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Appendix A

Flood and Geomorphic Issues Highwood River Upstream of Women's Coulee Canal Inlet

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EcoNomics

MD OF FOOTHILLS NO.31

Scoping Study - Flood-Related Areas of Concern on the Highwood River and Little Bow River within the Municipal District of Foothills

Desktop Review of Upper Highwood River

307074-02030-100 – WW-REP-0001

3 May 2017

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PROJECT 307074-02030-100 - SCOPING STUDY - FLOOD-RELATED AREAS OF CONCERN ON THE HIGHWOOD RIVER AND LITTLE BOW RIVER WITHIN THE MUNICIPAL DISTRICT OF FOOTHILLS

REV	DESCRIPTION	ORIG	REVIEW	WORLEY – PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
0	Issued as final	A. Pipinato	M.V.Thompson	T. Grendas	03-May-17		

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1. INTRODUCTION

In response to the 2013 flood event, the Municipal District of Foothills No. 31 (MD) requested Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) and WorleyParsons Canada Services Ltd., operating as Advisian, to undertake a Scoping Study to identify flood-related areas of concerns in the Highwood River and Little Bow River catchments within the MD limits (i.e. the Study Area).

Phase 1 of the Study identifies, in the catchments of the Highwood River and the Little Bow River, flood-related risk locations inside the MD boundary. In order to assist in scope refinement and funding application preparation, Phase 1 has been divided further into geographical areas based on perceived risk, MD residents, identified flood mitigation works that could affect MD residents and infrastructure, and other identified areas of concern.

This report focuses on a portion of the overall Study Area that includes the Upper Highwood River from approximately the MD western limits at the Kananaskis Country boundary to Woman's Coulee Canal (Mosquito Creek) inlet (i.e. the Upper Highwood). The catchment of the Highwood River at the Woman's Coulee Canal inlet is shown in Figure 1. An additional supporting document, similar in format to this one, has been prepared for Pekisko Creek-Stimson Creek, which are major tributaries in the Highwood River watershed. The main report is focused on the area downstream of Woman's Coulee Canal inlet.

This report summarizes the information gathered for the Upper Highwood, and it will be used to identify future data requirements and studies for this area. The report presents general watershed characteristics for the Upper Highwood River and its hydrology, infrastructure information from Alberta Transportation, existing studies and flood projects, local communities affected, a review of licences, and additional notes.

2. METHODOLOGY-REVIEW OF EXISTING INFORMATION

The methods used to develop this report focused on a desk-top review of existing information, as well as field visit information from other projects and key informant information. The following information was reviewed during report preparation:

- hydrometric and flow data for the Upper Highwood River, as defined for this study;
- air photographs of the Upper Highwood Area pre- and/or post-2013 flood;
- databases of the major hydraulic structures which may have been affected at the transportation crossings along the Highwood River;
- key findings of the MD gathered through assessment surveys that investigated both structures and landowner property damaged during the June 2013 flood;
- existing studies involving the Upper Highwood River catchment and projects which are part of the Alberta Environment and Parks (AEP) Flood Recovery Erosion Control (FREC) Program;
- information regarding the June 2013 flood peak flow estimates and other peak flows data;
- a summary of reported damages and concerns following the 2013 events from local communities which were contacted; and
- water license records for the Highwood River basin.

3. GENERAL WATERSHED CHARACTERISTICS

The Highwood River originates in the Front Ranges of the Canadian Rockies (including Highwood, Elk, High Rock, and Livingston sub-ranges) and the Rocky Mountain Foothills. The watershed's headwaters are at about 2,600 m. Etherington and Cataract creeks are major tributaries originating south of the main channel and upstream of the Upper Highwood River as defined herein. Trap and Sullivan creeks are major northern tributaries located within the Upper Highwood River. Bull, Pekisko, and Stimson creeks are major southern tributaries. There also are several minor steep tributaries, which likely contribute large coarse sediment loads.

In the headwater reach and just downstream, the main channel of the Highwood River flows southeast for approximately 36 km before turning east to northeast toward Longview AB at the Highway 40-Highway 542 junction. The MD boundary is located approximately 4 km east of the highway junction. At the upstream MD boundary, the river is still located in the Front Ranges but gives way to the Rocky Mountain Foothills just downstream. The river is re-directed to a southeast flow path approximately 9 km upstream of Longview and continues in this direction for another 10 km to the confluence with Pekisko Creek. At this point the river turns back to the northeast past the Woman's Coulee Canal inlet to the Town of High River downstream. The river transitions from the Rocky Mountain Foothills Region to the Southern Alberta Uplands (Interior Plains) just downstream of Longview and continues in the physiographic region until the downstream Upper Highwood River boundary where it transitions to Western Alberta Plains (Interior Plains) for the remainder of its downstream watershed The Upper Highwood River has a drainage area of 1,200 km² at Water Survey of Canada (WSC) Station 05BL008 Highwood River at Brown's Ranch (Village of Longview), increasing to approximately 1,650 km² at the Woman's Coulee Canal inlet

The irregular meandering planform of the Upper Highwood River within the MD is partially governed by canyon-valley bedrock confinement. The majority of residents along this river segment live on raised terraces or outside the confined canyon, and hence were outside the 2013 flood zone.

Pool-riffle morphology can be found throughout this river segment, which is likely sediment-load limited. However, the river bottom strata is associated with significant quantities of gravel and cobble, as well as boulders in some areas. The river west of the MD boundary is less confined with active flood plains and a more regular meandering planform interspersed between wandering channel reaches. Further upstream, in the headwaters, the Highwood River and its tributaries transition to step-pool and cascade morphologies due to increased slopes.

Photographs 1 to 4 show examples of different Upper Highwood River morphology.

4. HYDROLOGY

The hydrology of the Highwood River is characterized by low fall and winter flows transitioning to significant freshet and rain on snow peak flow events in spring, as well as rainfall-driven flow increases associated with some peak flow events in summer. Freshet, rain-on-snow, and rainfall driven events can result in flows 20 to over 100 times greater than baseflows. Flows tend to stay elevated through spring and early-summer before receding in late-summer and fall. Local snow-melt in early-spring in the foothills and plains regions result in local flow increases in the lower parts of the watershed before melting and flow increases in the mountainous regions begin.

Additional quantitative information pertaining to the Upper Highwood River flood flow information is provided below.

4.1 Water Survey of Canada Information

WSC regularly updates an extensive database of hydrometric data for the stations located along the Highwood River and its tributaries. Figure 2A shows the Highwood River catchment at its confluence with the Bow River and the location of the WSC hydrometric stations. The total High River catchment area is estimated at 3,952 km²,

The set of maps (shown as Figures 2, 3, 4) and the Table 1 provide location, information and data collection history of 11 WSC hydrometric stations along the Highwood River going downstream until the Town of High River. WSC hydrometric stations on Cataract Creek, Trap Creek, Pekisko Creek, Stimson Creek, and the Highwood Diversion Canal also are summarized.

4.2 Historical Peak Flows and Unit Flow Rates

In addition to station information, flood hydrology (years with greatest magnitudes and unit area runoff rates for comparison purposes) for the Upper Highwood's stations including estimates for the 2013 flood are provided in Table 2 in terms of instantaneous peak flows. It is worth noting that all water level recorders were lost during the 2013 flood.

The overview of the studies and reports listed in this document's bibliography was used to update the estimated peak flows and unit area peak flow relative to the June 2013 event at various locations in the Highwood Upper Basin, as detailed in the Tables.

WSC has provided a preliminary flow estimate of 980 m^3/s at Diebel's Ranch located within the Upper Highwood River. From this value, a summary of estimated 2013 flood flows for the Upper Highwood River, estimated using a watershed area relationship, is as follows,

- 540 m³/s at Highwood House (Hwy 542) Bridge (above Etherington Creek);
- 980 m³/s at Diebel's Ranch (05BL019); and
- 1,320 m³/s at Longview (05BL008).

The preceding values were verified through a HECRAS modelling exercise (WorleyParsons 2014).

In the period of operation, from 1912 to1920, for Highwood River at Brown's Ranch (05BL008) instantaneous peak flows were not registered.

In the period of operation, from 1909 to1931, for Pekisko Creek at Pekisko (05BL006) instantaneous peak flows were not registered.

5. FLOOD DAMAGES

5.1 Alberta Transportation Information

The Alberta Transportation (AT) database was interrogated for the characteristics of all the major bridges on the Upper Highwood River. The results are listed in Appendix 1.

AT Bridge Information System Coding Guide to interpret some of the acronyms can be found at: http://www.transportation.alberta.ca/Content/docType30/Production/bis_v2_05.pdf .

The Hydrotechnical Information System (HIS) is AT's primary tool to dynamically access the flood observation documents, hydrotechnical file histories and summaries, inspection and survey data, and stream profiles based on digital elevation map (DEM) data.

For the Highwood River, Pekisko Creek, and Stimson Creek, the database of the bridges listed in Table A can be consulted. The first six bridges listed belong to the Upper Highwood River area. Appendix 2 provides the flood inspection reports relative to the 2013 event.

Table A Bridges file ID for Highwood River, Pekisko Creek, and Stimson Creek

HIGHWOOD RIVER		STIMSON CREEK		PEKISKO CREEK	
Bridge Number	**Legal**	**Bridge Number**	**Legal**	**Bridge Number**	**Legal**
77498 [1]	NE29-16-5-5	73976	NW20-15-2-5	08241	SE3-17-3-5
81779BXL [1]	NW35-16-5-5	73611	SE17-16-2-5	08241	SE3-17-3-5
73641 [1]	NE14-17-4-5	77700	SW16-16-2-5	13108	NE1-17-3-5
01741 [1, 2]	NE17-18-2-5	73521	NW16-16-2-5	01970	NW8-17-2-5
70425 [1]	SW9-18-1-5	73389 [2]	NW33-16-2-5	78527 [2]	SE20-17-2-5
06570 [1]	NW24-18-1-5	01308 [2]	SE14-17-2-5	75732	NE20-17-2-5
00221	SW6-19-28-4			01126	NE25-17-2-5
00589	NW6-19-28-4				
84550	SW17-19-28-4				
81703	SW5-20-28-4				
74458N [2]	NE6-20-28-4				
74458S [2]	NE6-20-28-4				

HIGHWOOD RIVER		STIMSON CREEK		PEKISKO CREEK	
Bridge Number	**Legal**	**Bridge Number**	**Legal**	**Bridge Number**	**Legal**
01733	SW8-20-28-4				
00223 [2]	NE18-20-28-4				
00599 [2]	NE16-21-28-4				

Notes:

[1] Bridge located in the Upper Highwood River area as defined in this Report.

[2] Flood inspection report available in Appendix 2.

In addition to the information presented above, the following information was gleaned from the AT's HIS system:

a) Figures 5A and 5B show the location of the major bridges along the profile and plan view of Highwood River.

b) In bridge 01741 on Highway 22, the 2013 high water mark was estimated at about 1 to 1.5 ft. above the gabions on the north headslope. A full flood inspection report for the structure also is included in Appendix 2: the bridge reported no visible flood damage or embankment erosion.

c) No other damages were registered in the remaining four bridges (81779BXL, 73641, 70425 and 06570) in the AT database for the Upper Highwood River.

d) Figure 5C and 5D show the location of the AT major bridges along the profile and plan view of Stimson Creek.

e) Figure 6A and 6B show the location of the AT major bridges along the profile and plan view of Pekisko Creek.

Additional information pertaining to bridge infrastructure damaged during the 2013 event is provided in Section 6.

5.2 Municipal District Landowners Survey and Damaged Bridges and Roads Database

Advisian has summarized the general findings of the MD's survey conducted after the June 2013 flood event.

Reported damages returned to the assessors through their survey, range from acres of land lost to feet of water in the house.

Table 3 provides MD identifier (Roll Number) and legal location of damages collected during the survey campaign. In the Legal Land locations of Table 3 various instances of damage types (residential

basement, land only, etc.) were reported along the Highwood River upstream of the Coulee Canal Inlet, the Pekisko Creek or the Stimson Creek.

The MD Public Work Department informed that all of the damaged roads within the Upper Highwood came from small tributary streams overwhelming the culverts.

For each item in the map, a detailed database has been provided by the MD. Detailed design and construction information for repaired bridges is available, but not included in this report.

Table B summarizes the damaged bridges relative to the Upper Highwood River from the more extensive database provided by the MD. Some of the structures were already present, with less details, in Table A of the previous section and obtained from the AT database. In these cases, the structure has the same Bridge Number.

Table B 2013 Flood-Damaged Bridges inside the MD limits of the Upper Highwood Basin

Bridge Number	River	Damage	Road	Owner	Status
77700	Stimson	Damage	786 Ave W	MD	Repaired
73389	Stimson	Reports of Damage	HWY 22	Province	Unknown
01308	Stimson	Damage	HWY 540	Province	Repaired
01126	Stimson	Damage	642 St. W	MD	Repaired
75732	Pekisko	Destroyed	160 St. W	MD	Removed
01970	Pekisko	Damaged	2698 Dr. W	MD	Repaired
SW 6-18-3 W5	Highwood	Destroyed	Private Drive	Private	Not replaced
NW 7-18-3 W5	Highwood	Destroyed	Private Drive	Private	Replaced

As an example of the photographic evidence collected during the survey process, Photo A shows bridge 75732 on the Pekisko Creek, destroyed during the June 2013 flood.

Photo A Bridge 75732 on the Pekisko Creek, Destroyed During the June 2013 Flood

Provincial inspections have been carried out as well on the bridges damaged by the 2013 flood. Appendix 2 provides the available provincial bridge damage inspection reports for the Upper Highwood River, Pekisko Creek and Stimson Creek areas.

Table C summarizes the damaged roads items in the Upper Highwood River catchment from the database provided by the MD.

Table C 2013 Flood Damaged Roads inside the MD Limits of the Upper Highwood Basin

Full Street	Surface	Owner	Structure	Location
2698 Dr. W [2]	Chip Seal	MD	Dirt	2698 Dr. W (169 St -176 St.)
2698 Dr. W [2]	Chip Seal	MD	Dirt	2698 Dr. W (176 St - 179 St.)
2698 Dr. W [2]	Gravel	MD	Dirt	2698 Dr. W (179 St - 192 St.)
2698 Dr. W [2]	Gravel	MD	Dirt	2698 Dr. W (200 St - 208 St.)
2698 Dr. W [2]	Gravel	MD	Dirt	2698 Dr. W (192 St - 200 St.)
2698 Dr. W [2]	Gravel	MD	Dirt	2698 Dr. W (208 St - 224 St.)
594 Ave W [1]	Gravel	MD	Dirt	594 Ave W (288 St - 304 St.)
594 Ave W [1]	Gravel	MD	Dirt	594 Ave W (280 St - 288 St.)

Notes:

[1] Roads located along the Highwood River and upstream of the Woman's Coulee Inlet

[2] Roads located along the Pekisko Creek

Figure 7A shows the 2013 flood-affected areas (in orange) in the Upper Highwood River, Pekisko Creek, and Stimson Creek as registered in the MD database and updated at the time of writing this Report. It is susceptible to modifications and represents a compendium of first hand reports, imagery, dam breach reports, assessment surveys, provincial surveys, assessment notes and comments, survey reports, and staff pictures. However, in Figure 7B are shown specific observations of maximum water extents from the MD agriculture fieldsman. The fieldsman was directly collecting his information during the entire day of June 20, 2013, and the figure shows specific field observations in disagreement with, or in addition to, the overall flood-affected areas obtained in an indirect way, shown in Figure 7A.

6. EXISTING STUDIES AND POST-FLOOD PROJECTS

This section lists and briefly describes the major studies and reports relative to the Upper Highwood River catchment completed in the recent years:

- Upper Highwood River Water Management Plan by Alberta Environment, previous to the 2013 flood events (Alberta Environment 2008a and 2008b);
- Southern Alberta Flood Mitigation Feasibility Study prepared by AECOM for the Alberta Flood Recovery Task Force created immediately after the June 2013 floods (AECOM 2014); and
- projects belonging to the FREC Program, which provided funding to address immediate repairs and long-term community mitigation projects in response to major erosion damages from the June 2013 floods.

6.1 Upper Highwood River Water Management Plan (Pre-2013 Flood)

In 2008, Alberta Environment issued the *Water Management Plan for the Watersheds of the Upper Highwood and Upper Little Bow Rivers (Volume 1)* and the *Highwood Diversion Plan (Volume 2)*.

The Management Plan's scope included the entire portion of the Highwood River upstream of the confluence with the Sheep River.

As these documents were published a few years before the 2013 destructive events, they represent an important benchmark to evaluate objectives and directives as given at the time and to update water issues for surface and groundwater quality, quantity and effects of land use on the water bodies of the Highwood Basin. They also provide an important source of information about the operating periods of the diversions with maximum and minimum rates, target environmental flows and minimum operation flows in the basin. Of particular interest are the Highwood River instream minimum flow requirements versus the diversion flow limits and how the flood mitigation measures implemented or to be designed after 2013 may affect them. The flows regimes produced by the mitigation measures will in fact alter the split ratios between Highwood River and Little Bow River downstream of the Woman's Coulee intake during high flow events, as will be detailed in the main body of the Scoping Study. The mitigation measures may change the morphology of the Highwood River such that the minimum instream flow requirements should be re-evaluated. The Management Plan's therefore represent a historical baseline to assess alterations to diverted flows against the 2008 minimum flow requirements.

