slumping documented up and downstream of crossing caused naturally by higher water levels.
WC_0262	Sturgeon	UTM: 12 Easting: 335350 Northing: 5956539	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential	Armour is vegetation, creating erosion potential during flooding.
WC_0266	Toad Creek	UTM: 11 Easting: 689521 Northing: 5959114	Bridge - Permanent	Fish Passage: None Safety/Performance: high water levels Erosion/Sedimentation: None	Difficult to determine bridge integrity due to high water level. Stream is in contact with treated wood wingwalls and abutment walls. Recommend engineer inspection.
WC_0267	Sturgeon	UTM: 12 Easting: 333722 Northing: 5956709	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential due to no armour	Recommend armour on sparsely vegetated fill slopes to reduce erosion potential.
WC_0285	Sturgeon	UTM: 12 Easting: 679741 Northing: 5958455	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential due to partial armour	Recommended maintenance to complete placement of riprap on all fill slope areas.
WC_0326	Sturgeon	UTM: 12 Easting: 304240 Northing: 5957014	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential	Bridge curb has openings creating potential for sedimentation. Recommend closed bridge curbs to prevent sedimentation.
WC_0328	Sturgeon	UTM: 12 Easting:304240 Northing: 5957014	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill slope Erosion Extent: Low Total Erosion Area: 6 m^2	Sparsely vegetated fill slopes with rip-rap at the base of the slope and instream. Recommend seeding to strengthen armour on slopes.

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0330	Sturgeon	UTM: 12 Easting:305894 Northing: 5956340	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0342	Sturgeon	UTM: 11 Easting:691046 Northing: 5956120	Bridge - Permanent	Fish Passage: None Safety/Performance: Grader markers not present & high water levels Erosion/Sedimentation: None	The guardrail is currently posing no safety concerns but it is damaged.
WC_0343	Sturgeon	UTM: 11 Easting:686345 Northing: 5956762	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0348	Riviere Qui Barre	UTM: 11 Easting:311776 Northing: 5955732	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0355	Sturgeon	UTM: 12 Easting:311205 Northing: 5955396	Bridge - Permanent	Fish Passage: None Safety/Performance: Reflector signs missing Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 18 m^2	Recommend installing bridge reflectors and additional armour for sparsely vegetated fill slopes.
WC_0356	Sturgeon	UTM: 12 Easting:313990 Northing: 5955109	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 9 m^2	Recommend armour on sparsely vegetated banks to reduce erosion potential.
WC_0358	Sturgeon	UTM: 12 Easting:306549 Northing: 5955875	Bridge - Permanent	Fish Passage: None Safety/Performance: <10% blockage by woody debris Erosion/Sedimentation: None	Removal of organic debris (logs) recommended.

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0364	Carrot Creek	UTM: 12 Easting:324146 Northing: 5953573	Culvert - Multiple	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: Potential	Culverts installed at an angle along ditch drainage allowing for potential sedimentation. Channel re-alignment recommended if culvert replacement is to occur.
WC_0366	Sturgeon	UTM: 11 Easting:679848 Northing: 5955803	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 6 m^2	Fill slope erosion noted due to no armour present. Recommend installing rip-rap for bank protection.
WC_0368_outlet	Sturgeon	UTM: 11 Easting:679315 Northing: 5955528	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	WC_0379 is the inlet.
WC_0379_inlet		UTM: 11 Easting:679293 Northing: 5955504			Beaver dam located upstream, sitting at 1m high with water overflow.
WC_0357	Sturgeon	UTM:11 Easting:689647 Northing: 5956031	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	Structure is old timber frame.
WC_0382	Sturgeon	UTM: 11 Easting:678900 Northing: 5955295	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 20 m^2	Fill slope erosion noted due to no armour present. Recommend installing rip-rap for bank protection.
WC_0397	Sturgeon	UTM: 12 Easting:315354 Northing: 5952380	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0426	Sturgeon	UTM: 12 Easting:330389 Northing: 59651641	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	Floodplains up and downstream flooded.
WC_0479	Sturgeon	UTM: 12 Easting:317362 Northing: 5950071	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential	Recommend installing armour on sparsely vegetated banks to reduce erosion potential.
WC_0506	Kilini Creek	UTM: 11 Easting:689193 Northing: 5950850	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels Erosion/Sedimentation: None	High water levels. Recommend engineer inspection.
WC_0532	Sturgeon	UTM: 11 Easting:659053 Northing: 5951080	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 6 m^2	Timber substructure appears old but structural problems not noted. Recommend engineer inspection. Recommend installing armour on sparsely vegetated banks to reduce erosion potential.
WC_0548	Sturgeon	UTM: 12 Easting:327245 Northing: 5947482	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0567	Sturgeon	UTM: 12 Easting:318988 Northing: 5946831	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0581	Sturgeon	UTM: 12 Easting:324271 Northing: 5944489	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	Walkway flooded however sidewalk overpass installed so trail is still accessible and safe.
WC_0584	Sturgeon	UTM: 11 Easting:655396 Northing: 5947362	Bridge - Permanent	Fish Passage: None Safety/Performance: High water level Erosion Location: Outlet Erosion Source: Bank Slump Erosion Extent: Low	Recommend filling SE corner with rip rap for more secure amour. Recommend engineer inspection due to high water levels.

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
				Total Erosion Area: 2 m^2	
WC_0661	Atim Creek	UTM: 12 Easting:313770 Northing: 5942380	Bridge - Permanent	Fish Passage: None Safety/Performance: Grader markers/bridge reflectors are damaged Erosion Location: Both Erosion Source: Fill slope Erosion Extent: Low Total Erosion Area: 16 m^2	Fill slope is sparsely vegetated. Recommend armour to reduce erosion potential and fixing damaged signs.
WC_0694	Atim Creek	UTM: 12 Easting:307367 Northing: 5940909	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Bank slump Erosion Extent: Low Total Erosion Area: 3 m^2	Some earth movement around abutments but not a major issue since vegetated with rip-rap below.
WC_0735 _outlet	Atim Creek	UTM: 12 Easting:307775 Northing:5940035	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	WC_0750 is the inlet. Undersized culvert however surrounding banks are armoured with rip-rap so erosion/sedimentation is not a concern.
WC_0750 _inlet		UTM: 12 Easting:307773 Northing:5940065			WC_0735 is the outlet.
WC_0751	Atim Creek	UTM: 12 Easting:305698 Northing:5940000	Culvert- Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Undersized culvert however surrounding banks are armoured with rip-rap so erosion/sedimentation is not a concern.
WC_0765	Sturgeon	UTM: 11 Easting:641505 Northing:5939877	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0781	Sturgeon	UTM: 11 Easting:641517 Northing:5939861	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-

Table 3: Watercourse crossings identified as low risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure Type	Low Risk Issues	Comments/Recommendations
WC_0841	Atim Creek	UTM: 11 Easting:636705 Northing:5934508	culvert - single	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0843	Sturgeon	UTM: 12 Easting:303412 Northing:5936153	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: Potential	Curb has openings - road materials falling into stream. Recommend closed bridge deck to prevent sedimentation.
WC_0846	Atim Creek	UTM: 12 Easting:303522 Northing:5935686	culvert- single	Fish Passage: None Safety/Performance: None Erosion/Sedimentation: None	-
WC_0854	Atim Creek	UTM: 12 Easting:303106 Northing:5933336	culvert - single	Fish Passage: None Safety/Performance: < 10% blockage by instream rip-rap Erosion/Sedimentation: None	Recommend removing some of the instream rip-rap to prevent fish passage concerns.
WC_0866	Atim Creek	UTM: 12 Easting:303522 Northing:5930908	Culvert - single	Fish Passage: None Safety/Performance: undersized culvert Erosion/Sedimentation: None	-

