Appendix A
Stakeholder Issues Map ID Table

Stakeholder Identified Flood Risk Summary Table

Table A-1 summarizes stakeholder identified issues and specifies the flood risk for each issue. The map ID in column one corresponds to "Stakeholder Identified Historical Flood Issues" figures found in Figures 5-1-1 to 5-10-1 and can be found at the end of each sub-section in Sections 5, for the respective municipality. These flood risks were identified during the stakeholder meeting.

Table A-1: Stakeholder Consultation Flood Risk Summary

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
1	-	MD of Smoky River No. 130	-	Little Smokey Bridge	Low risk	High water at bridge.
2	-	MD of Smoky River No. 130	-	Gravel Pit	Low risk	Was flooded 1 week, no impacts to access.
3	-	MD of Smoky River No. 130	-	River banks flooded	Low risk	-
4	-	MD of Smoky River No. 130	-	River banks flooded	Low risk	-
5	-	MD of Smoky River No. 130	-	Flood area	Low risk	Floods annually due to overtopping of east-west canal. Railway track on south extents of flood area is at a high elevation and acts as a barrier. Building or developing the area is prohibited.
6	-	MD of Smoky River No. 130	-	Water reservoir	No risk	Water from Smoky River intake is pumped to reservoir, and then pumped to Town of Falher WTP. Water reservoir has 18 months storage capacity. No service interruption to the Town of Falher has occurred.
7	-	MD of Smoky River No. 130	-	River water intake at Smoky River	Moderate risk	Smoky River Intake was installed in 2006. Intake damage due log jams, siltation due to high flows from flood flow path. Pumps, gates, and piping are present. Intake needs to be cleaned out annually. Spring snowmelt and heavy rains occurs annually and cause flooding. If a heavy rainfall occurs in the Town of Grande Cache then intake is also affected. Intake cleaned out annually since install. Water is pumped to a water reservoir located northeast of the intake where water is pumped to WTP located in the Town of Falher.
8	-	MD of Smoky River No. 130	-	Flood Area River Intake at Smoky River	Low risk	Area floods from creek to east coming into the Smoky River due to snowmelt runoff.
9	-	MD of Smoky River No. 130	-	Flood Area	Low risk	Area floods due to snowmelt runoff from creek to east coming into the Smoky River.
10	-	MD of Smoky River No. 130	-	Slims Creek Bridge	Moderate risk	Flooded in April 2007, June 2011, and April 2013. Water backs up on south bank; a stream monitoring station is located here as well. The bridge deck came down on April 1st 2007.
11	-	MD of Smoky River No. 130	-	Doran Bridge	Moderate risk	Flooded in April 2007, June 2011, and April 2013. Bridge with piers. Bridge is designed for approx. 1:50 year. Bridge deck came down. South of the bridge overtops and $65,000 was spent on repairs to bridge pier piles and road.
12	-	MD of Smoky River No. 130	-	Peavine Creek	Info	Flows northeast.
13	-	MD of Smoky River No. 130	-	Hunting Creek	Info	
14	-	MD of Smoky River No. 130	-	Bridge culvert	Moderate risk	Water backs up and floods area to north during a large flood in 2013. Damage to farm and grain handling structures. A dyke was built around the farm and grain handling structures to mitigate future flooding. This location floods annually.
15	-	MD of Smoky River No. 130	-	Bridge culvert	Low risk	Bridge culvert is designed for 1:100 year event.
16	-	MD of Smoky River No. 130	-	Bridge culvert	Low risk	Bridge culverts are a bottleneck for flood flow and water backs up and flooding occurs.
17	-	MD of Smoky River No. 130	-	Flood Area	Low risk	Area floods due to water back up at surrounding flood flow bottleneck locations and from a bridge culvert flooding at Peavine Creek.
18	-	MD of Smoky River No. 130	-	Flood plain (approximate)	Low risk	Designated floodplain for approx. a half mile perpendicular outward from the creek. Building homes is prohibited. Flooding occurs due to a combination of rain and snowmelt or both concurrently. Flooding occurs annually in spring (April). Floodplain studies available from G-Pek and AE. Peavine Creek and Gervais drainage project (ditch) flows into this location as well.
19	-	MD of Smoky River No. 130	-	Winnagami Lake	Info	
20	-	MD of Smoky River No. 130	-	Township Road 790 drainage	Info	Drainage project receives drainage from south of Township Road 790.
21	-	Hamlet of Guy	-	Chaibos drainage project	Low risk	Contributes to flood flow path towards Guy.
22	-	Hamlet of Guy	-	Flooding	Low risk	Water flooded out from Chaibos drainage project and into Guy. Flooding at Wolf Honey causing damage. Manholes and lift stations flooded. Flooding lasted one hour.
23	-	Village of Donnelly	-	Culvert	Moderate risk	Ice blockage at culvert caused water to overflow and water flowed southwest below the water reservoirs, then west along the railway tracks, then south over the road into the Village. Homes flooded in two blocks damaging 15 homes, flooding main floors or basements and village office.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
24	-	Village of Donnelly	-	Village of Donnelly - Two Blocks Flooded	Moderate risk	Two blocks flooded in 2007. 15 homes damaged, flooding main floors or basements and village office.
25	-	Town of Falher	-	Water Reservoir	Low risk	Water reservoir is recharged from the Little Smoky River which is pumped from an intake on Little Smoky River.
26	-	Town of Falher	-	WTP	Low risk	Services Village of Donnelly, Village of Girouxville, and Town of Falher. WTP also services a few acreages and farms. Water coop has 300 members; Jean Cote and Guy are also serviced by WTP. WTP belongs to water commission.
27	-	Town of Falher	-	WWTP	No risk	Discharges southeast to Peavine Creek only in October.
28	-	Town of Falher	-	Ditch back up	High risk	Ditch receives flows from stormwater network from the Town and backs up contributing to flooding in the Town in June 2011 and August 2013.
29	-	Town of Falher	-	Storm network tie ins	High risk	Storm system ties in along ditch that runs north to south with several tie ins.
30	-	Town of Falher	-	Town of Falher - Flooding	High risk	June 24 2011, 44 homes affected, basement flooding. Event in August 2013 affecting 19 homes (9 cm or 3.5 inch) of rain in an hour. Basement flooding and lift station over capacity. Flooding due to surcharging of storm network due to heavy rainfall, no snowmelt, flows from storm network, canal and ditch back up, and drainage projects contributed as well.
31	-	Village of Girouxville	-	Control weir	Info	Weir was installed (approx.) in the spring of 2003. Weir may recharge the water reservoirs when the water level upstream in the canal rises above the weir and discharges in the water reservoirs. Canal previously was the main water supply, now functioning mainly for drainage.
32	-	Village of Girouxville	-	Home flooded	Low risk	August 2013 heavy rainfall caused the ditch to back up and flood one home.
33	-	Village of Girouxville	-	Village of Girouxville - Flooded Area	Moderate risk	Homes flooded in April/May of 2003 due spring snowmelt runoff (no rain). Flood waters flow from the northeast into the ditch along the railway track. 6 basements of home basements flooded. No weir in place at time of flood.
34	-	Birch Hills County	-	Culverts - road slumping	Low risk	Alberta Transportation owns the culverts. Slumping has occurred on Highway 733 and is an ongoing issue due to spring runoff.
35	-	Birch Hills County	-	Saddle (Burnt) River Bridge Crossing	Low risk	Bridge removed in 2009 and replaced with a low level crossing. Abutments scoured and moved due to erosion due to spring runoff. Saddle (Burnt) River low level crossing.
36	-	Birch Hills County	-	Water reservoir	No risk	Partially recharged from a drainage project (ditch) to the southwest.
37	-	Birch Hills County	-	Erosion Branches	Low risk	Many banks of the branches of the main stream incur erosion due to rain and snowmelt. Homes not close to erosion and not impacted.
38	-	Hamlet of Watino	-	WWTP	No risk	Located at a high elevation and not at risk of flood. Residences on piped sewer systems. Evaporation reservoir only. Pressure sewers. Pumps are residents owned each home with a pump. Cistern collects waster, when full, sewage then pumped to WWTP.
39	-	Hamlet of Watino	-	No ice jams	No risk	Ice jams to not occur at bridge.
40	-	Hamlet of Watino	-	New Bridge	Info	
41	-	Hamlet of Watino	-	Flooded Area	Low risk	Flooded in May 2011 due to snowmelt.
42	-	Hamlet of Watino	-	Annual Flood Area	Low risk	Annual flooding due to spring snowmelt.
43	-	Hamlet of Watino	-	Flooded Area	Low risk	Area flooded in May 2011 due to snowmelt.
44	-	Hamlet of Watino	-	Flood Zone	High risk	Considered in flood zone due to rain. Runoff and snowmelt in 2011/2013 caused high water level and flow in river. New bridge built parallel to old but not the reason for sloughed banks, only due to rain/snowmelt. Flood plain mapping available.
45	-	Hamlet of Watino	-	River Bank Erosion	High risk	Erosion and flooding due to snowmelt occurs annually every spring, with a large event in 2011. There are mostly summer cottages and holiday trailers. All 12 residences were evacuated in May 2011 but no homes were damaged. Water did not overtop river banks but were eroded. Total erosion has occurred and banks have reduced from approx. 45 degree to a vertical face.
46	-	Hamlet of Eaglesham	-	WTP	No risk	Services potable water to Hamlet of Eaglsham, Wanham, and Tangent. Collects surface water from spring runoff at Fox Creek. Fox Creek is an intermittent creek where water only flows during spring melt located at approx. Range Road 12, SW 21-78-26-5
47	-	MD of Spirit River No. 133	-	Prestville Drainage Bridge Culvert	Low risk	Prestville Drainage Bridge Culvert (bridge file #72707). Heavy rainfall flooded Highway 49 in approx. 1989/1990. Highway 49 was partially submerged, but drivable at some locations. Other locations were very deep and could not be accessed. Road was out of service for 4 days. Water backs up and floods to the south of the highway.
48	-	MD of Spirit River No. 133	-	Water Supply Watershed	Info	Watershed supplies raw water the Town of Spirit River WTP.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
49	-	MD of Spirit River No. 133	-	Dunvegan Creek	Info	
50	-	MD of Spirit River No. 133	-	Flow Monitoring Station	Info	Located approx. 200 m south of intersection of Township Road 61 and Range Road 62. Measures discharge in the Spirit River.
51	-	MD of Spirit River No. 133	-	Flow Monitoring Station	Info	Installed in the 1970s, measuring ditch flow. Discharge due to runoff from a flat area west of the monitoring station that drains into the Saddle (Burnt) River.
52	-	MD of Spirit River No. 133	-	Low Level crossing	High risk	Low Level Crossing (Highway 45) (bridge file #78824). Cement structure with pipes. Requires annual maintenance during spring snowmelt due to ice jams and trees that block the upstream pipe intakes. The low level crossing was reported to be situated at an elevation too great to function properly as a low level crossing. Flooding and damages occurred during March 2014 snowmelt. Ice jams upstream blocked the pipes, the large ice blocks were pushed up and over the road/bridge deck by the water that flowed toward the low level crossing. The large ice blocks landed and damaged the downstream end of the cemented pipes. Road was out of service for 7 days; people were detoured but only inconvenienced. Valley upstream of low level crossing flooded approx. 6 to 9 m (20 – 30 ft.) above the road deck on the low level crossing and approx. 12 m (40 ft.) above the river bed. There is another structure approx. 29 km (18 miles) upstream that is larger than the low level crossing.
53	-	MD of Spirit River No. 133	-	Bailey Creek (local name)	Low risk	Does not flow, just overflows the bank from runoff from the southwest.
54	-	MD of Spirit River No. 133	-	Erosion	Low risk	Erosion at on steep slope towards northeast. Erosion occurs due to fast flowing snowmelt runoff (0.90 to 1.2 m or 3-4 ft. deep) annually on a steep section of land located approx. 4 km west of the Town of Spirit River. The elevation drop is approx. 24 m (80 ft.) to the south.
55	-	MD of Spirit River No. 133	-	flooding spirit river valley	Low risk	Spirit River Valley is farmland located north of the Town of Spirit River which floods annually due to spring snowmelt or heavy rain. Road ditches and culverts fill up and roads flood approx. 31 m (100 ft.) on each side.
56	-	MD of Spirit River No. 133	-	Water Reservoir	Low risk	Water is collected from the watershed directly west of the reservoir and is pumped to the WTP at the Town of Spirit River. The reservoir has 3 years of water storage capacity. The reservoir supplies the Town of Spirit River and the Village of Rycroft. First priority to pump and service water is to the Village of Rycroft, second priority is the Town of Spirit River. In 1980 and 2000 (approx.) there was a drought. The water reservoir was not recharged (or small amount of recharge) for approx. 3 years. The Town of Spirit River had to ration water. The Village of Rycroft had enough water because they have a lower water demand than the Town of Spirit River.
57	-	MD of Spirit River No. 133	-	Saddle (Burnt) River Bridge Crossing	Low risk	On June 24, 2013, the high water level caused the river to change direction.
58	-	MD of Spirit River No. 133	-	Relatively flat flooded area	Low risk	Creeks fill up and lands are flooded from rain. Overland flooding occurs from rainfall only. Farmlands are flooded.
59	-	MD of Spirit River No. 133	-	Home flooded	Low risk	One home and garage was flooded due to overland flow from snowmelt due to the deposition of large dirt hills for construction purposes. These dirt hills changed the normal flow paths and caused flooding. When the dirt hills were used and removed, the home was no longer at risk of flooding (i.e. a one-time event). Any elevation changes in this large flat area can easily change flow paths and cause flooding in areas normally safe.
60	-	MD of Spirit River No. 133	-	Localized pockets of flooding in area	Low risk	A large flat area containing mainly farmlands and some rural homes is located in the northeast corner of the MD and is bordered by the Peace River, the Spirit River, Dunvegan Creek, and the east MD border. The area experiences localized pockets of flooding annually due to snowmelt, saturated soil, and rainfall. One home and garage was flooded due to overland flow from snowmelt and due to the deposition of large dirt hills for construction purposes. These dirt hills changed the normal flow paths and caused flooding. When the dirt hills were used and removed, the home was no longer at risk of flooding (i.e. a one-time event). Any elevation changes in this large flat area can easily change flow paths and cause flooding in areas normally safe.
61	-	MD of Spirit River No. 133	-	Prestville Creek	Info	
62	-	MD of Spirit River No. 133	-	Bremner Creek	Info	
63	-	MD of Spirit River No. 133	-	Rail Transload Facility	Low risk	Located in flood area, potential for future flooding.
64	-	Town of Spirit River	-	Town of Spirit River - No flooding	No risk	No flooding because the Town of Spirit River is located at a high elevation on a hill. No flood risk.
65	-	Town of Spirit River	-	WWTP	No risk	No flood risk because the banks of the cells are built up 3.6 m (12 ft.) above the ground surrounding the cells. Cells discharge to Ksituan River, but that rarely is required.
66	-	Town of Spirit River	-	WTP	Low risk	Supplies potable water to Town of Spirit River.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
67	-	Village of Rycroft	-	Farmer's Home Flooded in 1990 once	Low risk	Flooded one home due to runoff from southwest to northeast.
68	-	Village of Rycroft	-	Ditch collects water from overland flow	Info	Runoff flows northeast towards the Village of Rycroft.
69	-	Village of Rycroft	-	Overland flow to Village of Rycroft	Info	Runoff flows north towards the Village of Rycroft from this area.
70	-	Village of Rycroft	-	Road sag overtop of culvert	Low risk	Road sag 6 cm.
71	-	Village of Rycroft	-	Erosion Upstream of Culvert	Low risk	
72	-	Village of Rycroft	-	General Flood issues along flow path	Low risk	Flood issues in 1990, 2011, and 2013. Runoff is collected from the south of the village and directed to the stormwater infrastructure that is routed through the village. Storm drainage infrastructure including ditches and culverts going through the village has capacity issues along 48 and 49 Street proceeding north to Highway 49. Culverts backed up, erosion upstream of culverts, sag on Township Road 781 overtop of culvert crossing. Culvert crossing on Highway 49 at Highway 2 is a downstream bottle neck. Back-ups and flooded area to south in 1990, during 2011 rainfall, and 2013 snow melt. Culvert has not been upgraded currently, and as a result approx. three homes flooded in 1990; 2013 some damage to businesses.
73	-	Village of Rycroft	-	Village of Rycroft - Flooded area	Moderate risk	1990, 2011, and 2013 flooding. Runoff is collected from the south of the village and directed to the stormwater infrastructure that is routed through the village. Storm drainage infrastructure including ditches and culverts going through the village has capacity issues along 48 and 49 Street proceeding north to Highway 49 Culverts back-up, erosion upstream of culverts, sag on Township Road 782 overtop of culvert crossing. Culvert crossing on highway 49 at Highway 2 is a downstream bottle neck. Back-ups and flooded area to south in 1990, during 2011 rainfall, and 2013 snow melt. Culvert has not been upgraded currently, and as a result approx. three homes flooded in 1990; 2013 some damage to businesses.
74	-	Village of Rycroft	-	Tear up curbs to allow more flow	Low risk	2013 spring runoff. Culverts backed up out to the highway ditch and flooded homes and properties (manufactured homes). County tore out curbs to enhance the flow of water for when near state of emergency
75	-	Village of Rycroft	-	River intake damage WTP	Low risk	June 30/July 1, 2011 rainfall, river intake located northwest of Rycroft at WTP damaged. Service close to, but not interrupted. In the interim, service was provided from the water reservoir which was sufficient. Sediment in river intake and debris collected against the weir. River intake required cleaning and was repaired, and grading was replaced. Lift station and pumps were damaged due to excessive run time due to stormwater exceeding capacity of pumps from rainfall runoff. Spring snow melt also contributes to strain on system.
76	-	Village of Rycroft	-	Sub Station Flood	Low risk	Power station located at southeast corner of the village is a voltage step down station and powers Rycroft, Spirit River, Woking, and Central Peace. Not at risk of flooding historically, except when farmer southwest of station constructed temporary snow ditches to convey runoff from farmland to storm system along Township Road 782. Approx. 20% of power station had 1 ft. of flood water. No flooding in last 10 years due to existing conditions.
77	-	Village of Rycroft	-	Culvert back up - bottle neck	Moderate risk	Culvert acts as a bottle neck and water backs-up and floods area to south.
78	-	Town of Peace River	-	Erosion - Shaftsbury Estates	Low risk	Erosion in backyards and lawns of homes at Shaftsbury Estates due to runoff flowing along properties towards the river.
79	-	Town of Peace River	-	Homes flooding	Moderate risk	At approx. 114 Avenue and 101 Street, some flooding in homes due to runoff from the slope to the east that drain runoff towards this area and the river.
80	-	Town of Peace River	-	Ice buildup release from Smoky River	Info	Ice jam and build up from Smoky River could release before the ice releases in the Peace River, causing a large build-up of ice at the confluence. When the Peace River ice build-up releases, a large release of ice makes it downstream to Peace River causing flood issues.
81	-	Town of Peace River	-	Primary WTP	No risk	Located at a high elevation, no flooding issues.
82	-	Town of Peace River	-	Lower West Peace - Flooding	High risk	Sand seams run through Lower West Peace area. Existing water table is high and is raised if water level in the river is high; water table level exceeding EL. 315/316.5 or 317 m approx. will cause flooding of homes. When BC Hydro releases more water from the upstream Bennet Dam towards the Town of Peace River, then high water table flooding becomes an issue. Mitigation: BC Hydro has installed 9 relief wells in a pilot study and will install 30 wells total. Typically, but not necessarily, north end of Lower West Peace floods first. Basements are not allowed to be built in Lower West Peace. Basements flood due to high water table when water level is high in Peace River. Flooding typically occurs in the spring or when BC Hydro releases more water from the upstream Bennet Dam than usual.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
83	-	Town of Peace River	-	Railway drainage	High risk	Drainage from the railway to the west has caused properties on hill to move due to high water content in the soil and soil saturation. Issues with main sewer line on side of hill. Pipes need to be relocated and hill is moving. Water moves downhill and is eroding the hill.
84	-	Town of Peace River	-	Flood risk area	High risk	Flood risk area directly south of Hart Bridge.
85	-	Town of Peace River	-	Erosion	Low risk	Erosion on steep road side slopes due to rainfall and snowmelt runoff.
86	-	Town of Peace River	-	Town of Peace River	High risk	Downtown area at risk of flood.
87	-	Town of Peace River	-	Pats Creek Intake - Flooding	High risk	Pat's Creek intake and pipe which runs under Highway 2 then runs under the town to the river outfall. The outfall is located approx. at the river bank at 99 Avenue and 100 Avenue. Pat's Creek intake flooded twice in 2013. In early April 2013, partial collapse of pipe with lots of debris at the intake. June 2013 flood due to snowmelt and rainfall. April 2014 flood due to snowmelt and rainfall. Back up of water at the intake results in overland flooding over Highway 744 into the Town. The flood water is held in place by dykes. There is pipe deterioration and collapsing of the pipe combined with a potential ice blockage in the pipe. This causes the need to have storm sewers closed because of the high water and then back-up. The storm sewer is closed when flooding occurs and the downtown core is flooded by rainfall runoff and snowmelt. Ice blockage has occurred at intake. Trash rack on Pat's Creek requires upgrade because of excess of trash in 2013 when beaver dam at upper end let go.
88	-	Town of Peace River	-	Flood area	High risk	Basements back-up and overland flooding in this area on the east side of the river directly south of the WWTP. Sewage is pumped directly into river when necessary to prevent back up in homes.
89	-	Town of Peace River	-	WWTP	High risk	Clarifiers and other tanks could lift up when empty due to high water table causing upward water pressures. Lift station capacity issues when water infiltrates the lift station due to high water table. Issues occurred in 1992 & 1997 because of sewer back-up due to lift station capacity issues which is an annual concern and happens every time it floods. Crews must tend to the lift station, bringing in temporary pumps. Sewage was pumped from lift station directly over dykes into Peace River during 2013 and 2014 flood events.
90	-	Town of Peace River	-	Lift Station	Info	Improvements planned for lift station.
91	-	Saddle Hills County No.20	-	Erosion - Gabion Baskets on side slopes road	Low risk	Erosion protection (Gabion Baskets) installed along the side slopes of Highway 719 north of Henderson Creek to slow runoff in ditch towards bridge crossing at Henderson Creek. Scour around Gabion Baskets, some repaired, not all. No impact on traffic flow.
92	-	Saddle Hills County No.20	-	Culverts damaged	Low risk	2011 rainfall event: HWY 2 northeast of Braeburn, road closure two days. Two separate storms, first storm caused major damage to culvert. Second storm two weeks later caused highway to be overtopped. Culvert was repaired, no road damage.
93	-	Saddle Hills County No.20	-	Culverts damaged	Low risk	
94	-	Saddle Hills County No.20	-	Scour River Bank	Low risk	2011 June 30/July 1 rainfall: north bank of Saddle/Burnt River overflowed and damaged fairway of Chinook Valley Golf Course. Had to recreate two to three holes. Scoured river bank located approx. northeast of Highway 731 and 677 intersection.
95	-	Saddle Hills County No.20	-	Bridge Pipe	Low risk	2011 rainfall (first storm) washed out bridge pipe at Range Road 80 crossing Saddle/Burnt River which washed out twice prior to 2000. Large diameter culvert replaced with low level crossing, two or three smaller culverts encased and topped with concrete, concrete approach, and concrete outflow pad.
96	-	Saddle Hills County No.20	-	Bridge Pipe Washed out	Moderate risk	2011 June 30/July 1 rainfall: bridge pipe washed out at Economy Creek. Road was out for three years with local traffic detour increasing commuting time. Agricultural traffic was significantly inconvenienced. Bridge pipe replaced September 2014.
97	-	Saddle Hills County No.20	-	Bonanza Store Flooding	Moderate risk	Bonanza (informal community experienced flooding during 2011 rainfall and Easter 2003 spring snowmelt. Flooding occurs on several occasions annually. Bonanza store basement flooded but no other residents were affected by flood. Highway ditch on Highway 719 overflows and causes flooding. Overland flooding from the southeast. Possible solutions looked into include collecting runoff in reservoir and/or routing the runoff away.
98	-	Saddle Hills County No.20	-	Erosion - Road Side Slopes	Low risk	2011 June 30/July 1 rainfall: Poucecoupe River Township Road 134 crossing, erosion/scour issues along road slope. Mostly grassed areas but at erosion locations there are very steep slopes causing high velocity runoff which cause scour. Slopes were repaired to prevent road from being compromised. No road closures.
99	-	Saddle Hills County No.20	-	Erosion - Road Side Slopes	Low risk	2011 June 30/July 1 rainfall: Doe Creek Crossing located approx. 7 km east of Doe River. The side slopes are not grassed and are very steep. The side slopes incurred scour/erosion approx. 2.4 km (1.5 miles) of highway each way from crossing.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
100	-	Saddle Hills County No.20	-	Erosion - Gabion Baskets on side slopes road	Low risk	Erosion protection (Gabion Baskets) installed along the side slopes of Highway 719 north of Henderson Creek to slow runoff in ditch towards bridge crossing at Henderson Creek. Scour around Gabion Baskets, some repaired, not all. No impact on traffic flow.
101	-	Saddle Hills County No.20	-	Culverts Crossing - road washed out	Low risk	2011 June 30/July 1 rainfall: two storms two weeks apart, culvert crossing Highway 49 approx. 500 m west of Highway 719. Culvert was washed out completely from water up to one meter deep. Highway 49 completely dropped through culvert on east bound lane. Hole was filled with gravel initially but two weeks later an entire cross section of Highway 49 washed out. Road construction for a couple of months with only one lane traffic available. A detour was also in effect, with minor impact to through traffic and residents, as well as one day of service interruption.
102	-	Saddle Hills County No.20	-	Hamlin Creek Bridge	Low risk	2011 June 30/July 1 rainfall: Hamlin Creek Bridge approx. 14 km southeast of Silver Valley at Silver Valley Road, bridge pier scour due to high flow in creek due to rainfall, bridge may require replacement.
103	-	Saddle Hills County No.20	-	Josephine Crossing abandoned	High risk	2011 June 30/July 1 rainfall: Josephine Crossing at Hamlin Creek was washed out due to steep side slopes. Repairs are annual. Too costly to repair for four residences that are impacted therefore repairs are halted and crossing abandoned. No further mitigation planned. Means an additional 48 km (30 miles) detour for the four residents.
104	-	Saddle Hills County No.20	-	Henderson Creek	Info	
105	-	Hamlet of Woking	-	High Elevation	Info	
106	-	Hamlet of Woking	-	Hamlet of Woking - Community Hall flooded	Low risk	In 2009: railway along east side of town had undersized culverts, ditch backed up and flooded the community hall located south/southwest of railway. Approx. 0.15 m (6 inches) standing water on floor, no other property damage in town from 2009 flood.
107	-	Hamlet of Woking	-	Culver Railway Crossing Issues	Low risk	In 2009: railway along east side of town had undersized culverts; ditch backed up and flooded the community hall. Culvert crossings under railway were upsized, then in 2011 due to rainfall and spring snowmelt, runoff did not back up anymore and could reach the lift station much faster and is located southeast at approx. Highway 677 and First Avenue. Lift station filled up and was not able to convey sewage, residents not able to use sewer/flush for 6 hours, no basement back up, most houses have back flow prevention valves, no sewage back up occurred.
108	-	Hamlet of Woking	-	Culvert Railway Crossings Issues	Low risk	
109	-	Hamlet of Woking	-	Lift station flooded	Low risk	Lift station filled up and was not able to convey sewage, residents not able to use sewer/flush for 6 hours, no basement back up, most houses have back flow prevention valves, no sewage back up occurred.
110	-	County of Grande Prairie No.1	-	Large ditch to river in south	Low risk	Large ditch starting at south end of lake traveling south to Highway 43, then proceeds east along Highway 43, then proceeds south and connects to Wapiti River. Large area west and east side of ditch slopes towards ditch and drains into ditch. Erosion issues due to rainfall and snowmelt in this area. Ditch is identified as a very large body of water—a major waterway as it collects all water from area—erosion is significant along the corridor.
111	-	County of Grande Prairie No.1	-	High water table - flooding	Low risk	High water table in area south of City of Grande Prairie between Beaverlodge and Bezanson but below City of Grande Prairie, with a southern border of County of Grande Prairie No.1. Flooding occurs in this region caused by rainfall, snowmelt and the high water table annually. Minor impacts from flooding in this area, mostly infrastructure.
112	-	County of Grande Prairie No.1	-	Flooding around Bear Lake	Moderate risk	Area around Bear Lake floods as the lake expands—flat terrain – Hutterite colony to the south and farmland is impacted north, small subdivision as well.
113	-	County of Grande Prairie No.1	-	Wapiti River Bridge Closure	Low risk	Wapiti River Bridge closure – 1988, 1997, 2011 Heavy rainfall. Closure due to flooding.
114	-	City of Grande Prairie	-	Home almost flooded	Low risk	Flooding from 2007 snowmelt and 2011 rainfall from Bear River. A resident located to the south of the golf course erected a berm and was not affected.
115	-	City of Grande Prairie	-	Road floods usually every spring	Low risk	Township Road 720 road crossing Bear River floods annually in the spring for approx. a week. Residents can take detour, inconvenience only.
116	-	City of Grande Prairie	-	Ditch back up and flood roads	Low risk	A ditch backs up and road flooding occurs at approx. 83 Avenue and Resource Road (Range Road 60). Issue solved, in 2007 channel was upgraded, no more back up.
117	-	City of Grande Prairie	-	Stormwater Ponds Added	Info	Stormwater ponds added to alleviate ditch flooding
118	-	City of Grande Prairie	-	Trailer Camp Flooding	Low risk	Trailer camp area located east of Highway 40 and directly north of College Park. Flooding occurs annually due to snowmelt. Two or three camp stalls come close to flooding.
119	-	City of Grande Prairie	-	Stormwater ditch - high water level	Low risk	Ditch runs east-west starting at 89 Avenue and 108 Street proceeding through Canfor Industrial connecting to a creek to the east of the industrial site. Ditch water level high, but no flooding occurs.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
120	-	City of Grande Prairie	-	Flooding of Golf Course Hole 16	Low risk	Golf Course (Bear Creek) located northwest of City of Grande Prairie floods every spring (Hole 16).
121	-	City of Grande Prairie	-	City of Grande Prairie - Minor Flooding	Low risk	City of Grande Prairie storm system designed for two or five year return period. Any rainfall event over a two to five year return period could flood road network. Experienced minor flooding of creek due to rainfall and snowmelt.
122	-	City of Grande Prairie	-	Erosion at Creek Area	Low risk	North end of city has creek running through – flooding is usually contained but some erosion problems around 116 Street.
123	-	Town of Sexsmith	-	106 Street Annual Flooding	Moderate risk	Along 106 Street (north-south) annual spring snowmelt flooding if more than 0.9 m (3 ft.) of snow, road closure at least for one week, repair road and re-gravel $5,000-$10,000 cost annually.
124	-	Town of Sexsmith	-	Flood Area	Moderate risk	100 year flood event in July 2011 caused back up through creek system towards the north end of Town starting from the south end of Town, then flooded southeast portion of Town as well, concerned that that rail line may overtop or flood (CN brought in pumps), area experiences annual flooding. Also flooded in 2007 rainfall event.
125	-	Town of Sexsmith	-	Annual Flood Area	High risk	100 year flood event in July 2011: Northeast residences flooding, approx. 30 homes due to rainfall and snowmelt, flat area, difficult to remove water, annual flooding due to spring snowmelt
126	-	Town of Sexsmith	-	Flood Area	Low risk	2007/2011 flooding around 100 Street in the south end of Town, 2.4 m (8ft) deep flooding, 2 gas wells flooded but not damaged, removed and replaced culverts.
127	-	Town of Sexsmith	-	Town of Sexsmith - Flooding due to Town Creek	Moderate risk	100 year flood event in July 2011 caused back up through creek system towards the north end of Town starting from the south end of Town, then flooded southeast portion of Town as well, concerned that that rail line may overtop or flood (CN brought in pumps). Also flooded in 2007 rainfall event.
128	-	Town of Sexsmith	-	Culverts Crossing Road Replaced	Low risk	Removed and replaced culverts in southeast area of town, three days no road access due to rainfall in 2007/2011 where culverts were removed and replaced.
129	-	Town of Sexsmith	-	Town Creek	Info	Creek in town is 0.1% slope and runs through towns.
130	-	Hamlet of Clairmont	-	Commercial and Industrial Minor Flooding	Low risk	Insignificant flooding in industrial and commercial area of Clairmont located southwest of Clairmont Lake. Some ditch flooding.
131	-	Hamlet of Clairmont	-	Hamlet of Clairmont	Low risk	Historical flood issues; rainfall 2007 and July 2011; Town applied for disaster relief in both years. Creek overland flooding in spring, catchment issues – 5 times in last ten years – 100 year floods and run off from County.
132	-	Hamlet of Clairmont	-	Flooded Farmland Area	Low risk	Annual issues; stormwater ponds fill and drain into the lake; when lake fills, it drains through a ditch south of the highway, with 0.6 to 0.9 m (2 to 3 ft.) of water on agricultural lands; water may remain for weeks, farmers may not get onto land until July (land is at same elevation as lake).
133	-	Hamlet of Clairmont	-	Flat Ditch	Info	When lake fills, it drains through the ditch to south of the highway.
134	-	Hamlet of Clairmont	-	Annual Street Flooding	Low risk	Trailers west of Clairmont Lake – standing water, trailers not flooded, street/property flooding— soil saturation annually.
135	-	Hamlet of Clairmont	-	Annual Flooded Area	Low risk	Issues are: undersized culverts causing flooding in areas west of Clairmont Lake, some houses, mostly trailers, annual flooding, and minor flood impacts to residents. Standing water, trailers not flooded, street/property flooding.
136	-	Hamlet of Clairmont	-	Annual Flooded Area	Low risk	Fire Hall located west of Clairmont Lake, on high ground, does not flood, area surrounding Fire hall floods, roads not affected, annual flooding, no impact to residents.
137	-	Hamlet of Clairmont	-	Hamlet of Clairmont on Flat Area	Low risk	Flooding builds up from snowmelt and rainfall and spills outwards
138	-	MD of Greenview No.16	-	Residents Not Flooded	Low risk	
139	-	MD of Greenview No.16	-	Highway 223 Flooding - Culvert back up	Low risk	Culvert under Range Road 223 flooded from Spirit Creek. Overland flooding due to culvert backing up. No residents impacted. Livestock facilities flooded but no damage, livestock moved to higher ground. Washed gravel of road, gravel replaced, no road closure. Ditch flooded over north-south Range Road 223 (from Spirit Creek). Water flows through culvert under Range Road 223 to east and into New Fish Drainage System (a ditch going north)
140	-	MD of Greenview No.16	-	Bridge Pipe Flooding - West Montana Flats	Low risk	Bridge pipe backed up causing minor overland flooding in the area. No road overtopping. Cleaned out debris from upstream pipe.
141	-	MD of Greenview No.16	-	Mackie Flats Pit Road	Low risk	Water from river flooded and backed up Range Road 11 towards the north up to where road curves left, and then flooded west wards.
142	-	MD of Greenview No.16	-	Bridge Pipe TWP 670 West	Low risk	In July 2011, bridge pipe Township Road 670 West (west of highway). A beaver dam that broke upstream caused debris including logs to block the upstream pipe, caused water to back up, but did not flood road.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
143	-	MD of Greenview No.16	-	Dead Horse Creek North Bridge Pipe Flooding	Low risk	In July 2011, bridge crossing on Range Road 220 over Dead Horse Creek. Minor repairs to abutments. Road/bridge closure 2 days.
144	-	MD of Greenview No.16	-	Dead Horse Creek Bridge Flooding	Low risk	In July 2011, bridge crossing on Township Road 725 over Dead Horse Creek flooded. No damages. Road/bridge closure 2 days.
145	-	MD of Greenview No.16	-	Barrick Energy Road Bridge Flooding	Low risk	In July 2011, Bridge flooded from Little Smoky River Oxbow located directly east of Township Road 683. No damage to bridge.
146	-	MD of Greenview No.16	-	Bridge on TWP 683 Shallow Flooding	Low risk	In July 2011, Bridge flooded on Township Road 683 from Asplen Creek. Shallow water on bridge. Bridge remained open and drivable. No damage to bridge.
147	-	MD of Greenview No.16	-	Waskahigan River Bridge Flooding	Low risk	In July 2011, Waskahigan River Bridge Highway 43. Bridge flooded, not damaged.
148	-	MD of Greenview No.16	-	Losegun Bridge - Overland Flooding	Low risk	In July 2011, Losegun Bridge over a tributary of Little Smokey River of river located northeast of Little Smoky. River flooded causing overland flooding in the surrounding area of the bridge. Bridge not flooded. Monitoring Station GOC not damaged but in standing water. No residents in the vicinity.
149	-	MD of Greenview No.16	-	TWP 680 Road Flooding	Low risk	Little Smoky River flooding overland. Road closed for 4 days. Three residences to the north of flood area impacted no exit for them. Residents used canoe to cross flooded road and used a vehicle on other side.
150	-	MD of Greenview No.16	-	Culvert TWP 710A Close to Overtopping	Low risk	Culvert crossing Township Road 710A road approx. 600m west of Highway 49 and Township Road 710A intersection. Road close to overtopping, but did not overtop. High downstream flow creating scouring hole. Scour hole was repaired. Culvert size approx. 1500 mm in diameter.
151	-	MD of Greenview No.16	-	Valleyview Golf Course Road Flooding	Low risk	Valleyview Golf Course Road flooding at Township Road 693. Road flooded from Little Smoky River overland flooding. Workshop flooded, but nearby residence not affected.
152	-	MD of Greenview No.16	-	Culvert Sagging On Road 263	Low risk	In July 2011. Culvert sagging causing the road side slopes to sag up to half way into the 1st driving lane on the east side only. 600 mm diameter culverts. Were replaced with 2 x 600 mm diameter culverts. New road took a month to repair. Road was not closed when damaged.
153	-	MD of Greenview No.16	-	Lift Station to WTP	Low risk	Lift station at Little Smokey River approx. 15 m (50 ft.) above river. Pump for lift station located at river level. Cleaned out once but approx. last 20 years no issues.
154	-	MD of Greenview No.16	-	Flood Area Mackie Flats	Low risk	Water from river flooded and backed up Highway 11 towards the north up to where road curves left, and then flooded west wards.
155	-	City of Grande Cache	-	City of Grande Cache	No risk	No flood risk. Located approx. 152 m (500 ft.) above the river. Only at risk from basement flooding from excessive rainfall and piped sewer system backups.
156	-	City of Grande Cache	-	Alberta Transportation Bridge	Low risk	AT bridge across Smoky River is at washout risk known to AT. The bridge is used primarily by industry such as oil/gas. A bridge washout would have minimal impact to Grande Cache. Bridge was washed out once in the 1970s.
157	-	City of Grande Cache	-	Historical Highway 40 Flooding	Low risk	Muskeg River flooding of Highway 40 in the 80s – late May rain and snow pack melt – nothing major since. Muskeg River Flooding (Location Unknown).
158	-	City of Grande Cache	-	Historical Highway 40 Flooding	Low risk	Flooding in 1970. Smoky River flooding, flooded Highway 40, late May rain and heavy snow pack melt. Smoky River Flooding (Location Unknown).
159	-	Town of Valleyview	-	Town of Valleyview	No risk	No flooding.
160	Dene Tha' First Nation	M.D. of MacKenzie No. 23	Amber River 211	-	No risk	Not inhabited.
161	Dene Tha' First Nation	M.D. of MacKenzie No. 23	Zama Lake 210	-	No risk	Not inhabited.
162	Sousa Creek, Dene Tha' First Nation	M.D. of MacKenzie No. 23	Hay Lake 209	-	Moderate risk	Sousa Creek (stream) overflowed its bank due to May 15, 2013 snowmelt and rain. Damaged stream gauges.
163	Sousa Creek, Dene Tha' First Nation	M.D. of MacKenzie No. 23	Hay Lake 209	-	Low risk	Started flooding here.
164	Sousa Creek, Dene Tha' First Nation	M.D. of MacKenzie No. 23	Hay Lake 209	Creek Flooding	Moderate risk	Flooded on either side of Sousa Creek stream banks.
165	Little Red Cree	I.D. 24	Garden Creek	River Bank Flooding	Low risk	Is isolated. River banks floods sporadic. Flooding in approx. 2005. Population of approx. 100 people.
166	Little Red Cree	M.D. of MacKenzie No. 23	Fox Lake 162	Flood preparedness	High risk	Population approx. 3000 people. Preparations to fly people out in case of flooding are in place. Water sources are private wells and cisterns.
167	Little Red Cree	M.D. of MacKenzie No. 23	John D'or Prairie 215	Annual flooding	Moderate risk	Floods annually. Grant approved for Tiger Dam. 2013 flood shut bridge down. Three homes flooded along river and residents were evacuated. Population of approx. 1000 people.
168	Little Red Cree	M.D. of MacKenzie No. 23	John D'or Prairie 215	Annual flooding	Moderate risk	Floods annually.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
169	Beaver	M.D. of MacKenzie No. 23	Boyer 164	-	No risk	No Flooding.
170	Tall Cree	M.D. of MacKenzie No. 23	Tall Cree 173	-	No risk	No flooding.
171	Tall Cree	M.D. of MacKenzie No. 23	Tall Cree 173A	-	No risk	No flooding.
172	Beaver	M.D. of MacKenzie No. 23	Beaver Ranch 163	-	No risk	Not inhabited.
173	Beaver	M.D. of MacKenzie No. 23	Child Lake 164A (Eleske)	-	No risk	No flooding.
174	Jackfish	M.D. of MacKenzie No. 23	Upper Hay River 212	-	No risk	Not inhabited.
175	Dene Tha' First Nation	M.D. of MacKenzie No. 23	Bistcho Lake 213	-	No risk	Not inhabited.
176	Dene Tha' First Nation	M.D. of MacKenzie No. 23	Jackfish Point 214	-	No risk	Not inhabited.
177	Smith's Landing	I.D. 24	Fitzgerald, Thebathi	-	No risk	No flooding. Population of approx. 20 people.
178	Smith's Landing	I.D. 24	Thabachanare 196A	-	No risk	No flooding. Population of approx. 500 people
179	Mikisew Cree First Nation	I.D. 24	Peace Point 222	-	No risk	Not inhabited.
180	Horse Lake	County of Grande Prairie No. 1	Horse Lake 152B	-	No risk	No flooding.
181	Loon River Cree	M.D. of East Peace No. 131	Loon Prairie 237	-	No risk	Not inhabited.
182	Loon River Cree	M.D. of East Peace No. 131	Loon Lake 235	Water quality	No risk	Boiled water advisory. No flooding.
183	Trout Lake	M.D. of Opportunity No. 17	Trout Lake	-	No risk	Peerless and Trout Lake have a population of total of approx. 1000 people. No flooding.
184	Peerless	M.D. of Opportunity No. 17	Peerless Lake	-	No risk	No flooding.
185	Duncans	M.D. of Peace No. 135	Duncans 151A	Flood potential	Low risk	Potentially flood concerns (not known at the time).
186	Woodland Cree	M.D. of East Peace No. 131	Woodland Cree 226 (Cadotte Lake)	-	No risk	No flooding. Located at a high elevation of approx. 91 to 122 m (300 to 400 ft.) above the river,. A total population of approx. 1000 people.
187	Lubicon	M.D. of East Peace No. 131	Little Buffalo	-	No risk	Lubicon, no flood issues that are aware of. Population of approx. 500 people.
188	Woodland Cree	M.D. of East Peace No. 131	Woodland Cree 226	-	No risk	No flooding. Located at a high elevation of approx. 91 to 122 m (300 to 400 ft.) above the river. A total population of approx. 1000 people.
189	Woodland Cree	M.D. of East Peace No. 131	Woodland Cree 228	-	No risk	Not inhabited.
190	Sturgeon Lake Cree Nation	M.D. of Greenview No. 16	Sturgeon Lake 154	-	No risk	No flooding.
191	Duncans	M.D. of East Peace No. 131	William McKenzie 151K	-	No risk	Not inhabited.
192	Big Stone Cree Nation	M.D. of Opportunity No. 17	Wabasca 166	-	No risk	Not inhabited.
193	Big Stone Cree Nation	M.D. of Opportunity No. 17	Wabasca 166C	-	No risk	No flooding.
194	Big Stone Cree Nation	M.D. of Opportunity No. 17	Wabasca 166B	-	No risk	No flooding.
195	Big Stone Cree Nation	M.D. of Opportunity No. 17	Wabasca 166D	-	No risk	No flooding.
196	Big Stone Cree Nation	M.D. of Opportunity No. 17	Wabasca 166A	-	No risk	Estimated population of a few thousand. No flooding.
197	River Bank Erosion	M.D. of Greenview No. 16	Erosion	River bank erosion	Low risk	Grande Cache Coal Plant. Below the plant there is erosion on river bank.
198	Metis	M.D. of Greenview No. 16	Wyandie East	-	No risk	Road is approx. 4.6 to 6 m (15 - 20 ft.) above river. Metis, but no status.
199	Metis	M.D. of Greenview No. 16	Wyandie West	Flood potential	High risk	Metis, but no status. In flood zone.
200	Sousa Creek	M.D. of Greenview No. 16	Sousa Creek	Flooding	Moderate risk	Modular homes. Flooding in July 2014. Eight homes evacuated. Floods annually. Homes are at the creek elevation.
201	River Gauge	M.D. of Greenview No. 16	Little smoky	Flooding	Info	River gauge flooded in 2000s.
202	Muskeg river	M.D. of Greenview No. 16	Muskeg river	Flooding	Moderate risk	Muskeg River Coop, no status. Flooding due to beaver dam breaking. Occurred a few times in the past few years before 2015.
203	-	Buffalo Head Prairie Area	-	Flooding	High Risk	The Buffalo Head Prairie area is relatively flat and floods annually due to spring runoff.
204	-	Hamlet of Fort Vermilion	-	Flooding	Low Risk	Flooding of Peace River in 1934 due to ice-jams. This resulted in flooding the residents and commercial establishments where the airport is now located.
205		Hamlet of Fort Vermilion	-	Flood potential	Low Risk	River intake was damaged due to flooding twice in last twenty years. Service was not interrupted but ability to recharge the reservoir was affected.
206	-	M.D. of Mackenzie No. 23	-	Flooding	Low Risk	Flooding due to Beaver Ranch Creek overtopping its banks after a major rainfall event in 2011. It is mostly farm land and takes approximately 2-3 days for water to recede.
207	-	M.D. of Mackenzie No. 23	-	Flooding	Low Risk	Flooding of farmland and local infrastructure approximately 3 km west of Fort Vermilion.