During future flood condition, flow through the diversions will have to be optimized and operated to minimize downstream stress and damages wherever possible. As well, the receiving reservoirs and their operation will need careful consideration in re-establishing diversion flows immediately before, during and immediately after future flood events.

6.2 Southern Alberta Flood Mitigation Feasibility Study

The Study was completed in 2014 in response to the June 2013 floods, to review and evaluate flood mitigation proposals put forward by the Southern Alberta Flood Recovery Task Force, developing a set of selection criteria and identifying a water management strategy for future flood mitigation.

It covers fundamental feasibility criteria for a design flood event with 1-in-100 year probability which includes technical viability, cost-benefit analysis, stakeholders interests, and potential environmental effects. Based on these criteria, a number of flood mitigation alternatives and schemes are evaluated. Even though the Study does not include the complete and final set of flood mitigation structures completed in 2014, particularly in the Town of High River, it offers important support information for future analyses aimed at alleviating flood issues and mitigating damage in the Highwood River catchments.

6.3 Flood Recovery Erosion Control Program

The FREC projects within the Upper Highwood study area in or surrounding the Village of Longview (see also Figure 7C), are located as follows:

- on SW 16-18-2 W5. The location is on the Highwood just south (downstream) of Longview. The erosion protection was installed in late 2015. The location of this project is provided in Figure 7C; and
- on SW 17-18-2 W5 and NW 20-18-2 W5, the Village of Longview Water Well and Outfall Flood Protection, designed by MPE Engineering Ltd. (MPE).

Also, parts of the FREC framework are three completed project in the Woman's Coulee and Hoeh Dyke areas, downstream of the Upper Highwood River area:

- on NW 29-18-29 W5. The Woman's Coulee Project Location 1 (Figure 7D);
- on NW 29-18-29 W5. The Woman's Coulee Project Location 2 (figure 7D); and
- on NW 30-18-29 W5. The Hoeh Dyke DRP Repair 2014.

Figure 7D shows the above FREC project locations.

7. LOCAL COMMUNITIES REVIEW AND RECOMMENDATIONS

Major local communities in the Upper Highwood River whose water sources were impacted by the June 2013 flood were contacted for an update on water source damages and concerns of future flood risks.

7.1 Village of Longview

The village has two wells hydraulically connected to the Highwood River for raw water supply. They both were inundated by sediment during the June 2013 flood. After their electrical equipment was repaired they resumed pumping, but high turbidity remained an issue during spring surface run-off (AECOM 2014).

The Water Well and Stormwater Outfall Flood Protection design was completed by MPE (2014). The design includes extending the well head upward to prevent sediment entering the wells from above during flood conditions.

The Chief Administrative Officer of the Village of Longview (e-mail from Vicky Adamson, June 22, 2015) expressed concern about the water wells of the project mentioned above being located within the flood and erosion risk area. The well heads currently are being raised to mitigate the risk, but the issue remains a concern. Similarly, the outfall infrastructure is located within the flood and erosion risk area. This area also is being protected by the design provided by MPE.

7.2 Eden Valley

The Stoney Tribal Administration (Stoney) was contacted as part of the current due diligence process with particular regard to the Eden Valley Indian Reservation No 216 on the Upper Highwood River area.

The Reservation draws raw water from the Highwood River through an intake, and distributes it to a portion of its residents after it is treated in a local water treatment plant. The remaining residents obtain water from private wells or have water trucked in (AECOM 2014).

The Administration, via its Consultation Manager (e-mail from William Snow, June 19, 2015) communicated that Stoney Tribe is planning to complete a Water Needs Assessment Report by fall 2015. A flood plan will be part of the Assessment Report.

The Administration also expressed concern about the exclusion of most Indian Reserves from flood hazard mapping programs to date, and interest in coordinating with the MD scope of flood hazard mapping work and in promoting a Cultural Awareness session with the Stoney Tribe, particularly regarding Stoney Water Rights.

8. LICENSES REVIEW

Appendix 3 includes a collection of Surface Diversion Licenses and Well Diversion Licenses, as available from AEP License Viewer. The Appendix includes a license review of the entire Highwood River basin for this due diligence review.

Surface Diversion Licenses and Well Diversion Licenses are mapped in Figure 8A and Figure 8B, respectively.

9. PUSH-UP DAMS

A number of push-up dams have been identified from a satellite photos review in the agricultural area of the upper Highwood River and are mapped here (Figure 9) for future reference.

Push-up dams are minor barriers built by private owners to form small pond volumes on minor diversions or drainages to be used mainly for irrigation purposes. They are not always licensed and, while they do not collect large volumes individually, they can cause significant impacts if cascade failure occurs during a flood event.

Figure 9A shows, for example, the detail of a push-up dam whose tailwater discharges into Stimson Creek

In Figure 9B are shown all the push-up dams identified in the Highwood River, Pekisko, and Stimson Creeks basins.

The push-up dams geographic coordinates are reported in Table D.

Table D Push-Up Dams coordinates

ID	latitude	longitude
1	50°30'9.72"N	114° 8'53.48"W
2	50°28'20.35"N	114°14'4.70"W
3	50°29'15.72"N	114°13'15.60"W
4	50°25'30.18"N	114° 8'13.27"W
5	50°25'27.84"N	114°10'42.60"W
6	50°27'5.04"N	114°10'15.24"W
7	50°19'12.00"N	114°13'39.00"W

10. SUMMARY

The Upper Highwood River is defined as the segment of the Highwood River downstream of the MD Boundary (located approximately 33 km upstream of Longview) to the Woman's Coulee Canal Inlet on the Highwood River. This Report describes the Highwood River and the major tributaries in this area (i.e. Pekisko Creek and Stimson Creek) and discusses the flood issues identified for the mainstem of the Upper Highwood River

Flood issues as well as flood risk changes in this area, located upstream of the proposed or realized measures of flood control following the 2013 flood event, are limited to:

a) Bridge damages: The bridge on Highway 22 (01741) reported no visible flood damage or embankment erosion. No other damages were registered in the remaining four bridges in the Alberta Transportation database for this section of the Highwood River. Two private bridges were destroyed within sections 6 and 7 of 18-03 W4M. Given the unchanged conditions relative to river hydraulics, it is reasonable to assume that flood issues and risks will be similar in the future.

b) Road damages: Two localized road washouts were reported in Eden Valley area or immediately downstream. The same considerations on unchanged river hydraulics and flood risk level apply.

c) Landowner damages: Six instances of various damage types (residential basement, land only, etc.) were reported in quarter sections between Longview and the Pekisko Creek confluence.

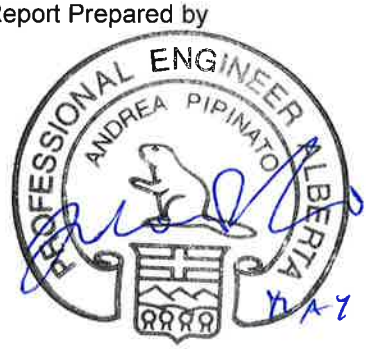
d) Few minor barriers built by private owners to form small pond volumes on minor drainage paths for irrigation purposes (push-up dams) have been located in the agricultural areas immediately upstream of the Pekisko Creek confluence. Similar considerations apply to these small man-made barriers.

The Upper Highwood River includes the river segment from the Pekisko Creek confluence downstream to Woman's Coulee Canal inlet. In general, impacts associated with this area in the MD were limited to damages to the Hogg Park Campground and some basement flooding and land damage. Twelve residents reported damage between Pekisko Creek confluence and Woman's Coulee Inlet. Although some bank erosion occurred throughout this river segment, residential buildings were located mainly on elevated terraces above the 2013 flood levels.

11. CLOSURE

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

Report Prepared by



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APEGA Permit to Practice No. P00725

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Tables

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Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL021	05BL019	05BL008	05BL003
Name	Highwood River Below Picklejar Creek	Highwood River at Diebel's Ranch	Highwood River at Brown's Ranch	Highwood River at High River
Active or discontinued	Discontinued	Active	Discontinued	Discontinued
Latitude	50° 29' 55" N	50° 24' 18" N	50° 31' 44" N	50° 35' 00" N
Longitude	114° 49' 02" W	114° 30' 02" W	114° 14' 14" W	113° 52' 20" W
Gross drainage area	132 km²	773.6 km²	1200 km²	1980 km²
Effective drainage area	N/A	N/A	N/A	N/A
Record length	21 Years	66 Years	9 Years	15 Years
Period of record	1965-1985	1950-2015	1912-1920	1908-1986
Regulation type	Natural	Natural	Natural	Regulated
Regulation length	N/A	N/A	N/A	N/A
Real-time data available	No	Yes	No	No
Sediment data available	Yes	Yes	No	No
Type of water body	River	River	River	River
EC Regional Office	CALGARY	CALGARY	CALGARY	CALGARY
Data contributed by	N/A	N/A	N/A	N/A
Datum of published data	ASSUMED DATUM	ASSUMED DATUM	N/A	ASSUMED DATUM

Period of operation	1965-1985	2012-2015	1950-2011	1920-1920	1917-1919	1912-1916	1983-1986	1981-1982	1914-1916	1908-1913
Type	Flow	Flow & Level	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
Operation schedule	Seasonal	Seasonal	Seasonal	Seasonal	Continuous	Seasonal	Continuous	Seasonal	Continuous	Seasonal
Gauge type	Recorder	Recorder	Recorder	Manual	Manual	Manual	Recorder	Recorder	Manual	Manual

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Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL004		05BL022			05BL027		05BL006		
Name	Highwood River Below Little Bow Canal		Cataract Creek Near Forestry Road			Trap Creek Near Longview		Pekisko Creek at Pekisko		
Active or discontinued	Active		Active			Active		Discontinued		
Latitude	50° 35' 08" N		50° 17' 06" N			50° 28' 38" N		50° 25' 40" N		
Longitude	113° 52' 09" W		114° 35' 19" W			114° 25' 34" W		114° 13' 30" W		
Gross drainage area	1953.4 km²		165.5 km²			137.4 km²		203 km²		
Effective drainage area	N/A		N/A			N/A		N/A		
Record length	30 Years		50 Years			37 Years		20 Years		
Period of record	1986-2015		1966-2015			1979-2015		1909-1931		
Regulation type	Regulated		Natural			Natural		Natural		
Regulation length	N/A		N/A			N/A		N/A		
Real-time data available	Yes		Yes			Yes		No		
Sediment data available	No		Yes			No		No		
Type of water body	River		River			River		River		
EC Regional Office	CALGARY		CALGARY			CALGARY		CALGARY		
Data contributed by	N/A		N/A			N/A		N/A		
Datum of published data	ASSUMED DATUM		ASSUMED DATUM			ASSUMED DATUM		N/A		
Period of operation	2012-2015	1986-2011	2012-2015	1972-2011	1966-1971	2012-2015	1979-2011	1923-1931	1911-1919	1909-1910
Type	Flow & Level	Flow	Flow & Level	Flow	Flow	Flow & Level	Flow	Flow	Flow	Flow
Operation schedule	Continuous	Continuous	Continuous	Continuous	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Miscellaneous
Gauge type	Recorder	Recorder	Recorder	Recorder	Recorder	Recorder	Recorder	Manual	Manual	Manual

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Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL023			05BL007				05BL025	
Name	Pekisko Creek near Longview			Stimson Creek near Pekisko				Highwood Diversion Canal Near Headgates	
Active or discontinued	Active			Active				Active	
Latitude	50° 33' 07" N			50° 25' 48" N				50° 33' 07" N	
Longitude	113° 59' 23" W			114° 10' 01" W				113° 59' 23" W	
Gross drainage area	231.9 km²			236 km²				N/A	
Effective drainage area	N/A			N/A				N/A	
Record length	39 Years			87 Years				39 Years	
Period of record	1977-2015			1911-2015				1977-2015	
Regulation type	Regulated			Regulated				Regulated	
Regulation length	N/A			N/A				N/A	
Real-time data available	Yes			Yes				Yes	
Sediment data available	No			Yes				No	
Type of water body	River			River				River	
EC Regional Office	CALGARY			CALGARY				CALGARY	
Data contributed by	N/A			N/A				N/A	
Datum of published data	ASSUMED DATUM			ASSUMED DATUM				ASSUMED DATUM	
Period of operation	2012-2015	1977-2011	1966-2011	2012-2015	1960-2011	1938-1959	1911-1919	2012-2015	1977-2011
Type	Flow & Level	Flow	Flow	Flow & Level	Flow	Flow	Flow	Flow & Level	Flow
Operation schedule	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal
Gauge type	Recorder	Recorder	Recorder	Recorder	Recorder	Manual	Manual	Recorder	Recorder

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Table 2
Largest Instantaneous Peak Flow and Flow Rate by WSC station in the Upper Highwood River

Station	05BL021	Highwood River Below Picklejar Creek - Area 132 km²	05BL019	Highwood River at Diebel's Ranch – Area 773.6 km²	05BL022	Cataract Creek Near Forestry Road – Area 165.5 km²
Year	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**
2013	-[1]	-	980[2]	1.2668	-	-
1995	-	-	661	0.8455	198	1.1964
1932	-	-	-	-	-	-
1942	-	-	-	-	-	-
2005	-	-	173	0.2236	39	0.2356
1923	-	-	-	-	-	-
1929	-	-	-	-	-	-
1953	-	-	283	0.3658	-	-
1974	52.7	0.3992	143	0.1849	48.1	0.2906
1972	44.5	0.3371	134	0.1732	39.6	0.2393
1967	41.6	0.3152	258	0.3335	39.4	0.2381
2008	-	-	225	0.2908	78.9	0.4767
1990	-	-	214	0.2766	56	0.3384
1998	-	-	187	0.2417	107	0.6465
1963	-	-	186	0.2404	-	-
1975	30.6	0.2318	174	0.2249	56.6	0.3420
2002	-	-	161	0.2081	43.9	0.2653
1981	36.8	0.2788	148	0.1913	48.8	0.2949
1965	-	-	138	0.1784	-	-

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Table 2
Largest Instantaneous Peak Flow and Flow Rate by WSC station in the Upper Highwood River

Station	05BL027	Trap Creek Near Longview– Area 137.4 km²	05BL023	Pekisko Creek near Longview - Area 231.9 km²	05BL007	Stimson Creek near Pekisko - Area 236 km²
Year	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**	**Peak Flow (m³/s)**	**Flow Rate (m³/s/km²)**
2013	-	-	147	0.6339	227	0.9619
1995	-	-	99.8	0.4304	98.6	0.4178
1932	-	-	-	-	-	-
1942	-	-	-	-	-	-
2005	54.7	0.3981	119	0.5132	135	0.5720
1923	-	-	-	-	-	-
1929	-	-	-	-	-	-
1953	-	-	-	-	53.2	0.2254
1974	-	-	13.2	0.0569	12.3	0.0521
1972	-	-	13.5	0.0582	14.8	0.0627
1967	-	-	53.8	0.2320	23.3	0.0987
2008	36.5	0.2656	64.6	0.2786	42.9	0.1818
1990	40	0.2911	37.6	0.1621	15.4	0.0653
1998	31.9	0.2322	85.3	0.3678	77.5	0.3284
1963	-	-	-	-	44.2	0.1873
1975	-	-	29.7	0.1281	26.2	0.1110
2002	18.4	0.1339	24.9	0.1074	45.2	0.1915
1981	33.8	0.2460	24.8	0.1069	18.9	0.0801
1965	-	-	-	-	-	-

Notes

[1] "-" indicates missing data or data not available

[2] Preliminary WSC Estimate (maximum instantaneous using slope-area methodology)

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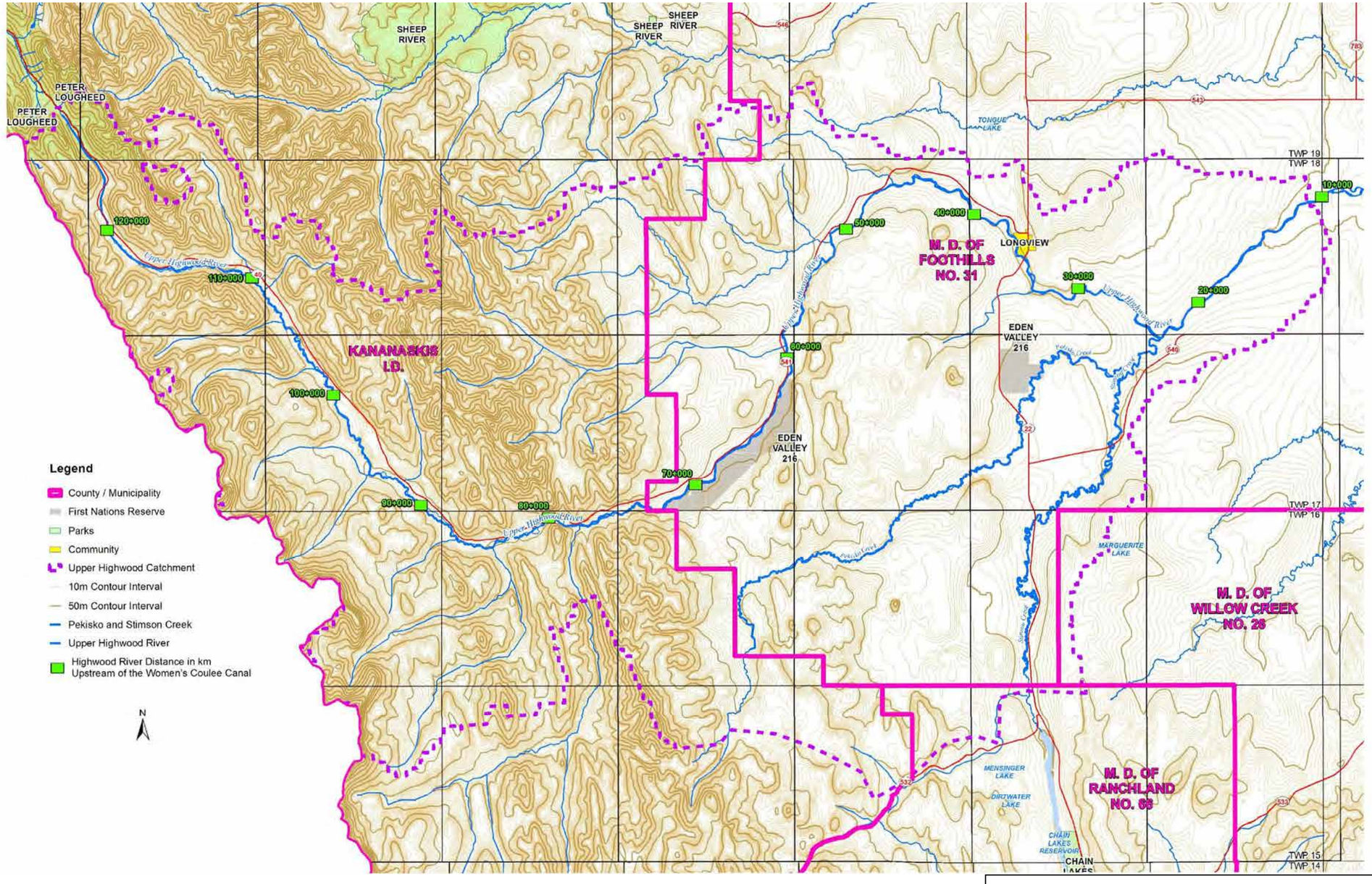
Table 3
2013 Municipal District Flood Landowners Damages Survey Locations in the Upper Highwood River Area