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_000a	Riviere Qui Barre	UTM: 12 Easting: 306425 Northing: 5972181	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels abutments/wingwalls Erosion/Sedimentation: None	Capacity of bridge has been reached and difficult to determine integrity. Recommend engineer inspection.
WC_0001	Little Egg Creek	UTM: 12 Easting: 320136 Northing: 5981337	Culvert - Multiple	Fish Passage**:** Some Concerns Safety/Performance: > 10% blockage by debris & undersized culverts Erosion/Sedimentation: None	Removal of vegetation at inlet. Potential culvert replacement due to damage and under sizing. Recommend engineer inspection.
WC_0002	Riviere Qui Barre	UTM: 12 Easting: 304018 Northing: 5981940	Culvert - Single	Fish Passage Assessment**:** Some Concerns Safety/Performance: > 10% blockage by debris Erosion Location (Inlet or Outlet): Both Erosion Source: Bank Slump, Ditch Gully Erosion Extent: Low Total Erosion Area: 3 m^2	Organic materials causing blockage. Recommend debris removal to re-establish fish passage, prevent flooding and bank slumping erosion.
WC_0018	Little Egg Creek	UTM: 12 Easting: 321443 Northing: 5978042	Culvert - Multiple	Fish Passage**:** Some Concerns Safety/Performance: > 10% blockage by debris & damaged/ undersized culverts. Erosion/Sedimentation: None	Damaged culvert, blockage caused by marker post that is collecting materials. Recommend fixing culvert marker so snow plows do not crush culvert during plowing.
WC_0075	Sturgeon	UTM: 12 Easting: 348794 Northing: 5969157	Bridge - Permanent	Fish Passage**:** None Safety/Performance: None Erosion Location (Inlet or Outlet): Outlet Erosion Extent: Low Total Erosion Area: 100 m^2	Erosion along riparian zone of river that contains a fenced off area for cattle but requires restoration by natural vegetation to re-stabilize banks.
WC_0082	Riviere Qui Barre	UTM: 12 Easting: 306503 Northing: 5971467	Bridge - Permanent	Fish Passage**:** None Safety/Performance: Wingwall in good condition but materials eroding from the side & high water levels Erosion Location: Both Erosion Source: Ditch Gully, other Total Erosion Area: High	Water levels high surrounding abutments/wingwalls, difficult to determine integrity. Recommend engineer inspection.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
				Erosion Extent: 8m^2	
WC_0078_ outlet	Sturgeon	UTM: 12 Easting: 347232 Northing: 5968217	Concrete culvert	Fish Passage**:** None Safety/Performance: None Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope, Bank slope Erosion Extent: Low Total Erosion Area: 400 m^2	WC_0083 is outlet. Signs of erosion along outlet bank slopes beside culvert outlet from past high water levels.
WC_0083_i nlet		UTM: 12 Easting: 347216 Northing: 5968207		Fish Passage**:** None Safety/Performance: None Erosion Location (Inlet or Outlet): Both Erosion Source: Bank Slump, Fill Slope Erosion Extent: Low Total Erosion Area: 15 m^2	WC_0078 inlet. Recommend restoration of riparian zone to prevent bank slumping.
WC_0091	Little Egg	UTM: 12 Easting: 327044 Northing: 5968112	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Inlet bankfull width > culvert inlet, thereby creating back pooling. Potential culvert replacement and/or engineer inspection.
WC_0110	Riviere Qui Barre	UTM: 12 Easting: 306065 Northing: 5968897	Bridge - Permanent	Fish Passage: None Safety/Performance: Damaged Guardrail & Other Erosion Location (Inlet or Outlet): Both Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 2 m^2	Other - large spaces between pavement deck slates, missing abutment piling, wingwall not secure. Recommend engineer investigation.
WC_0111	Sturgeon	UTM: 12 Easting: 334138 Northing: 5965865	Bridge - Permanent	Fish Passage: None Safety/Performance: Grader markers or bridge reflectors not present Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 10 m^2	Maintenance required to install amour on fill slope and to install grader markers/bridge reflectors.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0119	Little Egg	UTM: 12 Easting: 327492 Northing: 5965561	Bridge - Permanent	Fish Passage: None Safety/Performance:: Vegetation protruding from wingwall Erosion/Sedimentation: None	Recommend engineer inspection to determine if a replacement is required.
WC_0130	Little Egg	UTM: 12 Easting: 329119 Northing: 5965205	Culvert - Single	Fish Passage: None Safety/Performance: Undersized culvert Erosion Location: Inlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 10 m^2	Recommend engineer inspection to determine if replacement is required due to the undersized culvert.
WC_0132	Sturgeon	UTM: 12 Easting: 353533 Northing: 5962137	Bridge - Permanent	Fish Passage: None Safety/Performance: Damaged guardrail Erosion Location (Inlet or Outlet): Both Erosion Source: Ditch Gully, Bank Slump Erosion Extent: High Total Erosion Area: 10 m^2	Maintenance required to the active ditch gully erosion to prevent sedimentation. Recommend armour via rip-rap or bio-engineering (balsam poplar stakes or willow) to prevent erosion.
WC_0140	Little Egg	UTM: 12 Easting: 329749 Northing: 5964774	Culvert - Multiple	Fish Passage: None Safety/Performance: None Erosion Location: Inlet Erosion Source: Bank Slump Erosion Extent: High Total Erosion Area: 5 m^2	Maintenance required to remove instream materials and riparian reclamation to prevent bank slumping.
WC_0141	Little Egg	UTM: 12 Easting: 330726 Northing: 5964712	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: Damaged abutment wall (middle south) & >10% blockage Erosion/Sedimentation: None	Gabions upstream causing upstream blockage thereby creating fish passage concerns. Recommend investigation to determine if gabions are required and possible replacement of abutment wall.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0165	Sturgeon	UTM: 12 Easting: 340450 Northing: 5961909	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Extent: 20 m^2	Recommend armour on sparsely vegetated banks to reduce erosion potential.
WC_0184	Carrot Creek	UTM: 12 Easting: 326176 Northing: 5961665	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: None Erosion Location (Inlet or Outlet): Both Erosion Source: Ditch Gully Erosion Extent: Low Total Erosion Area: 10 m2	Crossing is located at headwater area and drainage upstream is mainly drainage. Damaged culvert, worth further investigation to restore headwaters if possible. Fish may not be present this far upstream but possible in spring.
WC_0199	Riviere Qui Barre	UTM: 12 Easting: 308607 Northing: 5962319	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: Damaged abutment wall with materials eroding from underneath & >10% blockage Erosion/Sedimentation: None	Recommend engineer inspection to determine abutment integrity & maintenance to removal instream materials creating blockage.
WC_0201	Toad Creek	UTM: 11 Easting: 684519 Northing: 5961499	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: High water levels Erosion/Sedimentation: None	Recommend engineer inspection to determine integrity of abutments/wingwalls. Bridge is currently functioning at high capacity.
WC_0218	Little Egg	UTM: 12 Easting: 333618 Northing: 5958308	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: None Erosion/Sedimentation: None	Upstream area has a steep grade caused by instream rip-rap, which creates turbulence and difficulties for fish that are weak swimmers. Maintenance is recommended to remove the instream rip-rap to the channel bank.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0226	Sturgeon	UTM: 12 Easting: 337417 Northing: 5958021	Bridge - Permanent	Fish Passage: None Safety/Performance: Damaged grader markers Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: High Total Erosion Area: 8 m^2	Fill slope erosion to be corrected with the addition of armour. Replace/fix grader markers. Recommend engineer inspection to ensure erosion has not created structure problems.
WC_0231	Carrot Creek	UTM: 12 Easting: 337417 Northing: 5958021	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Road Surface, Bridge Deck Erosion Extent: High Total Erosion Area: 4 m^2	Recommend closing bridge deck gaps by filling with grout to prevent sedimentation into stream & maintenance to remove instream sediment.
WC_0245	Carrot Creek	UTM: 12 Easting: 325544 Northing: 5958025	Culvert - Single	Fish Passage: None Safety/Performance: Culvert not utilized for stream connectivity. Erosion/Sedimentation: None	Area impacted by rural development and drainage channel is overgrown with water-tolerant vegetation. Recommend inspecting area for stream connectivity restoration.
WC_0256	Riviere Qui Barre	UTM: 12 Easting: 310688 Northing: 5958998	Bridge - Permanent	Fish Passage: None Safety/Performance: Damaged grader sign Erosion/Sedimentation: None	Recommend fixing/adding bridge signs.
WC_0259	Riviere Qui Barre	UTM: 12 Easting: 310820 Northing: 5957722	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels & vegetation moving around wingwalls Erosion/Sedimentation: None	Recommend engineer inspection to determine bridge integrity since bridge functioning near full capacity.
WC_0260	Toad Creek	UTM: 11 Easting: 687862 Northing: 5959626	Culvert - Single	Fish Passage : Serious Concerns Safety/Performance: > 10% blockage by debris & undersized culvert Erosion/Sedimentation: None	Recommend beaver dam removal to prevent flooding risks and free fish passage & possible replacement as culvert is severely undersized.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0265	Toad Creek	UTM: 11 Easting: 690534 Northing: 5958992	Bridge - Permanent	Fish Passage : None Safety/Performance: Vegetation protruding from wingwalls & high water levels Erosion/Sedimentation: None	Capacity of bridge has been reached and difficult to determine integrity. Recommend engineer inspection.
WC_0276	Toad Creek	UTM: 11 Easting: 690531 Northing: 5958888	Culvert - Single	Fish Passage : None Safety/Performance: undersized culvert Erosion/Sedimentation: None	Recommend engineer inspection. Possible replacement required.
WC_0278	Toad Creek	UTM: 11 Easting: 690554 Northing: 5958824	Culvert - Single	Fish Passage Concerns: Serious Concerns Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Greater area resembles a flood plain. Currently not enough flow or backwater for fish passage. Recommend assessing drainage pathway to ensure efficient watercourse pathway.
WC_0307	Toad Creek	UTM: 11 Easting: 690983 Northing: 5957546	Bridge - Permanent	Fish Passage : None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 16 m^2	Recommend installing armour to prevent fill slope erosion.
WC_0309	Sturgeon	UTM: 11 Easting: 679784 Northing: 5957391	Bridge - Permanent	Fish Passage : None Safety/Performance: Northern abutment wall angling inwards & grader markers/ bridge reflectors missing. Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 6 m^2	No grader markers or bridge reflectors. Recommend engineer inspection of abutment walls.
WC_0315	Carrot Creek	UTM: 12 Easting: 324201 Northing: 5955245	Culvert - Single	Fish Passage : None Safety/Performance: Undersized culverts Erosion/Sedimentation: None	Bankfull width upstream of culvert is much larger than culvert inlet. Possible replacement required.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0316	Sturgeon	UTM: 12 Easting: 331511 Northing: 5954935	Bridge - Permanent	Fish Passage : None Safety/Performance: Damaged guardrail Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 4 m^2	Recommend repairing guardrail and installing armour to sparsely vegetated fill slope to prevent erosion.
WC_0339	Sturgeon	UTM: 11 Easting:684702 Northing: 5956967	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: >10% blockage (log jam) and bridge curb is damaged Erosion/Sedimentation: None	Recommend maintenance to remove channel blockage and fix crumbling curb. Engineer inspection to ensure timber pilings were not damaged from log jam.
WC_0347	Sturgeon	UTM:11 Easting:666259 Northing: 5956365	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials eroding around wingwalls &high water levels Erosion Location (Inlet or Outlet): Both Erosion Source: Bank Slump, Ditch Gully Erosion Extent: Low Total Erosion Area: 6 m^2	Recommend engineer inspection to determine overall integrity. Maintenance required to address fill slope erosion and general cleanup of eroded area and garbage.
WC_0353	Sturgeon	UTM:11 Easting:688152 Northing: 5955787	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials moving around wingwalls & high water levels Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope, Bank Slump Erosion Extent: High Total Erosion Area: 32 m^2	Recommend engineer inspection to determine overall integrity and if replacement is required.
WC_0530	Sturgeon	UTM:12 Easting:317514 Northing: 5948995	Bridge - Permanent	Fish Passage: None Safety/Performance: Grader/reflector signs missing Erosion Location: Both Erosion Source: Bank Slump, Fill Slope Erosion Extent: High	Recommend correcting fill slope erosion and slumping by installing of armour. Install bridge signs.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
				Total Erosion Area: 8 m^2	
WC_0569	Kilini Creek	UTM:11 Easting:688883 Northing: 5949217	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials eroding from underneath abutments Erosion/Sedimentation: None	Recommend engineer inspection of abutment walls to determine integrity. Fence across stream is allowing organic material buildup downstream.
WC_0577	Carrot Creek	UTM:12 Easting:321080 Northing: 5946530	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials eroding from underneath wingwalls & road materials in stream bed due to missing curb Erosion/Sedimentation: None	Recommend engineer inspection to determine overall integrity and installment of a curb to prevent road materials from entering the stream. Possible replacement required.
WC_0579	Sturgeon	UTM:12 Easting:326522 Northing: 5946318	Bridge - Permanent	Fish Passage: None Safety/Performance: Grader/reflector signs missing Erosion/Sedimentation: None	Wetted width and bankfull width are very similar. Potential flooding risk for surrounding area however bridge is in good condition.
WC_0580	Sturgeon	UTM:12 Easting:326313 Northing: 5946170	Bridge - Permanent	Fish Passage: None Safety/Performance: Sidewalk under bridge is flooding, hazard signs present. Erosion/Sedimentation: None	Wetted width and bankfull width are very similar, look into flooding mitigation. Currently sidewalk closed due to flooding. Bridge is in good condition.
WC_0598	Carrot Creek	UTM: 12 Easting:321680 Northing: 5945062	Bridge - Permanent	Fish Passage Assessment: Some Concerns Safety/Performance: > 25% opening blockage due to downstream beaver dam & high water levels Erosion/Sedimentation: None	Recommend the removal of the beaver dam to prevent flooding risks & engineer inspection to determine abutment damage extent since water levels are high.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0681	Atim Creek	UTM: 12 Easting:309036 Northing: 5941805	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: None Erosion Location (Inlet or Outlet): Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 5 m^2	Recommend the removal of the beaver dam to mitigate fish passage concerns. Rip-rap on only one underside of bridge recommend installing armour on other side for erosion control.
WC_0725	Atim Creek	UTM: 12 Easting:306059 Northing: 5940239	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: None Erosion/Sedimentation: None	Beaver dam approximately 25m upstream may cause fish passage concerns but may also provide overwintering habit. Further inspection recommended to determine safety concerns and weather removal is required.
WC_0758	Sturgeon River	UTM: 11 Easting:641626 Northing: 5940192	Bridge - Permanent	Fish Passage: Potential Concerns Safety/Performance: None Erosion/Sedimentation: None	Rip-rap in stream bed may cause fish passage concerns for larger fish in low water years. Recommend removal of larger instream materials. Alternatively, the area provides suitable substrate for laying eggs and could be spawning habitat. Recommend further investigation prior to commencing any instream activities.
WC_0784	Atim Creek	UTM: 12 Easting:303983 Northing: 5938005	Culvert - Multiple	Fish Passage: Serious Concerns Safety/Performance: Outlet Gap (0.4 m) Erosion/Sedimentation: None	Outlet gap causing fish passage concerns. Possible replacement required, recommend engineer inspection.
WC_0798	Sturgeon	UTM: 11 Easting:639959 Northing: 5938896	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: Materials eroding from under abutments & damaged guardrail Erosion Location: Both Erosion Source: Bank Slump, Fill Slope Erosion Extent: High Total Erosion Area: 8 m^2	Recommended repairing fill slope armour to prevent further slumping and inspection by engineer since timber pilings appear old.
WC_0789_ inlet	Kilini Creek	UTM: 11 Easting:683851 Northing: 5939586	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: None Erosion Location (Inlet or Outlet): Inlet	Rip-rap has slipped into water and is causing some concerns for fish passage with low flow. Culvert Outlet is WC_0775 where the same problem with riprap is occurring.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0775_ outlet		UTM: 11 Easting:683878 Northing:5939587		Erosion Source: Bank slump/fill slope Erosion Extent: Low Total Erosion Area: 2 m^2	Minor maintenance recommended to remove instream rip-rap to prevent blockage. Water is along the outside of the culvert, which has the potential to cause erosion problems.
WC_0800_ inlet	Kilini Creek	UTM: 11 Easting:683491 Northing: 5939269	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: Undersized culvert Erosion Location: Outlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 2 m^2	Interesting position of watercourse crossing since it is parallel to road and best design is to install culvert perpendicular to flow. Recommend engineering inspection. Culvert outlet is WC_0790.
WC_0790_ outlet		UTM: 11 Easting:683491 Northing: 5939281			Recommend culvert replacement to ensure proper drainage. Culvert inlet is 0790.
WC_0817_ outlet	Atim Creek	UTM: 12 Easting:303580 Northing: 5936582	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: Instream sediment build-up is reducing flow through culvert Erosion/Sedimentation: None	Area has reduced wetted width within banks. Possible upstream obstruction. Buildup of instream materials. Recommend further inspection to determine site conditions. Inlet is WC_0836
WC_0836_ intlet		UTM: 12 Easting:303578 Northing: 5936567			Erosion control efforts have been installed (silt fencing/rip-rap). However, in-stream sediment buildup is creating fish passage concerns. Outlet is WC_0817.
WC_0819	Sturgeon	UTM: 11 Easting:638994 Northing: 5937784	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials moving around wingwalls & high water levels Erosion/Sedimentation: None	Bridge functioning at high capacity. Water is in contact with treated wood abutment and wing walls. Recommend engineer inspection.
WC_0865	Sturgeon	UTM: 11 Easting:635249 Northing: 5932493	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels & structural problems Erosion Location (Inlet or Outlet): Inlet Erosion Source: Other (missing wingwall) Erosion Extent: Low	Structural Problems: BA- broken abutments RA- rotten abutments V- vegetation protruding Bridge is at capacity for water level, hard to determine integrity of structure. Headwater