Map ID	Tribe	Municipality	Reserve Name	Flood Issues	Flood Risk	Notes
208	-	M.D. of Mackenzie No. 23	-	Flood potential	Low Risk	ATCO transmission and power generating station located approximately 10 kms west of Fort Vermilion were reported to be affected by flooding caused by ice-jams.
209	-	M.D. of Mackenzie No. 23	-	Flood potential	Low Risk	ATCO electric transmission line affected by ice jams.
210	-	M.D. of Mackenzie No. 23	-	Flood potential	Low Risk	A causeway located approximately 7 kms west of Fort Vermilion and south of the Peace River was reported to be flooded in the past and was 3 to 6 feet under water.
211	-	M.D. of Mackenzie No. 23	-	Flood potential	Low Risk	Major flooding was reported in 2011, at the water wells location, resulting in contaminated water supply. The wells were not assessable due to reported flooding of nearby areas and roads.
212	-	County of Northern Lights	-	Flooding	Low Risk	Dixonville has reported low flood impacts to residents and infrastructure. Drought has been an issue.
213	-	County of Northern Lights	-	Flooding	Low Risk	Deadwood has reported low flood impacts to residents and infrastructure.
214	-	County of Northern Lights	-	-	Info	Grimshaw and Warrenville withdraw water from aquifer (no flood issues have been reported)
215	-	County of Northern Lights	-	Flooding	Info	Rural residents east of Deadwood reported ice-jams in the Peace River at an oxbow. Flooding of roads.
216	-	County of Northern Lights	-	Flooding	Info	Carcajou was flooded in 2006
217	-	County of Northern Lights	-	Flooding	Info	Ice-jams at oxbow
218	-	County of Northern Lights	-	Flooding	Info	Landslides and moving hills at Hotchkiss
219	-	County of Northern Lights	-	Flood Potential	High Risk	Town of Manning is located in flood hazard area

Appendix B
Meeting Minutes and Stakeholder Contact Information

AECOM
101 – 18817 Stony Plain Road NW
Edmonton, AB, Canada T5S 0C2
www.aecom.com
780 486 7000 tel
780 486 7070 fax

Minutes of Meeting

		Start Time	End Time		
Date of Meeting	November, 26, 2014	2:00 pm	3:30 pm	Project Number	60334569
Project Name	Peace River Flood Mitigation Feasibility Study				
Location	AECOM Office Edmonton via Conference Call with Town of Grande Cache				
Regarding	Existing Flood Issues				
Attendees	Marcus McCullough (MM)	RAM			
	Ahtesham Shirazi (AS)	AECOM – Project Manager			
	Neil Hall (NH)	AECOM – Water Resources Engineer			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (AECOM's Sub-Consultant)			
	Brian Lot (BL)	Director of Emergency Management / Fire Chief-Grande Cache			
	Loretta Thompson	CAO Grande Cache			
Distribution	All Attendees, Heather Ziober (RAM) and Jagadish Kayastha (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
1. Flooding is a concern primarily for the MD of Greenview No.16. Grande Cache is located on a hill approx. 500 feet above everything and so flooding is not an issue, with the exception of flood basements from excessive rainfall and piped sewer system backups. 2. Certain areas in Grande Cache flooded from large storm event (hail and rain) in the 80s, storm/sanitary issues; flooding many homes 3. Flooding in 1970 a. Smoky River flooding, flooded highway 40, late May rain and heavy snow pack melt 4. Muskeg River flooding of highway 40 in the 80s – late May rain and snow pack melt – nothing major since 5. AT bridge across Smoky River is at washout risk known to AT. The bridge is used primarily by industry such as oil/gas. A bridge washout would have minimal impact to Grande Cache 6. Bridge over Smoky River susceptible to being washed out – happened in the 70s. Bridge used for industry daily (oil and gas, mining) but does not off community– Provincial Highway	Info

	ACTION ITEMS
7. Aboriginal coops along Smoky River north of Grande Cache or Victor Lake 8. Aboriginals from Jasper moved to river and pay taxes to MD of Greenview No.16 9. Suza Cree (aboriginal coop) evacuated last spring due to Smoky River flooding 10. Six aboriginal coops , three at least are at risk of flooding 11. Muskeg Aboriginals settlements affected by overland flooding in Muskeg River basin 12. Aseniwuche Winewak nation is Alberta's newest ~~Indian reserve~~Aboriginal group, located just outside Grande Cache. It will not be located on the IR mapping data that we have.	Obtain mapping for all aboriginal coops from MD of Greenview No.16; Contact Jeff Francis, Manager Protective Services, MD of Greenview (EA)
13. Victor Lake and Grande Cache Lake are joined by a canal, keeps lake level same, installed in 70s, for water supply only, no dam on Victor Lake 14. AE may have more details of the ditch/canal, AE in Edmonton 15. Associated Engineering may build new WTP to meet new regulations 16. 2x pumps to pump water from Victor Lake to Grande Cache, pumps approx. 20ft higher than Victor Lake 17. Victor Lake and community controlled by MD of Greenview No.16	Contact Associated Engineering if detail is required (JK)
18. Jeff Francis – manager Protective services for MD of Greenview No.16	Info
19. Cole mine and power plant approx. 10 miles north of Grande Cache	Contact MD of Greenview No.16 to find out if flood issues are present (EA)
20. No erosion issues for Grande Cache 21. Rock/bedrock soil conditions under Grande Cache	Info
22. Available GIS mapping of Town limits is not accurate	

AECOM
101 – 18817 Stony Plain Road NW
Edmonton, AB, Canada T5S 0C2
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780 486 7000 tel
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Minutes of Meeting

Date of Meeting	November, 27, 2014	Start Time 10:00am	End Time 12 noon	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	Town of Valleyview – Operations Office 4802 – 36 Avenue				
Regarding	Existing flood issues in MD of Greenview No.16, Town of Valleyview, and Mighty Peace Watershed Alliance				
Attendees	Marcus McCullough (MM)	RAM			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Gord Meaney (GM)	Operations Manager MD of Greenview			
	Norm Patterson (NP)	Road Manager East MD of Greenview			
	Venessa Ross (VR)	Administration Support for Infrastructure and Operations MD of Greenview			
	Jim Joelson (JJ)	Councillor Town of Valleyview			
	Adam Norris (AN)	Mighty Peace Watershed Alliance – Watershed Co-ordinator			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
MD of Greenview No.16	
1) Throughout MD: experienced road washouts, bridges and bridge pipe needing repairs, culvert damages, increased amount of beaver dam issues, and general flooding which compromised roads and approaches throughout the MD	Request Power Point Slides from Venessa Ross (EA)
2) Power Point slides with flood locations and photos available	
3) Key historical flooding dates: 1997, 1988, June 31st /July 1st 2011 (also, perhaps 2005)	
4) 2011 saw worst flooding in recent history	

5) Cause of flooding: a) Majority of flooding caused by heavy rain b) Snowmelt is localized, not the cause of flooding c) Beaver dams cause flooding issues d) No ice jam issues—some ice jams but fragile and break up before they pose a problem	Info
6. Flood affects: a. No public facilities within flood areas b. Some pipeline and road damage which affected industry c. No communities affected by flooding, only infrastructure d. Flooding impacts access roads, but other routes are available e. Ditch at New Fish Creek flooded, no residents impacted f. Fox Lake 7. Issues with ice bridges	
8. No designated flood risk areas a. Perhaps First Nations settlements along Smokey River West of Grande Cache, but not official designated flood risk area b. Three to six First Nation settlements along Smoky River west of Grande Cache could be impacted due to river flooding	Contact: Jeff Francis, Protective Services, MD of Greenview No.16 780.524.9502 (EA)
9. No turbidity issues in water supply	Info
10. No flood issues around Sturgeon Lake – First Nation not affected	
11. No flood mitigation projects under construction currently	
12. No flood mitigation strategies proposed currently	
13. No flood mitigation studies proposed currently	
14. No emergency management plan or evacuation plan related to floods or flood preparedness in place	
Documents provided by MD of Greenview No.16	
15. 3 x application for Disaster Recovery Assistance	Info
16. Application dates: a. 07/31/2011 b. 06/25/2011 c. 07/10/2011	
17. Operations Services List of Projects as a Result of Recent Rain and Flooding	
18. MD of Greenview No.16 submitted application through the ACRP program	
June/July 2011 Rainfall flooding MD of Greenview No.16	
19. Culvert under road 223 flooded from Spirit Creek a. Overland flooding b. No residents impacted c. Livestock facilities flooded but no damage, livestock moved to higher ground d. Washed gravel of road, gravel replaced, no road closure e. Ditch flooded over north-south road 223 (from Spirit Creek)	Info

20. Bridge Pipe TWP 670 West (west of highway) a. Debris including logs blocked upstream pipe, caused water to back up b. Beaver dams broke	
21. Losegun Bridge over a tributary of Little Smokey River of river located northeast of Little Smoky a. River flooded causing overland flooding in the surrounding area of the bridge b. Bridge not flooded c. Monitoring Station GOC not damaged but in standing water d. No residents impacted, no residents in the vicinity	
22. Waskahigan River Bridge Highway 43 a. Bridge flooded, not damaged.	
23. Riverside Golf Course 24. Flooding along the river, backed up some drive ways, last year was one of worst years	
25. TWP 680 Road flooded a. Little Smoky River flooding overland b. Road closed for 4 days c. 3 residences to the north of flood area impacted, no exit for them d. Residents used canoe to cross flooded road and used a vehicle on other side	
26. Bridge flooded on TWP 683 from Asplen Creek a. Shallow water on bridge b. Bridge remained open and drivable c. No damage to bridge	
27. Barrick Energy Road Bridge a. Bridge flooded from Little Smoky River Oxbow located directly east of road 683 b. No damage to bridge	
28. Valleyview Golf Course Road flooding at TWP 693 a. Road flooded from Little Smoky River overland flooding b. Workshop flooded, but nearby residence not affected	
29. Culvert crossing TWP710A road approx. 600m west of highway 49 and TWP710A intersection a. Road close to overtopping, but did not overtop b. High downstream flow creating scouring hole, repaired hole c. Culvert size approx. 1500mm	
30. Dead Horse Creek – South Bridge Flooded a. Bridge crossing on TWP 725 over Dead Horse Creek b. No damages c. Road/bridge closure 2 days	
31. Dead Horse Creek – North Bridge Flooded a. Bridge crossing on 220 over Dead Horse Creek b. Minor repairs to abutments c. Road/bridge closure 2 days	
32. West Montana Flats – Bridge Pipe flooding a. Bridge pipe backed up causing minor overland flooding in the area b. No road overtopping c. Cleaned out debris from upstream pipe	