Roll Number	Legal Land	Roll Number	Legal Land
1801157500	NE 15-18-1 W5	1802090000	SE 9-18-2 W5
1801157510	NE 15-18-1 W5	1801155010	W 15-18-1 W5
1702070000	SE 7-17-2 W5	1801097500	NE 9-18-1 W5
1802102500	SW 10-18-2 W5	1802177510	NE 17-18-2 W5
1801220000	SE 22-18-1 W5	1702132510	SW 13-17-2 W5
1702075000	NW 7-17-2 W5	1801160000	SE 16-18-1 W5
1801080000	SE 8-18-1 W5	1802122500	SW 12-18-2 W5
1801160010	SE 16-18-1 W5	1702077500	NE 7-17-2 W5
1802162500	SW 16-18-2 W5	1802205000	NW 20-18-2 W5
1702360000	SE 36-17-2 W5	1702330000	SE 33-17-2 W5
1801237510	NE 23-18-1 W5	000033893579	SE 22-18-1 W5
1801092520	SW 9-18-1 W5	000020899381	SE 8-18-1 W5
1801152500	SW 15-18-1 W5	000021460936	NE 25-18-1 W5
1801060000	SE 6-18-1 W5	000021243191	SW 16-18-2 W5
1801052500	SW 5-18-1 W5	000034956350	SW 15-18-1 W5
1702267500	NE 26-17-2 W5	000013895900	NW 25-17-2 W5
1801235010	NW 23-18-1 W5	000023327489	SW 12-18-2 W5
1702255000	NW 25-17-2 W5		

Figures



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Upper Highwood River Drainage Basin at the Women's Coulee Canal Inlet

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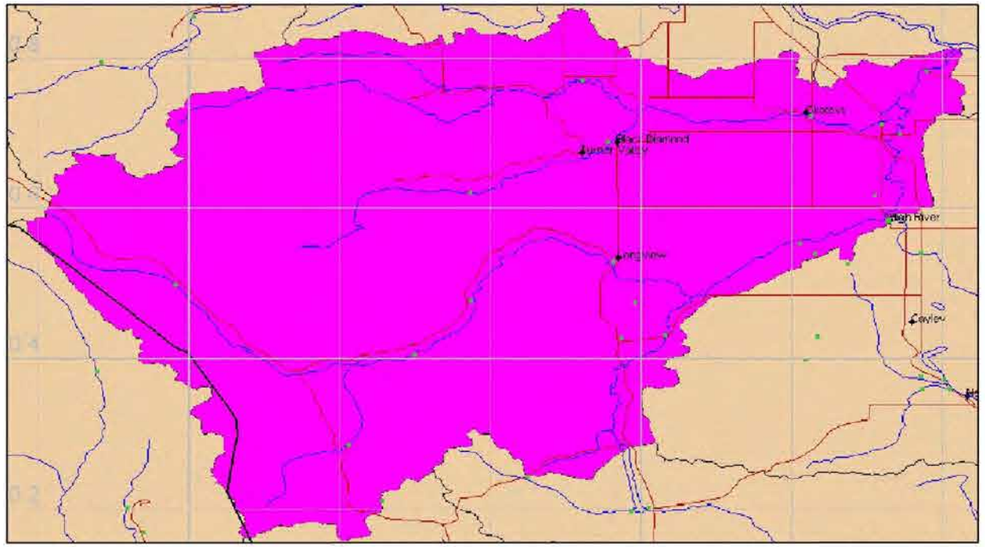

FIGURE 2A : WSC DRAINAGE BASIN FOR THE HIGHWOOD RIVER AT THE CONFLUENCE INTO THE BOW RIVER
NTS

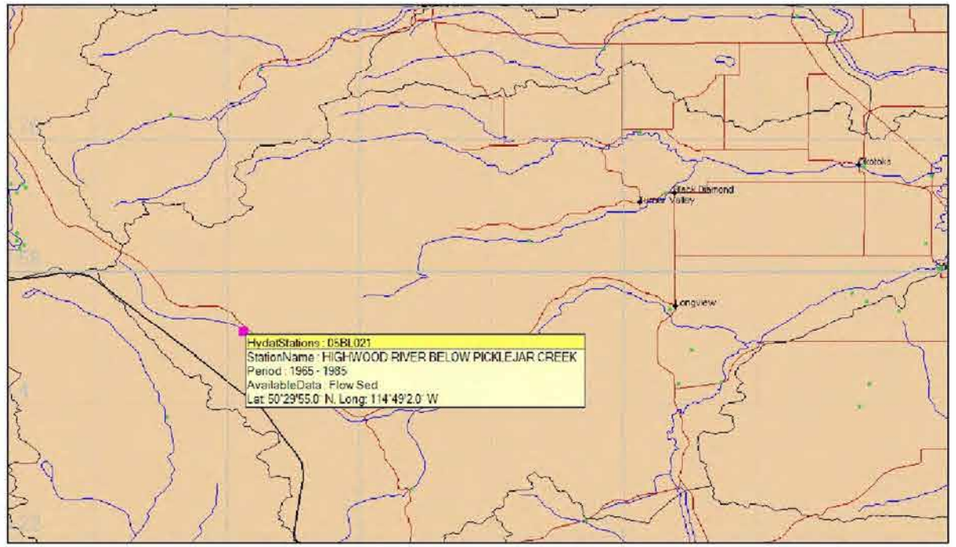

FIGURE 2B: LOCATION OF HIGHWOOD RIVER BELOW PICKLEJAR CREEK (05BL021)
NTS

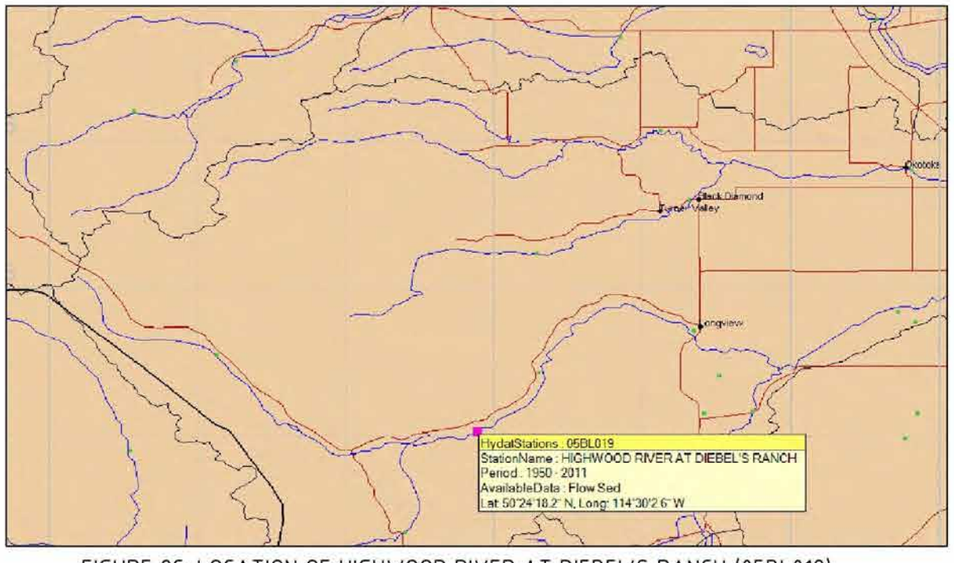

FIGURE 2C: LOCATION OF HIGHWOOD RIVER AT DIEBEL'S RANCH (05BL019)

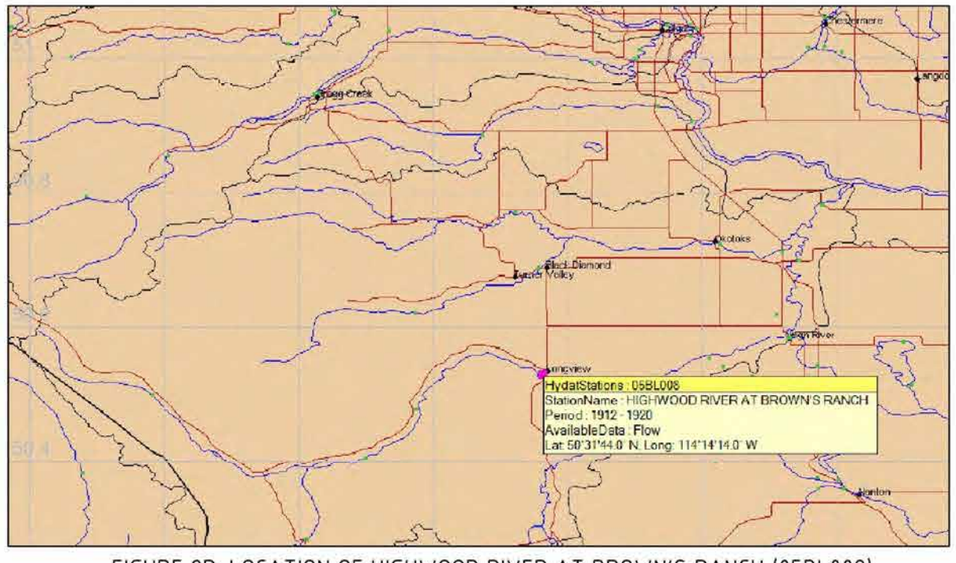

FIGURE 2D: LOCATION OF HIGHWOOD RIVER AT BROWN'S RANCH (05BL008)

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Water Survey of Canada – Highwood River Catchment and Stations

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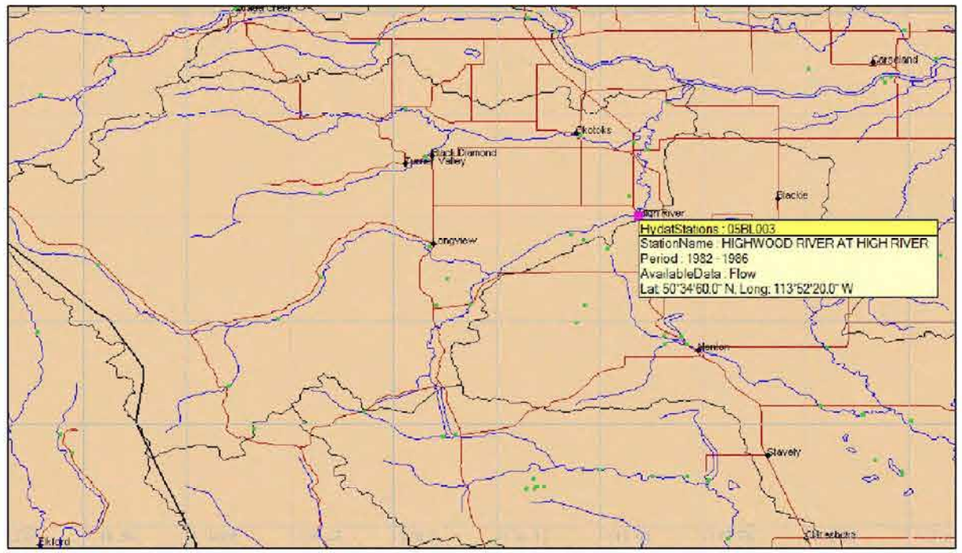

FIGURE 3A: LOCATION OF HIGHWOOD RIVER AT HIGH RIVER (05BL003)
NTS

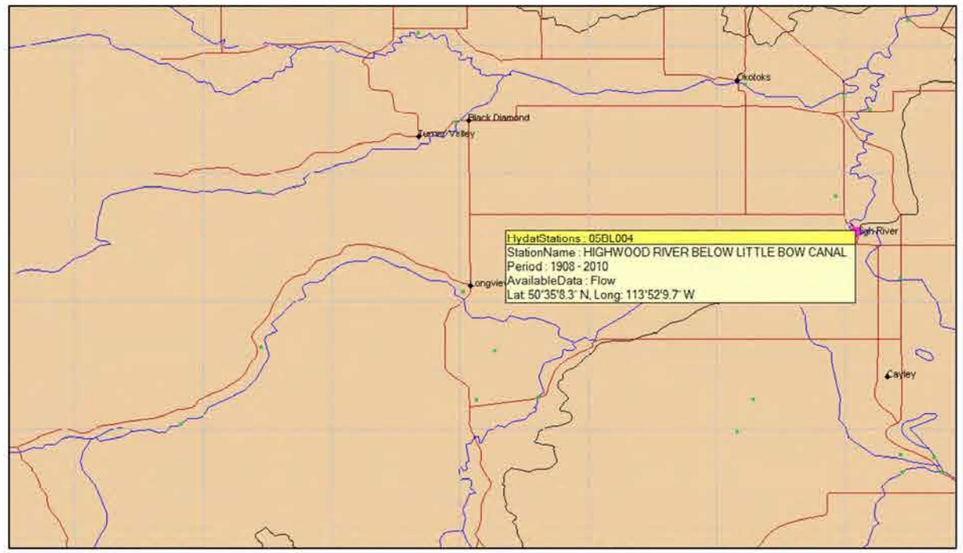

FIGURE 3B: LOCATION OF HIGHWOOD RIVER BELOW LITTLE BOW CANAL (05BL004)
NTS

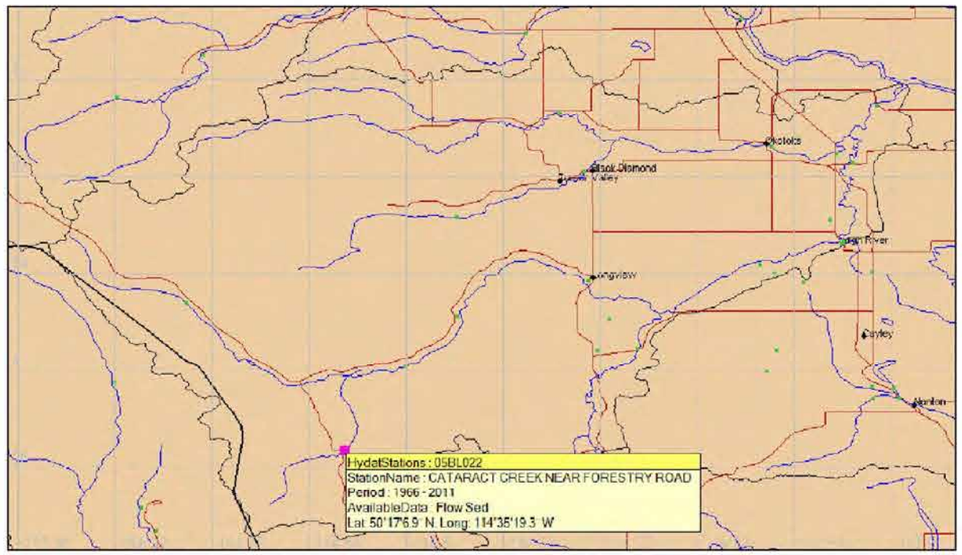

FIGURE 3C: LOCATION OF CATARACT CREEK NEAR FORESTRY ROAD (05BL022)
NTS

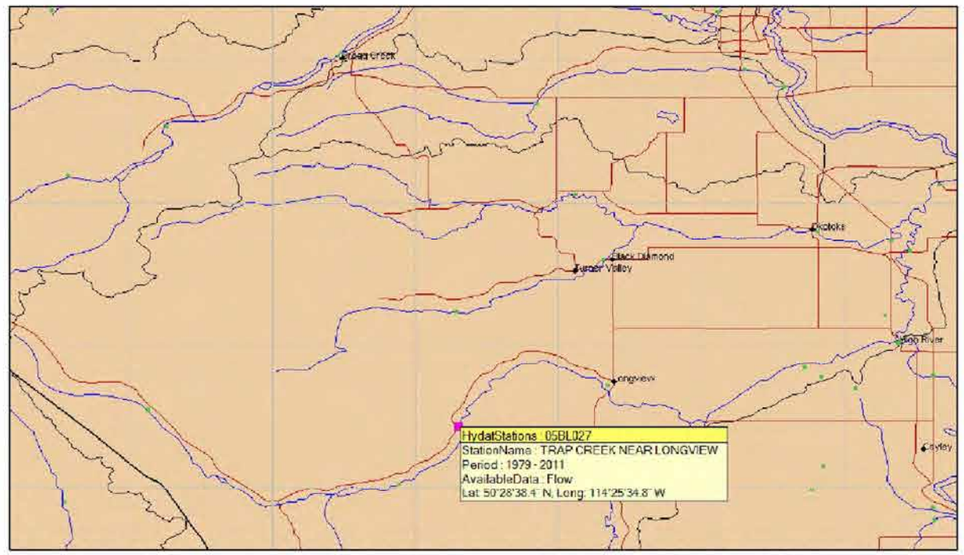

FIGURE 3D: LOCATION OF TRAP CREEK NEAR LONGVIEW (05BL027)
NTS

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Water Survey of Canada Highwood River Stations