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
				Total Erosion Area: 3 m^2	location. Recommended engineer inspection.
WC_0868	Sturgeon	UTM: 11 Easting:635683 Northing: 5931220	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: Materials eroding from underneath wingwalls & 80 % blockage by instream rip-rap Erosion at Site: Yes Erosion Source: Bridge deck Erosion Extent: Low Total Erosion Area: 8 m^2	Recommend removing instream rip-rap and installing along sides of stream for proper armour placement. Recommend engineer inspection to determine if wingwall replacement is required.
WC_0871	Atim Creek	UTM: 12 Easting:303005 Northing: 5930098	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: > 25% of the culvert diameter blocked & undersized culvert Erosion/Sedimentation: None	Recommend removal of beaver grate since mesh size is too small and thereby blocking fish passage& accumulating debris. Culvert replacement maybe required to prevent flooding.
WC_0872	Atim Creek	UTM: 12 Easting:303004 Northing: 5929365	Culvert - Single	Fish Passage: Some Concerns Safety/Performance: > 10% of the culvert is blocked by a beaver guard Erosion Location: Outlet Erosion Source: Ditch Gully Erosion Extent: Low Total Erosion Area 2 m^2	Beaver grate is not installed properly and is creating fish passage concerns due to blockage. Recommend removal and also inspection ditch gully erosion to prevent sedimentation.
WC_0875	Atim Creek	UTM: 11 Easting:699009 Northing: 5928264	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: Low flow due to upstream blockage & bridge reflectors down Erosion/Sedimentation: None	No blockage at bridge. Blockage is upstream and causing downstream impacts. Refer to WC_0881 in high risk for site recommendations.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0877	Sturgeon	UTM: 11 Easting:636760 Northing: 5928008	Culvert - Multiple	Fish Passage: Serious Concerns Safety/Performance: Sloped and not uniform culvert Erosion Location: Outlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 3 m^2	Headwater location; reduced flow. Recommend engineer inspection as crossing is old and many erosion issues. Deep valley with a high road and steep banks. Level of valley decreases at outlet, making the inlets sloped up. Culvert is too sloped and no backwater creating fish passage issues.
WC_0053	Riviere Qui Barre	UTM: 12 Easting: 304103 Northing: 5975450	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels & materials moving around the wingwalls Erosion Location: Outlet Erosion Source: Ditch Gully Erosion Extent: Low Total Erosion Area: 1 m^2	BA-broken/separated/damaged abutments Bridge is functioning at full capacity and engineer inspection is recommended to determine bridge integrity.
WC_0335	Carrot Creek	UTM: 12 Easting:324165 Northing: 5954070	Culvert - Multiple	Fish Passage: Some Concerns Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Recommend stream assessment of general area to ensure proper drainage as many areas contain pools and ditch drainage. Replacement required & potential channel re-alignment.
WC_0540	Sturgeon	UTM: 11 Easting:657729 Northing: 5949149	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 36 m^2	No armour, steep banks and active erosion. Recommend installing armour. Old timber frame, recommend engineer inspection. Instream fence creating some blockage downstream.