33. Wapiti River Bridge closure – 1988, 1997, 2011 Heavy rainfall a. Closure due to flooding b. Time of closure unknown	Follow up with City of Grande Prairie for more details (EA)
Town of Valleyview	
34. Affected by drought – experienced rain approx. three times in Summer 2014 – significant change from thirty years prior when it rained almost daily	Info
35. Water supply deemed not at risk and reliable 36. Valleyview sells water to MD	
37. Lift station at Little Smokey River approx. 50ft above river 38. Pump for lift station located at river level 39. Cleaned out once but approx. last 20 years no issues	
40. Water treatment facility located in town	
41. Wastewater releases to Sturgeon Creek	
42. Natural Gas Power Generation Station located on high ground southeast of Valleyview inside Smokey River Oxbow, no flood risk, is a booster station a. Power Station: approx.: lat. 54.942157, long. -117.203534	
43. Encana looking to draw water from Little Smoky River	
Mighty Peace Watershed Alliance	
44. Office located in McLennan	Info
45. Peace River affected by ice jams/Buffalo Head Hills area	
46. Flooding issues in Bear Creek	
47. Lack of flooding at Peace River/Athabasca Delta an issue	Consult with Fort Chipewayan and Metis Local 145
48. Very few river front properties – some along Peace River and possibly new homes in Grande Prairie	Info
49. Illegal ditching on agricultural lands is growing issue	
50. Saddle Hills and MacKenzie County experience erosion – overland flooding, losing lots of soil	
51. McLennan experiences no flooding – inter-basin transfer, Peavine Canal across the Smoky River	
52. Clear Hills County (west of Fairview) – Water from dugouts—overland flooding issues	
53. Pat's Creek in Town of Peace River– flooding issue	
54. Historical flood (12" of rain in 24 hours) caused flood downstream near Economy Creek Tower	

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	November, 27, 2014	1:30pm	3:15pm	Project Number	60334569
Project Name	Peace River Basin Water Management Feasibility Study				
Location	Town of Sexsmith – Town Office 9927 – 100 Street				
Regarding	Existing Flood Issues				
Attendees	Marcus McCullough (MM)	RAM			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Claude LaGace (CL)	Mayor of Sexsmith			
	Rachel Wueschner (RW)	Assistant Administrator of Town of Sexsmith			
	Cassandra Chabot-Madlung GIT (CC)	Project Technologist, Geology GIT County of Grande Prairie No.1			
	Matthew Konowalchuk (MK)	Senior Planner County of Grande Prairie No.1			
	Richard Sali CET (RS)	Project Technologist Grande Prairie Engineering Services			
	Ian Ketchem P.Eng (IK)	Beairsto Lehners Ketchum Engineers			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
County of Grande Prairie No.1	
1. Kelscun Lake located north east of City of Grande Prairie 2. Lake mostly dried up, depression where lake was before 3. Large ditch starting at south end of lake traveling south to Highway 43, then proceeds east along Highway 43, then proceeds south and connects to Wapiti River a. Large area west & east side of ditch slopes towards ditch and drains into ditch b. Erosion issues due to rainfall & snowmelt in this area c. Ditch is identified as a very large body of water—a major waterway as it collects all water from area—erosion is significant along the corridor	Determine impacts; is Highway 43 or 670 impacted (EA)

4. Power Plant and WTP a. No flood issues b. No water supply issues	Info
5. Cassandra Chabot-Madlung a. Would email Jagadish additional information about flooding in County of Grande Prairie No.1	Follow up with Cassandra Chabot-Madlung (EA)
6. Flood Issues: a. Ice jams were observed b. No flood mitigation projects currently undertaken c. High water table in area south of City of Grande Prairie between Beaverlodge and Bezanson but below City of Grande Prairie, with a southern border of County of Grande Prairie No.1 i. Flooding occurs in this region caused by rainfall, snowmelt and the high water table annually ii. Minor impacts from flooding in this area, mostly infrastructure 7. Some township roads in County No.1 are upgraded periodically 8. Area around Bear Lake floods as the lake expands—flat terrain – Hutterite colony to the south and farmland is impacted north, small subdivision as well 9. Bear Lake Watershed Group created as lake has dropped significantly – Bear Lake acts to mitigate flooding in Grande Prairie 10. Range Road 40 washed out several times from spring run-off and heavy snow fall (were Smoky River joins the Wapiti) a. Range Road 40 need repair, based on how fast water melts and amount of snow	Determine where ice jams were observed and if pose an issue/flooding (EA)
Town of Sexsmith	
11. Historical flood issues; rainfall 2007 and July 2011; Town applied for disaster relief in both years 12. Creek overland flooding in spring, catchment issues – 5 times in last ten years – 100 year floods and run off from County 13. Runoff flooded parts of Town of Sexsmith due to 2007 / 2011 rainfall and snowmelt 14. Southern area of Town experiences flooding due to rain fall and northern area due to snow melt 15. Experiences annual flooding at same locations 16. Sexsmith Bible School in flood area, two apartment buildings and a seniors' home 17. Northwest residences flooding, approx. 30 homes due to rainfall and snowmelt, flat area, difficult to remove water, annual flooding due to spring snowmelt – July 2011 18. Along 106 Street (north-south) annual spring snowmelt flooding if more than 3ft of snow, road closure at least for one week, repair road and re-gravel $5,000-$10,000 cost annually 19. 2007/2011 flooding around 100th Street in the south end of Town, 8ft deep flooding, 2x gas wells flooded but not damaged, removed and replaced culverts 20. 100 year flood event in July 2011 caused back up through creek system towards the north end of Town starting from the south end of Town, then flooded southeast portion of Town as well, concerned that that rail line may overtop or flood (CN brought in pumps) 21. Removed and replaced culverts in southeast area of Town, three days no road access due to rainfall in 2007/2011 where culverts were removed and replaced 22. Creek in town is .1% slope and runs through towns 23. Engineering consultants (Beairsto Lehners Ketchum) currently conducting flood study of Town of Sexsmith 24. Application to ACRP program currently in progress or being considered by the Town 25. No flood mitigation projects currently undertaken 26. No water supply issues	Info

Hamlet of Clairmont	
27. Flood Issues: 28. Hamlet is located between two lakes – Clairmont and Ferguson 29. Flooding due to rainfall and snowmelt 30. Experiences annual flooding at same locations 31. High water table area in area surrounding Clairmont approx. diameter of 12 km and is a flat area where water drains to from rainfall and snowmelt—water builds up and spills 32. Water table high in south portion, flooding even when there is not significant rain 33. Hamlet is 1 metre drop – if flooding occurs, water spreads out and floods a large area 34. Significant agricultural flooding in spring – north and northeast of Clairmont – north and south of intersection of highways 2 and 43 - thousands of acres under water for weeks, farmers don't get on land until July 35. Annual issues; stormwater pond drains up to the lake; when lake fills, it extends just south of the highway, with two to three feet of water on agricultural lands; water may remain for weeks, farmers may not get onto land until July (land is at same elevation as lake) 36. Insignificant flooding in industrial and commercial area of Clairmont located southwest of Clairmont Lake 37. West of Clairmont Lake a. Annual flooding due to culverts frozen shut with ice in early spring b. Need to steam culverts to remove ice; floods some residents on each side of water between two lakes and along Clairmont Lake c. Trailers west of Clairmont Lake – standing water, trailers not flooded, street/property flooding—soil saturation annually d. Water sits for weeks e. Issues are: undersized culverts causing flooding in areas west of Clairmont Lake, some houses, mostly trailers, annual flooding, minor flood impacts to residents f. Fire Hall located west of Clairmont Lake, on high ground, does not flood, area surrounding Fire hall floods, roads not affected, annual flooding, no impact to residents g. Berm has been constructed to protect some residences 38. Ferguson Lake also spills out – area southwest of lake underwater each year 39. No flood mitigation projects currently undertaken 40. No water supply issues	Info
Town of Wembley	
41. No flood issues known 42. Located at high elevation	Contact Town of Wembley (EA)
Town of Beaverlodge	
43. No information provided 44. Suggested to contact Beaverlodge directly	Contact Town of Beaverlodge (EA)

City of Grande Prairie	
45. City of Grande Prairie storm system designed for two or five year return period a. Any rainfall event over a two to five year return period could flood road network b. Experienced minor flooding of creek due to rainfall and snowmelt c. North end of city has creek running through – flooding is usually contained but some erosion problems around 116th Street d. A ditch backs up and road flooding occurs at approx. 83rd Avenue and highway 60 i. Issue solved, in 2007 channel was upgraded, no more back up e. Another ditch runs east-west starting at 89th Avenue and 108th Street proceeding through Canfor Industrial connecting to a creek to the east of the industrial site i. Ditch water level high, but no flooding occurs 46. Trailer camp area located east of highway 43 and directly north of College Park a. Flooding occurs annually due to freshet b. Two or three camp stalls affected by flooding 47. TWP 720 road crossing Bear River floods annually in the spring for approx. a week a. Residents can take detour, inconvenience only 48. Golf Course (Bear Creek) located northwest of City of Grande Prairie floods every spring (Hole 16) a. 116th Street between TWP 720 and 722 (approx. location) b. Flooding from 2007 snowmelt and 2011 rainfall from Bear River c. A resident located to the south of the golf course erected a berm and was not affected 49. Culvert issues in new areas	Reports and other documentation with AESRD (EA)
50. Existing studies of City of Grande Prairie a. Northwest Hydraulics Consultants study provided (hard copy) b. In Northwest Hydraulics study – water stays within the creek, most issues where water spans out tends to be up to the north at a flood fringe area by Bear Creek Golf Course. During a heavy rainfall and if the reservoir is backed up, then flooding will occur and road will washed out	Info

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Minutes of Meeting

Date of Meeting	November, 27, 2014	Start Time 4:00pm	End Time 5:40pm	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	Village of Rycroft Municipal Building – 4703 51 Street				
Regarding	Existing Flood Issues				
Attendees	Marcus McCullough	RAM			
	Jagadish Kayastha	AECOM – Water Resources Lead			
	Eric Afghan	AECOM – Water Resources Engineer			
	Jacqueline Tessier	Twenty/20 Communications (AECOM's Sub-Consultant)			
	Brian Ballard	Manager of Protective Services –Saddle Hills County			
	Robert Kobylanski	Village of Rycroft - Public Works Foreman			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
Saddle Hills County	
1. Flood issues impacted mostly infrastructure and some residents:	Info
2. 2011 rainfall event: HWY 2 east of Braeburn, culvert damaged, water flowing around outside of culvert, liners installed to repair, no road repairs	
3. 2011 rainfall event: HWY 2 northeast of Braeburn, road closure two days, two separate storms, first storm major damage to culvert, two weeks later second storm, HWY overtopped, repaired culvert, road not damaged	
4. 2011 June 31/July 1 rainfall: north bank of Saddle/Burnt River overflowed and damaged fairway of Chinook Valley Golf Course – had to recreate two to three holes, scoured river bank located approx. northeast of 731 and 677 intersection	
5. 2011 rainfall first storm, washed out bridge pipe at road 80 crossing Saddle/Burnt River, washed out twice prior to 2000, was large diameter culvert, now replaced with low level crossing, two or three smaller culverts encased and topped with concrete, concrete approach, concrete outflow pad	
6. 2011 June 31/July 1 rainfall, bridge pipe washed out at Economy Creek, road was out for three years, local traffic detour, increased commuting time, agricultural traffic significantly inconvenienced, bridge pipe replaced September 2014	
7. 2011 June 31/July 1 rainfall, Josephine Crossing at Hamlin Creek, washed out due to steep side	Info

slopes, repair annually, too costly to repair for four residences that are impacted, repairs halted and crossing abandoned, no further mitigation planned, means an additional 30 miles detour for the four residents 8. 2011 June 31/July 1 rainfall, Hamlin Creek Bridge approx. 14 km southeast of Silver Valley at Silver Valley Road, bridge pier scour due to high flow in creek due to rainfall, bridge may require replacement 9. 2011 June 31/July 1 rainfall, Doe River Crossing, approx. 7 km east of Doe River, approx. 1.5 miles of highway each way from crossing, the side slopes are not grassed, very steep, side slopes incurred scour/erosion 10. 2011 June 31/July 1 rainfall, Poucecoupe River, Road 134 crossing, erosion/scour issues along road slope, mostly grassed but at erosion locations very steep slopes, high velocity runoff causing scour, slopes were repaired to prevent road from being compromised, no road closures 11. Bonanza (informal community), flooding in 2011 rainfall and Easter 2003 spring snow melt, flooding occurs on several occasions annually, Bonanza store basement flooded, no other residents flood affected, highway ditch on 719 overflows and causes flooding, overland flooding from the southeast, possible solutions looked into include collecting runoff in reservoir and/or routing the runoff away 12. Erosion protection (Gabion Baskets) installed along the side slopes of 719 north of Henderson Creek to slow runoff in ditch towards bridge crossing at Henderson Creek, scour around Gabion Baskets, some repaired, not all – no impact on traffic flow 13. 2011 June 31/July 1 rainfall, two storms two weeks apart, culvert crossing Highway 49 approx. 500 m west of 719, culvert washed out completely, water up to one meter deep, highway 49 completely dropped through culvert on east bound lane, filled hole with gravel initially, two weeks later washed out entire cross section of highway 49, couple of months road construction with one lane traffic available, detour also in effect, minor impact to through traffic or residents, one day service interruption 14. Highway 49 starting at Range Road 115 up to the AB/BC border, culvert crossings along approx. 12 miles of highway, all culverts scoured and pavement sagged at inlet location on road shoulder, liners installed at greatest affected culverts locations, AT inspected all culverts and repaired worst ones, some others still require repair 15. Power plant and WTP no flood issues 16. No river ice jams 17. No flood hazard mapping done 18. No designated official flood risk area 19. No flood mitigation projects, strategies, and studies are proposed or ongoing 20. Only general risk assessment done under the “All Hazard Plan” but no specific flood plan	
Woking (Located in Saddle Hills County)	
21. Flooding due to rainfall and spring snowmelt in 2009 and 2011 a. In 2009: railway along east side of town had undersized culverts, ditch backed up and flooded the community hall located south/southwest of railway, approx. 6 inches standing water on floor, no other property damage in town from 2009 flood b. Culvert crossings under railway were upsized, then in 2011 due to rainfall and spring snowmelt, runoff did not back up anymore and could reach the lift station much faster and is located southeast at approx. 677 and 1st Avenue. Lift station filled up and was not able to convey sewage, residents not able to use sewer/flush for 6 hours, no basement back up, most houses have back flow valves, no sewage back up occurred	Info Info

c. Flooding mainly due to undersized culvert as a bottle neck and flooding HWY 182 d. Area which floods follows Railway Avenue e. Highway 2 to the south – water overtops highway towards the hills and south over the highway – water damaged highway and culverts – highway was closed for a day or two 22. Approx. 30 cm of rainfall in 12 hours in 1990 – washed out every road and back road crossing from southwest to northeast 23. Only water treatment plant at Woking – considering adding an additional one to solve other issues 24. No flood issues with water treatment plant	
Village of Rycroft (located in MD of Spirit River No.133)	
25. Historically rainfall and spring runoff cause flooding 26. 1990 rainfall, three homes flooded a. Farmer's home flooded due to runoff located at highway 49 and road 52 in 1990 27. 2011 rainfall, flooding within inches of homes a. 2011 June 31/July 1 rainfall, river intake at WTP damaged located northwest of the Rycroft, service not interrupted, but close. In the interim, service was provided from the water reservoir and was sufficient. Sediment in river intake, debris collected against weir, river intake required clean out and was repaired, grading was replaced. Lift station was damaged from pumps due to excessive run time due to stormwater exceeding capacity of pumps from rainfall runoff. Spring snow melt contributes to strain on system as well. 28. 2013 spring run-off, overland flooding, homes and some businesses flooded, was deemed worst flood in recent history a. Overland flow as creek runs through the village – causes erosion b. Culverts backed up out to the highway ditch and flooded homes/properties (manufactured homes) – County tore out curbs to enhance the flow of water - near state of emergency 29. 1990, 2011, 2013 flooding: a. Runoff is collected from the south of the village and directed to the stormwater infrastructure that is routed through the village. Storm drainage infrastructure including ditches and culverts going through the village has capacity issues along 49th and 48th street proceeding north to Highway 49, culverts backing up, erosion upstream of culverts, sag on 782 overtop of culvert crossing, culvert crossing highway 49 at Highway 2 is downstream bottle neck, back ups and flooded area to south in 1990, 2011 rainfall, 2013 snow melt, culvert has not been upgraded currently, as a result approx. three homes flooded in 1990; 2013 some damage to businesses. 30. Power station is a voltage step down station and powers Rycroft, Spirit River, Woking, and Central Peace. Located at southeast corner of the village. Not at risk of flooding historically except when farmer southwest of station constructed temporary snow ditches to convey runoff from farmland to storm system along 782. Approx. 20% of power station had 1 ft. of flood water, known that last 10 years no flooding has occurred due to existing conditions 31. Existing AT reports may be available	Check with Marcus McCullough for any available specific AT reports to Rycroft (EA)

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	November, 28, 2014	1:30pm	4:00pm	Project Number	60334569
Project Name	Peace River Basin Water Mitigation Feasibility Study				
Location	Northern Sunrise County Admin Office 135 Sunrise Road				
Regarding	Existing Flood Issues				
Attendees	Marcus McCullough (MM)	RAM			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Kelly Bunn (KB)	CAO Town of Peace River			
	Sandra Adams (SA)	Town of Peace River			
	Ian Cosh M.Sc., P.Eng (IC)	Director of Engineering, Planning & Development – Northern Sunrise County			
	Sebastian Dutrisac (SD)	Agricultural Fieldman – Northern Sunrise County			
	Doug Dallyn (DD)	Councillor, Ward 5-Three Creeks, Northern Sunrise County			
	Trent Mclaughlin (TM)	County of Northern Lights			
	Cheryl Anderson (CA)	County of Northern Lights			
	Brent Reese (BR)	County of Northern Lights			
	Arie Loogman (AL)	County of Northern Lights			
	Lyle McKen (LM)	MD of Peace No.135			
	Alisha Mody (AM)	MacKenzie Municipal Services Agency			
	Phil Rough (PR)	MacKenzie Municipal Services Agency			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

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	ACTION ITEMS
Town of Peace River	
1. Town of Peace River impacted by the number of waterways coming into the area: Peace River, Heart River, Pat's Creek and Smoky River (ice break-up) 2. Flash rainfall caused flooding early August, beginning of July 2013 in the downtown area 3. Many public facilities in flood risk downtown area such as pool, arena, town shops, etc. 4. Town has dykes along river banks to protect from river flooding, results in flood water from runoff or snowmelt to be contained within the Town – "bathtub" effect 5. Ice jam flooding from the Peace River and coming from Heart River and most recently, Pat's Creek 6. Ice jams have occurred in the past at the Peace River Bridge Overland flooding in 1992 and 1997 due to ice jams. 1997 there was a weakness in the dykes and downtown Peace River flooded. Since dikes raised in 1997/98 there is no overtopping dike from the river flooding 7. South of Heart Bridge and the downtown core has been flooded from runoff and snowmelt or Pat's Creek back up, additionally from the river due to ice jams (mostly in the 80s – once in 1935) 8. No trash rack in Heart River 9. Potential for flooding every year – depends on timing – if flood gates are closed because of impending ice break up and warm temperatures follow, there could be flooding issues	Info
10. BC Hydro controls river flow towards Town of Peace River – a protocol is in place where they attempt to freeze the water at a certain level to help mitigate when the ice goes out in the spring. It appears there is success but in the past there have been issues with ice jamming and overtopping the dykes at the Town of Peace River. They have been raised three times. There have been times when the ice is jammed in Peace River and then there is no room for the Heart River water to flow to and this results so it overflows 11. Compound ice jam issues from Smoky River and Peace River confluence upstream of the Town, if ice is released from the Smoky River first then ice builds up in the Peace River and when the ice is then released, a large amount of ice travels downstream and jams up against the Peace River Bridge resulting in flooding; occurred in 1986, 1992, and 1997	Info
Pat's Creek Intake & Pipe	
12. Pat's Creek intake and pipe that runs under Highway 2 then runs under the town to the river outfall, the outfall is located approx. at the river bank at 100 Avenue and 99 Avenue 13. Pat's Creek intake flooded twice in 2013, early April 2013 partial collapse of pipe and lots of debris at intake, June 2013 due to snowmelt and rainfall, April 2014 due to snowmelt and rainfall 14. Back up of water at the intake results in overland flooding over Highway 744 and into the Town, flood water is held in place by dykes. 15. There is pipe deterioration and collapsing of the pipe combined with a potential ice blockage in the pipe – need to have storm sewers closed because of the high water and then these back up 16. The storm sewer is closed when flooding occurs and the downtown core is flooded by rainfall runoff and snowmelt 17. Ice blockage has occurred at intake 18. Trash rack on Pat's Creek – but requires upgrade (application for this) – lots of trash in 2013 when beaver dam at upper end let go and it became a cascade 19. Gabions at outlet to Pat's Creek to prevent erosion – the hill is starting to slide	Info
20. Lower West Peace (residential area) a. Sand seams run through Lower West Peace area b. Existing water table is high and is raised if water level in the river is high; water table level exceeding EL. 315/316.5 or 317 m approx. will cause flooding of residents homes. When BC Hydro releases more water from the upstream Bennet Dam towards the Town of Peace River, then high water table flooding can become an issue. c. Mitigation: BC Hydro has installed 9 relief wells in a pilot study and will install 30 wells total. Typically, north end of Lower West Peace floods first, but not necessarily.	Info

d. Basements are not allowed to be built in Lower West Peace. Basements flood due to high water table when water level high in Peace River e. Flooding typically occurs in the spring or when BC Hydro releases more water from the upstream Bennet Dam than usual	
Erosion	
21. Faster / increased runoff delivery to the Town a. Due to forestry, runoff from rain and snowmelt travels to flood areas faster 22. Upsizing of culverts by AT results in faster delivery of runoff to the Town as well	Info
23. Erosion in backyards and lawns of homes at Shaftsbury estates due to runoff flowing to river	
24. South of Town approx. at 114 Avenue and 101 Street, homes had some flooding due to runoff from the slope to the east that drains runoff towards the river 25. On Highway 744 directly east of this area, the road has steep side slopes and cause erosion of the slopes 26. Drainage from the railway to the east of this area has caused properties on hill to move due to high water content in the soil / soil saturation 27. Issue with main sewer line on side of hill – pipes need to be relocated and hill is moving – water moves down hill and is eroding hill (also affecting old highway)	
28. Residential flooding (10205 – 92 Street) – rainfall and snow melt – steep slopes, slide spots into back yards – Thurber Line – not able to build over the line – TOB setback	
29. Judah Hill – important exit for Town – two slides being repaired by AT who are monitoring 7 slides which are unstable in Peace valley	
WTP, WWTP, Power	
30. WWTP a. Clarifiers and other tanks could lift up when empty due to high water table – upward water pressures b. Lift station under capacity issues when water infiltrates the lift station due to high water table; had issues in 1992 & 1997, sewer back-up due to lift station capacity issues, happens every time it floods and is a concern annually. Requires crews to attend to the lift station, crews bring in temporary pumps; sewage is pumped from lift station directly over dykes into Peace River during 2013 and 2014 flood events. Sewer back up occurs in resident's homes if not attended to. c. Basements back up and overland flooding in the area north of downtown on the east side of the river directly south of the WWTP – sewage is pumped directly into river when necessary to prevent back up in homes d. Improvements planned to lift stations but won't solve flooding issues	Info
31. No flood risk to WTP; at high elevation (located west end of town and to the south) a. Due to siltation from runoff and overland flow, water quality issues annually b. 15,000 NTU observed, turbid water, turbidity jumps annually 32. WTP upgrade scheduled, $20M, restrictions on water, residents have hauled water to supplement	
33. No flood risk or issues historically to power; no power generation station at Town of Peace River 34. Main transmission line crosses the river	
Flood Plans	
33. Town of Peace River has a flood evacuation plan in place 34. No officially designated flood risk areas in Town of Peace River 35. It was indicated that the Town needs a solution and a plan that better addresses any flooding; a response plan. Currently, the Town has experienced crews that can close the flood gates in 4 to 5	Info

hours. Before, it took two weeks to close the system. However, it was indicated that the Town wants a better system to be in place to respond to flooding. Additionally, a response system for the East and Lower West Peace areas	
Northern Sunrise County	
36. Historical flooding occurred: a. 1997 and 2001 b. Twice in 2013, significant localized flooding due to snowmelt and rainfall, Pats Creek Basin saw flooding, several bridge sized culverts failed c. 2014, extensive spring snowmelt flooding – see provided study – provided by Ian Cosh as an attachment on a USB stick d. Flood sources are snowmelt and rainfall e. Spring runoff often causes varying amounts of flooding f. Occasionally heavy rainfall will also cause flooding g. No ice jam issues in rivers h. Pat's Creek cascading event – recent flooding 2 pipes destroyed and two damaged i. Development is significant issue – faster flow of water	Info
37. Records of flood affected locations: a. Localized flooding issues due to overland flow identified in 2014 Drainage Study – provided on USB stick b. Maps indicating water management facilities constructed are in the 2014 Drainage study that is provided on a USB stick c. 2014 drainage study (provided on usb stick) d. 1983/1984 Alberta Environment Study (may be available)	Check with Marcus McCullough about AESRD 1983/1984 study (EA)
38. Documentation regarding physical evidence of flooding: a. AESRD has database of high water marks or bridge piles in Alberta b. Government program in place to pay farmers not to ditch so as to avoid flooding downstream c. Province has defined some areas as flood risk – area near High Prairie	Obtain information as needed from perhaps Marcus McCullough (EA)
39. Flood affected communities are Hamlets of Marie Reine (highest risk) and St. Isidore (least risk) Reno – part of Heart River Basin – during spring melt dams suffer the consequences, roadways are acting as dams. Due to development, water is rerouted and pipes become overloaded - 14 homes in danger. Issues are recurring and noted in the "report" – same problem area since the 80s	Info
40. Basin of Peace River is silting in with lots of mud and building up without cleaning itself out – affects water quality, water treatment – difficult to treat and costly – have to restrict usage and bring water in	Info
41. Water supply a. Need appropriate water level for intake – not too high or low 42. Holding ponds store water for three locations – also supplies the MD – reservoirs last possibility 3 or four months	
43. Wastewater treatment 44. Sewage lagoon in flood plain	
45. Flood mitigation projects under way: a. Nampa East Drainage line carried over from last year b. 2014 drainage study identified $5M in recommended works for 2015	
46. Current flood mitigation studies a. See attached report on USB Stick	Info

47. Proposed flood mitigation studies: a. Part of the recommendation from the 2014 Drainage Study is to do some additional studies on some portions that were beyond the original scope. Is planned to do this work in 2015	Info
48. Previous flood related or flood mitigation studies: a. Yes, 1983/1984 AEnv study	Info
49. Information rrelated to historical flood damages are available	Obtain flood damage information from Northern Sunrise County (EA)
50. No public facilities within the flood designated areas	Info
51. No flood hazard mapping	
52. No policy or regulations are being prepared or is in place regarding to development in designated flood risk areas	
53. There are both emergency management plans and evacuation plans in place; Director of Protective Services makes the deciding call	
54. Generally, communities have adequate and reliable water supplies; however, Little Buffalo does not. The issues are not related to flooding.	
55. There are erosion related problems – not provided	Obtain erosion related problems (EA)
56. The county does not qualify for federally or provincially-regulated flood reduction programs	Info
57. The county has submitted an application to the ACRP program	
MD of Peace No.135	
58. Historical flooding from spring snow melt in spring 59. Significant events in April/May of 2007 and 2013 60. 5 to 10 homes had basement flooding – not indicated where 61. Infrastructure mostly, water overtopping roads and culvert back ups – funding was provided through disaster relief program 62. Road closures – some roads two weeks detours, inconvenience	Info
63. Drainage issues – constructed ditches through AENV in 70s, no new construction in recent years, map, areas are registered and mapped 64. Mapping is available of culvert drainage and road damages 65. Study conducted in the seventies about drainage issues	Obtain study, maps abailable upon request (EA)
66. Some erosion on private properties	Info
67. WTP in Hamlet of Brownvale no flood risk, at high elevation, typically not affected – ground water is the source —no interruption of service 68. No issues with high quality groundwater source for water supply	
69. Eastern boundary is Peace River – land along the river can be impacted, typically no large communities, rather cabins and farmlands and recreations areas (Calina Flats). Only flood on recent record is in Carcajou (2006) – high water mark impacted some people	
70. Major flooding from rainfall in 1996/1997 in Sunny Valley located between Northstar and Deadwood; 2 homes impacted 71. Ice jams in Peace River located in Oxbow directly east of Deadwood, residents were moved to higher ground	Info