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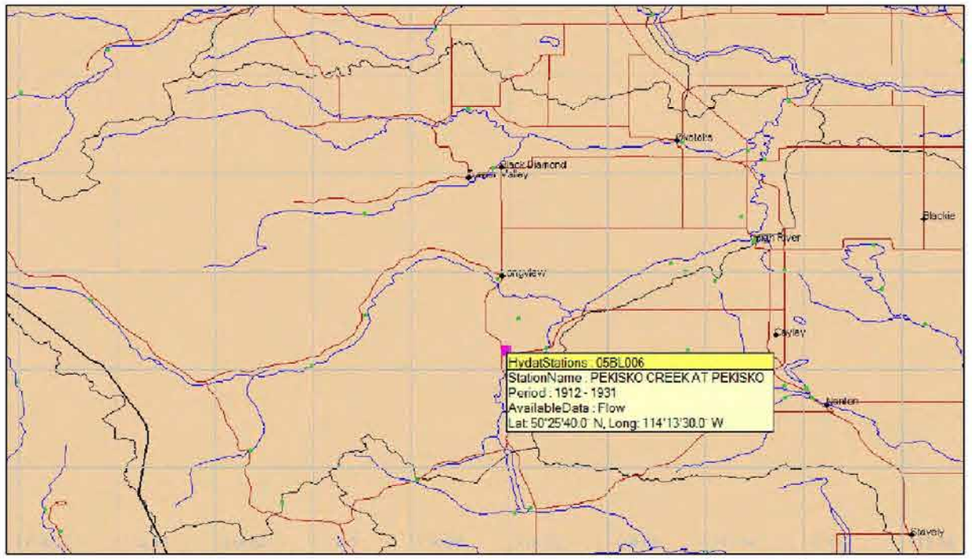

FIGURE 4A: LOCATION OF PEKISKO CREEK AT PEKISKO (05BL006)
NTS

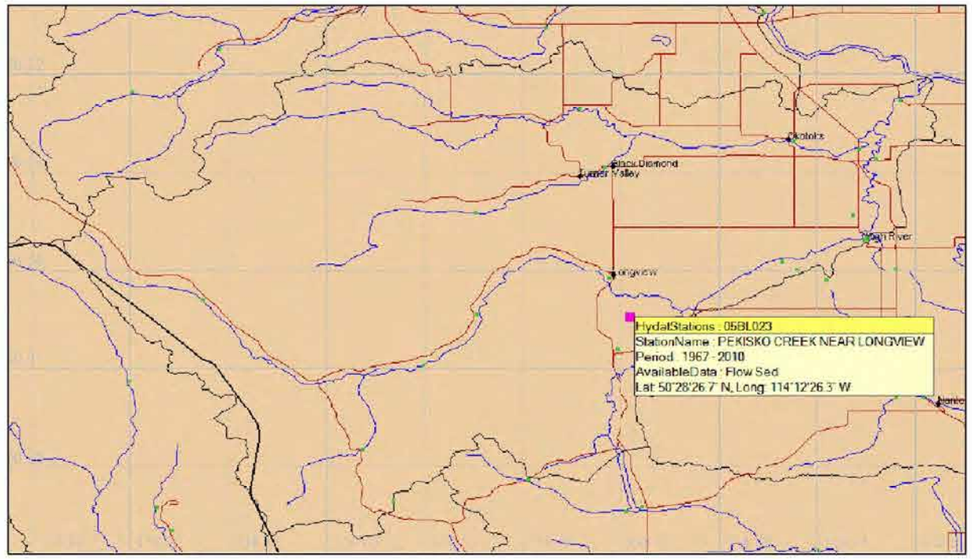

FIGURE 4B: LOCATION OF PEKISKO CREEK NEAR LONGVIEW (05BL023)
NTS

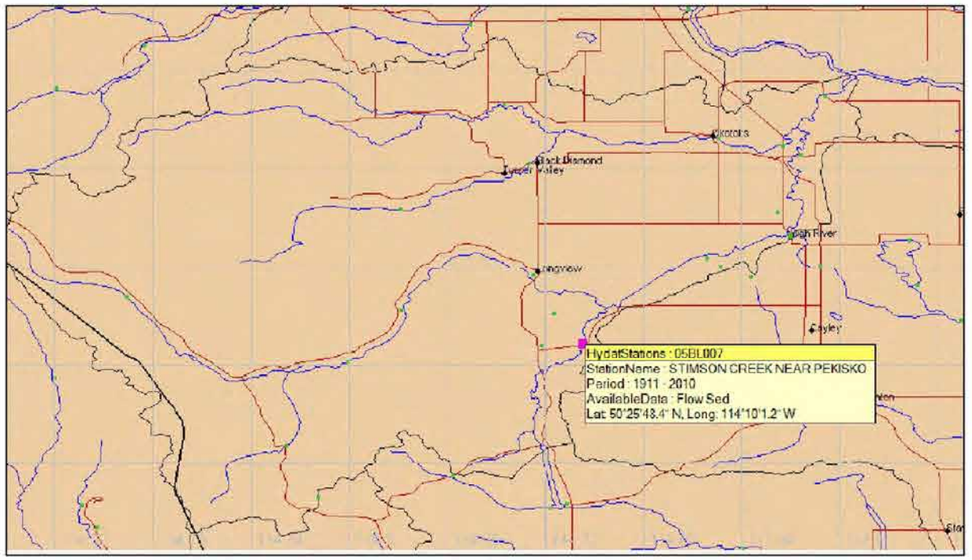

FIGURE 4C: LOCATION OF STIMSON CREEK NEAR PEKISKO (05BL007)
NTS

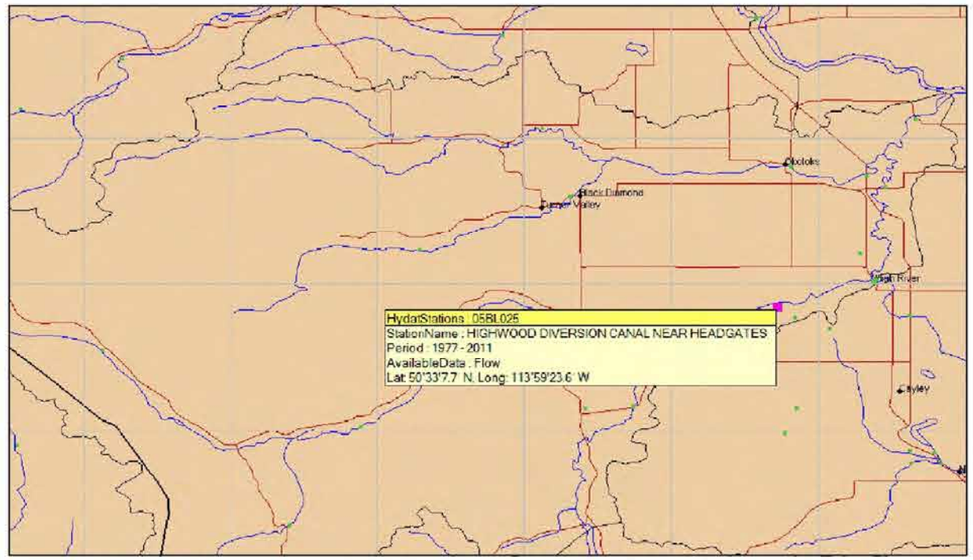

FIGURE 4D: LOCATION OF HIGHWOOD DIVERSION CANAL NEAR HEADGATES (05BL025)
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Water Survey of Canada Highwood River Stations

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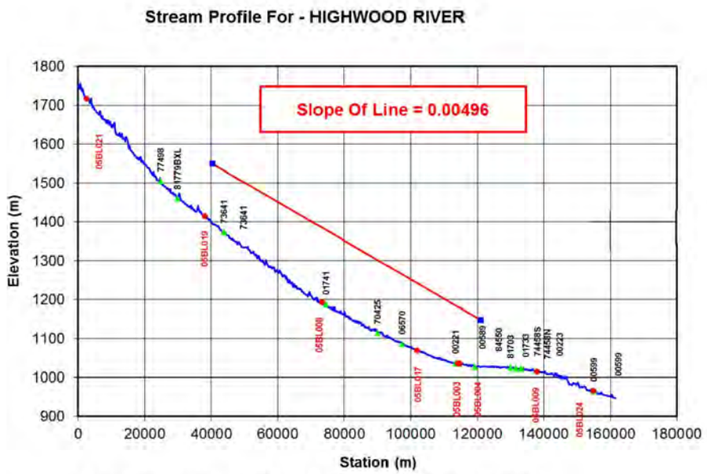

FIGURE 5A: STREAM PROFILE FOR HIGHWOOD RIVER.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.

NTS

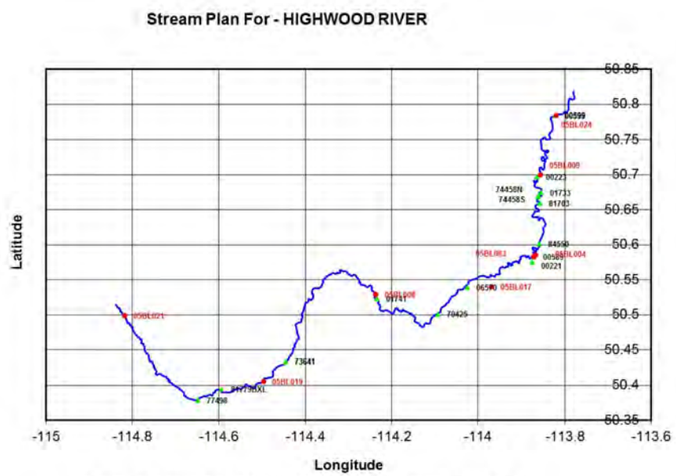

FIGURE 5B: STREAM PLAN FOR HIGHWOOD RIVER.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83

NTS

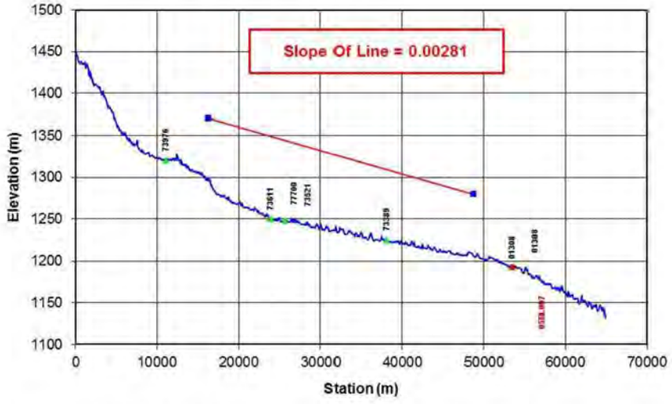

FIGURE 5C: STREAM PROFILE FOR STIMSON CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.

NTS

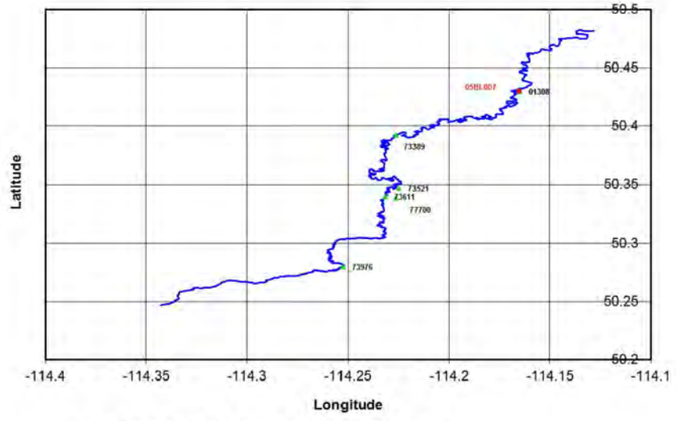

FIGURE 5D: STREAM PLAN FOR STIMSON CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83.

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Municipal District of Foothills No. 31 – Upper Highwood River Desktop Review

Stream Profiles and Plans

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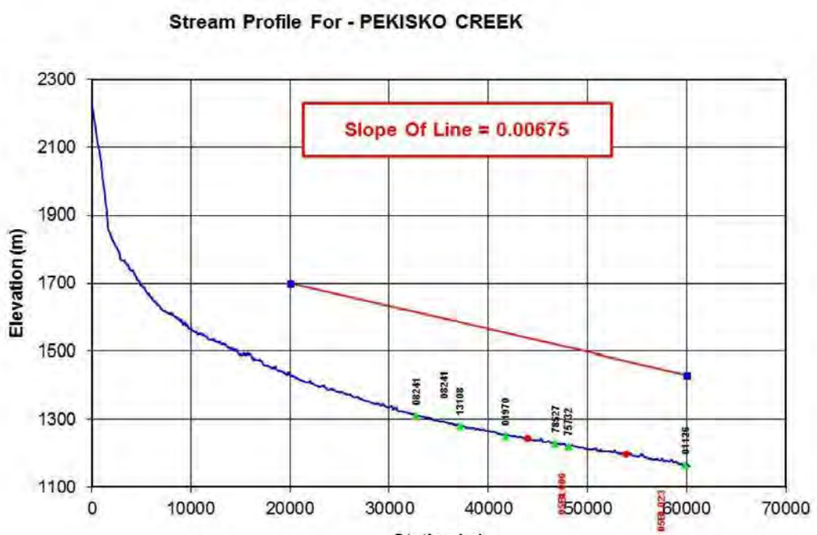

FIGURE 6A: STREAM PROFILE FOR PEKISKO CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.

NTS

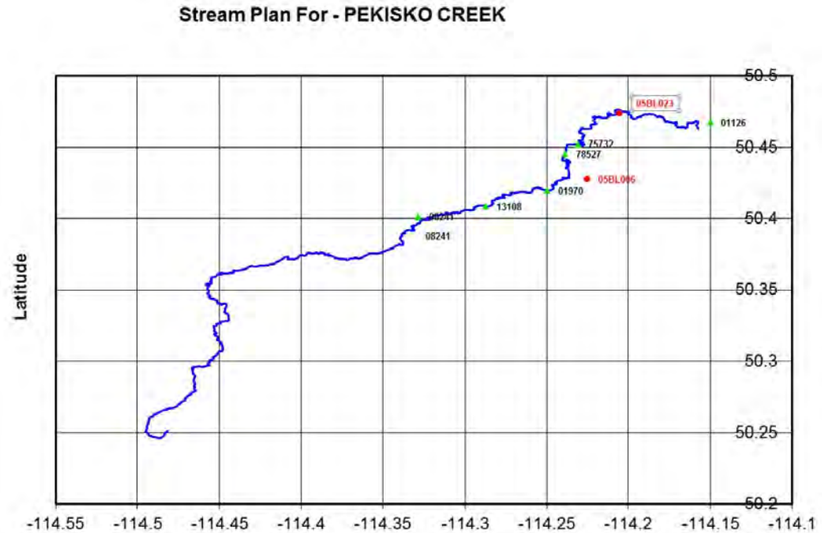

FIGURE 6B: STREAM PLAN FOR PEKISKO CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83.