Table 4: Watercourse crossings identified as medium risk including comments/recommendations.

Crossing ID	Watercourse Name	Co-ordinates	Structure type	Medium Risk Issues	Comments/Recommendations
WC_0611	Kilini Creek	UTM: 11 Easting:689040 Northing: 5945983	Bridge - Permanent	Fish Passage: None Safety/Performance: High water levels Erosion Location: Outlet Erosion Source: Bridge Deck Erosion Extent: Low Total Erosion Area: 2 m^2	Mound of sediments under bridge (falling from bridge deck). Bridge appears to be functioning at full capacity. Recommend engineer inspection.
WC_0867	Sturgeon	UTM: 11 Easting:635312 Northing: 5931396	Bridge - Permanent	Fish Passage: None Safety/Performance: Materials eroding from the side of wingwalls and slumping is present Erosion/Sedimentation: None	Area of secondary inflow has brought material to in front of wingwall. Instream sediment present throughout area. Recommend upstream investigation to determine erosion source.

Table 5: Watercourse crossing identified as high risk including comments/recommendations.

Crossing ID	Watercourse	Co-ordinates	Structure Type	High Risk Issues	Emergency Repair Required	Recommendations
WC_0013	Little Egg Creek	UTM: 12 Easting: 321444 Northing: 5978442	None	Fish Passage: Some Concerns Safety/Performance: Missing watercourse crossing Erosion/Sedimentation: None	Potential	Ditch drainage extensive. Recommend area inspection to restore drainage pattern and install culvert.
WC_0016	Riviere Qui Barre	UTM: 12 Easting: 305154 Northing: 5978797	Culvert - Single	Fish Passage: Serious Concerns Safety/Performance: > 50% of the culvert diameter blocked by debris Erosion/Sedimentation: None	Yes	Removal of blockage upstream to reduce flooding risk and to restore fish passage.
WC_0049	Little Egg Creek	UTM: 12 Easting: 326119 Northing: 5972933	Culvert - Single	Fish Passage: Serious Concerns Safety/Performance: Undersized culvert and submerged culvert Erosion/Sedimentation: None	Yes	Culvert inlet submerged and culvert outlet is undersized. Recommend replacement and engineer inspection.

Table 5: Watercourse crossing identified as high risk including comments/recommendations.

Crossing ID	Watercourse	Co-ordinates	Structure Type	High Risk Issues	Emergency Repair Required	Recommendations
WC_0088	Sturgeon River	UTM: 12 Easting: 349773 Northing: 5967349	Bridge - Permanent	Fish Passage: None Safety/Performance: None Erosion Location: Both Erosion Source: Fill Slope Erosion Extent: Low Total Erosion Area: 10 m^2	Yes	Active fill slope erosion requires maintenance to restore and engineer inspection to determine bridge integrity.
WC_0142	Riviere Qui Barre	UTM: 12 Easting: 307517 Northing: 5965608	Bridge - Permanent	Fish Passage: Serious Concerns Safety/Performance: >50 % blockage by debris/ garbage & damaged wingwall Erosion Location: Both Erosion Source: Bank Slump, Fill Slope. Erosion Extent: High Total Erosion Area: 60 m^2	Yes	Instream debris build up may be causing issues with timber pilings and fill slope erosion may cause structural problems. Recommend maintenance and engineer inspection to determine integrity of bridge.
WC_0234	Riviere Qui Barre	UTM: 12 Easting: 309271 Northing: 5959967	Bridge - Permanent	Fish Passage: Serious Concerns Safety/Performance: Missing wingwall &high water levels Erosion/Sedimentation: None	Yes	Recommend engineer inspection as watercourse appears to be functioning at full capacity. Missing wingwall on SE corner.
WC_0243	Toad Creek	UTM: 11 Easting: 686216 Northing: 5959880	Culvert - Single	Fish Passage: Serious Concerns Safety/Performance: > 50% of the culvert diameter blocked Erosion/Sedimentation: None	Yes	Upstream wetted width is significantly less than bankfull width and culvert inlet blockage is caused by rip-rap and tires. Recommend upstream investigation, engineer inspection and instream rip-rap removal.
WC_0284	Sturgeon River	UTM: 11 Easting: 683036 Northing: 5957752	Culvert - Multiple	Fish Passage: Serious Concerns Safety/Performance: Outlet Gap (0.3 m) Erosion Location: Outlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 9 m^2	Yes	Requires maintenance or replacement to restore fish passage.

Table 5: Watercourse crossing identified as high risk including comments/recommendations.

Crossing ID	Watercourse	Co-ordinates	Structure Type	High Risk Issues	Emergency Repair Required	Recommendations
WC_0374	Kilini Creek	UTM: 11 Easting: 690432 Northing: 5952520	Bridge - Permanent	Fish Passage: Serious Concerns Safety/Performance: >50% blockage by debris & damaged guardrail Erosion Location: Outlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 4 m^2	Yes	Bridge Out sign posted. Guard rail is instream causing log jam creating safety and fish passage concerns.
WC_0399	Sturgeon River	UTM: 11 Easting: 676156 Northing: 5954985	Bridge - Permanent	Fish Passage: Serious Concerns Safety/Performance: >25% blockage by debris & high water levels Erosion/Sedimentation: None	Potential	Recommend removal of instream materials (old bridge) to restore fish passage. Recommend engineer inspection to determine bridge integrity.
WC_0449	Carrot Creek	UTM: 12 Easting: 323826 Northing: 5952013	Culvert - Multiple	Fish Passage: None Safety/Performance: Undersized culvert Erosion/Sedimentation: None	Yes	Flooding risk due to undersized culverts. Recommend replacement. Danger Washout sign posted.
WC_0657	Kilini Creek	UTM: 11 Easting:688610 Northing: 5943621	Culvert - Single	Fish Passage: Serious Concerns Safety/Performance: None Erosion/Sedimentation: None	No	New culvert. Fish passage concerns upstream due to beaver dam across entire wetted width.
WC_0687	Atim Creek	UTM: 12 Easting:310660 Northing: 5941811	Bridge - Permanent	Fish Passage: None Safety/Performance: Collapsing wingwalls and materials eroding from underneath. Grader markers damaged. Erosion Location: Both Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 4 m^2	Yes	Bridge is functioning at full capacity and is damaged. Recommend replacement and engineer inspection.

Table 5: Watercourse crossing identified as high risk including comments/recommendations.