72. Farther north runoff caused roads to wash out – sometimes only roads washed out and affects a small population of one or two people – affects mostly agriculture not homes 73. Sunny Valley – ice jam related flooding – 2 houses destroyed in 1996 and 1997 – river overtopped at a tight bend in the river at the oxbow – residents have now moved 74. Deadwood, only road flooding/damage- due to beaver dams	
75. Possible instances when an individual gets flooded in the County since it is a big area with a small population; therefore, may not be documented or reported	Info
76. When Lac Cardinal water level rises due to rainfall/snow melt, Bear Creek is impacted, plugged up with beaver dams a. Bear Creek Golf course floods annually from rainfall/snow melt in spring/summer b. Floods farm lands and cannot be worked on. Some residents impacted	Info
77. Population in Weberville approx. 900 people, 78. Grimshaw, Warrenville, withdraws water from large aquifer, no drought issues 79. Aquifer is shared with MD 22, 135, 136, and 21 and is located where these MDs' borders meet 80. Water sources are: truck water in, groundwater (aquifer), surface dugouts for Weberville	Info
81. Southeast of Weberville roads were washed out, culverts backed up, inconvenience/detours	Info
82. Farmland flooding, yards, no homes impacted, perhaps impacted in 2006 or 2008 a. At Whitemud Creek, old AENV ditches – close to failures b. Whitemud Flats (where Whitemud meets the Peace River) recreation cabins flooded by river over topping the banks	Info
83. Subdivisions north of Manning could be impacted by a moving creek and moving Notiwikin River 84. Range Road 240A losing road due to meandering river 85. Extensive water network coming out of Manning – town operates the water treatment plant – only water issue is intake on Notikiwin River – both flood and drought are potential issues for the intake – big reservoirs in place when water cannot be drawn from river 86. Office staff high turnover, contact people on the ground such as operations personnel or the mayor for information that dates farther back	Check with Town of Manning (EA)
87. Dixonville stormsewer is okay, water source north of Dixonville are old water wells, perhaps a drought issues 88. In Dixonville, no flood issues, rather a drought situation 89. River intake for Dixonville water supply, issues if water level too low or high, a water reservoir has been built and can be used, historically no issues with water supply 90. South and southeast of Dixonville, old collapsing culverts	Info
91. At Hotchkiss, some slides, bridge/hills moving resulting in highway issues	Info
92. Kemp River – no population	Info
93. Lidar available of area north of Hawk Hills, mapped with all culverts 94. Some runoff causes erosion issues at Hawk Hills	Obtain Lidar with mapped culverts (EA)
95. Keg River drainage studies available a. Farmlands, roads impacted by erosion along sides of bridges, some roads washed out b. Little mitigation in place c. Some recreation cabins affected	Obtain Keg River drainage study (EA)
96. Paddle Prairie is their own entity	Contact Metis General Nation (JT/JK)

97. Notikiwin Provincial Park 98. Road going into park was washed out and rebuilt two years ago, banks of roads are sliding now 99. Creeks flow harder and faster which impacts roads 100. Farmers stopping overland flow and making it channel flow	Info
101. Carcajou has some residences and recreation facilities 102. Some people two to three houses	Info
103. Ice jam in approx 2006 – AENV did project in 2007 in oxbow of river – quite a few residents and cabins in this area	Info

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January, 14, 2015	9:30am	10:45am	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	AECOM Office - 18817 Stony Plain Road NW, Edmonton, Alberta				
Regarding	Existing flood issues within the Peace River Basin				
Attendees	Marcus McCullough (MM)	RAM			
	Ahtesham Shirazi (AHS)	AECOM – Project Manager			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Danny Jung (DJ)	Alberta Transportation - Infrastructure Manager Peace Region			
Distribution	Attendees, Heather Ziober (RAM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

		ACTION ITEMS
1)	BC Hydro controls discharge and release to Peace River from Bennett Dam– there is talk about building a new dam at Dunvegan	Info
2)	Flooding of tributaries (i.e., Pat's Creek) a result of overflow from the Peace River due to ice jams	Info
3)	All bridges and culverts are being sized for 1:100 as per design standard – there are many flooding issues that are localized	Info
4)	Northern Sunrise farmers are looking options to retain water	Info
5)	Northern Alberta flooding are generally cause of spring run-off	Info
6)	AT does not have highways in far north	Info
7)	Hamlet of Watino (localized rain events) are the cause of flooding	Info
8)	2011 and 2013 flooding (2013 was the highest water level in recent history)	
9)	It was believed by residents' of Watino that the new bridge had caused the flood, but is not the cause according to (DJ)	
10)	CN Rail owns culverts under rail; need to speak to CN rail pertaining culverts capacity and there future plan (if there are issues, Rycroft)	(JK)
11)	Determine if contact is to be made with CN directly	
12)	Undersized culverts, bridges, etc that have flood issues can be obtained from AT	(JK, Abhi Sood)
13)	High water marks if available can be provided by AT	
14)	Contact (DJ) for a list of flood affected items and flooding issues (historically – 20 years). Additional contact: Dave Morrison (bridges)	
15)	Some rural MDs have lowered standards for building bridges and culverts crossings and causing overflow. It is acceptable by the MDs in some rural areas.	Info
16)		
	Town of Peace River	Info
17)	Outlet at Pats Creek frozen in the spring of 2014	Info
18)	Manhole blew in town and flooded towards park and dyke was opened to release the flood water into Peace River	
19)	No overflow at inlet of Pats Creek occurred to cause overland flooding into the Town of Peace River	
20)	There was repair to Pats Creek pipe south of Highway 2 and this open pipe was flooded. Pipe is now closed	
21)	Flooding from manholes in the Town of Peace River	
22)	It was mentioned that farmers want to have water retaining structures upstream of the Pat's Creek	
23)	Localized flooding in Fort Vermillion due to ice jams and run-off – under flood watch every spring	(JT)
24)	Contact Fort Vermillion for local information	

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January, 14, 2015	11:00am	12:30pm	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	AECOM Office - 18817 Stony Plain Road NW, Edmonton, Alberta				
Regarding	Existing flood issues in the Peace Region				
Attendees	Marcus McCullough (MM)	RAM			
	Ahtesham Shirazi	AECOM – Water Resources Manager			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Pat Kennedy (PK)	First Nations Field Officer Alberta Emergency Management Agency			
Distribution	Attendees, Heather Ziober (RAM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
1) Paddle Prairie – Metis only located on a flat area, unnamed small creeks nearby 2) Most FN and Metis have a WTP that services the main town sites and most rural residents have private wells	Info
3) Swan River and Atikameg and other FN fall under other field officers a. Fran, Bryce, and Ian Fox 4) Request flood issues in FN located in other field officer's area from	(JK, EA)
Uninhabited First Nations	
5) Liard River Basin and MD of MacKenzie 23 a. Jackfish Point 124 b. Bistcho Lake 213 c. Zama Lake 210 d. Amber River 211 e. Beaver Ranch 163 6) Peace River Basin and I.D. 24 a. Peace Point 222 7) Peace River Basin and Northern Sunrise County 131 a. Loon Prairie 237 b. Woodland Cree 228 c. William McKenzie 151K 8) Peace River Basin and MD of Opportunity 17 a. Wabasca 166	Info
MD of MacKenzie 23 First Nations	Info
9) Hay Lake 209 – Dena Tha in Hay River Basin a. Sousa Creek (stream) overflowed its bank on May 13, 2013; rapid snowmelt and rain and caused flooding approximately 6 ft. over the banks b. Flooded on either side of Sousa Creek stream banks and FN is located on either side of bank c. Destroyed stream forecasting gauge stations d. Evacuated approximate 150 people in the area (50 – 60 homes) e. Wells are not structurally damaged but required new lining f. Previous flood in 1972 10) Fox Lake – Little Red Cree in Peace River Basin a. Population approx. 3000 people b. Flood evacuation plan is in place. There is no bridge in the area – but they have three car ferry transportation system across the river c. Water sources are private wells and cisterns	Info
11) John D'Or Prairie 215 – Little Red Cree in Peace River Basin a. Peace River floods annually b. 2013 flood shut down bridge c. Three homes flooded along Peace River and residents were evacuated d. Population approximate 1000 people. Flooding is from the creek not from the Peace River	Info
12) Boyer River 164 – Beaver FN in Peace River Basin a. No flooding	Info
13) Tall Cree 173 – Tall Cree in Peace River Basin a. No flooding 14) Tall Cree 173A – Tall Cree in Peace River Basin a. No flooding	Info

15) Child Lake 164A – Beaver FN at Eleske a. No flooding	Info
16) Meander River – no flood issues (just a few homes close to the river)	Info
ID 24 First Nations	Info
17) Little Red Cree First Nation a. Population approx. 100 people b. Located west of Garden River/Creek c. Floods annually, but affects few d. Bridge Shuts down and 3 or 4 homes affected e. Peace River banks flooded in 2005	Info
Regional MD of Wood Buffalo	Info
18) Thebathi 196 close to Fitzgerald – Smith's Landing FN in Slave River Basin a. No flooding b. Population approx. 20 people 19) Thabacha Nare 196A - Smith's Landing FN in Slave River Basin a. No flooding b. Population approximate 500 people	Info
County of Grande Prairie	Info
20) Horse Lakes 152B – Horse Lake FN in Peace River basin a. No flood issues	Info
Northern Sunrise County 131	Info
21) Loon Lake 235 – Loon River Cree in Peace River Basin a. Have boil water advisory b. No flooding 22) Woodland Cree 226 – Woodland Cree FN at Cadotte Lake in Peace River Basin a. No flooding, located at high elevation (300-400 ft). above stream b. Population approx. 1000 people 23) Little Buffalo – Lubicon FN in Peace River Basin a. No flood issues b. Population approx. 500 people	Info
MD of Opportunity 17	Info
24) Trout Lake – Peerless FN in Peace River Basin a. No flooding b. Total population for Peerless and Trout FN is appox. 1000 people 25) Wabasca 166C, 166B, 166D in Peace River Basin (close to Hamlet of Wabasca) a. No flooding 26) Deme FN a. No flooding	Info
MD of Peace 135	Info
27) Duncans 151A – Duncan FN in Peace River Basin a. Perhaps concerns but PK has not visited here as of yet	Info
MD of Greenview 16	Info
28) Surgeon Lake 154 in Peace River Basin a. No flooding	Info

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January, 15, 2015	9:30am	12:30pm	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	Town of Falher #011 Central Avenue S.W.				
Regarding	Existing flood issues MD of Smoky River No.130, Town of Falher, Villages of Girouxville and Donnelly				
Attendees	Marcus McCullough (MM)		Resilience and Mitigation (RAM), Alberta Environment and Sustainable Resource Development (AESRD)		
	Jagadish Kayastha (JK)		AECOM – Water Resources Lead		
	Eric Afghan (EA)		AECOM – Water Resources Engineer		
	Jacqueline Tessier (JT)		Twenty/20 Communications (Sub-Consultant to AECOM)		
	Kevin Cymbaluk (KC)		MD of Smoky River No.130 Public Works - Director of Operation		
	Dave Gervais (DG)		MD of Smoky River No.130 - CAO		
	Adele Parker (AP)		Town of Falher - CAO		
	Ernie Murchildon (EM)		Town of Falher - Director of Public Works		
	Lillianne Bissette (LB)		Village of Donnelly- CAO		
	Estelle Girard (EG)		Village of Girouxville - Municipal Administrator		
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

General Comments	ACTION ITEMS
- Severe rainfalls are occurring more frequently, and causing flooding almost every year - In 2013 – About 540 locations were flooded by spring runoff due to lack of operation and maintenance - Big issues were observed with few bridges during the 1:100 rainfall event - Every spring, roads are washed out and farmers (residents) are stranded - Flooding causes are rain or combination of rainfall and snowmelt	Info
MD of Smoky River No.130	
East-West Canal travelling from McLennan past Donnelly, Falher, and Girouxville	
1) An **east-west grass-lined canal** with sheet metal drop structures was built around the 1960s (rehabbed in the 70s) travelling northwest from Winnagami Lake to Kimiwan Lake (north of the Town of McLennan) – feeds from the north. 2) There is an outlet located at the southwest of Winnagami Lake and northwest at Kimiwan Lake 3) From Kimiwan Lake, the canal travels to west and has another outlet located south at Rat Lake 4) Water from north drains into Rat Lake 5) From Rat Lake, the canal travels west pass through the north side of the Village of Donnelly 6) The canal travels west (hugging the north side of the Town of Falher) along the WTP and proceeds west along the railway tracks for approx. 1.5 km 7) The canal then travels northwest and discharges into Hunting Creek 8) The canal continues west toward the Village of Girouxville starting from where the canal discharged into Hunting Creek 9) The canal then travels north along the east side of the Village of Girouxville and connects to a control weir just upstream of water treatment reservoirs for the Village of Girouxville 10) From upstream of the control weir, the canal also travels north and discharges into Hunter Creek 11) Storm sewers from Town of Falher and Donnelly both drain into the canal/ditch. 12) Before the control weir was in place, water could drain southwest towards the Village of Girouxville and cause flooding 13) AECOM to request digital flood photos and digital copies of completed flood studies from Kevin Cymbaluk and Dave Gervais	Info JK
14) No power plants are at flood risk in entire MD 15) Little Smoky River is the water supply for Falher, Donnelly, Girouxville and MD Coop 16) McLennan's water supply is from Winnagami Lake	Info
Peavine Creek & Bridge Crossing Flooding	
17) **Slims Creek Bridge Crossing** a. Flooding occurred on 2001, 2003, April 2007, June 2011, and April 2013 b. Water backs up on the south bank c. Stream monitoring station is located upstream of the Highway 220 bridge. It was anticipated that the bridge was designed for the 1:25 year storm event. It is a bottleneck for all upstream flooding issues d. Bridge deck came off on April 1, 2007 due to spring snowmelt	Info

18) **Doran Bridge (has bridge piers)** a. Flooding occurred in 2001, 2003, April 2007, June 2011, and April 2013 b. Designed to 1:50 year flood event c. South of bridge overtops regularly and affects deck piers d. Spent $65,000 to repair bridge pier piles and the deck in April 2013 19) **Bridge Crossing at end of Peavine Creek (most downstream end)** a. 2013 was a large flood; floods are occurring almost annually. The bridge acts as a bottleneck in the area b. Flooded a farm and a grain handling facility. Property was diked to mitigate future flooding c. Water backed up and flooded the area north of bridge 20) **Peavine Creek** a. Two streams east of Peavine Creek discharge into a ditch. The ditch runs west and connects into Peavine Creek upstream of the bridge (bottleneck) and overtop the bridge b. The two streams flood approximately half a mile across the river and area is a designated floodplain. There is housing restriction in the floodplain c. The two streams flood annually due to rain and/or spring snowmelt in April d. Gervais Drainage Project contributes to flooding of the two streams e. The area between the two streams and the downstream end of Peavine Creek floods due to (1) Peavine Creek flooding, (2) the two streams flooding, and (3) the Gervais Drainage Project flooding. 21) **Flooding** of pie shaped area east of Village of Girouxville a. Floods annually due to overtopping of east-west canal b. Railway track on south extents of flood area is at a high elevation and acts as a barrier c. Developing the flood plain area is prohibited	Info
Town of McLennan	
22) No flood issues at Town of McLennan	Info
Town of Falher	
23) **Desilets Drainage Project** captures a portion of the drainage from the south side of highway 790 and is located northeast of town a. The Desilets Drainage Project connects to a canal that travels and drains west along the north side of the Town of Falher and west toward the Village of Donnelly and discharges into Hunting Creek 24) **Flash Flood Control Ditch (grassed ditch)** a. Located west of Town of Falher along Highway 781 (east-west) starting at Central Avenue SW and 2nd Street NW travelling west along Township Road 781 and continuous north on Township Road 215 and crosses the railway tracks where water is discharged into the east-west canal (described in #1 to 9) b. Acts as a flood control ditch to convey flood waters out of town c. The entire stormwater pipe network for the Town of Falher ties into the north-south running portion of the flood control ditch. In the event of heavy rainfall and snowmelt, the runoff can be routed to the east-west canal via the flood control ditch	Info

d. **Flooding** in June 24, 2011 and August 2013 i) due to heavy rainfall (approx. 3.5" in 1 hour in 2013) caused stormwater pipe network to surcharge, east-west canal backed up contributing to flash flood control ditch back up, and increased flows from Desilets Drainage Project (and possibly other drainage projects) into east-west canal also contributed to flooding ii) 2011 – 44 homes affected, basement flooding, 5' of rain overnight – streets were like rivers, lift station could not keep up iii) 2013 – Lift stations run overcapacity, 19 homes were affected. The same amount of rain fell in the MD which flowed into the canal and Desilets project, adding more flows to the drainage system of the town. The town claimed for flood damages. Flood impacted agricultural lands as well. iv) Area is not designed as a flood plain. In rapid snow melt there is no system to hold stormwater and the pipe capacity cannot manage the flow	Info
e. AECOM to request digital flood photos and digital copies of completed flood studies from Ernie Marchildon and Adele Parker	JK
25) **Water Treatment Plant (WTP)** a. WTP in the Town of Falher is not affected by flooding b. Services the Villages of Girouxville and Donnelly, the Town of Falher, some acreages and farms in the vicinity of the Town of Falher, and the Hamlets of Jean Cote and Guy c. WTP water source is an intake on the Little Smoky River located approx. 20 km south of the Town of Falher. Water is pumped to a reservoir approximately 2.5 km northeast of the river intake. The reservoir has 18 months water supply capacity. Water is pumped and piped to the WTP in the Town of Falher.	Info
26) **River Intake on the Little Smoky River** a. The river intake is affected annually by spring snowmelt and heavy rains. The intake is also affected when it rains heavily in Grand Cache b. Damaged due to log jams and siltation due to high flows c. Cleaned out annually costing $20,000 and pump repairing cost $15,000 d. There are pumps, gates, and piping e. Intake installed in 2006 f. No ice jam problems	JK
27) **Flooding**- Road along a small branch (stream) of the Little Smoky River that travels east/west towards the river intake washes out and it is flooded 150 m north and south of the road during heavy rains and snowmelt	
28) At ski hill – intake requires frequent cleaning and maintenance due to silt	
29) **Wastewater Treatment Plant (WWTP)** a. Not at risk of flooding b. Discharges into Peavine Creek southwest through a series of ditches in October c. WWTP located south of Town of Falher	
Village of Donnelly	
30) **Flooding** in 2007 of two blocks a. Due to snowmelt/rainfall	

b. Area northeast of Village of Donnelly discharges southwest (overland flow) towards the Village of Donnelly. Overtopping of culvert contributed to overland flow and is located on Range Road 205 approx. 2.5 km northeast of Village due to ice blockage c. Flood waters flowed southwest overland, then west along the railway and south into the Village of Donnelly along Range Road 210 (also known as 3 Street). d. 15 homes were damaged (north part of the town, south of rail tracks on Main Street), flooded main floors or basements, village office was flooded e. Request digital flood photos and digital copies of completed flood studies from Estelle Girard	JK
Village of Girouxville	
31) **Water Reservoirs & Control Weir** a. East-west canal supplied water to recharge the water reservoirs located northeast of the Village b. A control weir was installed in the spring of 2003 to control the discharge from the east-west canal into the water reservoirs c. There is an outlet ditch located directly downstream of the control weir that discharges into the water reservoirs 32) **Flooded** in April/May 2003 due to snowmelt (not rain) in Village directly north of railway and east of 50 Street a. Overland flooding started from northeast of the Village and originated from the east-west canal at the water reservoirs. Flood waters flowed southwest towards the railway track where the ditch along the railway track was flooded and affected approx. 6 homes (basement flooding: 12" water depth) b. The weir control was not in place at the water reservoirs during the April/May 2003 flooding	Info
33) **Flooding** in August 2013 due to heavy rainfall a. Flood water travelled west in the ditch along the railway track and crossed the railway track south to approx. 48 Avenue and highway 782 where one home was flooded due to back up of water in the ditch - Concern for Girouxville – located at the end of the flow from the other municipalities - As long as the canal is flowing and it doesn't overflowed the berm, no flooding occurs 34) AECOM to request digital flood photos and digital copies of completed flood studies from Lilliane Bessette (CAO of Village of Donnelly) as well as CAO of Girouxville	JK
Hamlet of Guy	
35) **Flooding** in June 24, 2011 due to snowmelt a. Lasted 1 hour b. Floods contribute flow to Guy from a high elevation located east and northeast of Guy c. Chaibos drainage project located northeast of Guy flooded and contributed to flooding Guy d. Wolf Honey had damage and was flooded e. Manholes and lift stations flooded	Info

Drainage Projects	
36) Desilets drainage project a. A ditch that runs north to south along Township Road 212 from Highway 790 and discharges into the canal that travels east to west between the Village of Donnelly and the Town of Falher b. Another ditch starting half way between Highway 790 and the canal at Highway 2 connects to Desilets drainage project (the ditch)	Info
37) Chaibos drainage project, contributes to flooding in the Hamlet of Guy	
38) Gervais drainage project, drains into Peavine Creek and is approx. located in south of Donnelly	
39) AECOM to contact Kevin Cymbaluk and Dave Gervais – obtain drainage projects maps (PDF, CAD dwg) as well as archives at Alberta Environment for drainage projects digital files (shape files, CAD dwg, PDF, etc)	JK

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January, 15, 2015	3.45pm	6:30pm	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	Town of Spirit River - 4202 – 50 Street, Spirit River				
Regarding	Existing flood issues MD of Spirit River No.133				
Attendees	Marcus McCullough (MM)	Resilience and Mitigation (RAM), Alberta Environment and Sustainable Resource Development			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications			
	Kelly Hudson (KH)	MD of Spirit River No.133 - CAO			
	Jess Gingell (JG)	MD of Spirit River No.133 Public Works Supervisor			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

MD of Spirit River No.133	ACTION ITEMS
- Flooding happens when the water slows down and congregates - Most homes are high enough and usually do not get flooded – and generally people do not become isolated, rather inconvenienced - Water rises but may not cause damage to homes, roads/highways are not severely affected - In the northeast, flooding takes place and affects agricultural land, crops can be damaged or ruined - One Carville grain elevator is in the flood zone - Secure Energy built a plant in the flood zone - Burnt River and Spirit River are the two major waterways of the area.	Info
1) **General MD wide infrastructure (roads, culverts)** a. Generally in a normal year, the roads in the rural areas of the MD are in service, unless a large rainfall or snowmelt occurs b. Annually throughout the MD there is infrastructure related flooding involving culverts and roads c. Residents within the rural areas of the MD are inconvenienced by minor road flooding, many are long-time residents and have built their homes on hills/higher elevations. d. Residents may use detour if roads are washed out e. Annually, the MD spends approx. $35,000 to $50,000 on upgrading existing culverts to maintain drainage infrastructure f. Early snow melt can cause ice jam in canals which is the cause of flooding in spring g. Flood basin study conducted in 1986 for Alberta Environment - local copies were destroyed by flood h. AECOM to check with AESRD to obtain study report if available.	JK
2) **Bridge Crossing** Highway 2 between Road 52 and 771 over Saddle (Burnt) River - June 24, 2013 a. High water elevation in river b. River migrated, changed direction c. Crossing located d. Impact information need to be collect by AECOM	JK
3) **Prestville Drainage Bridge Culvert** (bridge file #72707) a. Flooded Highway 49 in approx. 1989/1990 due to heavy rainfall (12" in four hours) – June 29 b. Highway 49 was partially submerged (1 foot), and drivable at some locations, other locations were very deep and could not be accessed c. Road was out of service for four days d. Water back up and flooded to the south of the highway e. Bridge has been upgraded four times f. Flooding at Bremner Creek where it crosses Highway 2 – at some locations water depth over the tops of cars – about four days the highway was undriveable- over topped the bridge at Saddle Burnt Bridge g. River changed direction in 2013 and again in 2014 near Falher – became dangerously close to the bridge	
4) **Ditch along Road 774 & Durda Chute** a. Ditch collects drainage from Saddle Hills Watershed and is directed through ditch along Highway 2 and discharges via Durda Chute into Saddle (Burnt) River b. Durda chute is a steep wooden chute c. The water level in the Saddle (Burnt) River was high due to rainfall and snowmelt in 1990 d. AECOM to request digital photos of low level structure damages from Kelly Hudson (CAO)	JK

5)	**Low Level Crossing** (bridge file #78824) a. Concrete structure with pipes b. Requires annual maintenance during spring snowmelt due to ice jams and trees that block the upstream pipe intakes c. The low level crossing was reported to be situated at high elevation to function efficiently as a low level crossing d. **Flooding** and damages during March 2014 snowmelt i. Ice jams upstream blocked the pipes, large ice blocks, the ice blocks were pushed up and over the road/bridge deck by the water that flowed toward the low level crossing. The large ice blocks and trees, debris damaged the downstream end of the concrete pipe ii. Road was out of service for 7 days, people were detoured and inconvenienced the users iii. Valley upstream of low level crossing flooded approximately 20 – 30 ft. above the road deck on the low level crossing and high water mark was approximately 40 ft. above the river bed e. There is another structure approx. 18 miles upstream that is larger than the low level crossing f. Request digital photos of low level structure damages from Kelly Hudson (CAO)	Info JK
6)	**Flow Monitoring Station** a. Located at corner of highway 49 and Road 45 b. Installed in the 1970s, measures discharge due to runoff from a flat area west of the monitoring station that drains into the Saddle (Burnt) River	Info
7)	**Flow Monitoring Station** - Spirit River a. Approx. located 200 m south of intersection of Road 61 and 62 b. Measures discharge in the Spirit River	Info
8)	**Transload Facility (rail) Potential Flood Risk** a. New facility - has not flooded b. Located 800 m south of highway 49 where the rail crosses Road 50 c. Located in an area that frequently floods, it was indicated that this could be a flood risk	Info
9)	**Flooded Flat Area** (west of Village of Rycroft) a. In approx.1989/1990 a large area approx. 1.2 km east of the Village of Rycroft was flooded due to heavy rainfall (12" rainfall in 4 hours in June 1989). The area extend north and south of Highway 49 and surrounds Bremner and Prestville Creek b. Water was approximately 5 ft. deep in the centre of the entire area	Info
10)	**Flooding of Spirit River Valley** a. Spirit River Valley located north of the Town of Spirit River and is farm land b. Floods annually due to spring snowmelt or heavy rain c. Road ditches and culverts fill up and roads flood approx. 100 ft. on each side	Info
11)	**Erosion** a. Erosion occurs due to fast flowing snowmelt runoff (3-4 ft. deep) annually on a steep section of land located approx. 4 km west of the Town of Spirit River b. The elevation drop is approx. 80 ft. to the south	Info

12) **Flooded Area** a. Annually, spring snowmelt runoff flows from 4 km west of the Town of Spirit River toward the north and northeast where Bailey and Dunvegan Creek are located. b. Bailey Creek normally has no flowing water; the banks overflow and flood the area around the creek during spring snowmelt. Water is eventually drained into Dunvegan Creek located east of Bailey Creek c. Spirit Valley is the largest, most problematic area of watersheds. There is annual flooding as water flows across it – all road ditches fill completely and flooding takes place for approximate 100 feet each way. Cause can be spring run-off or rain. This is the best agricultural land in the MD.	Info
13) **Flooded Flat Area (localized)** a. A large flat area containing mainly farmlands and some rural homes located in the northeast corner of the MD and is bordered by the Peace River, the Spirit River, Dunvegan Creek, and the east MD border. b. The area experiences localized pockets of flooding annually due to snowmelt, saturated soil, and rainfall c. One homes and garage was flooded due to overland flow from snowmelt and due to the deposition of large dirt hills for construction purposes. These dirt hills changed the normal flow paths and cause flooding. When the dirt hills were used and removed, the home was not at risk of flooding anymore. A one-time event. d. Any elevation changes in this large flat area can easily change flow paths and cause flooding in areas normally safe e. The area experienced a 12” rainfall in 4 hours in June 1989 f. AECOM to obtain digital photos available from Kelly Hudson (CAO)	JK
Town of Spirit River	
14) No flood risk 15) Located on a higher elevation	Info
16) **Water Treatment Plant** a. Only supplies Town of Spirit River with potable water b. Receives water from a water reservoir approx. 3 km south of the Town of Spirit River c. Water is collected from a watershed directly west of the reservoir and is pumped to the WTP at the Town of Spirit River d. The reservoir has three years of water storage capacity e. The reservoir supplies the Town of Spirit River and the Village of Rycroft	Info
17) **Drought** a. Approx. in 1980 and 2000 there was a drought b. The water reservoir was not recharged (or small amount of recharge) for approx. 3 years c. First priority to pump and service water is to the Village of Rycroft, second priority is the Town of Spirit River i. The Town of Spirit River had to ration water ii. The Village of Rycroft had enough water (they have a lower water demand than the Town of Spirit River)	Info
14) **Wastewater Treatment Plant (evaporation cells only, no further treatment)** a. Not at risk of flooding, the banks of the cells are built up 12 ft. above the ground surrounding the cells b. Cells discharge to Ksituan River, but that is rarely required	Info

Prestville (locality)	
18) Flooding in 1990 in the Prestville area 19) Two homes were lost in the flood	Info
Manir (locality)	
20) No flood risk	Info
Silverwood (locality)	
21) No flood risk	Info
Bridgeview (locality)	
22) No flood risk	Info
Drainage Projects	
23) Young's drainage project	Info
24) Burnt River Durda Chute drainage project 25) Saddle Hills Watershed drains and discharges into the Durda Chute and into the Saddle (Burnt) River 26) AECOM acquired hard copy map and will request digital copy (CAD dwg, GIS shape file, or PDF) from Kelly Hudson (CAO)	JK
27) Willowvale Drainage Ditch - 2009 huge snowfall and stormwater, ditch built by GOA, designed for wet water flow – but it appears that the ditch has insufficient capacity for flow during spring runoff	Info