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Stream Profiles and Plans

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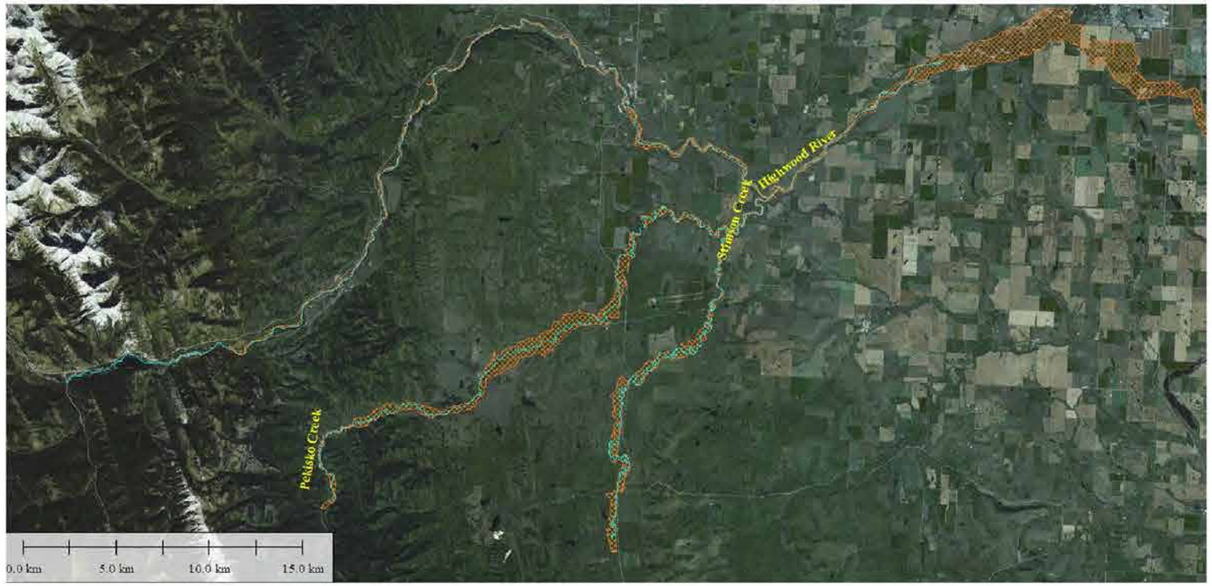

FIGURE 7A: FLOOD AFFECTED AREAS IN THE UPPER HIGHWOOD RIVER, PEKISKO CREEK AND STIMSON CREEK
NTS

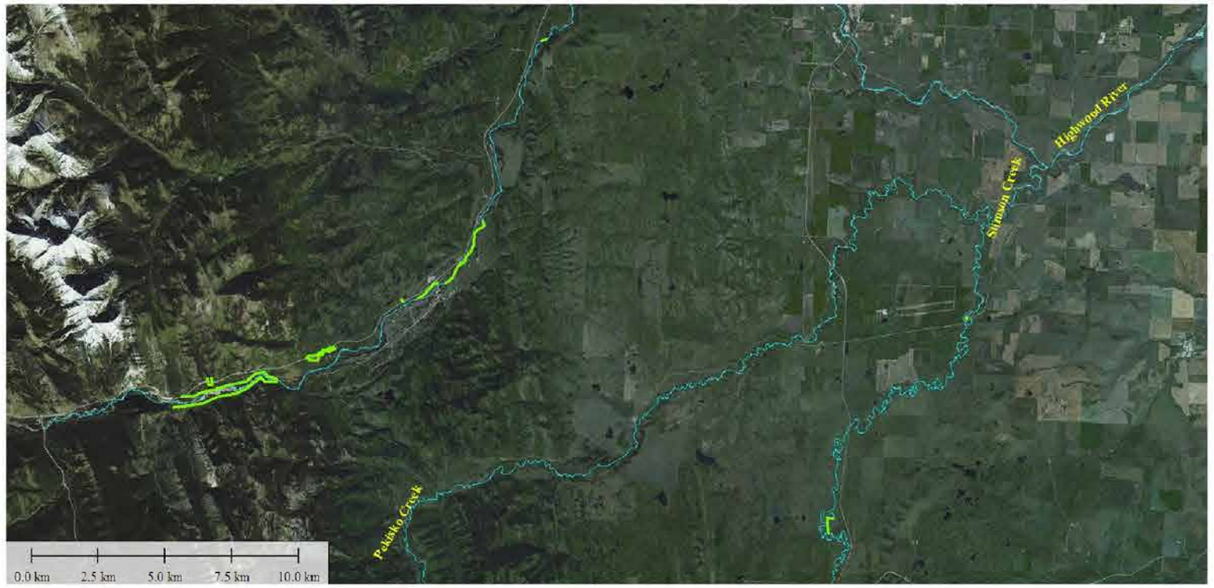

FIGURE 7B: OBSERVED WATER LINES DURING THE JUNE 2013 FLOODING OCCURRENCE
NTS

FIGURE 7C: LOCATION AND COORDINATES OF LONGVIEW FREC PROJECT
NTS

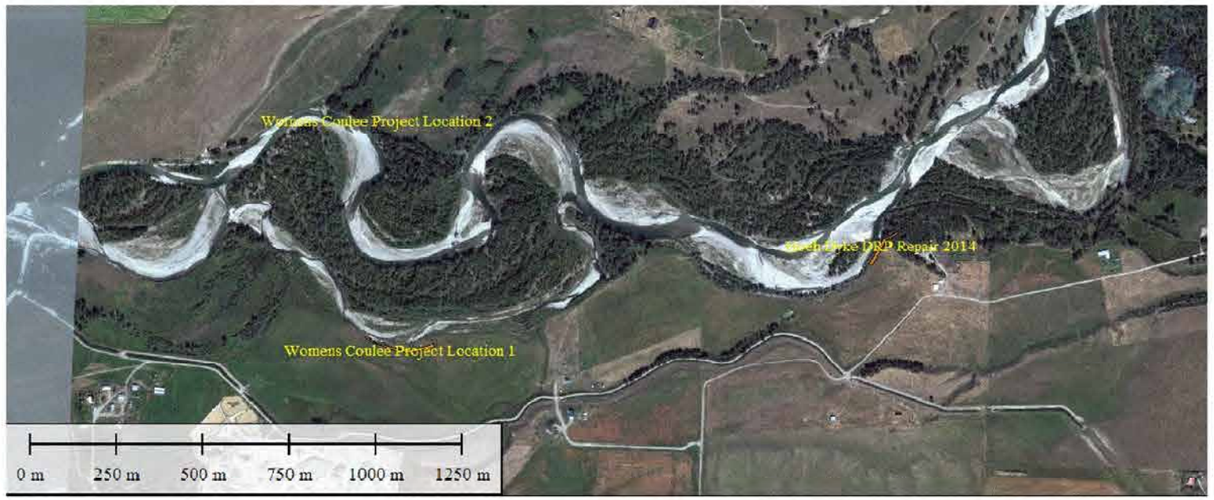

FIGURE 7D: LOCATION AND COORDINATES OF THE WOMEN'S COULEE AND HOEH DYKE FREC PROJECTS
NTS

	Municipal District of Foothills No. 31 – Upper Highwood River Desktop Review				
	Flood Affected Areas and FREC Projects				
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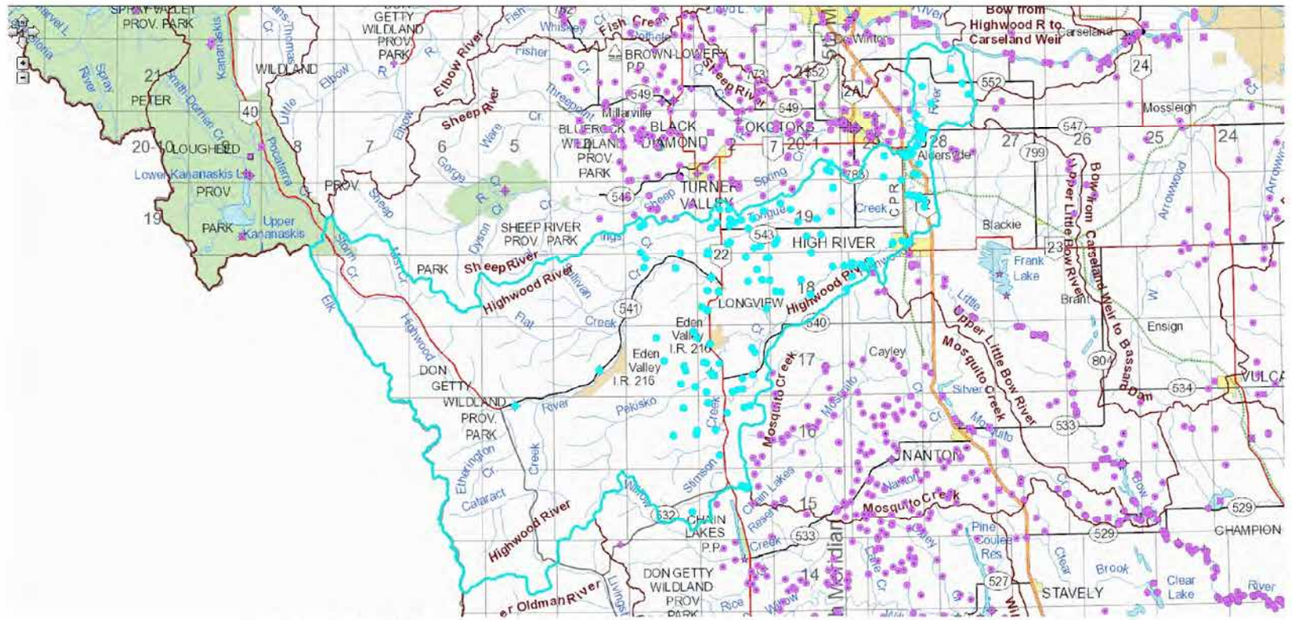

FIGURE 8A: LOCATION OF THE SURFACE DIVERSION LICENSES FOR THE HIGHWOOD RIVER BASIN

NTS

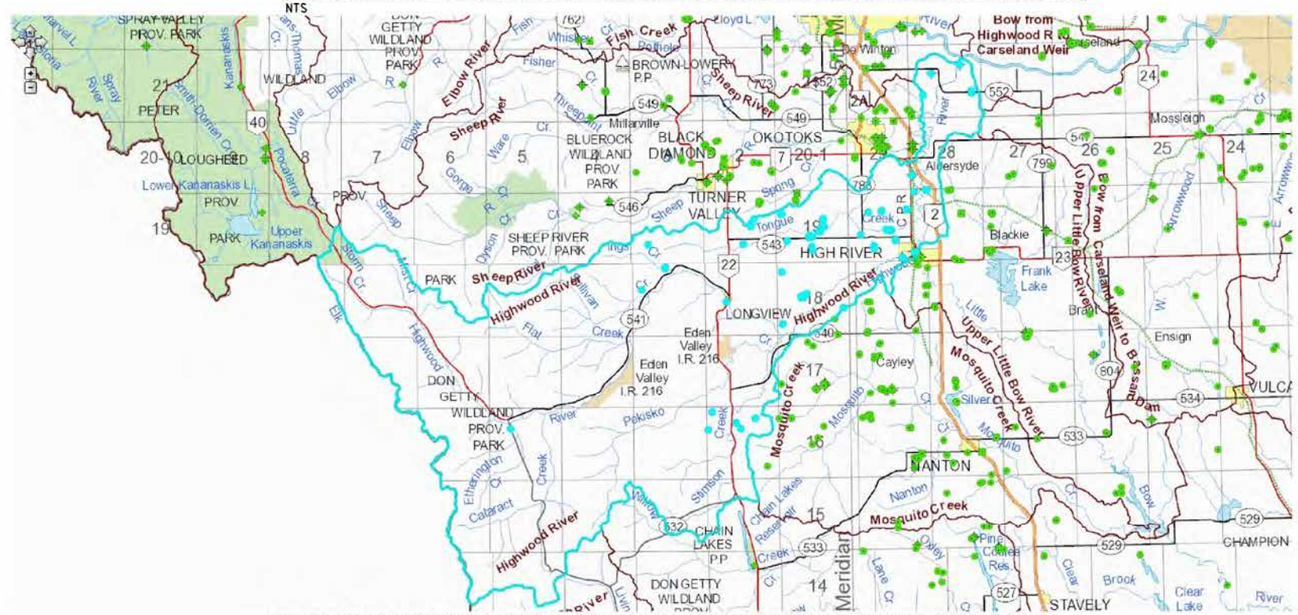

FIGURE 8B: LOCATION OF THE WELL DIVERSION LICENSES FOR THE HIGHWOOD RIVER BASIN

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Diversion Licenses

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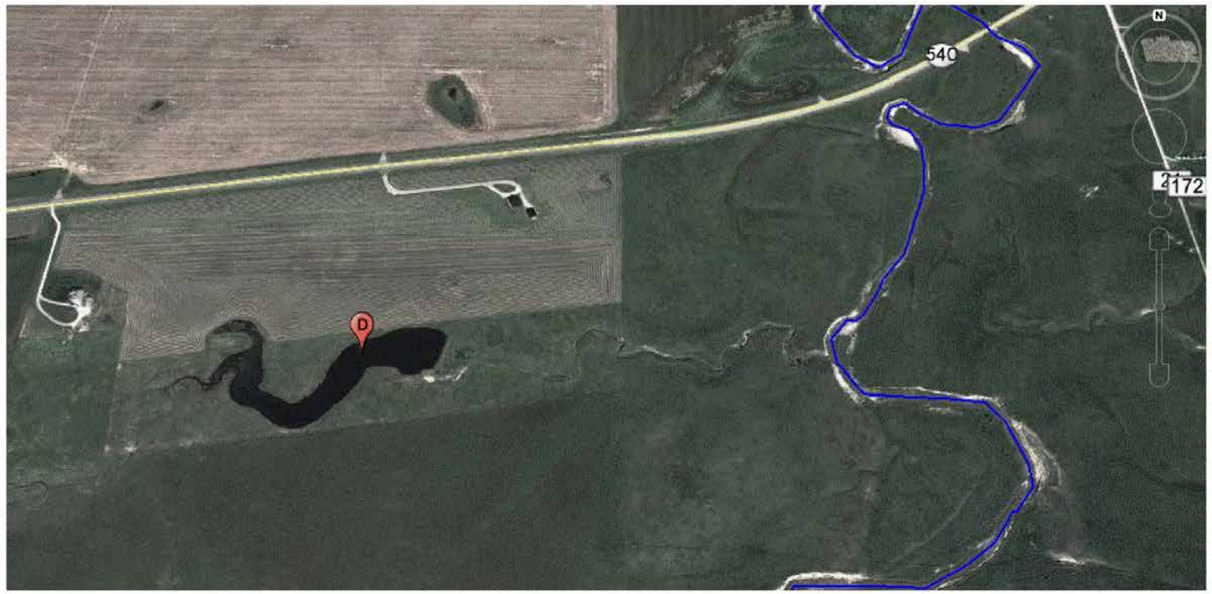

FIGURE 9A: DETAIL OF PUSH-UP DAM 5 IN THE STIMSON CREEK

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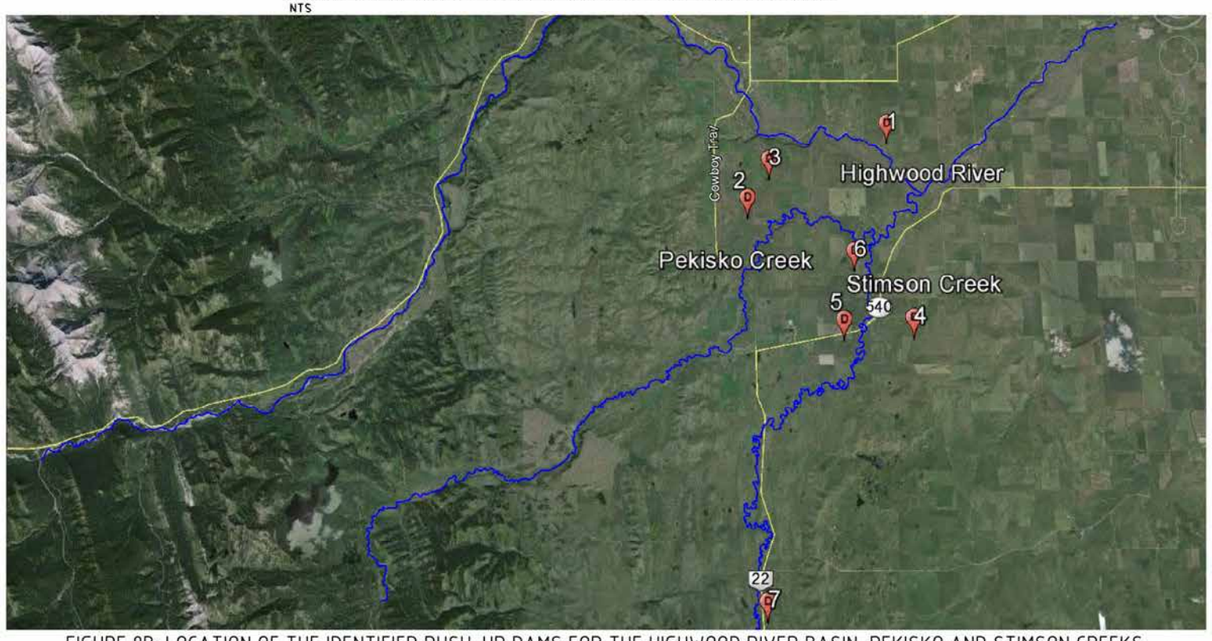

FIGURE 9B: LOCATION OF THE IDENTIFIED PUSH-UP DAMS FOR THE HIGHWOOD RIVER BASIN, PEKISKO AND STIMSON CREEKS

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Municipal District of Foothills No. 31 – Upper Highwood River Desktop Review

Push-Up Dams

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Photographs

Photo 1 Clearing and Recontouring Of Highwood River Floodplain Adjacent To Hwy 40, Just West Of the MD Boundary

Photo 2 Example of Bedrock Valley Confinement at Upper Highwood

Photo 3 Example of Narrow Valley Of Upper Highwood

Photo 4 Highwood River Downstream Of Highwood House Bridge before Entering Lower Valley

Appendices

Appendix 1 Infrastructures on the Highwood River, Pekisko Creek and Stimson Creek