Crossing ID	Watercourse	Co-ordinates	Structure Type	High Risk Issues	Emergency Repair Required	Recommendations
WC_0772_ outlet	Atim Creek	UTM: 12 Easting:304337 Northing: 5939630	Culvert - Single	Fish Passage: Serious Concerns Safety/Performance: Culvert gap (0.6 m) & undersized culvert Erosion Location: Both Erosion Source: Fill Slope, Bank Slump Erosion Extent: Medium Total Erosion Area: 21 m^2	Yes	Recommend replacing culvert with appropriate size, which will also solve fish passage concerns. WC_0780 is inlet.
WC_0780_ inlet		UTM: 12 Easting:304346 Northing: 5939597				Culvert outlet is WC_0772.
WC_0850	Atim Creek	UTM: 12 Easting:303641 Northing: 5935167	Culvert - Multiple	Fish Passage: Serious Concerns Safety/Performance: >50% blockage by debris & undersized culvert Erosion/Sedimentation: None	Yes	Beaver dam creating fish blockage concerns and potential flooding risks upstream.
WC_0861	Atim Creek	UTM: 12 Easting:303198 Northing:5931574	Culvert - Multiple	Fish Passage: Serious concerns Safety/Performance: > 50% blockage by debris & undersized culvert Erosion Location: Inlet Erosion Source: Bank Slump Erosion Extent: Low Total Erosion Area: 5 m^2	Yes	Recommend maintenance to remove beaver dam and possible replacement with a larger sized culvert.
WC_0881	Atim Creek	UTM: 11 Easting:698985 Northing:5928263	Culvert - Multiple	Fish Passage: Serious Concerns Safety/Performance: > 25% of the culvert diameter blocked by steel structure Erosion Location: inlet Erosion Source: under culvert Erosion Extent: medium Total Erosion Area: 2 m^2	Yes	Fish passage concerns are a result of a steel wall for water management located at the culvert inlet. Recommend inspecting area to decide if steel plate is still required as it is causing problems at the crossing.

Table 5: Watercourse crossing identified as high risk including comments/recommendations.

Crossing ID	Watercourse	Co-ordinates	Structure Type	High Risk Issues	Emergency Repair Required	Recommendations
WC_0323	Sturgeon	UTM: 11 Easting: 697794 Northing: 5957072	Bridge - Permanent	Fish Passage: Serious Concerns Safety/Performance: >50% blockage broken/damaged abutments Erosion Location: Both Erosion Source: Fill Slope, Bridge Deck Erosion Extent: Low Total Erosion Area: 6 m^2	Yes	Maintenance required due to buildup of log debris upstream that may be contributing to abutment damage and is also causing channel blockage. Recommend inspection by engineer to determine integrity.
WC_0582	Sturgeon	UTM: 11 Easting:320389 Northing: 5944401	Bridge - Permanent	Fish Passage: None Safety/Performance: Bridge reflectors missing Erosion Source: Bank Slump, Fill Slope Erosion Extent: High Total Erosion Area: 60 m^2	Yes	Fill slope and bank slumping erosion is extensive. Recommend engineer inspection for overall integrity
WC_0589	Kilini Creek	UTM: 11 Easting:689167 Northing:5947603	Bridge - Permanent	Fish Passage: Some Concerns Safety/Performance: > 10% blockage by instream sediment &materials eroding from around wingwalls Erosion Location (Inlet or Outlet): Both Erosion Source: Road Surface, Bridge Deck, Ditch Gully Erosion Extent: High Total Erosion Area: 10 m^2	Yes	Recommend replacement/maintenance to prevent sedimentation into stream as erosion is a major issue. Engineer inspection to determine replacement/maintenance options Fish passage concerns due to sedimentation. Recommend upstream inspection to determine sedimentation source as turbidity is visibly higher at this location.

5.0 References

Colby, B.R. 1964. Scour and Fill in Sand-Bed Streams: Sediment transport in alluvial channels. Geological Survey Professional Paper, 462-D. United States of America Printing Office. Washington, D.C.

Government of Alberta. 2015. Roadway Watercourse Crossing Inspection Manual. ISBN 978-1-4601-2038-5.

McCleary, R., C. Spytz, H. Schindler, R. Anderson, and M. Climie. 2007. Stream Crossing Inspection Manual. Version 3. C.R. Bamsey, ed. Clear Lake Ltd., Edgerton, AB.

The City of St. Albert. 2012. Sturgeon River: State of Watershed Report. The Office of Environment, St. Albert, Alberta.

Appendix 1: Glossary

Active channel: the parts of the bed and banks of a water body that are without terrestrial vegetation.

Bankfull Width: Estimated measurement of the width of a channel upstream from the crossing. It can be described as the point at which the water breaches its banks and flows onto the floodplain.

Bank Slump Erosion: gullying under bridge and leads to structural concerns.

Channel: at least 50 meters of visible bed and defined banks.

Ditch/Gully Erosion: fill and/or surface material near the bridge/culvert indicating movement towards channel by formation of gully due to surface runoff.

Emergency: a situation where there is an imminent risk to the aquatic environment, public health or safety, or an imminent risk of structural failure to a watercourse crossing.

Ephemeral: a watercourse that only exists for a short period following precipitation or snowmelt.

Erosion: the process by which soil and minerals are detached and transported by water, wind, gravity, ice and human activities.

Fill Slope Erosion: the fill material around a culvert and under a bridge indicating movement and impeding contact with the channel.

Fluvial: stream power great enough to transport and arrange bed materials and create a sequence of pools and riffles with no organic bridges and bed largely containing inorganic materials.

Intermittent: a watercourse with a channel that usually has no terrestrial vegetation; channel width often less than 0.4m with some bank development.

Maintenance: the repair, partial replacement or structural restoration of a watercourse crossing that results or may result in the disturbance or alteration of the bed or banks or active channel of a water body.

Non-fluvial: stream power not great enough to transport and arrange bed materials. Channel has varied width, no pools or riffles, organic bridges present with mostly organic bed material.

Permanent- Small: Channel has no terrestrial vegetation; channel width often 0.7m to 5m with defined banks.

Permanent- Large: A watercourse with a channel that has no terrestrial vegetation; channel width greater than 5m with defined banks.

Scour Pool: Net removal of sediment from a stream boundary by action of fluid flow (Colby 1964).

Watercourse: rivers, brooks, creeks or other natural water channel and the bed along which these flow. Ephemeral draws (runoff channels) and intermittent streams are included.

Watercourse crossing: a crossing or temporary crossing and any associated permanent or temporary structures that are or will be constructed to provide access over or through a water body, including bridges, open or closed-bottom culverts, fords or low-level crossings, temporary road crossings (ice roads or snow bridges), suspended, reclaimed, and structures and measures to isolate the location of the works, erosion protection structures, and sedimentation management structures.

Watershed: an area of land that drains with surficial topography downhill to a body of water, such as a stream, lake, river or wetland.

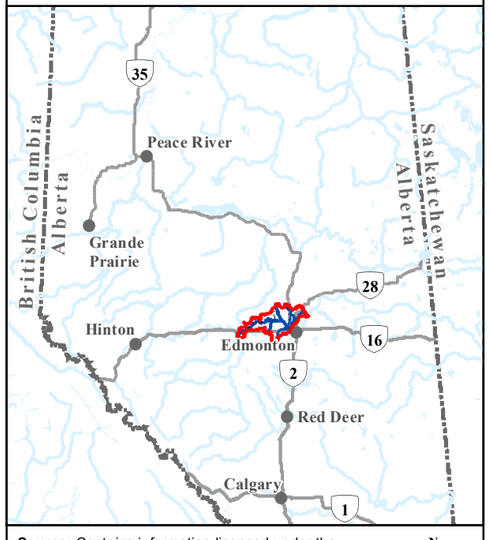
Appendix 2: Overview Map

NWSA
Sturgeon River Study

Water Course Crossing

Risk Assessment

- High
- Medium
- Low



Source: Contains information licensed under the Open Government Licenses - Canada and Alberta, Parkland County, City of Edmonton, StonyPlain, Strathcona County and Leduc
Imagery acquisition date: 2001 - 2016
Coordinates system: NAD 1983 UTM Zone 11N

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0 5 10 15 20 km

Date: January 16, 2019

Prepared by: G. Couture

CPP ENVIRONMENTAL

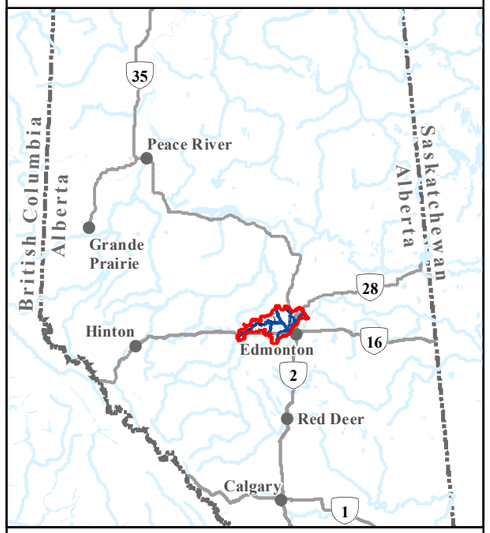
Appendix 3: Low Risk Watercourse Crossing Overview Map and Field Sheets