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January 16, 2015	9:00am	10:00am	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	MD of Greenview No.16 – 4806 36 Avenue, Town of Valleyview				
Regarding	Existing flood issues MD of Greenview No.16 follow up				
Attendees	Marcus McCullough (MM)	Resilience and Mitigation (RAM), Alberta Environment and Sustainable Resource Development (AESRD)			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications			
	Jeff Francis (JF)	MD of Greenview No.16 Manager – Protective Services			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
MD of Greenview No.16	
1) No flooding at Sturgeon Lake	Info
2) **Stream gauge station** located on Little Smoky River close to the confluence of Losegun Lake, Little Smoky and Waskahigan River a. Flooded in the 2000's and AECOM to obtain additional information	JK
Coops	
3) Muskeg River – Metis coop, no status a. Flooding occurred a few times due to beaver dams in 2014 b. Located on the Muskeg River approx. 30 km east of the City of Grande Cache	
4) Sousa Creek – Metis coop, no status a. Flooded in July 2014, flooding occurs annually from Sousa Creek (north side) b. Eight modular homes evacuated on the north side of the creek, the homes are located on the same elevation as the creek and are at risk of annual flooding (homes on the south side are not at risk) c. Sousa Creek coop is located at Sousa Creek approx. 3.5 km northeast of Grande Cache d. AECOM to contact Tom McDonald to obtain additional information.	JK
5) Wanyandie East – Metis coop, no status a. Not at flood risk – the road is approx. 15 to 20 ft. above the Smoky River b. Located on the south side of the Smoky River approx. 12 km north of the City of Grande Cache	Info
6) Wanyandie West – Metis coop, no status a. Located on the south side of the Smoky River inside a river bend approx. 12 km north of the City of Grande Cache b. Erosion nearby coal mine building and riprap protection on the both river banks	Info
7) Victor Lake – Metis coop 8) Main source of water comes from Grande Cache 9) No flooding issues in recent history	Info
Grande Cache Coal Plant 10) Located on the south side of the Smoky River approx. 12 km north of the City of Grande Cache 11) Erosion on the river bank below the plant at the bend in the river	Info
Town of Fox Creek	
12) Not aware of flood issues – situated at higher elevation	
Nose Creek Settlement 13) Flood potential was reported 14) AECOM to follow up with Pat Kennedy about Nose Creek flood potential	JK
Muskeg Seepee Coop – experience flooding due to beaver dam. Flooded in past few years but not in 2014	Info
Hamlet of Little Smoky – north of Fox Creek about 50 km – flooded in recent history, perhaps 2009 AECOM to contact the Hamlet directly to obtain the information	JK
Industrial camps – AECOM to determine if contact is required with Industry	JK
O'Brien Park – Flooding 15) Floods annually due to overtopping of the west river bank of the Wapiti River caused by the April/May snowmelt. However, no personal hazard due to flooding so far 16) Day camping only 17) Water drains after 1 – 2 weeks 18) City of Grande Prairie water intake on opposite side of river from O'Brien Park	Info

Drainage Projects	
19) **Land ownership maps available** in ArcGIS, CAD, and PDF format a. Maps contain location of coops and drainage projects in the MD of Greenview No.16 b. AECOM to contact: Sally Rosson and Jeff Francis for digital maps, shape files, and CAD dwgs	JK

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Minutes of Meeting

		Start Time	End Time		
Date of Meeting	January, 16, 2015	12 noon	12:45pm	Project Number	60334569
Project Name	Peace River Basin Flood Mitigation Feasibility Study				
Location	Birch Hills County – 4601 – 50 Street - Hamlet of Wanham				
Regarding	Existing flood issues Birch Hills County				
Attendees	Marcus McCullough (MM)	RAM			
	Jagadish Kayastha (JK)	AECOM – Water Resources Lead			
	Eric Afghan (EA)	AECOM – Water Resources Engineer			
	Jacqueline Tessier (JT)	Twenty/20 Communications (Sub-Consultant to AECOM)			
	Dion Hynes (DH)	Birch Hills County Director of Public Work & Emergency Services			
Distribution	Attendees, Heather Ziober (RAM) and Ahtesham Shirazi (AECOM)				
Minutes Prepared By	Eric Afghan				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	ACTION ITEMS
Birch Hills County	
1) Highway 733 crossing the Bad Heart River experiences road slumping, ongoing issue due to spring snowmelt runoff. 2) Culverts at this location owned by Alberta Transportation	Info
3) **Flooding** in April 2012 due to spring snowmelt (Birch Hills, MD Smoky and Saddle Hills hit hard) a. Damaged and repaired the infrastructure (culverts, roads) b. Disaster relief grant was granted	Info
4) **General flooding** occurs in the county a. Infrastructure including roads and culverts b. Annual maintenance approx. $20,000 to $30,000 c. Farmlands are affected but not homes – most are older homesteads	Info
5) **Drought** a. A drought occurred for approx. 2.5 years in the 6 years prior to 2015 b. A water hauling program was in place from approx. 2008 to 2011	Info
6) **Erosion** a. A tributary stream to the Bad Heart River located east of the intersection of Highway 677 and Highway 733 has bank erosion due to rain and snowmelt b. There are no homes in the vicinity	Info
7) Generally there is not much flooding in Birch Hills County –However flooding is experienced annually in low lying areas (localized) culverts back up and ditches over run due to snow melt	Info
8) Power generation stations have no flood issues	Info
9) Four Hutterite Colonies are not affected by flooding	Info
10) **Bridge Crossing** over Saddle (Burnt) River in the northwest of Birch Hills County (Peace Provincial Wildlife Park) a. Bridge abutment moved over the years due to spring snowmelt runoff caused scour b. Bridge crossing removed in 2009 and replaced with a low level crossing c. River is dry most of the time, but when water flows, it flows hard	Info
11) **Water Supply** – most rural residences are on private groundwater well or use cisterns (surface water collection) or dug outs	Info
12) **Power** – services are not at risk of flooding	Info
Hamlet of Watino	
13) No river ice jams at the bridge crossing the Smoky River upstream of the Hamlet of Watino	
14) Designated flood zone and mapping available (not sure about development restrictions) 15) Flood Management Study (Birch Hills, Watino) sent to AECOM	Info
16) Water source is wells and cisterns – private not municipal	Info
17) **Bridge Crossing Highway 49** – crossing over Smoky River at the Hamlet of Watino a. Due to rain and snowmelt in 2011 and 2013, high water level and flow in the Smoky River a. River banks partially sloughed away b. New bridge was built parallel to the old one c. Water Survey Canada gauging station upstream of the bridge	Info
18) **Annual flooded area** due to spring snowmelt west of bridge crossing Highway 49 at the Hamlet of Watino along the north Smoky River bank	Info
19) **Flooded Area** a. Area south of Smoky River and directly west of Highway 49 was flooded in May 2011 due to snowmelt. Farmlands only b. Area west of Smoky River and the Hamlet of Watino was flooded in May 2011 due to snowmelt. Farmlands only	Info

20) **Erosion** a. Rainfall causes annual erosion problems. The May 2011 snowmelt and rain in the mountains was a large event. b. Erosion occurs along the south Smoky River bank; there are summer cottages and holiday trailers c. Total of 12 residents in the area, all 12 were evacuated, but none were damaged, water did not overtop the river banks, but the bank was eroded from approx. 45 degree to a vertical face d. AECOM to obtain historical data/info from AESRD	JK
21) **Wastewater Treatment Plant (WWTP)** a. Located northeast of the hamlet of Watino at a high elevation along the west side bank of the Smoky River b. All resident on piped sewer system (pressure sewer) that is pumped to the WWTP c. Each resident has a pump and a cistern which collects wastewater. The wastewater is then pumped to the WWTP d. The WWTP consists of an evaporation pond only and does not discharge into the river	Info
Hamlet of Eaglesham	
22) **Water Treatment Plant (WTP)** a. WTP provides potable water to the Hamlets of Eaglesham, Wanham, and Tangent b. Reservoir has 3.5 years of water storage capacity c. Water is piped and pumped to Wanham and Tangent d. Water is collected from spring runoff from Fox Creek. Fox Creek only contains water during spring snowmelt, otherwise the Fox Creek is dry e. A registered drainage project collects water from Fox Creek and then is piped to the WTP	Info
Drainage Projects	
23) Doreen Drainage Project a. Located approximately 2 km east of the intersection of Highway 739 and Highway 49 and flows southeast b. Discharge into a creek which discharges into the Smoky River c. Alleviates drainage north of Highway 49 d. Annual flooding due to snowmelt e. The ditches along most range roads / township roads that cross Doreen drainage project have flooded f. Approx. four homes were close to flooding g. AECOM to request CAD, ArGIS, PDF Land Use maps containing drainage projects from Dion Hynes	JK
24) Registered drainage project located southwest of the Hamlet of Eaglesham a. Water from the drainage project is collected and used as a water source for WTP in the Hamlet of Eaglesham	Info
25) Bouchard Ditch – north of Tangent – AESRD aware of some flooding issues in this area. Ditch on 794 runs into the Smoky River and created a huge crevasse due to high flow velocities.	Info

Stakeholder Contact Information Tables

Six stakeholder meetings were held during the duration of the stakeholder consultation process of the Peace River Flood Mitigation Feasibility Study. The Stakeholder Meeting Attendees list is presented in Table B-1 below. Further contact information for the stakeholders who attending the meetings, as well as those stakeholders which were contacted via phone or email during the project, are listed in Table B-2.

Table B-1: Stakeholder Meeting Attendees

Contact Name	Contact Title	Community / Agency
November 26, 2014 Meeting		
Brian Lot	Director of Emergency Management/Fire Chief	Grande Cache
Loretta Thompson	CAO	Grande Cache
November 27, 2014 Meeting		
Venessa Ross	Administration Support for Infrastructure and Operations	M.D. of Greenview
Gord Meaney	Operations Manager	M.D. of Greenview
Norm Patterson	Road Manager East	M.D. of Greenview
Jim Joelson	Councillor	Town of Valleyview
Adam Norris	Watershed Co-ordinator	Mighty Peace Watershed Alliance
Rachel Wueschner	Assistance Administrator	Town of Sexsmith
Claude LaGace	Mayor	Town of Sexsmith
Richard Sali	Project Technologist, C.E.T.	Grande Prairie Engineering Services
Cassandra Chabot-Madlung	Project Technologist, Geology G.I.T.	County of Grande Prairie No. 1
Ian Ketchem	Professional Engineer	BeairstoLehnersKetchum Engineers
Mathew Konowalchuk	Senior Planner	County of Grande Prairie No. 1
Brian Ballard	Manager of Protective Services	Saddle Hills County
Robert Kobylanski	Public Works Foreman	Village of Rycroft
November 28, 2014 Meeting		
Kelly Bunn	CAO	Town of Peace River
Sandra Adams	Director of Engineering and Infrastructure	Town of Peace River
Ian Cosh	Director of Engineering, Planning & Development	Northern Sunrise County
Sebastian Dutrisac	Agricultural Fieldman	Northern Sunrise County
Doug Dallyn	Councillor, Ward 5 – Three Creeks	Northern Sunrise County
Trent Mclaughlin		County of Northern Lights
Cheryl Anderson		County of Northern Lights
Brent Reese		County of Northern Lights
Arie Loogman		County of Northern Lights
Lyle McKen		MD of Peace No.135
Alisha Mody		Mackenzie Municipal Services Agency
Phil Rough		Mackenzie Municipal Services Agency
January 15, 2015 Meeting		
Dave Gervias	CAO	M.D. of Smoky River
Kevin Cymbaluk	Director of Operations (Public Works)	M.D. of Smoky River
Adele Parker	CAO	Town of Falher
Ernie Murchildon	Director of Public Works	Town of Falher
Estelle Girard	Municipal Administrator	Town of Girouxville
Lillianne Bissette	CAO	Town of Donnelly
Kelly Hudson	CAO	M.D. of Spirit River
Jess Gingell	Public Works Supervisor	M.D. of Spirit River

Contact Name	Contact Title	Community / Agency
January 19, 2015 Meeting		
Jeff Francis	Manager, Protective Services	M.D. of Greenview
Dion Hynes	Director of Public Works and Emergency Services	Birch Hills County
February 25, 2015 Meeting		
Joulia Whitteton	CAO	Mackenzie County
Grant Smith	Agriculture Fieldman	Mackenzie County

Table B-2: Stakeholder Contact List

Stakeholder	Date of Contact	Contact Name	Contact Title	Phone	Email	Notes
Associations						
Alberta Water SMART	Contacted April 6 and April 8	Megan VanHam	Alberta Water SMART	403-210-5278	megan.vanham@albertawatersmart.com	
Mighty Peace Watershed Alliance	November 27 (Stakeholder Meeting)	Adam Norris	Watershed Co-ordinator	780-552-4354	mpwa.execdirector@telus.net	
Mackenzie Municipal Services Agency	November 28 (Stakeholder Meeting)	Alisha Mody** Phil Rough	Municipal Planner	780-338-38-62	alisha@mmsa.ca	
Government						
Alberta Transportation		Barry Pape (Municipal Programs) Danny Jung	Rural Transportation Engineer	780-624-1266 780-624-6280		
Alberta Environment & Sustainable Resource Development (AESRD)		Darcy Beach Dave Hervieux	ESRD Executive Director Peace Region ESRD Regional Fish & Wildlife	780-624-6541 780-538-5618	dave.hervieux@gov.ab.ca	
Alberta Parks – Peace River District Office		Ray Gibson		780-624-6486		
Alberta Parks – Northwest Region Office		Calvin McLeod	Regional Director	780-538-8010	calvin,mcleod@gov.ab.ca	
Alberta Parks – Consultation and Engagement	Contacted December 22	Elizabeth Driver	Manager	780-644-5355		
Aboriginal/Métis						
Beaver First Nation – Beaver Ranch 163, 163A, 163B, Boyer River 164, Child Lake 164A		Kieran Broderick		250-793-4595	kieran.broderick@beaverfirstnation.ab.ca	
Big Stone Cree Nation – Wabasca 166, 166A, 166B, 166C, 166D		Melvin Beaver	Director	780-953-2099	melvin.beaver@bigstone.ca	
Dene Tha' First Nation – Bushe River 207, Amber River 211, Hay Lake 209, Upper Hay River 212, Zama Lake 210, Bistcho Lake 213, Jackfish Point 214		Baptiste Metchooyeah	Consultation Manager	780-841-8933	baptiste.metchooyeah@denetha.ca	
Duncan's First Nation – Duncans 151A, Willian McKenzie 151K		Ken Rich	Director of Lands	780-597-3777	ken-DNF@hotmail.com	
Horse Lake First Nation – Horse Lake 152B		Jayme Savard	HLFN Lands Development	780-356-2472	jayme.savard@hlfnirc.ca	
Little Red River Cree Nation – Fox Lake162, Garden Creek, John d'Or Prairie 215		Harvey Sewepagaham	Director/Consultation Co-ordinator	780-759-3912	harvey.sewepagaham@littleredriverforestry.ca	
Loon River First Nation – Loon Lake 235, Loon Prairie 237, Swampy Lake 236		Eva Whitehead	Manager	780-649-2211	tlus@loonriver.ab.ca	
Lubicon Lake Band – Lubicon Lake Cree		Wayne Auger	Consultation Manager	780-629-2356	w_auger@hotmail.com	
Mikisew Cree First Nation - Devils Gate 220, Mikisew Cree, Peace Point 222		Melanie Dene	Consultation Co-ordinator		melanie.dene@mcfnqir.ca	
Peerless Trout First Nation 478		Doreen Seeseequon	Consultation Co-ordinator	780-859-0545	doreen.seeseequon@ptfn.ca	
Tallcree First Nation – Tallcree 173, 173A		Mike Cardinal	Interim Consultation Manager	780-927-4111		
Treat 8 First Nations of Alberta		Kevin Ahkimnachie	Director of Livelihood	780-444-9366	kahkimnachie@treaty8.org	
Whitefish Lake First Nation (Atikameg) – Utikoomak Lake 155, 155A, 155B		Fabian Grey	Consultation Co-ordinator	780-767-2658	fabiangry@hotmail.com	
Paddle Prairie Métis Settlement		Sylvia Johnson	President	780-624-4219	sjohnson@metis.org	
6 Métis Settlements		Jeff Francis		780-524-9502		
Municipalities / Counties						
Birch Hills County	January 19 (Stakeholder Meeting)	Dion Hynes		780-864-5295	dion@birchhillscounty.com	
Clear Hills County No. 21	Emailed December 23, February 11, April 6	Allan Rowe	CAO	780-685-3925	allan@clearhillscounty.ab.ca	

Stakeholder	Date of Contact	Contact Name	Contact Title	Phone	Email	Notes
County of Grande Prairie No. 1	November 27 (Stakeholder Meeting) November 27 (Stakeholder Meeting)	Mathew Konowalchuk Cassandra Chabot-Madlung** Bill Rogan	Senior Planner Project Technologist CAO	780-532-9722	brogan@countygp.ab.ca	
County of Northern Lights No. 22	November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting)	Trent McLaughlin Cheryl Anderson Brent Reese Arie Loogman	Director of Public Works	780-625-7192	dpw@countyofnorthernlights.com	
Mackenzie County No. 23	Phone Meeting	Joulia Whittleton Ron Polenski	CAO Director of Services and Community Operations North	780-927-3718	jwhittleton@mackenziecounty.com	
M.D. of Big Lakes	Emailed on December 19 and January 6	Pat Olansky	CAO	780-523-5955	cao@mdbiglakes.ca	
M.D. of Fairview No. 136	Emailed	Sandra Fox	CAO	780-835	sandra.fox@mdfairvew.ab.ca	
M.D. of Greenview No. 16	November 27 (Stakeholder Meeting) November 27 (Stakeholder Meeting) November 27 (Stakeholder Meeting) January 16 (Stakeholder Meeting)	Venessa Ross Gord Meaney Norm Patterson** Grant Gyurkovits	Administration Support Operations Manager Road Manager east General Manager, Infrastructure & Planning	780-524-7618 780-588-7246	venessa.ross@mdgreenview.ab.ca grant.gyurkovits@mdgreenview.ab.ca	
M.D. of Opportunity No. 17	Emailed February 12, April 6	Helen Alook Gerry Keege Simon Cardinal	CAO	780-891-3778	cao@mdopportunity.ab.ca gerry@mdopportunity.ab.ca	
M.D. of Smoky River No. 130	January 15 (Stakeholder Meeting)	Lucien Turcotte Dave Gervais	CAO Public Works	780-837-2221 ext.103	lturcotte@mdsmokyriver.com	
M.D. of Spirit River No. 133	January 15 (Stakeholder Meeting)	Kelly Hudson	CAO	780-864-3500	khudson@mdspiritriver.ab.ca	
M.D. of Peace No. 135	November 28 (Stakeholder Meeting)	Lyle McKen	CAO	780-338-3845	lmcken@mdpeace.com	
Northern Sunrise County No. 131	November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting)	Ian Cosh** Sebastian Dutrisac Doug Dallyn	Director of Engineering, Planning & Development Agricultural Fieldman Councillor, Ward 5 – Three Creeks		icosh@northernsunrise.net	
Regional Municipality of Wood Buffalo	Phoned/Emailed December 19; Emailed January 6, February 12, February 20, and April 6	Marg Villebrun			marg.villebrun@woodbuffalo.ab.ca	
Saddle Hills County No. 20	November 27 (Stakeholder Meeting)	Brian Ballard	Manager Protective Services	780-864-370	bballard@saddlehills.ab.ca	
Yellowhead County		Jack Ramme	CAO	780-723-4800	jramme@yellowheadcounty.ab.ca	
			City			
City of Grande Prairie	November 27 (Stakeholder Meeting)	Greg Scerbak Richard Sali	City Manager	780-538-0300	gscerbak@cityofgp.com	
			Towns			
Town of Beaverlodge	Phoned December 19	Rick Willey	CAO	780-354-2201	rwilley@beaverlodge.ca	Questionnaire Returned – No meeting required
Town of Fairview		Daryl Greenhill	CAO	780-835-5461	cao@fairview.ca	Town indicated that there are no flooding issues- located on a slope, no watercourse. No meeting required.
Town of Falher	January 15 (Stakeholder Meeting)	Adele Parker	CAO	780-837-2247	aparker@town.falher.ab.ca	
Town of Fox Creek		Roy F.W. Dell	CAO	780-622-3896	operations@foxcreek.ca	
Town of Grande Cache	November 26 (Stakeholder Meeting)	Loretta Thompson	CAO	780-827-3362	Loretta.thompson@grandecache.ca	
Town of Grimshaw		Brian Allen	CAO	780-322-4626	cao@grimshaw.ca	
Town of High Level	December 23, February 11, February	Tom Derreck	CAO	780-926-2201	tderreck@highlevel.ca	

Stakeholder	Date of Contact	Contact Name	Contact Title	Phone	Email	Notes
	20, February 27, April 6					
Town of Manning	December 19, January 6, February 12	Dennis Edgedy	CAO	780-836-9280		Email Jan6, Feb 12 indicated no river flooding-emailed regarding other flooding. Discussed by phone that Manning is in flood zone - an emergency response plan is in place
Town of McLennan		Lorraine Willer	CAO	780-324-3065	cao@mclennan.ca	Town indicated there are no flooding issues.
Town of Peace River	November 28 (Stakeholder Meeting) November 28 (Stakeholder Meeting)	Kelly Bunn** Sandra Adams	CAO	780-624-2574	kbunn@peaceriver.net	
Town of Rainbow Lake	Email December 23, April 6	Dan Fletcher	CAO	780-956-3934	dfletcher@rainbowlake.ca	
Town of Sexsmith	November 27 (Stakeholder Meeting) November 27 (Stakeholder Meeting) November 27 (Stakeholder Meeting)	Rachel Wueschner** Claude LaGace** Ian Ketchum	Assistant Administrator Mayor BeairstolLehnersKetchum Engineers	780-568-7264	tosadmin@sexsmith.ca mayorlagace@sexsmith.ca	
Town of Spirit River		Deedra Deveau	CAO	780-864-3998	cao@townofspiritriver.ca	
Town of Valleyview	November 27 (Stakeholder Meeting)	Garry Peterson Jim Joelson**	Town Manager Councillor	780-524-5150	gpeterson@valleyview.ca	
Town of Wembley	Phoned December 17	Lori Parker Aaron Halwa	CAO Public Works	780-766-2269 780-518-0857	admin@wembley.ca publicworks@wembley.ca	Town indicated that there are no flooding issues.
Villages						
Village of Berwyn		Olive Toews	CAO	780-338-3922	vberwyn@serbernet.com	
Village of Donnelly	January 15 (Stakeholder Meeting)	Lilliane Bessette	CAO	780-925-3835	lb.vilofdon@serbernet.com	
Village of Girouxville	January 15 (Stakeholder Meeting)	Estelle Girard	Municipal Administrator	780-323-4270	girouxvl@serbernet.com	
Village of Hines Creek	December 23	Leanne Walmsley	CAO	780-494-3690	leanne@abnorth.com	Village indicated that there are no flooding issues.
Village of Hythe	Phoned December 17	Greg Gayton	CAO	780-356-3888	admin@hythe.ca	
Village of Nampa		Dianne Roshuk	Interim CAO	780-322-3852	cao@nampa.ca	
Village of Rycroft	November 27 (Stakeholder Meeting)	Robert Kobylanski	Public Works Foreman		cao@rycroft.ca	

** Key Stakeholder Contact

Appendix C
Flood Frequency Analysis

Water

Alberta Environment and Sustainable Resource Development

Hamlet of Watino, Town of Manning and Hamlet of Fort Vermilion Flood Frequency Analysis

Prepared by:

AECOM
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Project Number:

60334569

Date:

July, 2015

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to Consultant which has not been independently verified;
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1. Hamlet of Watino Flood Frequency

1.1 Introduction

A Flood Frequency analysis has been completed for the Smoky River, at the Hamlet of Watino. The drainage area, as reported by Environment Canada Data Explorer is 50,300 km^2.

Historical flow data obtained from the Water Survey Canada (WSC) Stream Gauge Station 07GJ001 (Smoky River at Watino) was used for the Flood Frequency Analysis. The station location is shown in Figure 1-1.

Environment Canada Data Explorer was used to find the maximum instantaneous and maximum daily flow data for the station and was used for the Flood Frequency analysis.

Figure 1-1: Station Location

1.2 Historical Flow Data

The total contributing catchment area to Station 07GJ001 is 50,300 km^2. The effective area is reported as 49,600 km^2. Table 2-1 details the maximum annual flow data extracted from the WSC gauging station 07GJ001.

Table 1-1: Historical Flow Data at WSC gauge station 07GJ001

Year	Month--Day	Max Flow (m^3/s)
1916	07--05	2780
1917	05--22	2620
1918	07--14	1720
1919	06--12	2920
1920	05--09	3110
1921	06--08	1580
1955	06--02	4500
1956	06--13	2150
1957	08--13	1850
1958	06--30	2300
1959	06--28	1850
1960	06--23	4420
1961	07--03	1280
1962	07--20	2250
1963	05--01	2010
1964	08--04	3060
1965	07--10	5210
1966	05--12	2300
1967	06--03	2200
1968	06--14	2370
1969	04--30	1100
1970	06--05	1460
1971	07--13	4450
1972	06--14	8180
1973	05--18	1380
1974	04--27	2690
1975	06--30	1710
1976	08--18	2450
1977	05--07	2460
1978	06--17	1780
1979	06--15	2390
1980	06--06	3400
1981	06--03	1350

Year	Month--Day	Max Flow (m^3/s)
1982	07--17	6630
1983	07--28	2690
1984	06--10	1710
1985	05--26	1020
1986	05--30	1910
1987	08--03	6330
1988	06--13	1510
1989	07--04	1800
1990	06--13	8620
1991	05--11	2520
1992	06--04	921
1993	06--26	1070
1994	07--06	1730
1995	06--22	1510
1996	06--01	3540
1997	07--13	4690
1998	07--03	1440
1999	05--26	1330
2000	07--11	1710
2001	07--20	3490
2002	06--19	1570
2003	04--18	1400
2004	06--08	2190
2005	05--18	1180
2006	05--28	1100
2007	05--06	3150
2008	05--25	1460
2009	07--09	3090
2010	09--30	1090
2011	07--11	4560
2012	06--08	2410
2013	06--16	2190
2012	06--08	5.212
2013	06--16	4.84

1.3 HYFRAN Input

Table 1-2 details the maximum instantaneous flows that were calculated (in red) and the instantaneous maximum flows (I-Max) which were input into HYFRAN. HYFRAN is a hydrostatistical frequency analysis software which fits a set of data, such as peak flow data, to various statistical distributions. The results can be used to determine the

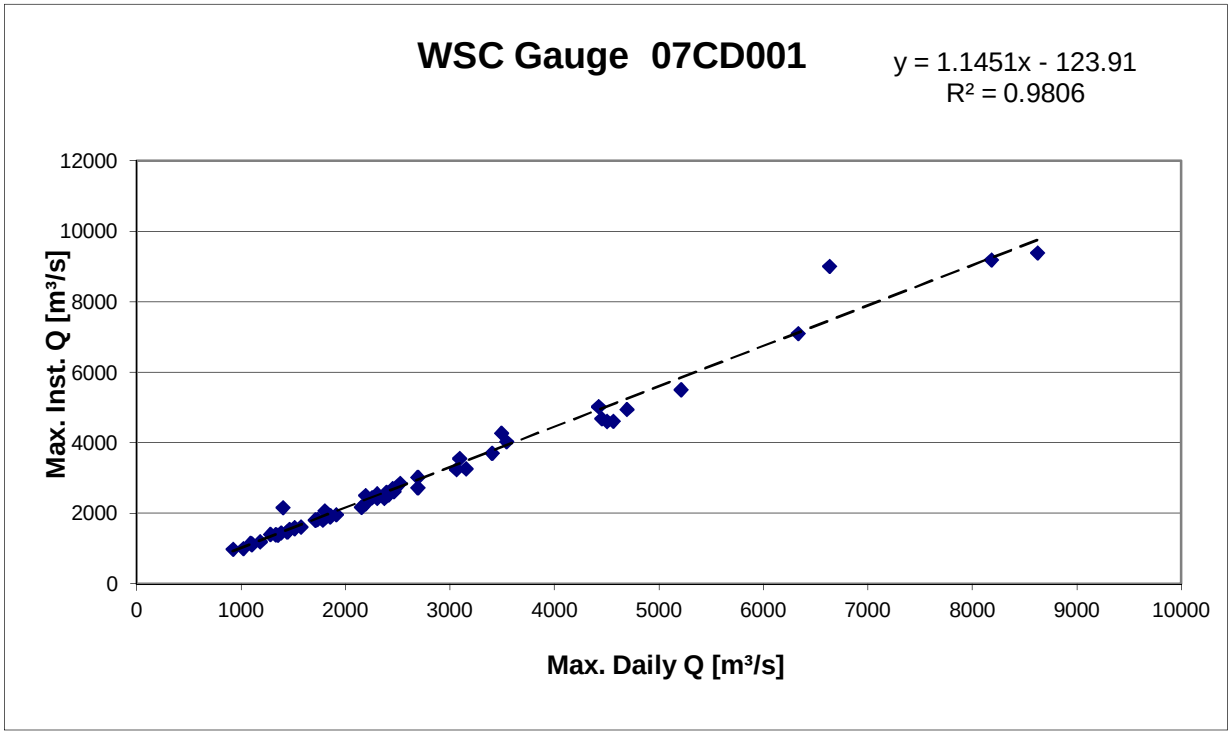
peak flow for different return periods. The equation which was used to calculate the missing values of peak flow (I-MAX) was 1.1451x-123.91, which was obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow as shown in Figure 1-2.