Structure ID	Legal Land Location / Structure Name / Location Description	Region / District / Municipality	Managed By / CMA / Constituency	Span Types / Located On / Located Over	Structure Type	Primary Usage / In Service Yr / Superstr. Yr	No Spans\Pipes / Max Span Len. (m) / Max Pipe Dia. (mm)	Clr Roadway (m) / Nom. Len. (m) / Skew	Single (t) / Semi (t) / Train (t)	Cond. Rat. % / Suff. Rat. % / Insp. Date	Deck Height / Drainage Area	Design Discharge 1in25 / Design Discharge 1in50 / Design Discharge 1in100
Crossing Type: WATERCRS-ST												
Watercourse Crossing: HELLS CREEK												
76998 -1	SW SEC 29 TWP 57 RGE 8 W6M	PEACE REGION	Alberta Transportation (AIT)	RPE	BRIDGE	RV	1	12.4		88.9	6.5	
	GRANDE CACHE	GRANDE PRAIRIE	CMA05	40:36 C1 7.323	CULV	1997				63.4	5	
	HELLS CREEK CULVERT ON HIGHWAY 40, 7 KM NOF GRANDE CACHE	MD GREENVIEW	CS085	HELLS CREEK (WATERCRS-ST)			5137.0	10.0		09-04-2014		
Watercourse Crossing: HENDERSON CREEK												
72957 -1	SW SEC 5 TWP 79 RGE 10 W6M	PEACE REGION	SADDLE HILLS COUNTY	SPE	BRIDGE	RV	1	7.9		44.4	6.7	
	GORDONDALE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	CULV	1970				55.3	70	
	HENDERSON CREEK CULVERT ON LOCAL ROAD NEAR GORDONDALE	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)			4616.0	15.0		22-08-2012		
72616 -2	SE SEC 7 TWP 79 RGE 10 W6M	PEACE REGION	SADDLE HILLS COUNTY	SP	BRIDGE	RV	1	8.0		88.9	11.1	33
	GORDONDALE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	CULV	2002				93.1	90	
	HENDERSON CREEK CULVERT ON LOCAL ROAD, 1 KM S OF GORDONDALE	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)			4610.0	-20.0		17-02-2010		
73032 -2	NW SEC 17 TWP 79 RGE 11 W6M	PEACE REGION	SADDLE HILLS COUNTY	SC	STANDARD	RV	3	10.1	28.0	83.3		
	GORDONDALE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	BRIDGE	2005	12.0	28.0	49.0	80.9	169	
	HENDERSON CREEK BRIDGE ON LOCAL ROAD NEAR GORDONDALE	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)		2005		.0	62.0	22-08-2012		
72279 -1	SW SEC 15 TWP 79 RGE 11 W6M	PEACE REGION	Alberta Transportation (AIT)	RD	MAJOR	RV	3	9.8	28.0	50.0	6.7	
	GORDONDALE	GRANDE PRAIRIE	CMA05	49:02 C1 25.512	BRIDGE	1977	15.2	45.6	49.0	52.1	171	71
	HENDERSON CREEK BRIDGE ON HIGHWAY 49, 6 KM W OF GORDONDALE	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)		1977		.0	62.0	27-06-2013		
71643 -1	SE SEC 23 TWP 79 RGE 13 W6M	PEACE REGION	SADDLE HILLS COUNTY	TH, TT	MAJOR	RV	2	7.4	35.7	50.0	9.7	
	BAY TREE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	BRIDGE	1951	45.7	51.8	57.4	50.5	370	155
	HENDERSON CREEK BRIDGE ON LOCAL ROAD, 4 KM N OF BAY TREE	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)		1950		.0	78.4	28-02-2012		
73982 -2	NE SEC 29 TWP 79 RGE 12 W6M	PEACE REGION	Alberta Transportation (AIT)	WG	MAJOR	RV	3	10.0	28.0	77.8		
	BONANZA	GRANDE PRAIRIE	CMA05	719:02 C1 4.581	BRIDGE	2009	31.0	83.0	49.0	68.5	334	
	HENDERSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 719 NEAR BONANZA	CT SADDLE HILLS	CS001	HENDERSON CREEK (WATERCRS-ST)		2009			62.0	28-02-2012		
Watercourse Crossing: HENDRICKSON CREEK												
77277 -1	SW SEC 31 TWP 55 RGE 3 W6M	NORTH CENTRAL REGION	Alberta Transportation (AIT)	SPE;SPE	BRIDGE	RV	2	8.1		55.6	9.1	
	MUSKEG RIVER	EDSON	CMA05	40:32 C1 25.082	CULV	1971				40.8	13	
	HENDRICKSON CULVERT ON PROVINCIAL HIGHWAY 40 NEAR MUSKEG RIVER	CT YELLOWHEAD	CS085	HENDRICKSON CREEK (WATERCRS-ST)			1502.0	-30.0		07-05-2014		
Watercourse Crossing: HIGHLAND CREEK												
09889 -1	SW SEC 28 TWP 31 RGE 5 W5M	CENTRAL REGION	MOUNTAIN VIEW COUNTY	SPE	BRIDGE	RV	1	7.9		77.8	3.7	
	BERGEN	RED DEER	UNDEFINED CMA	LOCAL ROAD	CULV	1962				72.5	31	
	BERGAN CREEK CULVERT ON LOCAL ROAD NEAR BERGEN	CT MOUNTAIN VIEW	CS077	HIGHLAND CREEK (WATERCRS-ST)			2134.0			09-07-2014		
Watercourse Crossing: HIGHTOWER CK												
75135 -2	SW SEC 16 TWP 55 RGE 27 W5M	NORTH CENTRAL REGION	Unknown Private Organization or Indivi	WG	MAJOR	RV	1	4.8	28.0	77.8	13.7	
	ENTRANCE	EDSON	UNDEFINED CMA	LOCAL ROAD	BRIDGE	2001	24.4	24.4	49.0	63.1	10	
	LOCAL ROAD BRIDGE OVER HIGH TOWER CREEK NEAR ENTRANCE	CT YELLOWHEAD	CS085	HIGHTOWER CK (WATERCRS-ST)		2001			62.0	23-10-2004		
Watercourse Crossing: HIGHWOOD RIVER												
74458 N-2	NE SEC 6 TWP 20 RGE 28 W4M	SOUTHERN REGION	Alberta Transportation (AIT)	WG	MAJOR	RV	3	12.4	28.0	83.3	11.6	
	ALDERSYDE	CALGARY	CMA27	2:12 R1 11.802	BRIDGE	1997	35.0	91.0	49.0	63.9	2310	
	HIGHWOOD RIVER BRIDGE ON HIGHWAY 2, 1 KM SE OF ALDERSYDE	MD FOOTHILLS	CS070	HIGHWOOD RIVER (WATERCRS-ST)		1997		-20.0	62.0	28-02-2015		1150
74458 S-1	NE SEC 6 TWP 20 RGE 28 W4M	SOUTHERN REGION	Alberta Transportation (AIT)	CT	MAJOR	RV	4	15.2	28.0	44.4	8.8	
	ALDERSYDE	CALGARY	CMA27	2:12 L1 11.749	BRIDGE	1957	25.0	85.4	49.0	42.5	2310	
	HIGHWOOD RIVER BRIDGE ON HIGHWAY 2, 1 KM SE OF ALDERSYDE	MD FOOTHILLS	CS070	HIGHWOOD RIVER (WATERCRS-ST)		1957			62.0	28-02-2015		1150
01741 -1	NE SEC 17 TWP 18 RGE 2 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	CS, PO	MAJOR	RV	5	7.9	41.0	77.8	19.5	
	LONGVIEW	CALGARY	CMA27	22:10 C1 37.818	BRIDGE	1961	26.8	105.1	48.8	58.6	1162	
	HIGHWOOD RIVER BRIDGE ON HIGHWAY 22, 1 KM S OF LONGVIEW	MD FOOTHILLS	CS071	HIGHWOOD RIVER (WATERCRS-ST)		1961			61.9	06-02-2014		
00589 -1	NW SEC 6 TWP 19 RGE 28 W4M	SOUTHERN REGION	Alberta Transportation (AIT)	RB	MAJOR	RV	2	8.5	28.0	55.6	6.7	
	HIGH RIVER	CALGARY	CMA27	2A:03 C1 2.869	BRIDGE	1964	26.5	53.0	49.0	48.9	1930	
	HIGHWOOD RIVER BRIDGE ON HIGHWAY 2A, AT N BOUNDARY OF HIGH RIVER	HIGH RIVER	CS063	HIGHWOOD RIVER (WATERCRS-ST)		1964			62.7	25-06-2014		
84550 -1	SW SEC 17 TWP 19 RGE 28 W4M	SOUTHERN REGION	M.D. OF FOOTHILLS NO. 31	WG	MAJOR	RV	2	13.4	28.0			
	HIGHRIVER	CALGARY	UNDEFINED CMA	PROP. HWY 543	BRIDGE	2011	60.0	97.0	49.0			
	BRIDGE STRUCTURE OVER THE HIGHWOOD RIVER LOCATED ON LOCAL ROAD N	MD FOOTHILLS	CS063	HIGHWOOD RIVER (WATERCRS-ST)		2011			62.0			
77498 -1	NE SEC 29 TWP 16 RGE 5 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	DBT	MAJOR	RV	3	12.5	28.0	66.7	5.4	
	LONGVIEW	CALGARY	CMA27	LOCAL ROAD	BRIDGE	1986	23.9	60.1	49.0	68.6	371	
	HIGHWOOD RIVER BRIDGE ON LOCAL ROAD, 43 KM SW OF LONGVIEW	ID KANANASKIS	CS071	HIGHWOOD RIVER (WATERCRS-ST)		1986		-10.0	62.0	10-11-2014		200

Structure ID	Legal Land Location / Structure Name / Location Description	Region / District / Municipality	Managed By / CMA / Constituency	Span Types / Located On / Located Over	Structure Type	Primary Usage / In Service Yr / Superstr. Yr	No Spans\Pipes / Max Span Len. (m) / Max Pipe Dia. (mm)	Clr Roadway (m) / Nom. Len. (m) / Skew	Single (t) / Semi (t) / Train (t)	Cond. Rat. % / Suff. Rat. % / Insp. Date	Deck Height / Drainage Area	Design Discharge 1in25 / Design Discharge 1in50 / Design Discharge 1in100
Crossing Type: WATERCRS-ST												
Watercourse Crossing: HIGHWOOD RIVER												
73641 -2	NE SEC 14 TWP 17 RGE 4 W5M LONGVIEW HIGHWOOD RIVER BRIDGE ON LOCAL ROAD, 23 KM SW OF LONGVIEW	SOUTHERN REGION CALGARY EDEN VALLEY #216	Federal Indian Affairs UNDEFINED CMA CS071	CBC LOCAL ROAD HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 2005 2005	1 42.0	9.0 42.0 9.0	28.0 49.0 62.0	100.0 82.3 02-12-2005	 15	
00599 -1	NE SEC 16 TWP 21 RGE 28 W4M OKOTOKS HIGHWOOD RIVER BRIDGE ON HIGHWAY 552, 18 KM NE OF OKOTOKS	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS063	TH 552:02 C1 12.453 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1924 1924	2 61.0	5.0 122.0	27.5 41.5 47.0	44.4 23.0 02-03-2013	18.3 3990	
00223 -1	NE SEC 18 TWP 20 RGE 28 W4M ALDERSYDE HIGHWOOD RIVER BRIDGE ON HIGHWAY 547, 5 KM SE OF OKOTOKS	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS063	PO 547:02 C1 1.207 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1963 1963	3 34.1	7.9 102.3	50.9 55.3 68.3	72.2 68.2 26-11-2014	13.4 2340	 500
Watercourse Crossing: HINES CREEK												
71821 -1	NE SEC 35 TWP 81 RGE 5 W6M FAIRVIEW HINES CREEK BRIDGE ON HIGHWAY 682, 18 KM W OF FAIRVIEW	PEACE REGION GRANDE PRAIRIE MD FAIRVIEW	Alberta Transportation (AIT) CMA04 CS001	CBT 682:02 C1 12.401 HINES CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1989 1989	3 26.0	9.0 72.0 .0	28.0 49.0 62.0	66.7 58.0 19-06-2012	10.9 1240	 225
71596 -1	SW SEC 10 TWP 84 RGE 3 W6M HINES CREEK HINES CREEK BRIDGE ON LOCAL ROAD NEAR HINES CREEK	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	CLEAR HILLS COUNTY UNDEFINED CMA CS001	TT LOCAL ROAD HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1962 1962	3 8.5	6.1 20.7	28.0 49.0 62.0	50.0 50.2 21-09-2013	4.6 565	
77761 -1	NW SEC 13 TWP 84 RGE 3 W6M FAIRVIEW HINES CREEK BRIDGE ON LOCAL ROAD NEAR FAIRVIEW	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	CLEAR HILLS COUNTY UNDEFINED CMA CS001	PA LOCAL ROAD HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1952 1952	3 6.1	6.4 18.3 .0	24.0 40.0 54.0	44.4 41.3 02-12-2013	4.0 492	
71672 -1	SW SEC 19 TWP 84 RGE 2 W6M DEER HILL HINES CREEK BRIDGE ON LOCAL ROAD NEAR DEER HILL	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	CLEAR HILLS COUNTY UNDEFINED CMA CS001	HC LOCAL ROAD HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1968 1968	2 8.5	7.3 17.0	1.0 1.0 1.0	38.9 47.0 02-12-2013	3.7 466	
72581 -2	SW SEC 8 TWP 81 RGE 4 W6M FAIRVIEW HINES CREEK BRIDGE ON LOCAL ROAD, 19 KM SW OF FAIRVIEW	PEACE REGION GRANDE PRAIRIE MD FAIRVIEW	M.D. OF FAIRVIEW NO. 136 UNDEFINED CMA CS001	WG LOCAL ROAD HINES CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 2006 2006	1 50.0	9.0 50.0 16.0	28.0 49.0 62.0	88.9 73.6 19-06-2012	10.0	
13109 -1	SE SEC 21 TWP 83 RGE 4 W6M HINES CREEK HINES CREEK BRIDGE ON HIGHWAY 64, 5 KM SE OF HINES CREEK	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	Alberta Transportation (AIT) CMA04 CS001	SC 64:06 C1 5.155 HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1966 1966	3 8.5	10.5 20.7	 	50.0 58.6 12-09-2013	4.6 786	
77972 -1	SE SEC 17 TWP 85 RGE 2 W6M DEER HILL WATERCOURSE BRIDGE ON LOCAL ROAD NEAR DEER HILL	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	CLEAR HILLS COUNTY UNDEFINED CMA CS001	PG LOCAL ROAD HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1988 1952	3 8.5	7.5 20.7	28.0 49.0 62.0	44.4 57.0 27-01-2011	2.9 240	 28
74191 -1	SE SEC 5 TWP 85 RGE 2 W6M WHITELAW HINES CREEK BRIDGE ON LOCAL ROAD NEAR WHITELAW	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	CLEAR HILLS COUNTY UNDEFINED CMA CS001	PG LOCAL ROAD HINES CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1953 1953	2 6.1	6.4 12.2	28.0 49.0 62.0	50.0 59.2 02-12-2013	3.4 186	
71312 -1	NE SEC 33 TWP 83 RGE 3 W6M FAIRVIEW HINES CREEK CULVERT ON HIGHWAY 685, 12 KM W OF HINES CREEK	PEACE REGION GRANDE PRAIRIE CT CLEAR HILLS	Alberta Transportation (AIT) CMA04 CS001	RPE 685:02 C1 25.608 HINES CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1987	1 6885.0	8.5	 	55.6 66.0 26-08-2012	11.4 600	
Watercourse Crossing: HOME COULEE												
75126 -1	SW SEC 21 TWP 27 RGE 19 W4M WAYNE HOME COULEE CULVERT ON HIGHWAY 56, 10 KM SE OF WAYNE	SOUTHERN REGION CALGARY CT WHEATLAND	Alberta Transportation (AIT) CMA21 CS083	SPE 56:08 C1 14.823 HOME COULEE (WATERCRS-ST)	BRIDGE CULV	RV 1959	1 1829.0	10.4 -20.0	 	44.4 52.1 29-08-2013	12.0 24	
76416 -1	NW SEC 34 TWP 26 RGE 19 W4M HUSSAR WATERCOURSE CULVERT ON LOCAL ROAD NEAR HUSSAR	SOUTHERN REGION CALGARY CT WHEATLAND	WHEATLAND COUNTY UNDEFINED CMA CS083	SP LOCAL ROAD HOME COULEE (WATERCRS-ST)	BRIDGE CULV	RV 1968	1 1500.0	8.2 -20.0	 	66.7 69.4 04-01-2012	11.3 5	
09496 -1	SW SEC 16 TWP 27 RGE 19 W4M WAYNE HOME COULEE CULVERT ON HIGHWAY 569, 12 KM SE OF WAYNE	SOUTHERN REGION CALGARY CT WHEATLAND	Alberta Transportation (AIT) CMA21 CS083	MP 569:02 C1 8.667 HOME COULEE (WATERCRS-ST)	BRIDGE CULV	RV 1997	1 2700.0	8.6 .0	 	44.4 62.4 23-01-2015	6.2 18	
Watercourse Crossing: HONEYMOON CREEK												
80264 -1	NE SEC 25 TWP 12 RGE 5 W5M COLEMAN HONEYMOON CREEK BRIDGE ON LOCAL ROAD NEAR COLEMAN	SOUTHERN REGION LETHBRIDGE MD RANCHLAND	M.D. OF RANCHLAND NO. 66 UNDEFINED CMA CS071	HC LOCAL ROAD HONEYMOON CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1961 1961	1 8.5	7.3 8.5 15.0	30.1 52.8 75.4	55.6 67.0 06-07-2011	3.0 26	
Watercourse Crossing: HOOD CK												