NWSA
Sturgeon River Study

Water Course Crossing

Risk Assessment

- Low



Source: Contains information licensed under the Open Government Licenses - Canada and Alberta, Parkland County, City of Edmonton, StonyPlain, Strathcona County and Leduc
Imagery acquisition date: 2001 - 2016
Coordinates system: NAD 1983 UTM Zone 11N

N W E S

1:400,000

0 5 10 15 20 km

Date: January 15, 2019

Prepared by: G. Couture

CPP ENVIRONMENTAL

Inspection Date: May 08, 2018
Watercourse Name: Riviere Qui Barre
GPS Co-ordinates:
UTM: 12 | **Easting:** 305,114 | **Northing:** 5,977,877

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 3m (Estimated to Nearest Metre)
Crossing Type: Culvert - Single
Culvert(s) Diameter: 1.93 m
Erosion at Site: No

Greater than 10% of the culvert diameter blocked by debris?: No
Structural Problems: Yes, undersized culvert

Substrate in Culvert?: Unknown
For what length of culvert?: unknown
What proportion has backwater?: 100%
Culvert Slope: Level and Uniform
Outlet Gap: unknown
Pool Depth: unknown
Substrate Type: unknown
Embedded?: Unknown
Scour pool apparent?: No

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: pooling at inlet as outlet . no apparent cause. High beaver activity 0.8km up steam. Downstream spreads out into a wetland area. Could not measure pool depth at inlet or outlet due to safety concerns. Water was filling the culvert half way. The pool depth could be approximately 0.8m.

Crossing ID: WC_0036

Photo No.: Photos-20180508-171437.jpg
Description: Upstream

Photo No.: Photos-20180508-171456.jpg
Description: Inlet

Photo No.: Photos-20180508-171524.jpg
Description: Downstream

Photo No.: Photos-20180508-171548.jpg
Description: Outlet

inspection Date: May 07, 2018
Watercourse Name: Little Egg Creek
GPS Co-ordinates:
UTM: 12 | **Easting:** 327,675 | **Northing:** 5,971,323

Stream Classification: Fluvial (Permanent - Small) **Bankfull Width:** 6m (Estimated to Nearest Metre) **Crossing Type:** Culvert - Multiple **Culvert(s) Diameter:** 1.1m both
Erosion at Site: No
Structural Problems: Yes, culverts are undersized

Greater than 10% of the culvert diameter blocked by debris?: No
Substrate in Culvert?: unknown **Substrate Type:** unknown
For what length of culvert?: unknown
What proportion has backwater?: 100%
Culvert Slope: Level and uniform
Outlet Gap: None **Embedded?:** No
Pool Depth: 0.75 m **Scour pool apparent?:** No

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Same area as WC_0073. Channel could have been historically diverted to where it is today. Channel is excavated in a straight line and runs diagonally across road. Pooling noted at inlet, sign that the culverts are undersized.

Crossing ID: WC_0060

Photo No.: Photos-20180507-173248.jpg
Description: Downstream

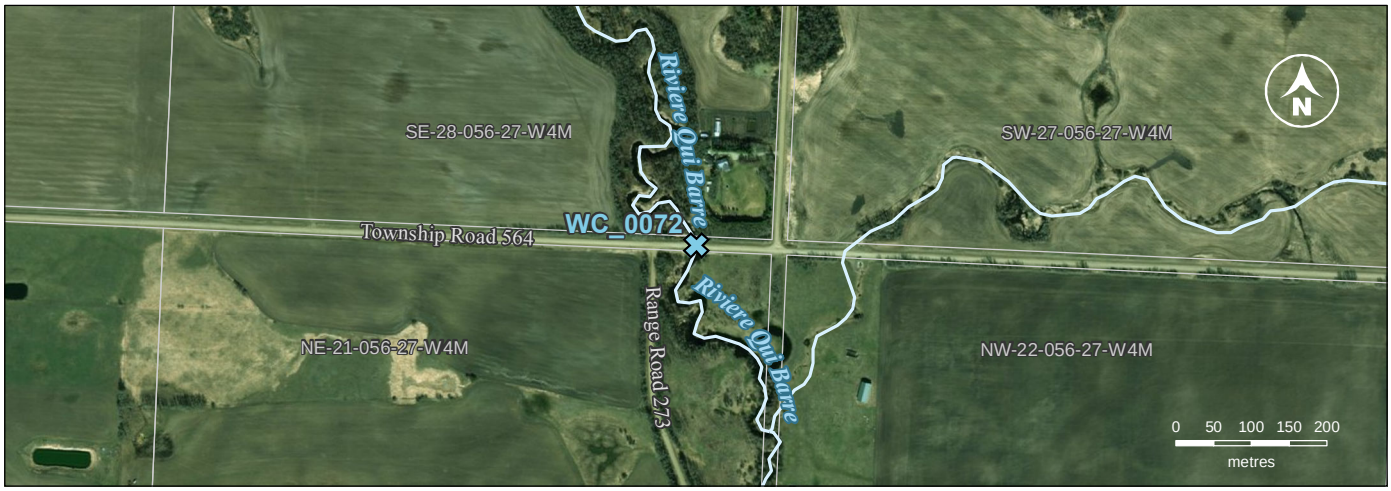
Photo No.: Photos-20180507-173307.jpg
Description: Outlet

Photo No.: Photos-20180507-173419.jpg
Description: Veg Bunch In Outlet

Photo No.: Photos-20180507-174135.jpg
Description: Upstream

Photo No.: Photos-20180507-174213.jpg
Description: Inlet

Crossing ID: WC_0060



Inspection Date: May 08, 2018
Watercourse Name: Riviere Qui Barre
GPS Co-ordinates:
UTM: 12 | **Easting:** 306,425 | **Northing:** 5,972,181

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 7m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: Potential **Erosion Location (Inlet or Outlet):** Outlet
Erosion Source: Fill Slope
Erosion Extent: Low **Total Erosion Area:** 2 m^2

Most Common Bridge Substructure Material: Concrete
Total Deck Length: 10 m
Deck Width (Number of Lanes): 2
Decking Material: Concrete
Decking Pattern: Open
Curb Type: None - There is no curb, or the curb pattern has openings
Road Surface Material: Gravel
Abutment Type: Concrete Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath

Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: Riprap
Opening Blockage: 0%

Structural Problems: N
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments:

beaver dam approx 20m upstream and no armor on fill slope in one area that is non-vegetated creating fill slope erosion.

Crossing ID: WC_0072

Photo No.: Photos-20180508-175443.jpg
Description: Downstream

Photo No.: Photos-20180508-175535.jpg
Description: Outlet

Photo No.: Photos-20180508-175611.jpg
Description: Deck

Photo No.: Photos-20180508-175627.jpg
Description: Upstream

Photo No.: Photos-20180508-175712.jpg
Description: Inlet

Crossing ID: WC_0072

Inspection Date: May 04, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:
UTM: 12 | **Easting:** 346,341 | **Northing:** 5,967,128

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 30m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent **Erosion at Site:** No

Most Common Bridge Substructure Material: Concrete
Total Deck Length: 50 m
Deck Width (Number of Lanes): 2
Decking Material: Other - steel
Decking Pattern: Closed
Curb Type: Concrete
Road Surface Material: Other - pavement
Abutment Type: Concrete Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: Geotextile, gravel and vegetation
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: No, sign is not present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: No bridge reflectors or graders present

Crossing ID: WC_0084

Photo No.: Photos-20180504-172702.jpg
Description: Deck

Photo No.: Photos-20180504-173300.jpg
Description: Upstream

Photo No.: Photos-20180504-173356.jpg
Description: Inlet West

Photo No.: Photos-20180504-173600.jpg
Description: Armour

Photo No.: Photos-20180504-173623.jpg
Description: Downstream

Crossing ID: WC_0084

Photo No.: Photos-20180504-173646.jpg
Description: Outlet West

Photo No.: Photos-20180504-173715.jpg
Description: Outlet - East

Inspection Date: May 07, 2018
Watercourse Name: Little Egg Creek
GPS Co-ordinates:
UTM: 12 | **Easting:** 327,614 | **Northing:** 5,969,020

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 10m (Estimated to Nearest Metre)
Crossing Type: Culvert - Single **Culvert(s) Diameter:** 1.5m
Erosion at Site: No
Structural Problems: Yes, undersized culvert

Greater than 10% of the culvert diameter blocked by debris?: No
Substrate in Culvert?: unknown **Substrate Type:** unknown
For what length of culvert?: unknown
What proportion has backwater?: 50%
Culvert Slope: Level and uniform
Outlet Gap: None **Embedded?:** No
Scour pool apparent?: No

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Inlet has pools of water forming on the sides of the culvert. Area under the inlet is pooling and creating an inlet gap.