Table 1-2: Peak Flows and HYFRAN Input Values

Year	I-MAX	MAX	I-MAX/MAX
1916	3060	2780	1.10
1917	2876	2620	1.10
1918	1846	1720	1.07
1919	3220	2920	1.10
1920	3437	3110	1.11
1921	1685	1580	1.07
1955	4620	4500	1.03
1956	2190	2150	1.02
1957	1920	1850	1.04
1958	2570	2300	1.12
1959	1950	1850	1.05
1960	5040	4420	1.14
1961	1420	1280	1.11
1962	2460	2250	1.09
1963	2178	2010	1.08
1964	3260	3060	1.07
1965	5520	5210	1.06
1966	2440	2300	1.06
1967	2395	2200	1.09
1968	2440	2370	1.03
1969	1130	1100	1.03
1970	1550	1460	1.06
1971	4700	4450	1.06
1972	9200	8180	1.12
1973	1460	1380	1.06
1974	2740	2690	1.02
1975	1834	1710	1.07
1976	2720	2450	1.11
1977	2630	2460	1.07
1978	1830	1780	1.03
1979	2610	2390	1.09
1980	3720	3400	1.09
1981	1400	1350	1.04
1982	9020	6630	1.36
1983	3040	2690	1.13

Year	I-MAX	MAX	I-MAX/MAX
1984	1830	1710	1.07
1985	1020	1020	1.00
1986	1980	1910	1.04
1987	7110	6330	1.12
1988	1580	1510	1.05
1989	2090	1800	1.16
1990	9400	8620	1.09
1991	2870	2520	1.14
1992	1000	921	1.09
1993	1101	1070	1.03
1994	1840	1730	1.06
1995	1610	1510	1.07
1996	4050	3540	1.14
1997	4960	4690	1.06
1998	1490	1440	1.03
1999	1410	1330	1.06
2000	1820	1710	1.06
2001	4290	3490	1.23
2002	1630	1570	1.04
2003	2180	1400	1.56
2004	2520	2190	1.15
2005	1210	1180	1.03
2006	1150	1100	1.05
2007	3280	3150	1.04
2008	1560	1460	1.07
2009	3570	3090	1.16
2010	1170	1090	1.07
2011	4630	4560	1.02
2012	2540	2410	1.05
2013	2290	2190	1.05

Figure 1-2: Maximum Instantaneous Flow vs Maximum Daily Flow



1.4 HYFRAN Graphs

Four distributions were used to estimate the non-exceedance probability of peak flows for different return periods. Figures 1-3 through 1-6 show the GEV (maximum likelihood), 3-parameter lognormal (maximum likelihood), Gumbel (maximum likelihood) and Pearson Type III (conditional maximum likelihood), respectively.

Figure 1-3: GEV (Maximum Likelihood) Probability of Flow Levels

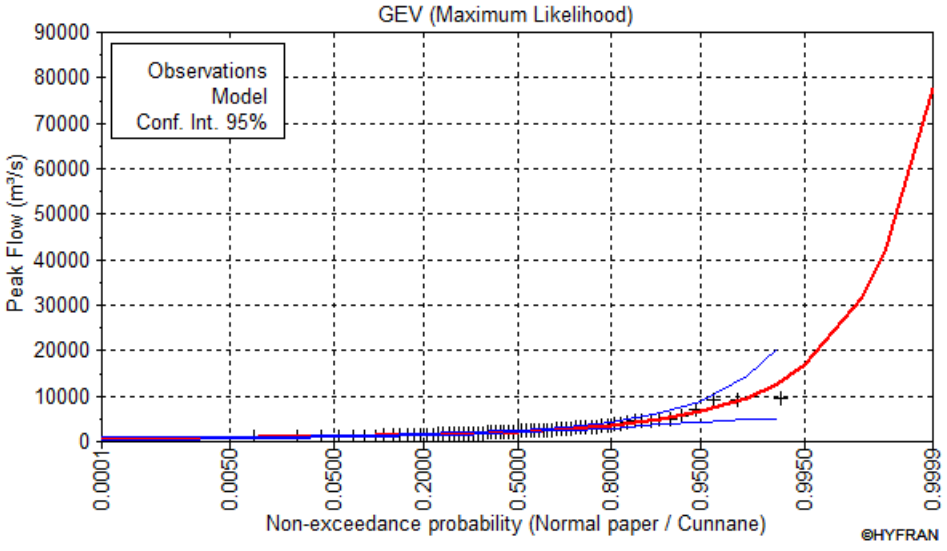


Figure 1-4: 3 Parameter Lognormal (Maximum Likelihood) Probability of Flow Levels

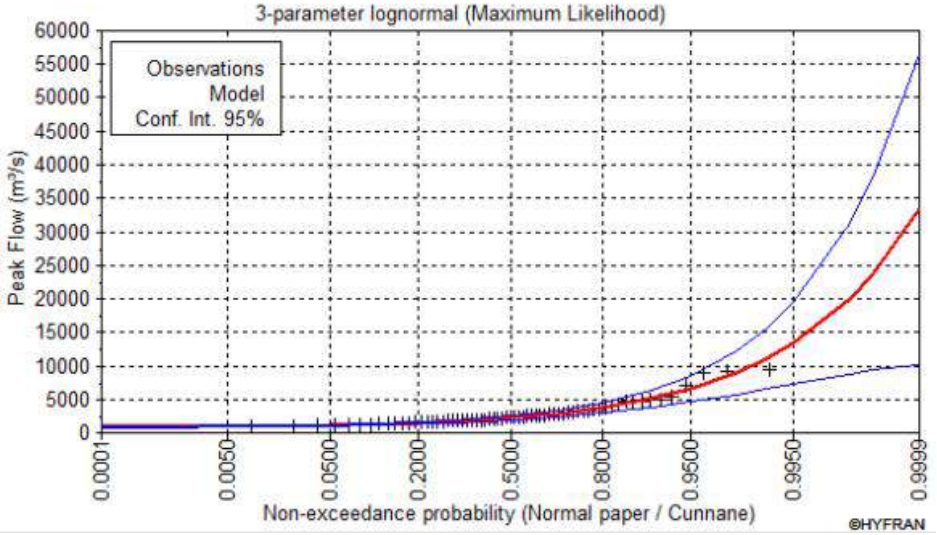


Figure 1-5: Gumbel (Maximum Likelihood) Probability of Flow Levels

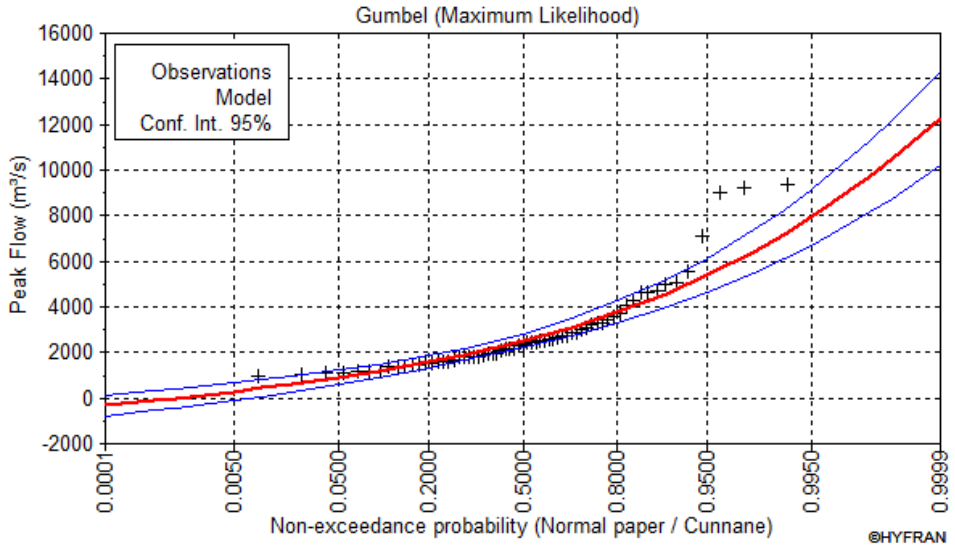
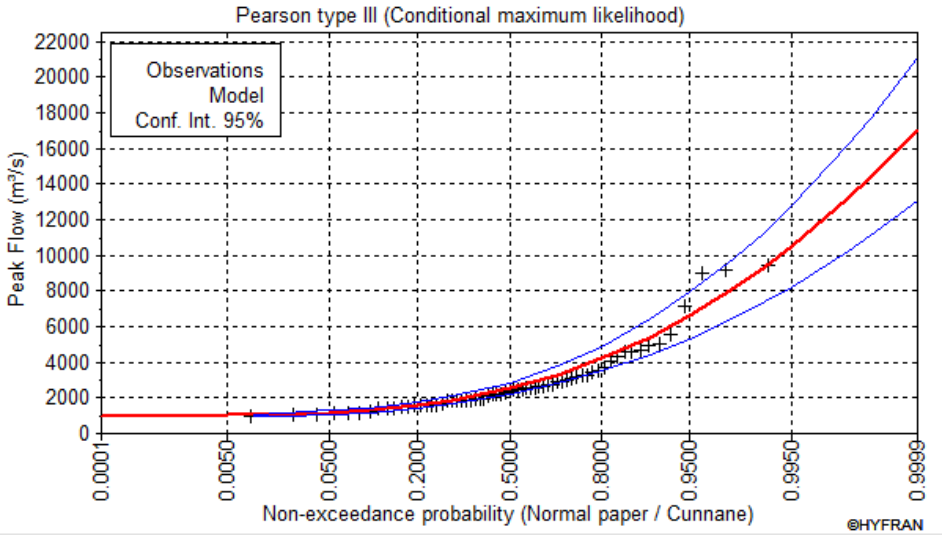


Figure 1-6: Pearson Type III (Conditional maximum likelihood) Probability of Flow Levels



From Figures 1-3 through 1-6, the GEV distribution was chosen to represent the data because it provided reasonable consistency with the input data. Table 1-3 tabulates the different return period flood flows for the various distributions at WSC gauging station 07GJ001.

Table 1-3: HYFRAN Frequency Analysis Results

Frequency	GEV Distribution	3-Parameter Log-Normal	Gumbel	Pearson Type III
(years)	m^3/s	m^3/s	m^3/s	m^3/s
2	2260	2260	2520	2520
5	3660	3760	3770	4190
10	4990	5080	4590	5410
20	6680	6590	5380	6610
50	9700	8940	6410	8180
100	12,800	11,000	7170	9350
200	16,800	13,400	7940	10,500
500	24,100	17,000	8950	12,100

1.5 Conclusions

A Flood Frequency Analysis has been conducted at WSC gauging station 07GJ001 (Smoky River at Watino). The Environment Canada Data Explorer was used to find the raw data for that station and the missing peak flow values were obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow. The GEV distribution from the HYFRAN was used to establish peak flows for the 100, 50 and 20 year return period. Therefore during the 100, 50 and 20-year storm event, the estimated peak flows are 12,800 m^3/s, 9,700 m^3/s, and 6,680 m^3/s respectively.

2. Town of Manning Flood Frequency

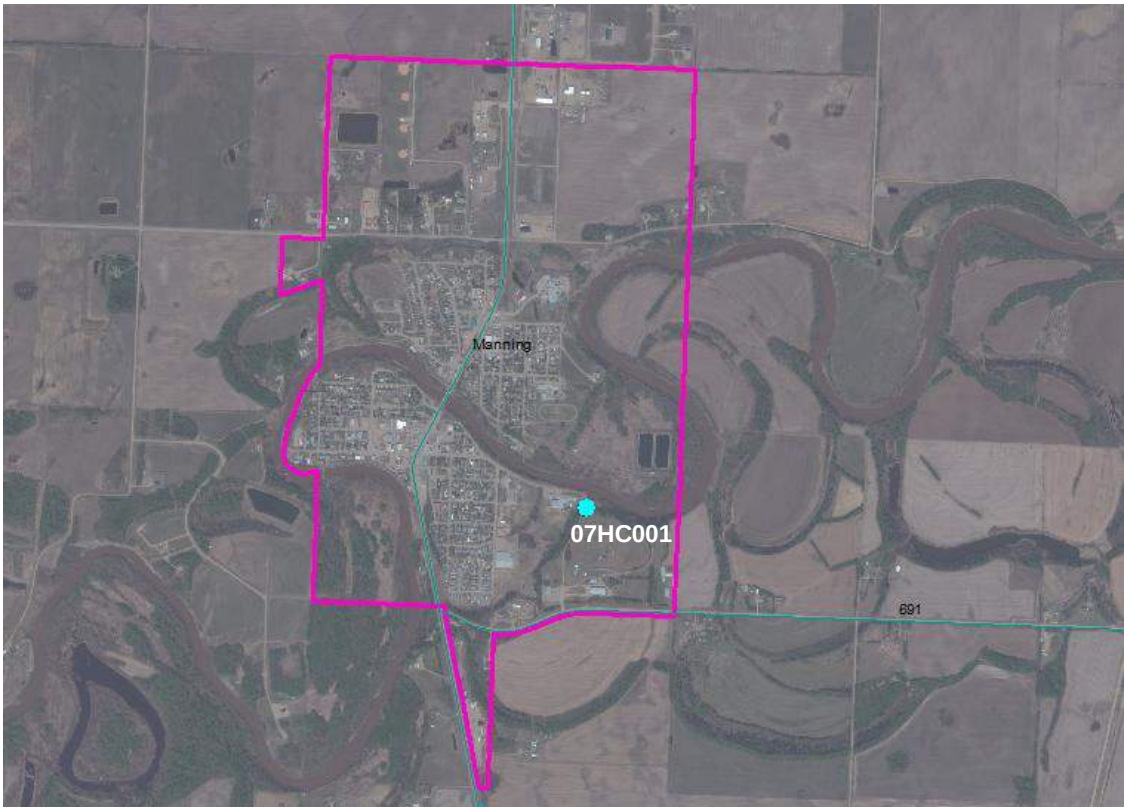
2.1 Introduction

A Flood Frequency analysis has been completed for the Notikewin River, at the Town of Manning. The drainage area, as reported by Environment Canada Data Explorer is 4,678.8 km^2.

Historical flow data obtained from the Water Survey Canada (WSC) Stream Gauge Station 07HC001 (Notikewin River at Manning) was used for the Flood Frequency Analysis. The station location is shown in Figure 2-1.

Environment Canada Data Explorer was used to find the maximum instantaneous and maximum daily flow data for the station and was used for the Flood Frequency analysis.

Figure 2-1: WSC Stream Gauge Station Location



2.2 Historical Flow Data

The total contributing catchment area to Station 07HC001 is 4,678.8 km^2. The effective area is reported as 4,663.8 km^2. Table 2-1 details the maximum annual flow data extracted from the WSC gauging station 07HC001.

Table 2-1: Historical Flow Data at WSC gauging station 07HC001

Year	Month--Day	Max flow (m^3/s)
1961	05--20	114
1962	05--22	123
1963	07--26	433
1964	05--23	504
1965	04--29	253
1966	05--12	106
1967	05--18	217
1968	07--31	95.1
1969	05--01	317
1970	07--02	174
1971	06--28	217
1972	07--12	459
1973	06--19	217
1974	05--09	306
1975	06--30	85
1976	08--19	179
1977	06--04	422
1978	05--24	405
1979	06--01	190
1980	09--28	33.4
1981	05--03	172
1982	05--15	113
1983	06--21	175
1984	05--23	230
1985	05--05	104
1986	05--13	117
1987	08--04	187
1988	07--02	315
1989	05--28	165
1990	06--14	337
1991	06--16	135
1992	05--02	138
1993	06--25	149

Year	Month--Day	Max flow (m^3/s)
1994	05--05	192
1995	04--27	41.2
1996	09--03	151
1997	06--22	232
1998	07--22	90.6
1999	06--11	61.9
2000	07--10	131
2001	07--26	110
2002	05--21	87.7
2003	04--25	128
2004	09--24	105
2005	04--24	192
2006	05--27	46
2007	05--07	340
2008	05--24	132
2009	05--30	90.2
2010	05--28	45.9
2011	07--11	357
2012	05--07	53.7
2012	03--13	2.185

2.3 HYFRAN Input

Table 2-2 details the maximum instantaneous flows that were calculated (in red) and the instantaneous maximum flows (I-Max) which were input into HYFRAN. HYFRAN is a hydrostatistical frequency analysis software which fits a set of data, such as peak flow data, to various statistical distributions. The results can be used to determine the peak flow for different return periods. The equation which was used to calculate the missing values of peak flow (I-MAX) was 1.0666x-0.508, which was obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow as shown in Figure 2-2.

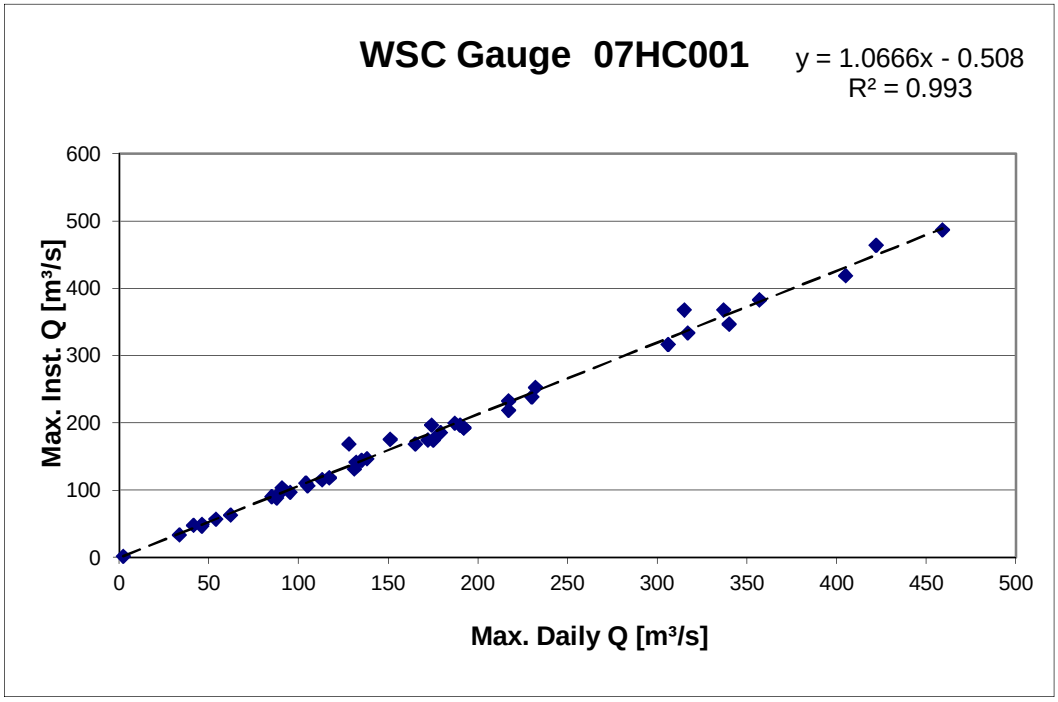
Table 2-2: Peak Flows and HYFRAN Input Values

Year	I-MAX	MAX	I-MAX/MAX
1961	121.1	114	1.06
1962	130.7	123	1.06
1963	461.3	433	1.07
1964	537.1	504	1.07
1965	269.3	253	1.06
1966	112.6	106	1.06
1967	219	217	1.01
1968	97.4	95.1	1.02

Year	I-MAX	MAX	I-MAX/MAX
1969	334	317	1.05
1970	197	174	1.13
1971	231.0	217	1.06
1972	487	459	1.06
1973	233	217	1.07
1974	317	306	1.04
1975	90.9	85	1.07
1976	186	179	1.04
1977	464	422	1.10
1978	419	405	1.03
1979	197	190	1.04
1980	34	33.4	1.02
1981	175	172	1.02
1982	116	113	1.03
1983	175	175	1.00
1984	239	230	1.04
1985	111	104	1.07
1986	119	117	1.02
1987	200	187	1.07
1988	368	315	1.17
1989	169	165	1.02
1990	368	337	1.09
1991	145	135	1.07
1992	147	138	1.07
1993	158.4	149	1.06
1994	193	192	1.01
1995	48.3	41.2	1.17
1996	176	151	1.17
1997	253	232	1.09
1998	104	90.6	1.15
1999	63.4	61.9	1.02
2000	132	131	1.01
2001	116.8	110	1.06
2002	88.9	87.7	1.01
2003	169	128	1.32
2004	107	105	1.02
2005	193	192	1.01
2006	49.9	46	1.08
2007	347	340	1.02
2008	142	132	1.08

Year	I-MAX	MAX	I-MAX/MAX
2009	98.5	90.2	1.09
2010	46.9	45.9	1.02
2011	383	357	1.07
2012	57.5	53.7	1.07

Figure 2-2: Maximum Instantaneous Flow vs Maximum Daily Flow



2.4 HYFRAN Graphs

Four distributions were used to estimate the non-exceedance probability of peak flows for different return periods. Figures 2-3 through 2-6 show the GEV (maximum likelihood), 3-parameter lognormal (maximum likelihood) Gumbel (maximum likelihood) and Pearson Type III (maximum likelihood), respectively.

Figure 2-3: GEV (Maximum Likelihood) Probability of Flow Levels

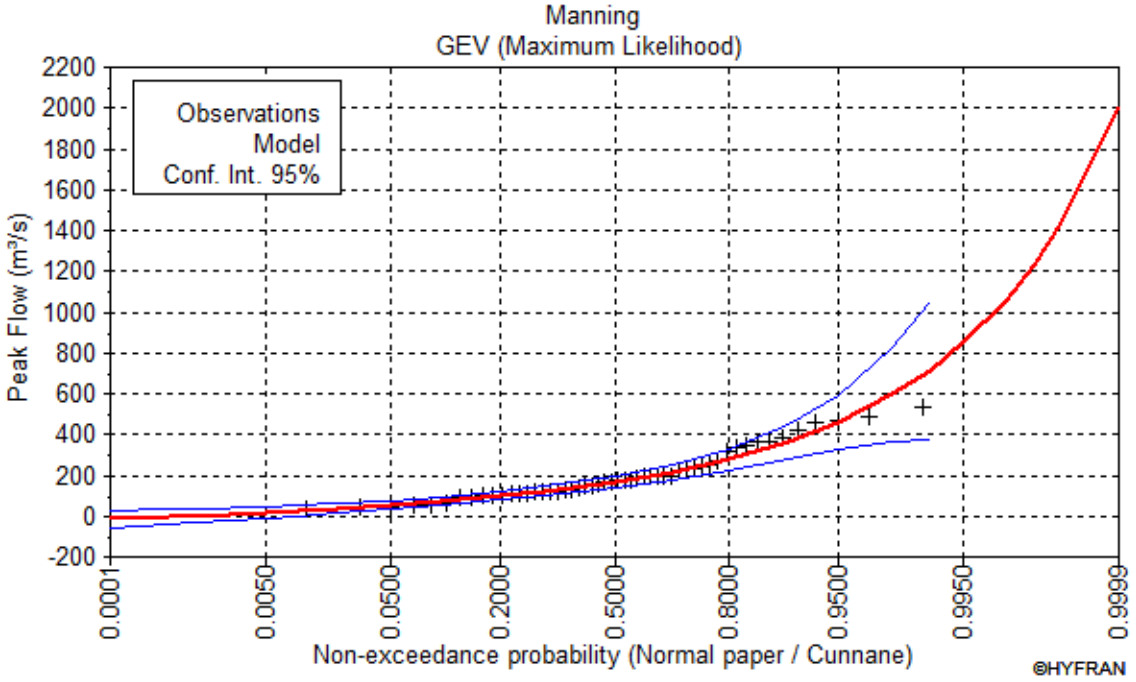


Figure 2-4: 3 Parameter Lognormal (Maximum Likelihood) Probability of Flow Levels

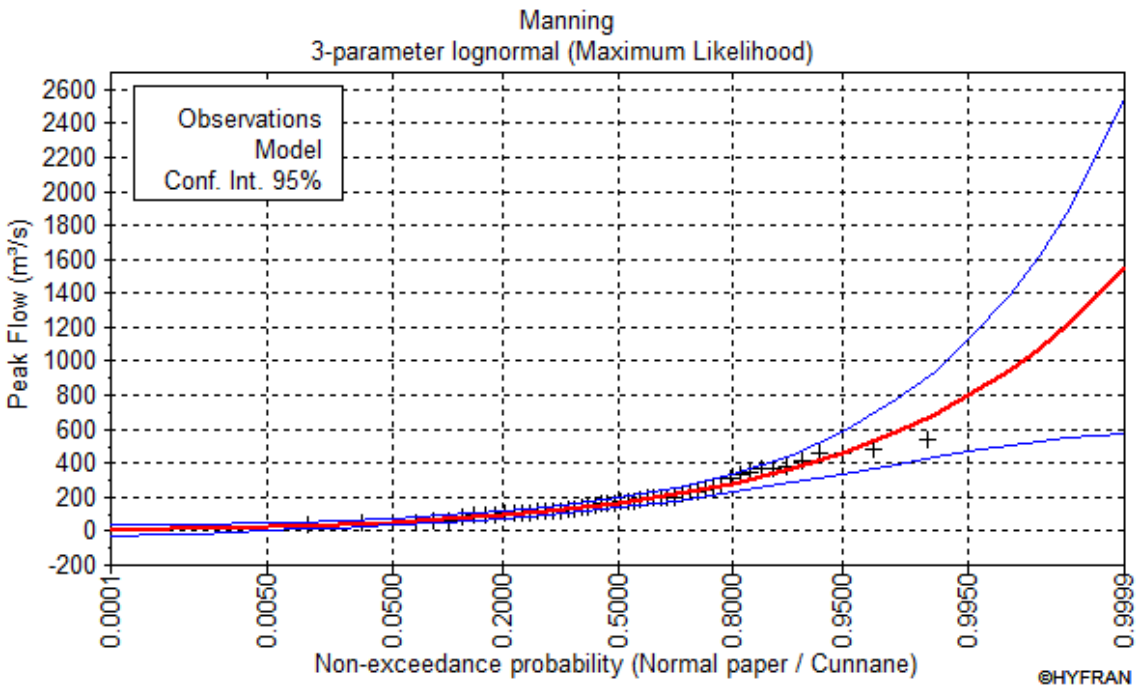


Figure 2-5: Gumbel (Maximum Likelihood) Probability of Flow Levels

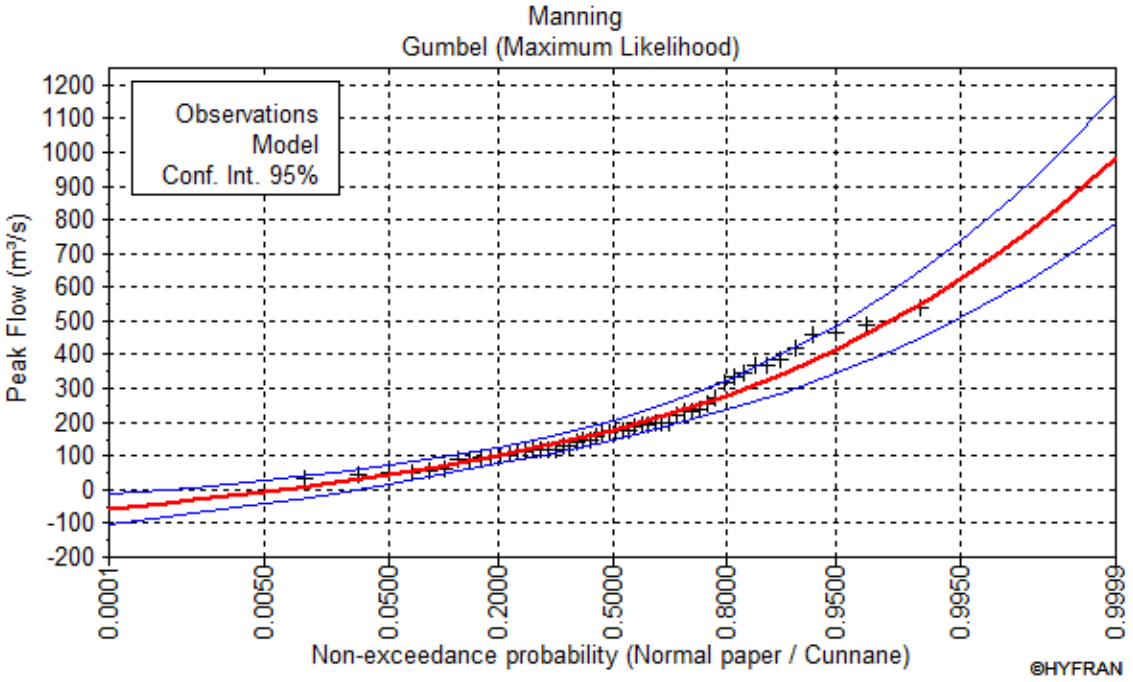
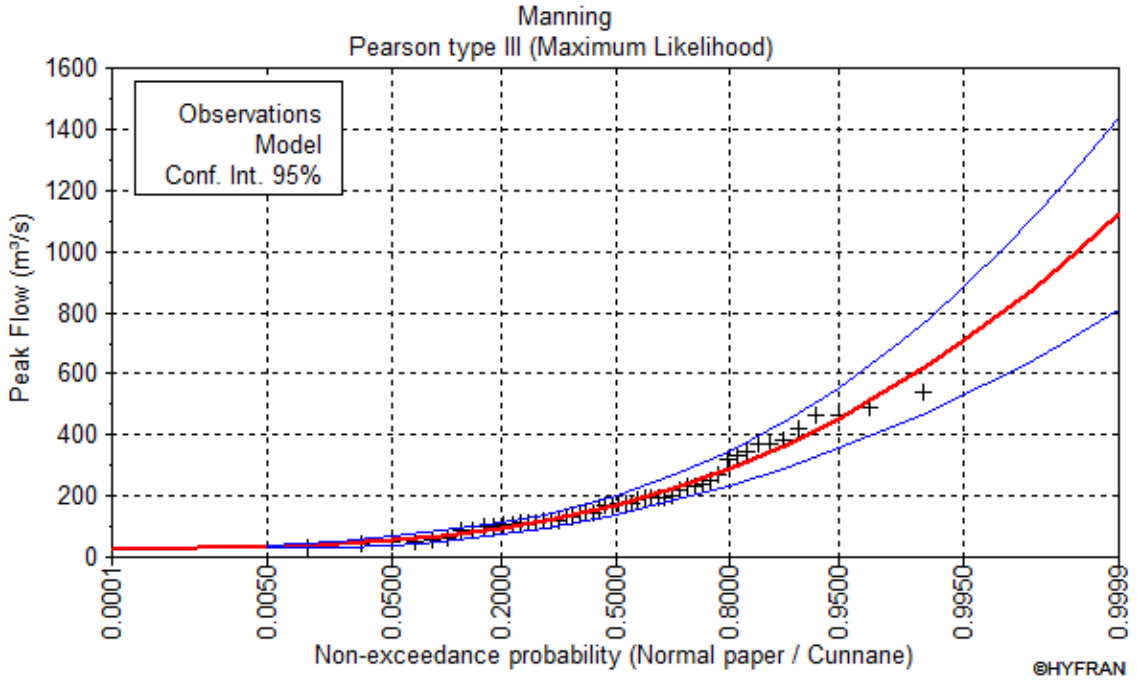


Figure 2-6: Pearson Type III (Maximum Likelihood) Probability of Flow Levels



From Figures 2-3 through 2-6, the GEV distribution was chosen to represent the data because it provided reasonable consistency with the input data. Table 2-3 tabulates the different return period flood flows for the various distributions at WSC gauging station 07HC001.