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Crossing Type: WATERCRS-ST												
Watercourse Crossing: PEIGAN CREEK												
74844 -1	NE SEC 29 TWP 7 RGE 6 W4M ORION PEIGAN CREEK BRIDGE ON LOCAL ROAD NEAR ORION	SOUTHERN REGION LETHBRIDGE CT FORTY MILE	COUNTY OF FORTY MILE NO. 8 UNDEFINED CMA CS055	PG LOCAL ROAD PEIGAN CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1959 1959	3 6.1	7.3 18.3	28.0 49.0 62.0	55.6 59.6 19-01-2015	3.0 192	
13981 -1	SE SEC 27 TWP 7 RGE 5 W4M MANYBERRIES PEIGAN CREEK CULVERT ON LOCAL ROAD NEAR MANYBERRIES	SOUTHERN REGION LETHBRIDGE CT FORTY MILE	COUNTY OF FORTY MILE NO. 8 UNDEFINED CMA CS055	SPE LOCAL ROAD PEIGAN CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1973	1 2744.0	8.5		55.6 56.2 16-12-2011	4.9 78	
06742 -1	SW SEC 6 TWP 8 RGE 5 W4M MANYBERRIES PEIGAN CREEK CULVERT ON LOCAL ROAD NEAR MANYBERRIES	SOUTHERN REGION LETHBRIDGE CT FORTY MILE	COUNTY OF FORTY MILE NO. 8 UNDEFINED CMA CS055	SP LOCAL ROAD PEIGAN CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1976	1 4300.0	8.5 -37.0		55.6 69.4 15-12-2011	7.3 129	
06871 -1	NW SEC 19 TWP 7 RGE 7 W4M ORION PEIGAN CREEK CULVERT ON LOCAL ROAD, 24 KM NW OF ORION	SOUTHERN REGION LETHBRIDGE CT FORTY MILE	COUNTY OF FORTY MILE NO. 8 UNDEFINED CMA CS055	SP;SP LOCAL ROAD PEIGAN CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1977	2 4267.0	9.1 9.0		33.3 50.3 14-01-2014	4.0 414	
07781 -1	SW SEC 27 TWP 7 RGE 5 W4M MANYBERRIES PEIGAN CREEK CULVERT ON LOCAL ROAD NEAR MANYBERRIES	SOUTHERN REGION LETHBRIDGE CT FORTY MILE	COUNTY OF FORTY MILE NO. 8 UNDEFINED CMA CS055	SPE LOCAL ROAD PEIGAN CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1977	1 3364.0	8.7 15.0		55.6 58.2 16-12-2011	4.6 78	
Watercourse Crossing: PEKISKO CREEK												
75732 -1	NE SEC 20 TWP 17 RGE 2 W5M LONGVIEW PEKISKO CREEK BRIDGE ON LOCAL ROAD NEAR LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS071	HC LOCAL ROAD PEKISKO CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1963 1963	3 11.6	9.1 23.8	28.0 49.0 65.5	22.2 36.2 31-07-2013	3.4 218	
78527 -1	SE SEC 20 TWP 17 RGE 2 W5M LONGVIEW PEKISKO CREEK BRIDGE ON HIGHWAY 22, 10 KM S OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS071	DBT 22:10 C1 28.108 PEKISKO CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1984 1984	1 42.0	9.5 42.0	28.0 49.0 62.0	66.7 55.5 06-02-2014	7.7 181	127
01126 -1	NE SEC 25 TWP 17 RGE 2 W5M HIGH RIVER PEKISKO CREEK BRIDGE ON LOCAL ROAD, 16 KM SE OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS071	DBT LOCAL ROAD PEKISKO CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1984 1984	2 30.0	7.5 60.0 10.0	28.0 49.0 62.0	66.7 68.6 21-05-2015	9.7 480	27
01970 -1	NW SEC 8 TWP 17 RGE 2 W5M PEKISKO PEKISKO CREEK BRIDGE ON LOCAL ROAD, 12 KM S OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS071	PT LOCAL ROAD PEKISKO CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1926 1926	1 30.5	4.9 30.5	24.0 34.5 42.5	50.0 29.0 21-05-2015	3.7 181	
08241 -2	SE SEC 3 TWP 17 RGE 3 W5M LONGVIEW EMERSON CREEK CULVERT ON LOCAL ROAD SW OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS071	MP LOCAL ROAD PEKISKO CREEK (WATERCRS-ST)	BRIDGE CULV	RV 2005	1 3000.0	8.0		100.0 82.9 17-08-2009	4.2 95	
Watercourse Crossing: PEMBINA RIVER												
75186 -1	SE SEC 9 TWP 58 RGE 3 W5M BARRHEAD PEMBINA RIVER BRIDGE ON HIGHWAY 33, 14 KM S OF BARRHEAD	NORTH CENTRAL REGION ATHABASCA CT BARRHEAD	Alberta Transportation (AIT) CMA10 CS050	PO 33:06 C1 0.044 PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1960 1960	4 30.5	7.9 122.0	42.4 49.0 62.0	38.9 38.6 11-02-2015	10.4 7764	1274
02031 -1	NW SEC 20 TWP 53 RGE 7 W5M ENTWISTLE CN RAIL BRIDGE OVER PEMBINA RIVER NEAR ENTWISTLE	NORTH CENTRAL REGION EDSON CT YELLOWHEAD	Canadian National Railways UNDEFINED CMA CS087	DT RAILWAY CNR PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1910 1910	1 300.0	300.0				
70509 -1	SW SEC 22 TWP 59 RGE 2 W5M MANOLA PEMBINA RIVER BRIDGE ON LOCAL ROAD, 3 KM N OF MANOLA	NORTH CENTRAL REGION ATHABASCA CT BARRHEAD	COUNTY OF BARRHEAD NO. 11 UNDEFINED CMA CS050	PO LOCAL ROAD PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1959 1959	3 41.8	9.8 119.2	28.0 49.0 62.0	55.6 61.9 12-01-2015	10.1 10744	
01245 -1	SE SEC 9 TWP 60 RGE 1 W5M ROSSINGTON PEMBINA RIVER BRIDGE ON HIGHWAY 18, AT ROSSINGTON	NORTH CENTRAL REGION ATHABASCA CT WESTLOCK	Alberta Transportation (AIT) CMA10 CS050	RB 18:10 C1 21.115 PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1952 1952	4 33.5	120.6 7.0	56.2 68.7 82.6	55.6 51.6 11-02-2015	9.4 10650	
13166 -1	NE SEC 4 TWP 62 RGE 27 W4M DAPP PEMBINA RIVER BRIDGE ON HIGHWAY 661, 5 KM W OF DAPP	NORTH CENTRAL REGION ATHABASCA CT WESTLOCK	Alberta Transportation (AIT) CMA10 CS050	TH, RD 661:06 C1 10.686 PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1935 1935	3 76.2	7.3 111.3		44.4 50.8 30-08-2013	10.1 2587	1275
73919 E-1	SE SEC 1 TWP 57 RGE 7 W5M SANGUDO PEMBINA RIVER BRIDGE ON HIGHWAY 43, AT N BOUNDARY OF SANGUDO	NORTH CENTRAL REGION STONY PLAIN CT LAC STE. ANNE	Alberta Transportation (AIT) CMA12 CS087	RB 43:18 R1 17.353 PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1955 1955	6 31.1	9.5 136.6	44.2 69.6 84.4	44.4 47.3 04-03-2015	12.8 6764	
74969 -1	SE SEC 1 TWP 50 RGE 9 W5M DRAYTON VALL PEMBINA RIVER BRIDGE ON HIGHWAY 621, 19 KM NW OF DRAYTON VALLEY	NORTH CENTRAL REGION STONY PLAIN CT BRAZEAU	Alberta Transportation (AIT) CMA11 CS056	PO 621:02 C1 16.358 PEMBINA RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1960 1960	3 29.9	7.9 78.1	46.0 59.9 70.0	33.3 41.0 03-09-2014	9.1 3005	

Structure ID	Legal Land Location / Structure Name / Location Description	Region / District / Municipality	Managed By / CMA / Constituency	Span Types / Located On / Located Over	Structure Type	Primary Usage / In Service Yr / Superstr. Yr	No Spans\Pipes / Max Span Len. (m) / Max Pipe Dia. (mm)	Clr Roadway (m) / Nom. Len. (m) / Skew	Single (t) / Semi (t) / Train (t)	Cond. Rat. % / Suff. Rat. % / Insp. Date	Deck Height / Drainage Area	Design Discharge 1in25 / Design Discharge 1in50 / Design Discharge 1in100
Crossing Type: WATERCRS-ST												
Watercourse Crossing: STEEN RIVER												
73410 -1	NW SEC 3 TWP 122 RGE 19 W5M	PEACE REGION	Alberta Transportation (AIT)	RB	MAJOR	RV	3	11.0	70.7	38.9	10.1	
	STEEN RIVER	PEACE RIVER	CMA01	35:20 C1 0.001	BRIDGE	1961	21.9	59.1	95.8	59.8		
	STEEN RIVER BRIDGE ON HIGHWAY 35, 3 KM S OF STEEN RIVER	CT MACKENZIE	CS074	STEEN RIVER (WATERCRS-ST)		1961			123.7	24-10-2013		
Watercourse Crossing: STEEP CREEK												
73394 -1	NW SEC 17 TWP 72 RGE 19 W5M	PEACE REGION	Alberta Transportation (AIT)	SP	BRIDGE	RV	1	9.0		55.6	10.5	
	SUNSET HOUSE	PEACE RIVER	CMA06	747:02 C1 18.172	CULV	1981				51.5	13	
	STEEP CREEK CULVERT ON PROVINCIAL HIGHWAY 747 NEAR SUNSET HOUSE	CT BIG LAKES	CS002	STEEP CREEK (WATERCRS-ST)			1800.0	-46.0		16-01-2014		
Watercourse Crossing: STEEPHILL CREEK												
75206 -1	NW SEC 9 TWP 104 RGE 16 W5M	PEACE REGION	Alberta Transportation (AIT)	SM	STANDARD	RV	3	9.0	28.0	44.4	5.8	
	LA CRETE	PEACE RIVER	CMA01	697:04 C1 0.007	BRIDGE	1985	10.0	30.0	49.0	56.6	240	77
	STEEPHILL CREEK BRIDGE ON HIGHWAY 697, 15 KM W OF BUFFALO HEAD PRAIF	CT MACKENZIE	CS074	STEEPHILL CREEK (WATERCRS-ST)		1985			62.0	11-06-2013		
Watercourse Crossing: STEEPROCK CREEK												
70677 -2	NW SEC 27 TWP 72 RGE 12 W6M	PEACE REGION	COUNTY OF GRANDE PRAIRIE NO. 1	SC	STANDARD	RV	3	8.9		88.9		
	LYMBURN	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	BRIDGE	2008	12.0	28.0		78.4		
	STEEPROCREEK CREEK BRIDGE ON LOCAL ROAD NEAR LYMBURN	CT GRANDE PRAIRIE	CS062	STEEPROCK CREEK (WATERCRS-ST)		2008		.0		16-06-2014		
76345 -1	SW SEC 23 TWP 72 RGE 13 W6M	PEACE REGION	COUNTY OF GRANDE PRAIRIE NO. 1	TT	STANDARD	RV	1	6.1	21.3	44.4	3.0	
	GOODFARE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	BRIDGE	1949	7.9	7.9	37.3	47.3		
	STEEPROCK CREEK CREEK BRIDGE ON LOCAL ROAD NEAR GOODFARE	CT GRANDE PRAIRIE	CS062	STEEPROCK CREEK (WATERCRS-ST)		1949			53.2	11-09-2014		
72193 -1	NW SEC 30 TWP 72 RGE 12 W6M	PEACE REGION	COUNTY OF GRANDE PRAIRIE NO. 1	TT	STANDARD	RV	3	6.2	29.4	44.4	5.2	
	GOODFARE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	BRIDGE	1961	8.5	25.5	51.5	58.2		
	STEEPROCREEK CREEK BRIDGE ON LOCAL ROAD NEAR GOODFARE	CT GRANDE PRAIRIE	CS062	STEEPROCK CREEK (WATERCRS-ST)		1961			73.5	28-08-2008		
71300 -1	SW SEC 25 TWP 72 RGE 13 W6M	PEACE REGION	Alberta Transportation (AIT)	RPA	BRIDGE	RV	1	10.2		55.6	5.4	
	GOODFARE	GRANDE PRAIRIE	CMA05	671:02 C1 3.400	CULV	1986				61.6	277	65
	STEEPROCK CREEK CULVERT ON HWY 671, 9 KM W OF GOODFARE	CT GRANDE PRAIRIE	CS062	STEEPROCK CREEK (WATERCRS-ST)			7150.0	10.0		12-09-2013		
Watercourse Crossing: STERNE CREEK												
76530 -1	NE SEC 16 TWP 57 RGE 7 W6M	PEACE REGION	Alberta Transportation (AIT)	SP	BRIDGE	RV	1	8.2		55.6	8.2	
	GRANDE CACHE	GRANDE PRAIRIE	CMA05	40:34 C1 19.966	CULV	1968				53.9	34	
	STERNE CREEK CULVERT ON HWY 40, 11 KM E OF GRANDE CACHE	MD GREENVIEW	CS085	STERNE CREEK (WATERCRS-ST)			4300.0			08-04-2014		
Watercourse Crossing: STETSON CREEK												
79006 -1	NW SEC 7 TWP 62 RGE 12 W6M	PEACE REGION	Unknown Private Organization or Indivi	SP	BRIDGE	RV	1	7.3		44.0		
	GROVEDALE	GRANDE PRAIRIE	UNDEFINED CMA	LOCAL ROAD	CULV	1977				44.5	77	
	STETSON CREEK CULVERT ON LOCAL ROAD NEAR GROVEDALE	MD GREENVIEW	CS062	STETSON CREEK (WATERCRS-ST)			4300.0			01-11-1988		
Watercourse Crossing: STEWART CREEK												
74664 -1	NW SEC 14 TWP 24 RGE 10 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	FP-BP	BRIDGE	RV	1	26.0		66.7	2.8	
	CANMORE	CALGARY	CMA28	1:02 L1 12.026, 1:02 R1 12.090	CULV	1957				60.3	10	
	STEWART CREEK CULVERT ON HIGHWAY 1, AT E BOUNDARY OF CANMORE	MD BIGHORN	CS049	STEWART CREEK (WATERCRS-ST)			1765.0			27-11-2013		
Watercourse Crossing: STIMSON CREEK												
77700 -1	SW SEC 16 TWP 16 RGE 2 W5M	SOUTHERN REGION	M.D. OF FOOTHILLS NO. 31	HH	STANDARD	RV	3	8.2	28.0	44.4	3.7	
	LONGVIEW	CALGARY	UNDEFINED CMA	LOCAL ROAD	BRIDGE	1961	8.5	25.5	49.0	48.4	153	
	STIMSON CREEK BRIDGE ON LOCAL ROAD NEAR LONGVIEW	MD FOOTHILLS	CS071	STIMSON CREEK (WATERCRS-ST)		1961		30.0	67.2	31-07-2013		
73976 -1	NW SEC 20 TWP 15 RGE 2 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	HC	STANDARD	RV	3	7.3	28.0	44.4	3.7	
	LONGVIEW	LETHBRIDGE	CMA27	532:02 C1 22.782	BRIDGE	1965	6.1	18.3	49.0	57.2	34	
	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 532 NEAR LONGVIEW	MD RANCHLAND	CS071	STIMSON CREEK (WATERCRS-ST)		1965		-15.0	65.5	17-05-2013		
01308 -1	SE SEC 14 TWP 17 RGE 2 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	HC	STANDARD	RV	3	8.2	30.1	33.3	3.7	
	PEKISKO	CALGARY	CMA27	540:02 C1 4.817	BRIDGE	1969	8.5	25.5	52.8	58.0	122	
	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEV	MD FOOTHILLS	CS071	STIMSON CREEK (WATERCRS-ST)		1969			75.4	08-03-2013		
73389 -1	NW SEC 33 TWP 16 RGE 2 W5M	SOUTHERN REGION	Alberta Transportation (AIT)	DBT	MAJOR	RV	1	10.1	28.0	66.7	5.0	
	LONGVIEW	CALGARY	CMA27	22:10 C1 21.953	BRIDGE	1984	32.0	32.0	49.0	56.2	202	
	STIMSON CREEK BRIDGE ON HIGHWAY 22, 16 KM S OF LONGVIEW	MD FOOTHILLS	CS071	STIMSON CREEK (WATERCRS-ST)		1984			62.0	06-02-2014		
Watercourse Crossing: STONE CREEK												
00818 -1	SE SEC 3 TWP 40 RGE 24 W4M	CENTRAL REGION	LACOMBE COUNTY	MP	BRIDGE	RV	1	9.0		44.4	3.0	
	CLIVE	RED DEER	UNDEFINED CMA	LOCAL ROAD	CULV	1998				64.7		
	STONE CREEK CULVERT ON LOCAL ROAD NEAR CLIVE	CT LACOMBE	CS066	STONE CREEK (WATERCRS-ST)			2000.0			23-10-2007		

Appendix 2 Provincial Bridge Inspection Schedules for the MD of Foothills No. 31

Post Flood Bridge Inspection Form

Bridge File Number	00223-1	**Inspector Name**	T CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 547, 5 KM SE OF OKOTOKS	**Assistant Name**	
		Inspection Date	JUNE 10/13