Crossing ID: WC_0090

Photo No.: Photos-20180507-175737.jpg
Description: Downstream

Photo No.: Photos-20180507-180102.jpg
Description: Upstream

Photo No.: Photos-20180507-180127.jpg
Description: Inlet

Photo No.: Photos-20180507-180241.jpg
Description: Outlet

Photo No.: Photos-20180507-180437.jpg
Description: Side of culvert pools

Crossing ID: WC_0090

Inspection Date: May 08, 2018
Watercourse Name: Riviere Qui Barre
GPS Co-ordinates:
UTM: 12 | **Easting:** 307,789 | **Northing:** 5,965,214

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 7m (Estimated to Nearest Metre)
Crossing Type: Culvert - Single
Culvert(s) Diameter: 3.5 m
Erosion at Site: No
Structural Problems: None

Greater than 10% of the culvert diameter blocked by debris?: No
Substrate in Culvert?: unknown
Substrate Type: unknown
For what length of culvert?: unknown
What proportion has backwater?: 100%
Culvert Slope: level and uniform
Outlet Gap: none
Embedded?: No
Pool Depth: none
Scour pool apparent?: No

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Stream bed and banks are very soft.

Crossing ID: WC_0153

Photo No.: Photos-20180508-195754.jpg
Description: Upstream

Photo No.: Photos-20180508-195804.jpg
Description: Inlet

Photo No.: Photos-20180508-200037.jpg
Description: Downstream

Photo No.: Photos-20180508-200222.jpg
Description: Outlet

Photo No.: Photos-20180508-200305.jpg
Description: Mammal Presence

Crossing ID: WC_0153

Inspection Date: May 07, 2018
Watercourse Name: Little Egg Creek
GPS Co-ordinates:
UTM: 12 | **Easting:** 332,124 | **Northing:** 5,961,441

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 8m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: No **Erosion**

Most Common Bridge Substructure Material: Timber
Total Deck Length: 7 m
Deck Width (Number of Lanes): 2
Decking Material: Concrete
Decking Pattern: Closed
Curb Type: Concrete
Road Surface Material: Other - pavement
Abutment Type: Log Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath **Wingwall Functioning?:** Yes - in good condition and no materials eroding from underneath **Armour:** None
Opening Blockage: 0%
Cause of blockage: None
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present
Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: No active erosion. Bank slumping coming around wingwalls noted. No amour present. Water is in contact with abutment walls. Structural integrity could not be determined.

Photo No.: Photos-20180507-202107.jpg
Description: Downstream

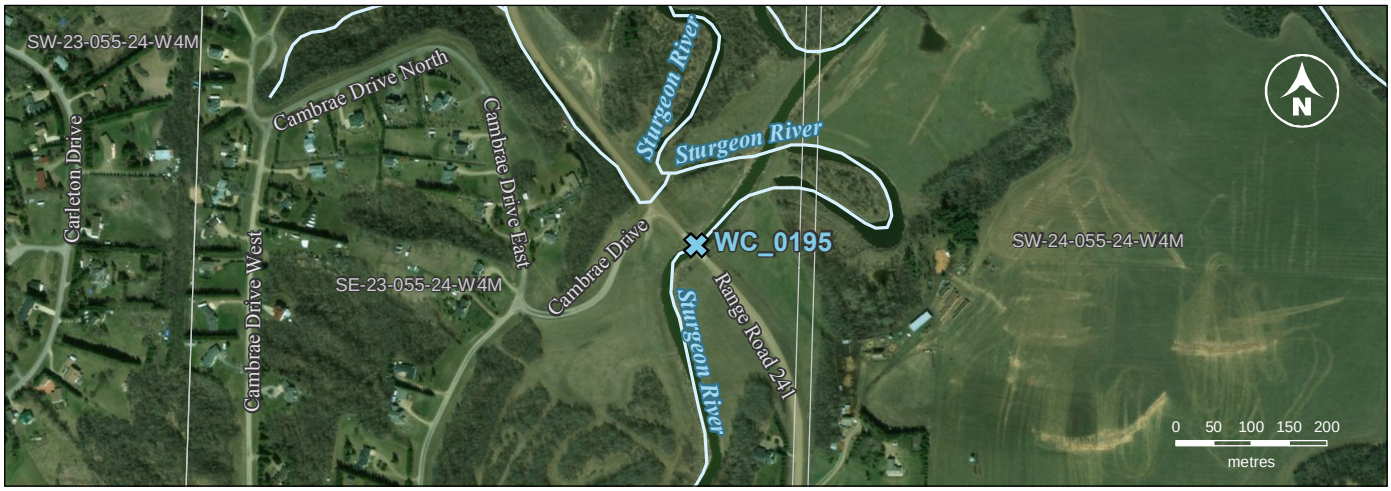
Photo No.: Photos-20180507-202114.jpg
Description: Outlet

Photo No.: Photos-20180507-202135.jpg
Description: Sediment Erosion

Photo No.: Photos-20180507-202320.jpg
Description: Inlet

Photo No.: Photos-20180507-202411.jpg
Description: Upstream

Crossing ID: WC_0176



Inspection Date: May 04, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:
UTM: 12 | **Easting:** 338,595 | **Northing:** 5,960,027
Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 20m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent

Erosion at Site: No **Erosion Location (Inlet or Outlet):** n/a

Most Common Bridge Substructure Material: Steel
Total Deck Length: 22 m
Deck Width (Number of Lanes): 2
Decking Material: Other - steel
Decking Pattern: Closed
Curb Type: Concrete
Road Surface Material: Other - pavement
Abutment Type: Steel Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: Vegetation
Opening Blockage: 0%

Structural Problems: None
Bridge Signs: Yes, sign is present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Armour is only present on the west side. Vegetated fill slope is present however no other form of armour is present and could lead to erosion with higher water levels.

Photo No.: Photos-20180504-190452.jpg
Description: Upstream

Photo No.: Photos-20180504-190502.jpg
Description: Inlet

Photo No.: Photos-20180504-191126.jpg
Description: Downstream

Photo No.: Photos-20180504-191150.jpg
Description: Outlet

Photo No.: Photos-20180504-191403.jpg
Description: Deck

Crossing ID: WC_0195

Inspection Date: May 07, 2018
Watercourse Name: Little Egg Creek
GPS Co-ordinates

UTM: 12 | **Easting:** 332,166 | **Northing:** 5,959,330

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 3m (Estimated to Nearest Metre)
Crossing Type: Culvert - Single
Erosion at Site: No
Structural Problems: None

Culvert(s) diameter: 3m

Greater than 10% of the culvert diameter blocked by debris?: No

Substrate in Culvert?: Unknown
For what length of culvert?: Unknown **Substrate Type:** Unknown
What proportion has backwater?: 100%
Culvert Slope: level and uniform
Outlet Gap: None **Embedded?:** No
Pool Depth: None **Scour pool apparent?:** No

Fish Passage Assessment: No Concerns

Emergency Repair Required?: No

Overall Risk: Low
Comments: Approximately 2m before and after the culvert starts and ends, there is riprap in stream.

diameter 3.9m

Crossing ID: WC_0205

Photo No.: Photos-20180507-203454.jpg
Description: Upstream

Photo No.: Photos-20180507-203510.jpg
Description: Inlet

Photo No.: Photos-20180507-204131.jpg
Description: Outlet

Photo No.: Photos-20180507-204143.jpg
Description: Downstream

Crossing ID: WC_0205

Inspection Date: May 04, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:
UTM: 12 | **Easting:** 335,350 | **Northing:** 5,956,539

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 12m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: No

Most Common Bridge Substructure Material: Steel
Total Deck Length: 40 m
Deck Width (Number of Lanes): 2
Decking Material: Concrete
Decking Pattern: Closed
Curb Type: Concrete
Road Surface Material: Other - pavement
Abutment Type: Steel Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: V
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Armour present in the form of vegetation. Potential erosion source during flooding.

Crossing ID: WC_0262

Photo No.: Photos-20180504-195324.jpg
Description: Upstream

Photo No.: Photos-20180504-195403.jpg
Description: Inlet

Photo No.: Photos-20180504-195530.jpg
Description: Downstream

Photo No.: Photos-20180504-195543.jpg
Description: Outlet

Crossing ID: WC_0262

Inspection Date: May 14, 2018
Watercourse Name: Toad Creek

GPS Co-ordinates:

UTM: 11 | **Easting:** 689,521 | **Northing:** 5,959,114

Stream Classification: Fluvial (Permanent - Small)
Bankfull Width: 6m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent

Erosion at Site: No

Most Common Bridge Substructure Material: Timber
Total Deck Length: 5 m
Deck Width (Number of Lanes): 1
Decking Material: Concrete
Decking Pattern: Open
Curb Type: Concrete
Road Surface Material: Gravel
Abutment Type: Log Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: None
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Beaver dam noted 25m upstream. Beaver activity noted. Capacity of bridge has been reached and difficult to determine the integrity of structure. Stream is in contact with treated wood wingwalls and abutment walls.