Table 2-3: HYFRAN Frequency Analysis Results

Frequency (Years)	GEV Distribution	3-Parameter Log-Normal	Gumbel	Pearson Type III
(years)	m^3/s	m^3/s	m^3/s	m^3/s
2	168	168	177	169
5	278	283	280	289
10	364	369	348	373
20	457	459	414	453
50	596	585	498	557
100	716	688	562	633
200	851	796	625	708
500	1060	951	708	807
1000	1,230	1,080	771	881

2.5 Conclusions

A Flood Frequency Analysis has been conducted at WSC gauging station 07HC001 (Notikewin River at Manning). The Environment Canada Data Explorer was used to find the raw data for that station and the missing peak flow values were obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow. The GEV distribution from the HYFRAN was used to establish peak flows for the 100, 50 and 20 year return period. Therefore during the 100, 50 and 20-year storm event, the estimated peak flows are 716 m^3/s, 596 m^3/s, and 457 m^3/s respectively.

3. Hamlet of Fort Vermilion Flood Frequency Analysis

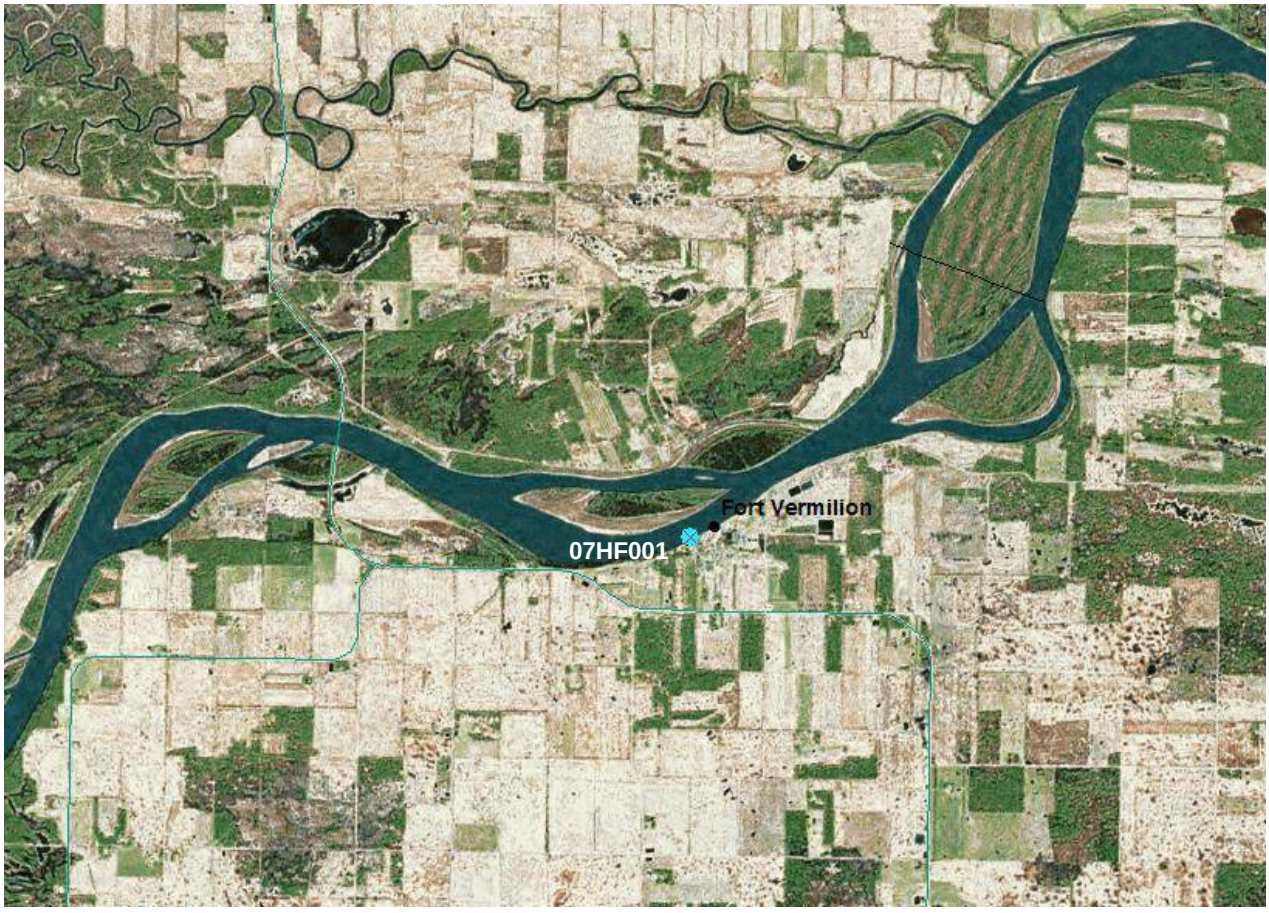
3.1 Introduction

A Flood Frequency analysis has been completed for the Peace River at Fort Vermilion (07HF001), located in Fort Vermillion, AB. The contributing drainage area, according to Environment Canada Data Explorer is 223,000 km^2.

The Water Survey Canada (WSC) Stream Gauge Station 07HF001 (Peace River at Fort Vermilion) was used for the Flood Frequency Analysis. The station location is shown in Figure 3-1.

Environment Canada Data Explorer was used to find the maximum instantaneous and maximum daily flow data for the station and was used for the Flood Frequency analysis.

Figure 3-1: Station Location



3.2 Historical Flow Data

The total contributing catchment area to Station 07HF001 is 223,000 km^2. Table 3-1 details the maximum annual flow data extracted from the WSC gauging station 07HF001.

Table 3-1: Historical Flow Data at WSC gauge station 07HF001

Date	Year	Max m³/s
6/22/1918 19:00	1918	11200
6/8/1922 8:00	1922	9340
7/12/1965 22:00	1965	12100
5/16/1966 13:00	1966	7790
6/8/1970 20:00	1970	3710
7/15/1971 17:00	1971	8580
6/16/1972 7:00	1972	11200
6/22/1973 21:00	1973	4640
7/3/1975 18:00	1975	4020
8/21/1976 0:00	1976	6800
6/13/1977 17:10	1977	6510
5/31/2006 12:16	2006	2960
9/16/2006 20:31	2006	
5/8/2007 20:16	2007	5760
11/18/2008 1:31	2008	
7/12/2009 22:01	2009	4920
9/18/2009 14:01	2009	

3.3 HYFRAN Input

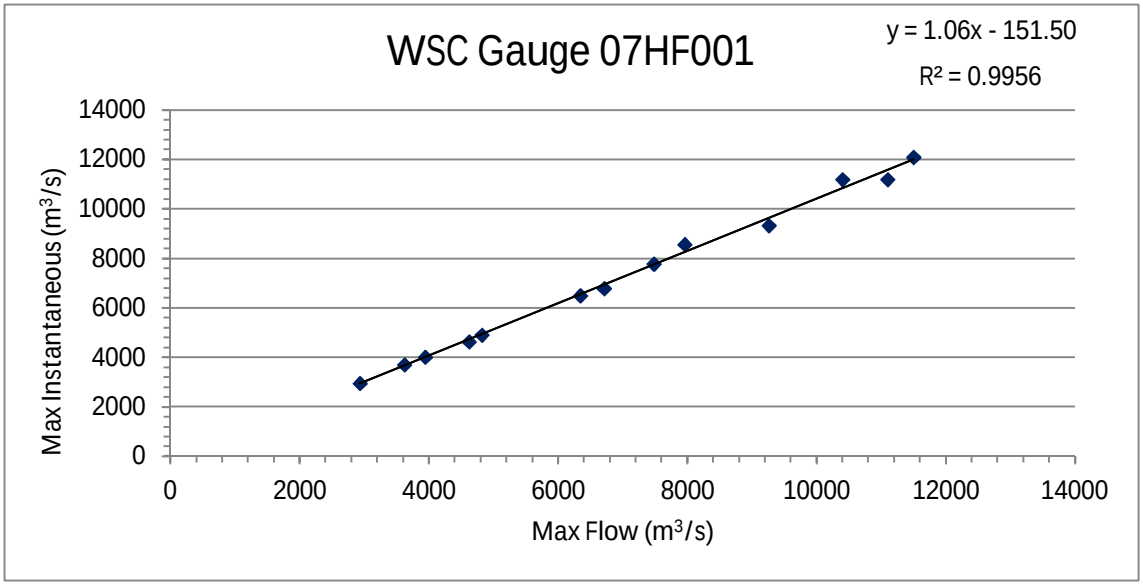
Table 3-2 details the maximum instantaneous flows that were calculated (in red) and the values (I-Max) which were input into HYFRAN. HYFRAN is a frequency analysis software which fits a set of data, such as peak flow data, to various statistical distributions. The results can be used to determine the peak flow for different return periods. The equation which was used to calculate the missing values of peak flow (I-MAX) was 1.06x-151.50, which was obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow, as shown in Figure 3-2.

Table 3-2: Peak Flows and HYFRAN Input Values

Year	I-MAX	MAX	I-MAX/MAX
1915	1320	1320	1
1917	8791	8470	1.037908
1918	11200	11100	1.009009
1919	9414	9060	1.039073
1920	10343	9940	1.040554

Year	I-MAX	MAX	I-MAX/MAX
1921	9330	8980	1.038924
1922	9340	9260	1.008639
1961	10311	9910	1.040507
1962	9235	8890	1.038753
1963	6668.936	6460	1.032343
1964	12940	12400	1.043577
1965	12100	11500	1.052174
1966	7790	7480	1.041444
1967	10829	10400	1.041228
1968	6247	6060	1.030795
1969	2762	2760	1.000904
1970	3710	3620	1.024862
1971	8580	7960	1.077889
1972	11200	10400	1.076923
1973	4640	4620	1.004329
1974	6722	6510	1.032523
1975	4020	3940	1.020305
1976	6800	6710	1.013413
1977	6510	6340	1.026814
1978	3882	3820	1.016136
2006	2960	2930	1.010239
2007	5856	5690	1.029169
2008	4177	4100	1.018844
2009	4920	4820	1.020747

Figure 3-2: Maximum Instantaneous Flow vs Maximum Daily Flow



3.4 HYFRAN Graphs

The annual series peak flows were plotted using various different statistical probability distribution curves including Log-Pearson III, Halphen of Type B, and Weibull. The observed data points were plotted and visually inspected for goodness of fit. Figures 3-3 through 3-5 show the Log-Pearson Type III (Methode SAM), Halphen of Type B (maximum likelihood), and Weibull (maximum likelihood), respectively.

Figure 3-3: Log-Pearson Type III (Methode SAM) Probability of Flow Levels

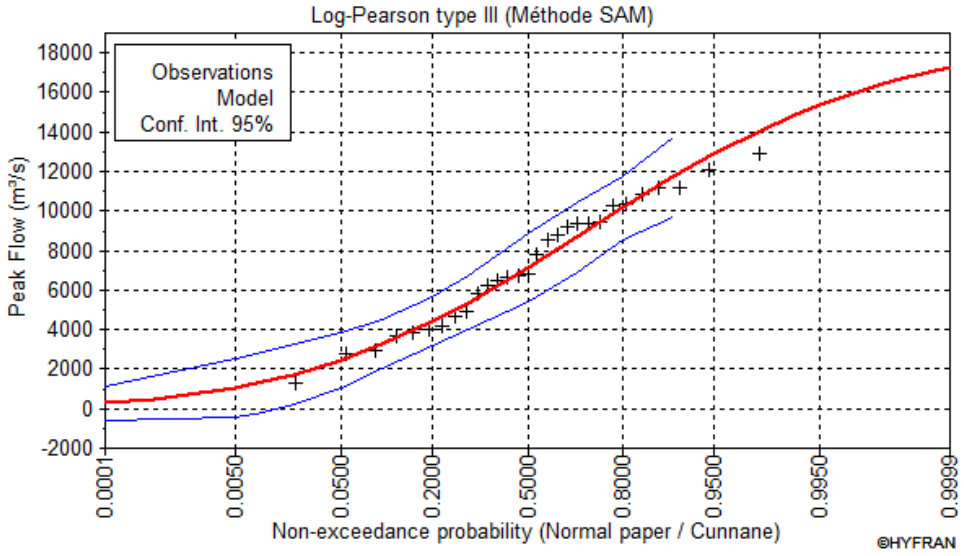


Figure 3-4: Halphen of Type B (Maximum Likelihood) Probability of Flow Levels

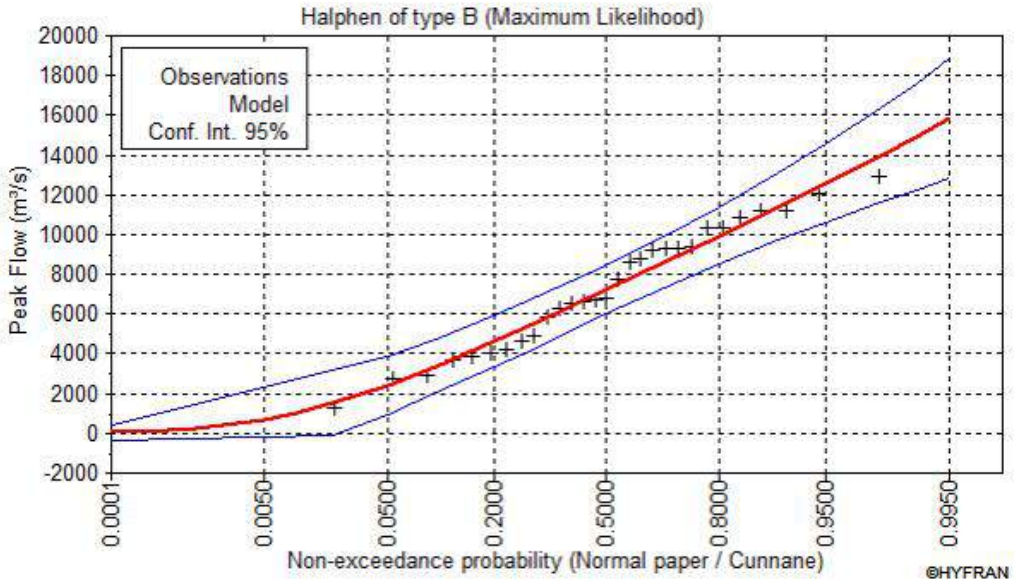
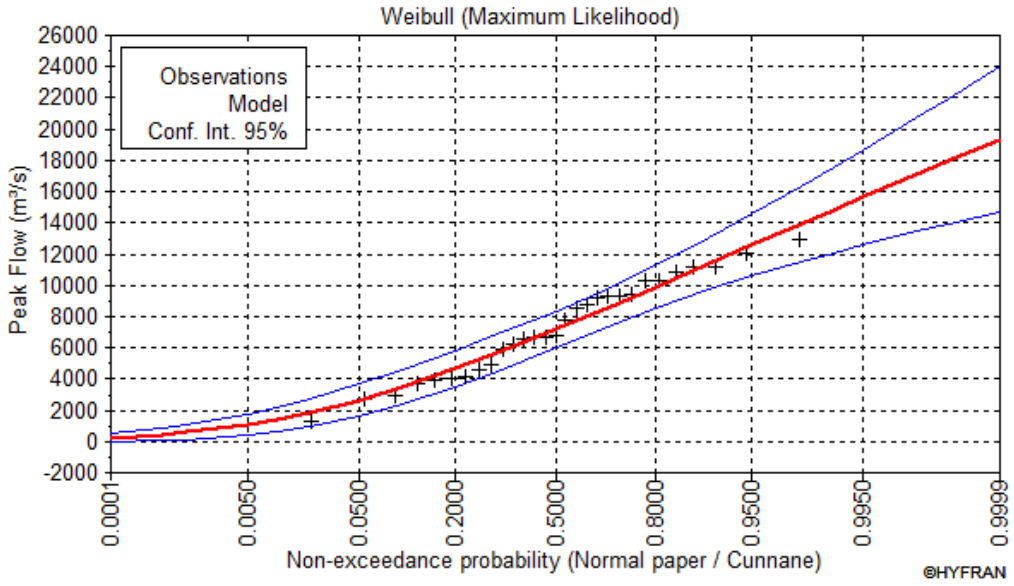


Figure 3-5: Weibull (Maximum Likelihood) Probability of Flow Levels



From Figures 3-3 through 3-5, the Log-Pearson Type III distribution was chosen to represent the data because it provided reasonable consistency with the input data. Table 3-3 shows the resultant flows for various return periods, as reported by HYFRAN. The 100 year event corresponding to the Log-Pearson Type III produces a peak flow of 14,797 m^3/s.

Table 3-3: HYFRAN Frequency Analysis Results

Frequency (years)	Log-Pearson Type III m^3/s	Weibull m^3/s	Halphen of type B m^3/s
2	7127	7177	7225
5	10169	9911	9945
10	11714	11369	11395
20	12898	12575	12605
50	14092	13929	13990
100	14797	14827	14941
200	15376	15646	15862

3.5 Conclusions

A Flood Frequency Analysis has been conducted at WSC gauging station 07HF001 (Peace River at Fort Vermilion). The Environment Canada Data Explorer was used to find the raw data for that station and the missing peak flow values were obtained by graphing the known maximum daily flow values versus the maximum instantaneous flow. The Log-Pearson Type III distribution from the HYFRAN was used to establish peak flows for the 100 year return period. Therefore during the 100 year storm event, the estimated peak flows is 14,797.0 m^3/s.

Appendix D
Environmental Overview

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List of Abbreviations

ACCS	Alberta Culture and Community Spirit
ACIMS	Alberta Conservation Information Management System
AESRD	Alberta Environment and Sustainable Resource Development
AOI	Area of Interest
CEAA	Canadian Environmental Assessment Act
COP	Code of Practice
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EPEA	Environmental Protection and Enhancement Act
ESA	Environmentally Sensitive Areas
FWMIS	Fisheries and Wildlife Management Information System
FWIMT	Fish and Wildlife Internet Mapping Tool
GIS	Geographic Information System
HRIA	Historical Resources Impact Assessment
HRV	Historical Resource Value
MBCA	Migratory Birds Convention Act
NPA	Navigation Protection Act
NRCB	Natural Resources Conservation Board
QWAES	Qualified Wetland Aquatic Environmental Specialist
RAP	Restricted Activity Period
SARA	Species at Risk Act

Distribution List

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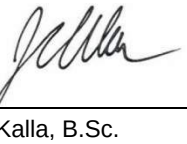
Revision Log

Revision #	Revised By	Date	Issue / Revision Description
0		May 29, 2015	Draft
1		July 13, 2015	Final

AECOM Signatures

Report Prepared By:



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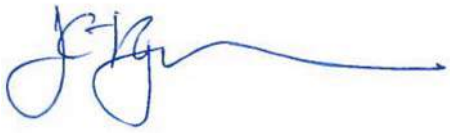

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1. Introduction

AECOM conducted an environmental overview desktop review for proposed flood mitigation works in the Peace River Watershed in Alberta. The purpose was to compile information on existing conditions and to provide recommendations for future works associated with possible flood mitigation options. The desktop review consisted of examining a variety of publically available ecological databases and reports. This desktop review does not follow the format of an Environmental Impact Assessment (EIA) due to the limited engineering, hydrological, geotechnical, hydrogeological, and geological information available for the location. This is considered an environmental overview desktop report and is intended as a general guidance document outlining some of the major environmental concerns and regulatory issues associated with potential flood mitigation projects, and their surrounding area.

Through public consultation and flood analysis, communities with a medium or high risk for flooding events were identified, and flood mitigation options were proposed. An Area Of Interest (AOI) for each community was identified including the potential flood extent and flood mitigation footprint. The AOI was used as a search area to identify environmental issues. The following communities were identified as at risk and are the focus of this environmental desktop report:

<u>High Risk Communities</u>

- Hamlet of Watino
- Town of Peace River
- Town of Sexsmith
- Town of Manning
- Hamlet of Fort Vermilion
- Town of Falher

<u>Medium Risk Communities</u>

- Village of Rycroft
- Buffalo Head Prairie

Within each search area, the following databases were searched:

- The Listing of Historic Resources (Alberta Culture and Community Spirit (ACCS) 2015a)
- Wildlife Sensitivity Datasets (Alberta Environment and Sustainable Resource Development: AESRD 2014a)
- The Environmentally Sensitive Areas (ESA) Scores shapefile (AESRD 2014b)
- The Alberta Conservation Information Management System (ACIMS 2014)
- Fisheries and Wildlife Management Information System (FWMIS)
- Alberta Merged Wetland Inventory (AESRD 2014c)

A general explanation of each database searched, as well as an overview of possible Federal and Provincial legislation is covered in Sections 2 and 3, respectively of this report. Section 4 describes the specific search results and applicable legislation for each high risk flood community.

Recommendations are supported by AECOM ecologists with a variety of specializations including, but not limited to, terrestrial vegetation, wildlife, fish and fish habitat, wetlands, and environmental permitting. To date, no field investigations have been conducted. As such, there is potential for permitting requirements to change, once field conditions are confirmed and detailed engineering information is provided.

2. Environmental Concerns Overview

2.1 Historical Resources

The *Listing of Historic Resources* (Listing), issued by the Government of Alberta every February and August, is an online tool that identifies lands that contain or are believed to contain historic resources. The Listing is used to provide early indication that development may impact historic resources (ACCS 2015a). Areas in the Listing contain predominantly archaeological and paleontological sites, Aboriginal traditional use sites of a historic resource nature, and historic structures (ACCS 2015b). Each parcel of land in the Listing is assigned a Historical Resource Value (HRV) ranging from 1 to 5, and is defined as follows (ACCS 2015b):

- HRV 1: Protected under the Alberta Historical Resources Act as Provincial Historic Resources, world heritage sites, or lands owned by ACCS for resource protection and promotion
- HRV 2: Designated under the *Historical Resources Act* as a Municipal or Registered Historic Resource
- HRV 3: Contains a significant historic resource that will likely require avoidance
- HRV 4: Contains a historic resource that may require avoidance
- HRV 5: Believed to contain a historic resource

Each entry in the Listing also contains a corresponding letter which indicates the primary historic resource category, and is defined as follows (ACCS 2015):

- a – archaeological
- c – cultural
- gl – geological
- h – historic period
- n – natural
- p – palaeontological

A database search of the Listing (current to March 2015) in Geographic Information System (GIS) format was searched for each AOI. If a proposed development contains lands on the Listing, then a *Historical Resources Act* clearance must be obtained (ACCS 2015). Historical Resources Impact Assessments (HRIA) are required when an activity will or will likely result in the alteration, damage, or destruction of an historic resource. Mitigation must be provided and depending on the value of the resource, projects may be required to change or move to avoid disturbing the historical resource. It should be noted that the Listing does not include all land that may contain historical resources, and when previously unknown historic resources are discovered, their locations must be reported and added to the Listing. The minister of Alberta Culture & Community Spirit may order that any site undergo a HRIA if activity is likely to threaten the integrity of a natural resource (ACCS 2015).

2.2 Wildlife Sensitivity Data Sets

Wildlife Sensitivity Datasets provided by AESRD (2014a) were used to identify key range and wildlife layers which fall within each AOI. Key wildlife and Biodiversity Zones were found to fall within the Manning, Fort Vermilion, Watino, and Peace River AOIs.

Key Wildlife and Biodiversity Zones are intended to prevent: (1) loss and fragmentation of habitat, (2) short and long-term all-weather public vehicle access, sensory disturbance during periods of thermal or nutritional stress on wildlife, and (3) the development of barriers to wildlife corridors (e.g. stream crossings). Typically, Key Wildlife and Biodiversity Zones are established along major river valleys. Such landforms have the topographic variation and site productivity conditions that yield high levels of biodiversity and good winter browse conditions with adequate cover (AESRD 2010).

The following guidelines are recommended for development within Key Wildlife and Biodiversity Zones (AESRD, 2010):

1. New permanent access development is not recommended.
2. Where temporary access is required, it should be designed and managed to minimize disturbance to wildlife and degradation of associated habitat.
3. The applicable timing restrictions on industrial activities are applicable and required for all upgraded access roads and/or seismic activity due to the impacts on wildlife. No construction is permitted from January 15th to April 30th north of Highway 1 which includes all AOIs in this study.
4. Guidelines will be applied in an equitable fashion for all industrial sectors within a region, recognizing that some flexibility is required for site/area-specific conditions and particular land use activities. The expectation is that all winter activities are planned to be completed prior to the timing restrictions. Relaxation from the timing restriction requires approval and is based on extenuating circumstance. For example:
   a. Timing restrictions may be adjusted in exceptional and localized situations if other considerations are applied that still protect the wildlife resource.
   b. Where localized temporary valley crossings are required to access adjacent tableland areas outside of the Key Wildlife and Biodiversity Zones.

2.3 Environmentally Significant Areas

ESAs represent places in Alberta that are important to the long-term maintenance of biological diversity, soil, water, or other natural processes, at multiple spatial scales (Fiera Biological Consulting Ltd., 2014). They are identified as areas containing rare or unique elements in the province or areas that include elements that may require special management consideration due to their conservation needs. ESAs do not represent government policy and are not necessarily areas that require legal protection, but instead are intended to be an information tool to help inform land use planning and policy at local, regional, and provincial scales.

The September 2014 update to the ESA shapefile consists of summed ESA scores for each quarter section in Alberta. ESA scores are based on multiple criteria, sub-criteria, and indicators which represent the presence of different environmental components. A quarter section is designated as an ESA when the combined criterion score is at least 0.189. The four main criterions used to calculate ESA scores are:

1. Areas that contain focal species, species groups, or their habitats
2. Areas that contain rare, unique, or focal habitat
3. Areas with ecological integrity
4. Areas that contribute to water quality and quantity

The ESA Scores shapefile, provided by AESRD (2014b), was searched for ESAs that overlap each AOI. Any ESAs identified will be noted in the summary table of each AOI.