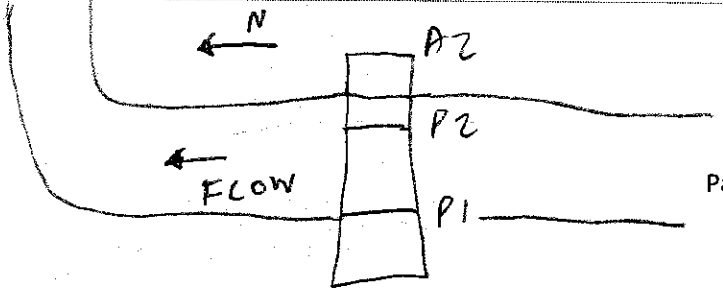
Legal Land Location	NE SEC 18 TWP 20 RGE 28 W4M
Longitude; Latitude	-113.86S053;50.697073
Unique Span Types	PO

Approach Road	- NO FLOOD DAMAGE VISIBLE
Approach Guardrail	- NO FLOOD DAMAGE VISIBLE - FLEX BEAM ALL CORNERS
Approach Embankment	- NO FLOOD DAMAGE VISIBLE

Vertical Alignment	- O.K. - VA IS GOOD AT APPROACHES AND BRIDGE
Horizontal Alignment	- O.K. - HA IS GOOD - NO SIGNS OF DISPLACEMENT

Superstructure General	- NO FLOOD DAMAGE VISIBLE - GIRDERS ALIGNED WITH BEARINGS - NO SIGNS OF SETTLEMENT

Abutment Backwall	- NO FLOOD DAMAGE VISIBLE
Abutment Wingwall	- NO FLOOD DAMAGE VISIBLE
Abutment Piles	- NOT SEEN - NO FLOOD DAMAGE SEEN - NO DISPLACEMENT SEEN
Abutment Stability	- O.K. - - NO DISPLACEMENT
Abutment Scour/Erosion	- NO FLOOD DAMAGE SEEN - CONCRETE SLOPE PROTECTION INTACT
Pier Piles	- NOT SEEN - NO MISALIGNMENT SEEN - NO DISPLACEMENT SEEN
Pier Stability	- O.K. - NO DEFLECTION SEEN - MASSIVE CONCRETE - NO SIGNS OF INSTABILITY
Pier Scour/Erosion	- WATER TOO DEEP TO SEE. - PIERS ARE ON PARTIALLY IN RIVER - NO SCOUR ON WHAT WAS SEEN
Pier Bracing/Struts/ Sheathing	- N/A



Post Flood Bridge Inspection Form

Bridge File Number	00223-1	**Inspector Name**	T CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 547, 5 KM 5E OF OKOTOKS	**Assistant Name**	
		Inspection Date	JULY 10/13

Legal Land Location	NE SEC 18 TWP 20 RGE 28 W4M
Longitude; Latitude	-113.865053;50.697073
Unique Span Types	PO

Channel Alignment	- ENTERS STRAIGHT AND CURVES EAST AT D/S. - FLOWS S TO N
High Water Mark	- 4.720 m TO BOTTOM OF GIRDERS @ EAST - 7,300 m TO BOTTOM OF GIRDER @ WEST - BRIDGE ON GRADE
Bank Stability	- SCOURED ALL ALONG EAST BANK - SCOURED TO BEDROCK @ N.W.
Drift/Debris	- TREE @ P2
Slope Protection	- CONCRETE - SCOURED DOWN TO CONCRETE @ TOE @ EAST
Guidebank/Spurs	- N/A
Drainage	- O.K. - NO DAMAGE FROM OTHER DRAINAGE
Adequacy of Opening	- O.K. - BRIDGE PASSED FLOOD WITH NO SERIOUS SCOUR

Other Item	
Other Item	
Other Item	
General Comment	- BRIDGE PASSED FLOOD WATER - SCOUR DOWN TO CONCRETE SLOPE PROTECTION APRON AT P2 - SCOUR ALONG ALL OF EAST BANK - REMOVE DRIFT AT P2.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks

2

Photo 1 Looking d/s at south side of bridge from s.e. bank.

Photo 2 Looking u/s at north side of bridge from n.w. bank.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks

Photo 3 Looking d/s at south side of bridge.

Photo 4 Drift at P2.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks

Photo 5 East bank scoured down to concrete slope protection under bridge.

Photo 6 Looking west along north side.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks

Photo 7 Looking east along south side.

E OF HWY 2

Post Flood Bridge Inspection Form

Bridge File Number	00599-1	**Inspector Name**	T CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 552, 18 KM NE OF OKOTOKS	**Assistant Name**	
		Inspection Date	JULY 10/13

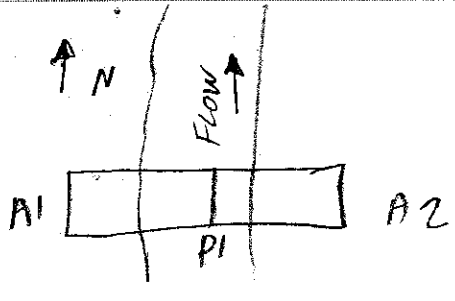
Legal Land Location	NE SEC 16 TWP 21 RGE 28 W4M
Longitude; Latitude	-113.821685;50.784023
Unique Span Types	TH

Approach Road	- NO FLOOD DAMAGE VISIBLE
Approach Guardrail	- FLEX BEAM AT ALL CORNERS - NO FLOOD DAMAGE VISIBLE
Approach Embankment	- NO FLOOD DAMAGE VISIBLE

Vertical Alignment	- O.K. - VA IS GOOD AT APPROACHES AND BRIDGE
Horizontal Alignment	- O.K. - HA IS GOOD - NO SIGNS OF DISPLACEMENT

Superstructure General	- NO FLOOD DAMAGE VISIBLE - TRUSS ALIGNED WELL WITH BRG'S. - NO SIGNS OF SETTLEMENT

Abutment Backwall	- NO FLOOD DAMAGE VISIBLE
Abutment Wingwall	- NO FLOOD DAMAGE VISIBLE
Abutment Piles	- SEEN - NO FLOOD DAMAGE VISIBLE - NO DISPLACEMENT SEEN
Abutment Stability	- O.K. - NO DEFECTION SEEN
Abutment Scour/Erosion	- NONE SEEN - CONCRETE SCOPE PROTECTION INTACT
Pier Piles	- NOT SEEN - NO MISALIGNMENT SEEN - NO DISPLACEMENT SEEN
Pier Stability	- O.K. - NO DEFECTION SEEN - NO SIGNS OF INSTABILITY
Pier Scour/Erosion	- WATER TO DARK TO SEE - PIER IN RIVER
Pier Bracing/Struts/ Sheathing	- N/A



Post Flood Bridge Inspection Form

Bridge File Number	00599-1	**Inspector Name**	TCAMEY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 552, 18 KM NE OF OKOTOKS	**Assistant Name**	
		Inspection Date	JULY 10/13

Legal Land Location	NE SEC 16 TWP 21 RGE 28 W4M
Longitude; Latitude	-113.821685;50.784023
Unique Span Types	TH

Channel Alignment	- GOOD - STRAIGHT THROUGH - FLOWS S TO N
High Water Mark	- 6m BELOW BOTTOM CHORD
Bank Stability	- ROCK WALL AT EAST BANK - CUT BANK N.W. BANK
Drift/Debris	- DRIFT ON PIER
Slope Protection	- O.K. - ROCK WALL @ EAST - CONCRETE @ WEST
Guidebank/Spurs	- N/A
Drainage	- O.K. - NO DAMAGE FROM DRAINAGE
Adequacy of Opening	- GOOD OPENING - HIGH WATER ONLY TO 6m OF BOTTOM CHORD - BRIDGE UNAFFECTED BY FLOOD

Other Item	
Other Item	
Other Item	
General Comment	- FLOOD WATER PASSED UNDER BRIDGE - GOOD HEIGHT OF SUPERSTRACTURE - CLEAR DRIFT FROM PIER

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks

Photo 1 Looking d/s at south side of bridge.

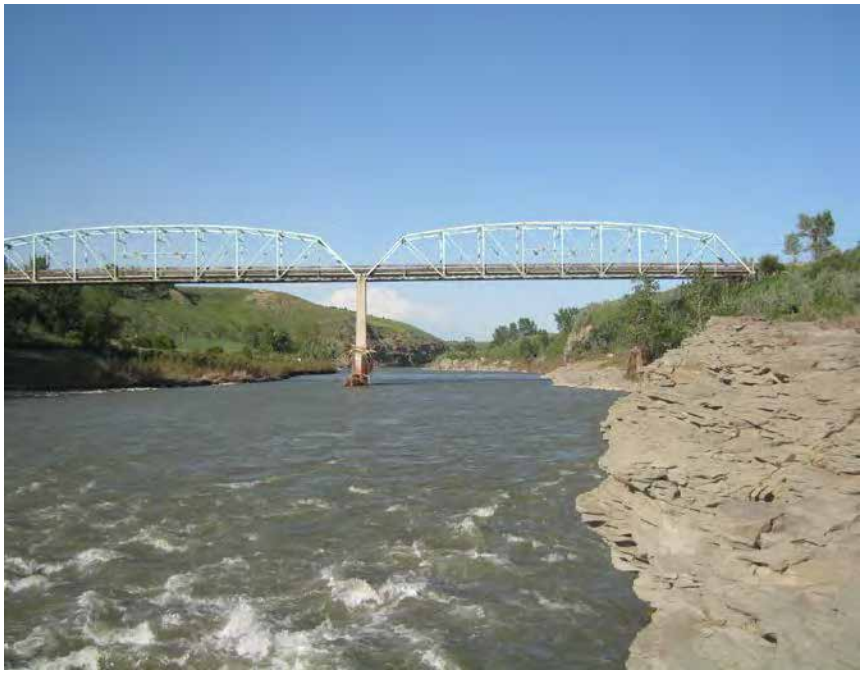


Photo 2 Looking d/s at bridge from s.e. bank.

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks

Photo 3 Looking u/s at bridge from n.w. bank- cut bank at n.w.

Photo 4 Looking d/s along east bank- rock wall runs all along east bank.

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks

Photo 5 Drift at pier.

Photo 6 Looking west along north side.

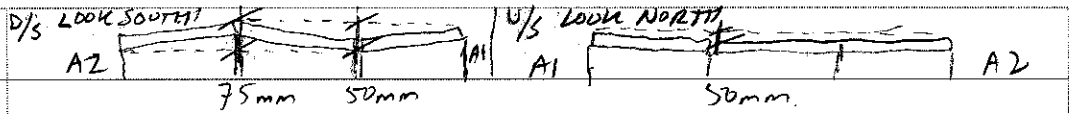
File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks

Photo 7 Looking east along south side.

Post Flood Bridge Inspection Form

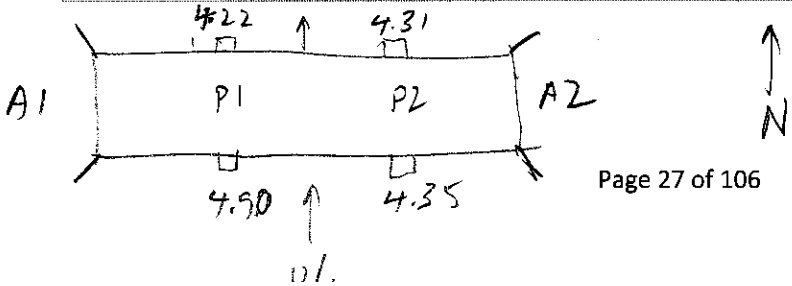
Bridge File Number	01308-1	**Inspector Name**	J. RUSD
Location Description	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEW	**Assistant Name**	
		Inspection Date	15-JUNE-2013

Legal Land Location	SE SEC 14 TWP 17 RGE 2 W5M
Longitude; Latitude	-114.165077;50.430037
Unique Span Types	HC

Approach Road	HIGHWATER OVERTOPPED WEST APPROACH ROAD. EROSION VISIBLE AT NORTH SHOULDER
Approach Guardrail	16 GUARDRAIL POSTS AT NORTHWEST HAVE BEEN UNDERMINED BUT ALL POSTS AND GUARDRAIL ARE STILL IN PLACE ↳ NOT FUNCTIONAL
Approach Embankment	EMBANKMENT GRANULAR FILL AROUND 16 POST AT NORTHWEST HAS BEEN WASHED DOWNSLOPE 4 METERS - REPLACE AND RE-TAMP AROUND POSTS
Vertical Alignment	
Horizontal Alignment	SPAN ONE SHIFTED 30mm SOUTH OVER PIER ONE

Superstructure General AMOUNT	SOME INSTABILITY NOTED, UNCERTAIN IF FROM RECENT FLOODS. OF ACCUMULATION OF DRIFT ON BRIDGE INDICATES WATER FLOWED OVER THE DECK FROM EITHER RIVER CHANNEL FLOW OR WEST APPROACH DRAINAGE/OVERLAND FLOW.

Abutment Backwall	NO VISIBLE FLOOD DAMAGE
Abutment Wingwall	NO VISIBLE FLOOD DAMAGE
Abutment Piles	NO VISIBLE FLOOD DAMAGE
Abutment Stability	EAST ABUTMENT CAPS SLIGHTLY ROTATED TOWARDS BACKWALL - O.K. - NO VISIBLE FLOOD DAMAGE
Abutment Scour/Erosion	BOTH ABUTMENT HEADSLOPES + SCOUR PROTECTION WASHED AWAY 75% AT WEST, 90% AT EAST
Pier Piles	4 PIER PILES NOT ALIGNED OR PLUMB IN ONE PLANE. PIER PILES APPEAR TO BE IN GOOD CONDITION.
Pier Stability	NO VISIBLE FLOOD DAMAGE
Pier Scour/Erosion	PIER SCOUR HEIGHTS: 4.22m AT N.W. PIER, 4.31 AT N.E PIER 4.90m AT S.W. PIER, 4.35 AT S.E. PIER
Pier Bracing/Struts/ Sheathing	NO VISIBLE FLOOD DAMAGE



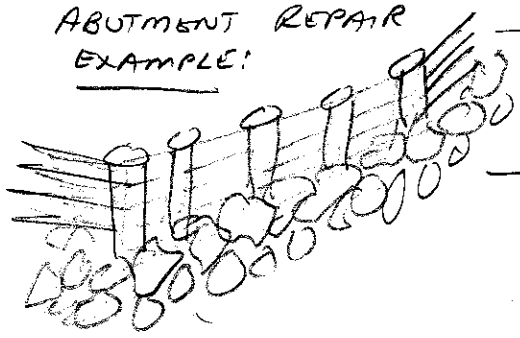
Post Flood Bridge Inspection Form

Bridge File Number	01308-1	**Inspector Name**	J. RUSU
Location Description	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEW	**Assistant Name**	
		Inspection Date	15-JUNE 2013

Legal Land Location	SE SEC 14 TWP 17 RGE 2 W5M
Longitude; Latitude	-114.165077;50.430037
Unique Span Types	HC

Channel Alignment	GOOD - NO VISIBLE FLOOD DAMAGE
High Water Mark TO	TOP OF CURB - DEBRIS ON S.W. FENCING AND PACKED IN DECK DRAINS
Bank Stability	VERTICAL BANKS 50m D/S - MINOR
Drift/Debris	DEBRIS FIELD AT S.W. FLOOD PLAIN. DRIFT ON PIERS
Slope Protection	ALMOST ALL SCOUR PROTECTION AT HEADSLOPES AND U/S OF BRIDGE IS DISPLACED D/S.
Guidebank/Spurs	NONE / N/A
Drainage	HIGHWATER SPILLED BANKS AND WASHED OVER WEST APPROACH ROAD AND ONTO BRIDGE.
Adequacy of Opening	ADEQUACY IMPROVED SINCE HEADSLOPES HAVE WASHED OUT - APPEARS TO STILL BE UNDERSIZED FOR RECENT FLOWS. LOCAL RESIDENTS REPORT CROSSING CLOSURE DURING FLOODS.
Other Item	
Other Item	
Other Item	
General Comment	ABOTMENT REPAIRS! - LOWER BACKWALL SHEATHING TO STREAMBED (IF NOT ALREADY IN PLACE) - PLACE 50m³ CLASS 3 RIP RAP AT FOOT OF ABUTMENTS AND WRAP AROUND U/S / D/S WING WALLS

ABOTMENT REPAIR EXAMPLE:



→ LOWER BACKWALL SHEATHING.

→ 50m³ CLASS 3 RIP RAP

File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview

Photo 1
Every deck drain plugged with tightly packed debris.

Photo 2
From NW abutment looking east showing north (D/S) girder line vertical misalignment. Approx. 75mm between span 2 and 3 and 50mm between Sp. 1 and 2.

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Photo 3
From U/S looking north (D/S) at bridge. Note vertical misalignment between spans 2 and 3.

Photo 4
From U/S SE bank looking NW at U/S girder fascia . Vertical misalignment seen at this angle also.

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Photo 5
Washed out headslope at east abutment. Note slightly rotating abutment cap – 15mm. 50m^3 class 2 rock along the base of the back wall and wrapping around U/S and D/S wing walls is recommended.

Photo 6
Washed out headslope at west abutment. Requires rip rap.

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Date	July 14, 2013
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Photo 7
Looking northeast showing drift elevation relative to bridge deck elevation and west approach road.

Photo 8
Looking east at NW approach guardrail post erosion from SW overflow.

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Photo 9
30mm horizontal misalignment between span 1 and 2.