Crossing ID: WC_0266

Photo No.: Photos-20180514-190111.jpg
Description: Upstream

Photo No.: Photos-20180514-190138.jpg
Description: Downstream

Photo No.: Photos-20180514-190209.jpg
Description: Outlet

Photo No.: Photos-20180514-190225.jpg
Description: Deck

Photo No.: Photos-20180514-190307.jpg
Description: Inlet

Photo No.: Photos-20180514-190345.jpg
Description: Old beaver dam

Crossing ID: WC_0266

Inspection Date: May 04, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:

UTM: 12 | **Easting:** 333,722 | **Northing:** 5,956,709

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 16m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: No

Most Common Bridge Substructure Material: Timber
Total Deck Length: 17 m
Deck Width (Number of Lanes): 1
Decking Material: Wood
Decking Pattern: Closed
Curb Type: None - There is no curb, or the curb pattern has openings
Road Surface Material: Gravel
Abutment Type: Treated Lumber
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: None
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: Yes, sign is present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Recommend armour on vegetated banks to reduce erosion potential. Treated lumber abutments in stream.

Photo No.: Photos-20180504-200833.jpg
Description: Deck

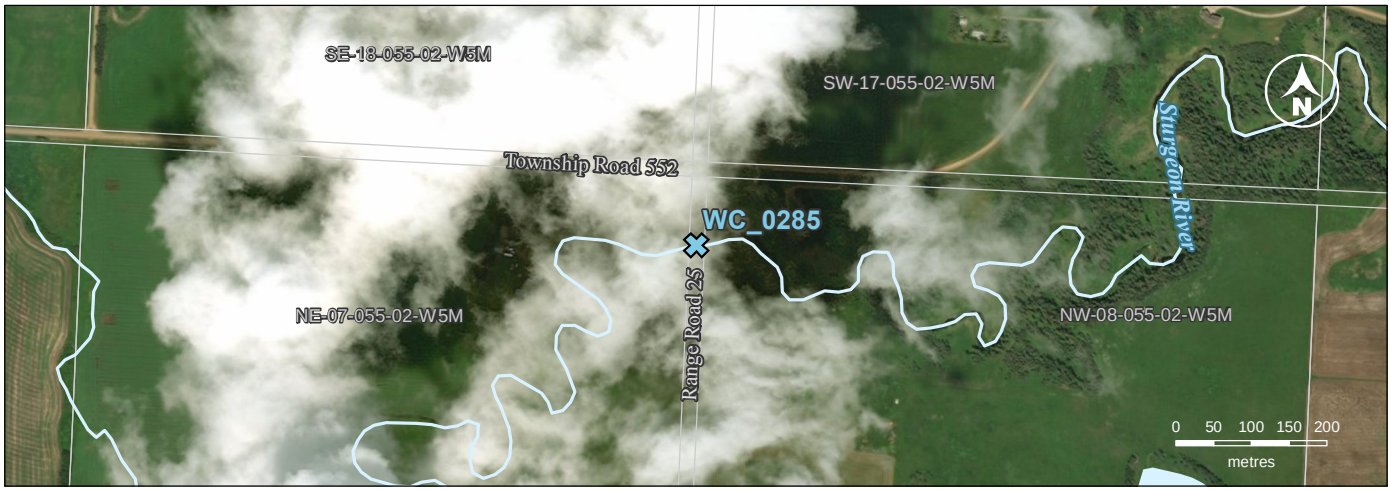
Photo No.: Photos-20180504-200859.jpg
Description: Upstream

Photo No.: Photos-20180504-200945.jpg
Description: Downstream

Photo No.: Photos-20180504-201100.jpg
Description: Outlet

Photo No.: Photos-20180504-201652.jpg
Description: Inlet

Crossing ID: WC_0267



Inspection Date: May 11, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:
UTM: 11 | **Easting:** 679,741 | **Northing:** 5,958,455

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 12m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: Yes **Erosion Location (Inlet or Outlet):** Both
Erosion Source: Fill Slope
Erosion Extent: Low **Total Erosion Area:** 6 m^2

Most Common Bridge Substructure Material: Timber
Total Deck Length: 13 m
Deck Width (Number of Lanes): 1
Decking Material: Concrete
Decking Pattern: Open
Curb Type: Concrete
Road Surface Material: Gravel
Abutment Type: Other - log piling with steel beams reinforced
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: Riprap
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Recent construction occurred in area. Riprap was placed on downstream side of bridge under wingwalls and partly under bridge. Fill slope erosion is occurring in the areas where riprap was not placed. New timber planks placed over lower part of abutment wall.

Crossing ID: WC_0285

Photo No.: Photos-20180511-193505.jpg
Description: Outlet

Photo No.: Photos-20180511-193729.jpg
Description: Deck

Photo No.: Photos-20180511-193743.jpg
Description: Downstream with 3/4 beaver dam

Photo No.: Photos-20180511-193819.jpg
Description: Upstream

Photo No.: Photos-20180511-193854.jpg
Description: Inlet

Photo No.: Photos-20180511-194307.jpg
Description: Rip rap

Crossing ID: WC_0285

Photo No.: Photos-20180511-194337.jpg
Description: Rip rap

Inspection Date: May 14, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:

UTM: 12 | **Easting:** 304,240 | **Northing:** 5,957,014

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 10m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: No

Most Common Bridge Substructure Material: Timber
Total Deck Length: 21 m
Deck Width (Number of Lanes): 1
Decking Material: Wood
Decking Pattern: Open
Curb Type: None - There is no curb, or the curb pattern has openings
Road Surface Material: Gravel
Abutment Type: Log Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: None
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: Yes, sign is present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Smaller wingwalls. Stream is in contact with timber abutments.

Crossing ID: WC_0326

Photo No.: Photos-20180514-210744.jpg
Description: Deck

Photo No.: Photos-20180514-210807.jpg
Description: Upstream

Photo No.: Photos-20180514-210831.jpg
Description: Downstream

Photo No.: Photos-20180514-210947.jpg
Description: Inlet

Photo No.: Photos-20180514-211328.jpg
Description: Outlet

Crossing ID: WC_0326

Inspection Date: May 14, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:

UTM: 11 | **Easting:** 695,180 | **Northing:** 5,957,225

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 10m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: Yes **Erosion Location (Inlet or Outlet):** Both
Erosion Source: Fill Slope
Erosion Extent: Low **Total Erosion Area:** 6 m^2

Most Common Bridge Substructure Material: Steel
Total Deck Length: 27 m
Deck Width (Number of Lanes): 2
Decking Material: Concrete
Decking Pattern: Closed
Curb Type: Concrete
Road Surface Material: Other - pavement
Abutment Type: Steel Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath

Armour: Riprap
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: No, sign is not present
Grader markers or bridge reflectors?: Yes, sign is present

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments: Riprap in contact with stream.

Photo No.: Photos-20180514-202606.jpg
Description: Downstream

Photo No.: Photos-20180514-202621.jpg
Description: Outlet

Photo No.: Photos-20180514-202746.jpg
Description: Upstream

Photo No.: Photos-20180514-202825.jpg
Description: Inlet

Photo No.: Photos-20180514-203115.jpg

Crossing ID: WC_0328

Inspection Date: May 14, 2018
Watercourse Name: Sturgeon River
GPS Co-ordinates:

UTM: 12 | **Easting:** 305,894 | **Northing:** 5,956,340

Stream Classification: Fluvial (Permanent - Large)
Bankfull Width: 15m (Estimated to Nearest Metre)
Crossing Type: Bridge - Permanent
Erosion at Site: No

Most Common Bridge Substructure Material: Timber
Total Deck Length: 17 m
Deck Width (Number of Lanes): 1
Decking Material: Wood
Decking Pattern: Open
Curb Type: None - There is no curb, or the curb pattern has openings
Road Surface Material: Gravel
Abutment Type: Log Pilings
Abutment Functioning?: Yes - in good condition and no materials eroding from underneath
Wingwall Functioning?: Yes - in good condition and no materials eroding from underneath
Armour: Vegetation
Opening Blockage: 0%
Cause of blockage: Other - none
Structural Problems: None
Bridge Signs: Yes, sign is present
Grader markers or bridge reflectors?: Damaged, sign is either down or needs to be replaced

Fish Passage Assessment: No Concerns
Emergency Repair Required?: No
Overall Risk: Low
Comments:

Crossing ID: WC_0330