2.4 Vegetation and Rare Plants

The Manning, Fort Vermilion, Watino, Falher, Peace River, and Buffalo Head AOIs are within the Dry Mixedwood Ecoregion of Alberta's Boreal Forest Natural Region, which is characterized by level to gently undulating plains comprised predominantly of glacial till or lacustrine composition (Natural Regions Committee 2006). This subregion is characterized by aspen (*Populus tremuloides)* forests on uplands in the Peace River area with understories of rose (*Rosa* sp.), low-bush cranberry (*Vaccinium macrocarpon*), beaked hazelnut (*Corylus cornuta*), and Canada buffaloberry (*Shepherdia canadensis*). Fens commonly occur in low-lying areas.

Steep slopes are interspersed with porcupine grass (*Stipa spartea)*, June grasses (*Koeleria macrantha)*, and pasture sagewort (*Artemisia frigida)*, while less pronounced slopes have a higher abundance of wheat grass (*Agropyron spp.*) and Saskatoon (Amelanchier alnifolia)-buckbrush (*Symphoricarpos occidentalis*) shrublands in ravines and gullies (Natural Regions Committee 2006).

The proposed Sexsmith and Rycroft AOI are within the Peace River Parkland Natural Subregion of Alberta's Parkland Natural Region, which is characterized by gently rolling plains, and steep grassy and forested slopes along the Peace River. The upland plains are defined by mainly Solonetzic soils as well as intergrades of Dark Gray and Black Chernozemic, while the valley slopes are a mix of Regosols, Brunisols and Rego Dark Brown Chernozems (Natural Regions Committee 2006). Within this subregion, upland forests of aspen with understories containing beaked willow (*Salix bebbiana*), prickly rose (*Rosa acicularis*), snowberry (*Symphoricarpos* sp.), bluejoint (*Calamagrostis canadensis*) and a variety of forbes are characteristic sites of the subregion. The lower valley often contains balsam poplar (*Populus balsamifera*), with understories dominated by red-osier dogwood (*Cornus sericea*) and horsetail (*Equisetum* sp.) (Natural Regions Committee 2006).

ACIMS was searched to identify rare species (or species of conservation concern) within each AOI (ACIMS 2014). This search included both sensitive and non-sensitive element occurrences. Sensitive element occurrences refer to species where precise location details cannot be distributed without due cause.

If rare plant species have been documented within an AOI, rare plant surveys will be required prior to construction. The presence of rare plants can cause delays to construction if the plants have to be relocated or may require modifications to construction methodologies and/or location if the rare plants species are listed as Species at Risk.

Rare plants identified in the ACIMS database search will be included in the summary table of each AOI.

2.5 Wildlife and Species at Risk

Data from the FWMIS was provided by regional AESRD biologists in April 2015 for wildlife species detected within a 20 kilometres (km) radius of each AOI. The dataset includes bird, mammal, amphibian, and reptilian sightings. A 20 km radius was used as many wildlife species have large home ranges. Species that have an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", or are listed under the Federal *Species at Risk Act* (SARA) as "Special Concern", "Threatened", or "Endangered" are included in a summary table within each AOI subsection.

Specific mitigation is required for Species at Risk which include restricted timing windows, disturbance free zones, and the inability to destroy or alter specific habitat features (e.g. dens, nests, hibernacula, etc.). Similarly, migratory birds are and their nests are protected under the federal *Migratory Birds Convention Act*. Mitigation efforts would be required that may include, but are not limited to, abiding to migratory bird and sensitive species restricted timing windows, modifications to construction methodologies and/or schedule, and designing for wildlife passage/use during detailed design.

2.6 Fisheries

AESRD's Fish and Wildlife Internet Mapping Tool (FWIMT) was used to search the FWMIS database for waterbodies which have the potential to be impacted by proposed flood mitigation within each AOI. FWIMT was also used to determine the fish species recorded in each water body identified. These results are presented in a table for each AOI. The *Water Act* Codes of Practice Management Area Maps were used to determine the class and Restricted Activity Period (RAP) for each water body identified.

It is important to note that detailed fish and fish habitat reviews may be required depending on the final design of proposed flood mitigation within each AOI.

2.7 Wetlands

The Alberta Merged Wetland Inventory acquired from AESRD (2014c) was reviewed for potential wetland areas that overlay each AOI. As per the *Water Act* (Government of Alberta 2014a), all wetlands are protected and any impacts to a wetland as a result of proposed flood mitigation projects will require compensation. It is important to note that this dataset does not account for any temporary wetlands. To document temporary wetlands, a wetland inventory must be completed.

3. Legislation Overview

Below is a non-comprehensive list of regulatory agencies, regulations, and acts that will have to be consulted and considered once more detailed project information is known. Until detailed project descriptions are determined, required regulatory approvals and timelines are not definite and are subject to change based on alterations to the extent or scope of the project. There may be various other minor Federal, Provincial, Municipal approvals or permits required for the project (e.g. burning permits, noise-bylaws) that are not included here. These should be determined and looked at in further detail when the scope of the project is narrowed.

3.1 Federal Legislation and Requirements

Works associated with proposed flood mitigation projects may involve the following federal legislation depending on the final engineering design: *Canadian Environmental Assessment Act* (CEAA), *Fisheries Act, Navigation Protection Act* (NPA)*, Migratory Birds Convention Act* (MBCA), and SARA.

3.1.1 Canadian Environmental Assessment Act

The Canadian Environmental Assessment Agency (the Agency) is responsible for the administration of the regulations and legislation associated with CEAA (S.C. 1992, c.37; Government of Canada 2014a). Under CEAA, a federal Environmental Assessment (EA) is required for projects defined on the *CEAA Regulations Designating Physical Activities* (Government of Canada 2014b) or Ministerial Order. A federal EA only considers potential adverse environmental effects that are within federal jurisdiction, including:

- Fish and fish habitat
- Other aquatic species
- Migratory birds
- Federal lands
- Effects that cross provincial or international boundaries
- Effects which impact Aboriginal peoples
- Changes to the environment that are directly linked to federal decisions about a project

3.1.2 Fisheries Act

The *Fisheries Act* (R.S.C. 1985, c. F-14) applies to all Canadian fisheries waters and Fisheries and Oceans Canada (DFO) has the responsibility to administer and enforce the conservation and protection of fish habitat on private property, as well as on provincial and federal lands (Government of Canada 2013). Section 36(3) of the *Fisheries Act* prohibits the discharge of deleterious substances into a water body, Section 20(1) requires that any works conducted in and around a water body accommodate fish passage; and Section 35(1) prohibits serious harm to fish, which includes fish and fish habitat that are part of or support commercial, recreational, or Aboriginal fisheries. Serious harm is defined in the *Fisheries Act* as the death of fish, a permanent alteration to fish habitat, and/or the destruction of fish habitat.

DFO has established a self-assessment tool outlining project activities and criteria that do not require DFO review. DFO also provides *Measures to Avoid Harm to Fish and Fish Habitat* which are designed to avoid causing serious harm to fish and fish habitat. “Serious harm” is defined in the Fisheries Act as the death of fish; a permanent alteration to fish habitat; and/or the destruction of fish habitat. If a project does not meet the criteria established by DFO to avoid serious harm to fish and effects cannot be mitigated, a Request for Review must be submitted for consideration by the Minister of Fisheries and Oceans.

Upon review, if activities are determined to cause serious harm to fish, an Application for Authorization will be required that will include a fish and fish habitat report, available design information, a description of effects on fish and fish habitat, a description of measures and standards to avoid or mitigate serious harm to fish and an offsetting plan.

3.1.3 Navigation Protection Act

The Navigation Protection Program supports the regulation of works constructed or placed in, on, over, under, through, or across, navigable waters in Canada in accordance with the NPA (R.S.C., 1985, c. N-22; Government of Canada 2014c). As part of the Federal Government's 2012 Bill C-45, amendments were made to the NPA including implementation of a schedule listing major waterways for which notification to the minister is required. Proponents also have the option of "opting in" under the NPA if a project is likely to impact navigation on a non-scheduled waterway. An application for approval under the NPA is only required when proposed works are likely to substantially interfere with navigation. Works meeting the assessment criteria of the Minor Works Order are classified as "Minor Works" under the NPA, and may proceed without a notice to the minister. The classes of Minor Works established by the order are:

- Erosion-Protection Works
- Docks and Boathouses
- Boat Ramps, Slipways and Launch Ramps
- Aerial Cables — Power and Telecommunication
- Submarine Cables — Power and Telecommunication
- Pipelines Buried Under the Bed of Navigable Water
- Pipelines and Power or Communication Cables Attached To Existing Works
- Works within a Boomed-Off Area Upstream or Downstream of an Existing Work For Water Control
- Outfalls and Water Intakes
- Dredging
- Mooring Systems

3.1.4 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA)[1994, amended in 2010, c.22, Government of Canada 2010] (MBCA) and Migratory Birds Regulation [2005, amended in 2014, c1035] are administered by Environment Canada (Government of Canada 2014d). Under the MBCA, Canadian Wildlife Service (CWS) has jurisdictional interest with respect to the management of migratory birds and migratory bird populations, protecting nationally significant nesting habitats, and regulating the hunting of migratory game birds such as ducks and geese. Section 6(a) of the General Prohibitions of the Migratory Birds Regulations C.R.C., c. 1035, states that it is an offence to "disturb, destroy or take a nest, egg, or nest shelter" of a migratory bird. Additionally, Section 35(1) stipulates that "no person shall deposit or permitted to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds".

The MBCA specifies that efforts should be made to preserve and protect habitat necessary for the conservation of migratory birds. This includes nesting and wintering grounds, migratory bird corridors, and encompasses such activities as tree clearing, wetland consolidation, and temporary and permanent disturbances occurring in proximity to migratory bird habitat.

3.1.5 Species at Risk Act

The *Species at Risk Act* [2002, c.29] (SARA) provides protection for Canadian indigenous species, subspecies, and distinct populations and their critical habitats under federal jurisdiction (Fish, migratory birds, species on federal lands). Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated, endangered, or threatened species. Basic prohibitions of SARA do not apply to species listed as "Special Concern". SARA does not apply to lands held by the Province of Alberta or its private citizens unless "the laws of Alberta do not effectively protect the species or the residences of its individuals" (Government of Canada 2014e). The Minister may issue an order in council to protect federally listed species that occur on provincial or private lands, but this has not occurred within any of the Areas of Interest. If SARA listed species are identified on a project site and are under federal jurisdiction (Federal lands, birds listed under the *Migratory Birds Act*, or fish species), specific mitigation and a SARA permit will be required.

3.2 Provincial Legislation

3.2.1 Alberta Environmental Protection and Enhancement Act

AESRD is the provincial ministry responsible for the administration of the *Environmental Protection and Enhancement Act* (EPEA; R.S.A. 2000, c. E-12; Government of Alberta 2014b). This Act is one of the most faceted pieces of environmental legislation in Alberta.

The EPEA covers the provincial Environmental Assessment Process. A Director appointed by the Minister is responsible for reviewing project summaries submitted by the proponents. This initial review process will determine if the project is Mandatory (requires an Environmental Impact Assessment (EIA) report), Exempted (from the Environmental Assessment Process), or Discretionary (an EIA not required, but other approvals may be required, or more information is required to make a determination). A list of Mandatory and Exempted activities can be found in the most recent *Environmental Assessment (Mandatory and Exempted Activities) Regulation*. Similar to the CEAA process, the Director may decide that the potential for environmental impacts warrant further consideration and can order an EIA to be undertaken for projects not listed as a Mandatory activity in the Regulation.

3.2.2 Natural Resources Conservation Board Act

The Natural Resources Conservation Board (NRCB), established in 1991, is an agency independent from the Government of Alberta that reviews proposed non-energy natural resource projects (NRCB 2014). The *EPEA* sets which projects require EIAs, and of those projects, EPEA determines which will also require a review by the NRCB under the *Natural Resources Conservation Board Act* (R.S.A. 2000, c. N-3; Government of Alberta 2014c) (NRCB 2007).

3.2.3 Water Act

All water resources located within the province of Alberta are owned by the Provincial Government. AESRD administers the Alberta *Water Act,* which is the primary legislation governing the use and management of Alberta's water resources, including wetlands. Alberta's *Water Act* (R.S.A. 2000, c. W-3; Government of Alberta 2014a) requires approval and/or attainment of a license before undertaking construction in a surface water body or activities related to a water body which have the potential to impact the aquatic environment. Specific activities do not require a *Water Act* approval as long as they adhere to the applicable Code of Practice (COP) under the *Water Act*.

3.2.4 Alberta's Wetland Policy

Alberta's Wetland Policy, governed by AESRD and Alberta Energy Regulator, was phased in during the summer of 2014 (Government of Alberta 2013a). The Wetland Policy applies to all wetlands in the province with no discrimination between wetlands located in the green versus white zone of Alberta, and focusses on conserving and minimizing wetland losses. The previous wetland policy separated wetlands between two zones within the province: the white zone, located in settled and agricultural areas of southern Alberta and the green zone in the boreal, northern part of the province. In-depth inventories have been conducted in the white zone, while classification occurred within the green zones. If wetlands are to be impacted, they will need to be evaluated by a Qualified Wetland Aquatic Environmental Specialist (QWAES) using a standardized tool to determine Wetland Value. The score determined from the tool will be used in the decision making process in order to avoid, mitigate, or replace wetland losses. Wetland Value will also be used to determine wetland replacement/compensation ratios that are necessary for the *Water Act* approval process (Government of Alberta 2013a).

If any wetlands were identified during the desktop review, the results were recorded within the summary table of the AOI.

3.2.5 Historical Resources Act

The *Historical Resources Act* (R.S.A. 2000, c. H-9) protects historic resources in Alberta, including paleontological, prehistoric, historic, archaeological, and certain cultural or natural objects, sites, or structures (Government of Alberta 2013b). Pursuant to the Act, a Historical Resource Clearance is needed for projects where effects on known and unknown historical resources could occur.

3.2.6 Public Lands Act

All land not privately owned, including the bed and shores of all permanent watercourses and water bodies, are considered Alberta Public Lands unless they are owned by the Government of Canada. Approvals under the *Public Lands Act* [R.S.A. 2000, c. P-40] (Government of Alberta 2014d) are required for any activity on Public Lands or the bed or shore of Crown owned rivers, streams, or lakes. If the final project design involves work on public land, or within the shed and shore of a waterbody, a disposition application under the *Public Lands Act* will be required. Any associated work which involves temporary access or laydown areas will require a Temporary Field Authorization.

3.2.7 Wildlife Act

On private land and Alberta's Public Lands, the Alberta government has the responsibility for all wildlife, including Species at Risk, as established by the *Natural Resources Transfer Act* of 1930. Alberta's *Wildlife Act* (R.S.A. 2000, c. W-10) designated endangered and threatened species, and provincially listed species potentially influenced by the Project (Government of Alberta 2014e). Alberta's *Wildlife Act* protects the residences of wildlife on private and public lands. More specifically, a person must not willfully molest, disturb or destroy a house, nest or den of certain species. Section 96 of the *Wildlife Regulation* (Government of Alberta 2014f) outlines the wildlife species, areas, and time of year when the Act applies. All endangered wildlife, upland game birds, some migratory birds, snake and bat dens, and beavers (in some instances) are covered under Section 36 of the Act. For most wildlife, disturbing the habitat of these animals is prohibited year-round throughout Alberta. AESRD staff may recommend timing restrictions on activities to minimize disturbance to the nests/dens/hibernaculum of breeding wildlife and birds. The *Wildlife Act* also protects endangered plant species (both vascular and non-vascular) listed in the *Wildlife Regulation*. Project delays and/or project related modifications may arise should any provincially listed Species at Risk occur within any AOI. Mitigation measures, set back distances, and restricted timing windows will be required.

3.2.8 Legislation Timelines

Table 1 provides estimated timelines of environmental authorizations and permits, should they be required for proposed flood mitigation works.

Table 1: Timeline of Various Environmental Authorizations and Permits

Regulatory Agency	Approvals	Estimated Timeline
Department of Fisheries and Oceans	Request for Review,	60 days
	Fisheries Act Authorization	90 days
Alberta Environment and Sustainable Resource Development	Dispositions	6 months to a year
	Temporary Field Authorization	2 days to 2 weeks
	First Nations Pre-Consultation Assessment	Less than 2 weeks
	Water Act COP Notifications	No wait time
	Water Act Approval	2 to 3 months
	Environmental Protection and Enhancement Act Environmental Impact Assessment Approval	2 to 3 years
Alberta Culture	Statement of Justification under *Historical Resources Act*	1 to 2 months
	Clearance Letter resulting from a Historical Resources Impact Assessment	2 months to a year
Canadian Environmental Assessment Agency	Project Description submitted to the Agency	45 days to determine if Environmental Assessment is required
	Environmental Assessment Decision	1 to 2 years (Occurs concurrently with EIA process and is followed by the NRCB Approval if required)
	Natural Resources Conservation Board Approval	1 to 2 years
Environment Canada	*Species at Risk Act* Permit	6 months
Transportation Canada	*Navigable Water Protection Act* Notification	90 days

4. High Risk Flood Communities

4.1 Hamlet of Watino

Databases identified in Section 1 were searched to identify environmental factors within the Hamlet of Watino AOI. The proposed works for this area includes providing scour protection to the bank of Smoky River, and building a dyke along Smoky River to prevent flooding. Figure 1 and Figure 2 show the Hamlet of Watino AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.1.1 Background

The Hamlet of Watino is in Birch Hills County. Land use in the county is mainly agricultural operations with some industrial and commercial developments. Oil and gas provide the largest sector of employment in Birch Hills County.

The Hamlet of Watino is located along the Smoky River. Smoky River is a tributary of the Peace River originating in the Canadian Rockies and joining the Peace River south of the town of Peace River, Alberta. This river flows along the eastern edge of Watino. Flooding in the area is generally a result of heavy rainfall events (AESRD, 2014d).

4.1.2 Historical Resources

A database search of the *Listing of Historic Resources* (current to March 2015) revealed land with HRVs of 4 and 5 in the Hamlet of Watino AOI (Figure 2, Table 2). Fifteen areas were identified with HRVs of 5, with primary resource categories of paleontological and/or archaeological. Three areas were identified with HRVs of 4, with primary resource categories of paleontological.

Table 2: Historic Resource Value of Land within the Hamlet of Watino Area of Interest

Alberta Township System (Meridian-Rge-Twp-Sec-QtrSec)	HRV[1]	Category
5-24-77-27-9,10	4	p
5-24-77-34-9,10,15,16	4	p
5-24-77-35-2	4	p
5-24-77-22-1-10,16	5	p
5-24-77-23-1-14	5	p
5-24-77-23-1-5,11-13	5	a
5-24-77-26-2-11,14-16	5	p
5-24-77-28-11-14	5	p
5-24-77-33-2-10	5	p
5-24-77-34-5,6,11-14	5	p
5-24-77-34-5,6,9-12	5	a
5-24-77-35-1,8,9,16	5	p
5-24-77-35-1-4,8,9,16	5	a
5-24-78-2-1,7,11,13	5	a
5-24-78-2-1,7-11,13-16	5	p
5-24-78-4-1,7-11,14-16	5	p
5-24-78-9-1,8,9,16	5	a
5-24-78-9-1-3,6-11,14-16	5	p

Note: [1]- Historical Resource Value, a--archaeological; p-paleontological

4.1.3 Wildlife and Species at Risk

Within the 20 km search radius of the Hamlet of Watino AOI; eight birds, one mammal and one amphibian were listed by AESRD, Alberta Wildlife Act, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and/or SARA (Table 3). In total, there are 10 species listed with an AESRD general status of “At Risk”, “May be At Risk”, or “Sensitive”, and no species listed with a SARA status of “Special Concern”, “Threatened”, or “Endangered”.

Table 3: Listed Species within 20 km of the Hamlet of Watino Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Northern Goshawk	*Accipiter gentilis*	Sensitive	-	Not At Risk	-	-
Northern Harrier	*Circus cyaneus*	Sensitive	-	Not At Risk	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
Swainson's Hawk	*Buteo swainsoni*	Sensitive	-	-	-	-
Trumpeter Swan	*Cygnus buccinator*	At Risk	Threatened	Not At Risk	-	-
MAMMALS						
Bobcat	*Lynx rufus*	Sensitive	-	-	-	-
AMPHIBIANS						
Long-toed Salamander	*Ambystoma macrodactylum*	Sensitive	-	Not At Risk	-	-

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.1.4 Fisheries

The Hamlet of Watino AOI includes the Smoky River. The Smoky River is a Mapped Class C Water Body with a RAP of September 10th to July 15th as per the AESRD COP (AESRD 2015b). Twenty-one species of fishes have the potential to live within the watershed including eight species of sportfish: Arctic Grayling, Burbot, Goldeye, Mountain Whitefish, Northern Pike, Rainbow Trout, and Walleye (AESRD 2013, Table 4).

Table 4: Fish Species that have been documented within the Smoky River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
SPORTFISH					
Arctic Grayling	*Thymallus arcticus arcticus*	May-June	Sensitive	Not Listed	Not Listed
Bull Trout	*Salvelinus confluentus*	Fall	Special Concern	Threatened	Not Listed
Burbot	*Lota lota*	Winter	Secure	Not Listed	Not Listed
Goldeye	*Hiodon alosoides*	Spring	Secure	Not Listed	Not Listed
Mountain Whitefish	*Prosopium williamsoni*	Fall	Secure	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Spring	Secure	Not Listed	Not Listed
Rainbow Trout	*Oncorhynchus mykiss*	Spring-Summer	Secure	Not Listed	Not Listed
Walleye	*Sander vitreum*	Winter-Spring	Secure	Not Listed	Not Listed
NON-SPORTFISH					
Emerald Shiner	*Notropis atherinoides*	Spring-Summer	Secure	Not Listed	Not Listed
Flathead Chub	*Hybopsis gracilis*	Summer	Secure	Not Listed	Not Listed
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
Longnose Dace	*Rhinichthys cataractae*	Spring-Summer	Secure	Not Listed	Not Listed
Longnose Sucker	*Catostomus catostomus*	Spring	Secure	Not Listed	Not Listed
Northern Pikeminnow	*Ptychocheilus oregonensis*	Spring	Sensitive	Not Listed	Not Listed
Pearl Dace	*Margariscus margarita*	Spring-Summer	Undetermined	Not Listed	Not Listed
Redside Shiner	*Richardsonius balteatus*	Spring	Secure	Not Listed	Not Listed
Slimy Sculpin	*Cottus cognatus*	Spring	Secure	Not Listed	Not Listed
Spoonhead Sculpin	*Cottus ricei*	Spring	May Be at Risk	Not at Risk	Not Listed
Spotfin Shiner	*Cyprinella spiloptera*	Summer	-	Not Listed	Not Listed
Trout-Perch	*Percopsis omiscomaycus*	Spring-Summer	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes:1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015)

The Arctic Grayling are listed as “Sensitive” within Alberta because their population has been on a decline due to climate change factors such as habitat fragmentation, overharvesting, and increased water temperatures (AESRD, 2005). This species has also been determined an “intermediate priority candidate” in 2004 by COSEWIC.

Since Bull Trout are a protected species, project limitations such as timing windows and habitat compensation could be anticipated within the Hamlet of Watino AOI.

Northern Pikeminnow is listed as “Sensitive” by AESRD and Spoonhead Sculpin is listed as “May Be At Risk”. Status reports for these species have not been developed at the time of this report.

4.1.5 Applicable Legislation

4.1.5.1 Canadian Environmental Assessment Act

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, activities included in this project are not likely to require an EA.

4.1.5.2 Fisheries Act

The proposed flood mitigation design for this community, at the time of this overview report, includes scouring the bank of Smoky River from 45 to 90 degrees, implementing bank protection, laying rip rap, and building a dyke along Smoky River to prevent flooding. The proposed project design for the Hamlet of Watino AOI, at the time of this report, may impact the bank and has the potential to impact fish and fish habitat. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. When a detailed project design becomes available, self-assessment should be performed to determine if a Request for Review and potentially an Application for Approval under the *Fisheries Act* will be required.

- Approvals or COP notifications under the Water Act
- A Request for Review from the minister of Fisheries and Oceans
- An Application for Authorization under the Fisheries Act

4.1.5.3 Navigation Protection Act

A notification will not be required by Transport Canada as the Smoky River is not included in the Schedule of the NPA. Proponents are still required to ensure that no proposed works restrict the navigability of a water body.

4.1.5.4 Migratory Birds Convention Act

Environment Canada's map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Hamlet of Watino AOI (Environment Canada 2014). Within Zone B5, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.1.5.5 Species at Risk Act

There are no SARA listed species identified within the 20 km search radius of the proposed AOI. Should a listed species be encountered within the Hamlet of Watino AOI, a survey may need to be completed and restricted activity periods and setback distances followed for the identified species.

4.1.5.6 Alberta Environmental Protection and Enhancement Act

The proposed project design is not listed as a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor does it require an approval under the *Activities Designation Regulation.* Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.1.5.7 Water Act

The proposed works have the potential to alter the flow, level and/or location of water, and do not fall under the criteria for a *Water Act* COP Notification so a *Water Act* approval will be required.

4.1.5.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. An area of open water was identified from the Alberta Merged Wetland Inventory, the Smoky River.

4.1.5.9 Historical Resources Act

The recommendation for this project is that a Historical Resources Overview be conducted based on final project designs, with a submission of a Statement of Justification for either a *Historical Resources Act* Clearance, or to conduct a HRIA, if the area has not been previously cleared under the *Historical Resources Act*.

4.1.6 Conclusion

Table 5 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 5: Summary Table of the Hamlet of Watino Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	HRVs of 4 and 5	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land.
ESAs	none	-	-
Parks	None	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	Open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation.
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	Key Wildlife and Biodiversity Zone	Alberta Wildlife Act	Follow recommended Industrial Use Guidelines. See Section 2.2
Fisheries and Aquatic Resources	Smoky River - Class C,	Fisheries Act, Water Act	Restricted Activity Period September 10 - July 15. DFO self-assessment to determine if Request for Review or Application for Authorization will be required. Water Act Approval Application. Compensation may be required if there is aquatic habitat destruction.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 10 (AESRD General Status), 0 (SARA) Fish - 4 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st

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Peace River Basin Flood Mitigation Feasibility Study
Alberta Environment and Sustainable Resource Development

Appendix D
Hamlet of Watino Area of Interest
Environmental Overview
ESAs and Wetlands

AECOM

Figure: 1

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Peace River Basin Flood Mitigation Feasibility Study

Alberta Environment and Sustainable Resource Development

Project No.: 60334569

Appendix D

Hamlet of Watino Area of Interest

Environmental Overview

Key Range Layers and HRVs

AECOM

Figure: 2

4.2 Town of Peace River

Databases identified in Section 1 were searched to identify environmental factors within the Peace River AOI. The proposed flood mitigation for this AOI involves re-aligning the Pat's Creek storm pipe that discharges into the Peace River. Several re-alignment options are being examined:

1. Northern Alternative (discharges north of the existing outfall)
2. 96th Avenue Alternative (involves twinning the storm pipe, and a second outfall north of the exiting outfall)
3. Southern Alternative (discharges south of the existing outfall)
4. 98th Street Alternative (discharges north of Highway 2 bridge)

Figure 3 and Figure 4 show the Town of Peace River AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.2.1 Background

The Town of Peace River is a growing community straddling the banks of the Peace River. It serves as the main trading area in the Mighty Peace Country. The highest population sector is under the age of 14 and the lowest sector is over the age of 65, indicating a young, rapidly growing population (Discover the Peace Country 2015a).

The Peace River basin covers an area of 323,000 square kilometres (km^2) across both British Columbia and Alberta (Government of British Columbia, 2003). The river is 1,923 km long and a principal tributary of the Mackenzie River System (The Canadian Encyclopedia, 2014). It flows from the east arm of Williston Lake, through the Rocky Mountains, cutting across the northwestern Alberta prairies, meandering through northern Alberta, flowing into Wood Buffalo National Park. The river flows into the Slave River where the waters are carried to Great Slave Lake, which eventually drains into the Mackenzie. The Peace River contributes 58 billion cubic metres of water per year into Alberta from British Columbia, three times the flow of all rivers in southern Alberta combined (AESRD, 2015a).

4.2.2 Historical Resources

A database search of the *Listing of Historic Resources* (current to March 2015) revealed land with HRVs of 1, 4 and 5 occurring in the Town of Peace River AOI (Table 6, Figure 4). Three areas were identified with HRVs of 5, with primary resource categories of paleontological and archaeological. Two areas were identified with HRV's of 4, with primary resource categories of paleontological and archaeological. One legal subdivision was identified with an HRV value of 1, indicating that it is protected under the Alberta *Historical Resources Act* as a Provincial Historic Resource, World Heritage Site, or owned by ACCS. This HRV has a historic period primary resource category.

Table 6: Historic Resource Value of Land within the Town of Peace River Area of Interest

Alberta Township System (Meridian-Rge-Twp-Sec-QtrSec)	HRV[1]	Category
5-21-83-29-1,4,8,11,14-16	5	a
5-21-83-32-3,4,6-12,14-16	5	a
5-21-83-32-1-3,6-16	5	p
5-21-83-29-14,15	4	p
5-21-83-32-1,2,5	4	a
5-21-83-32-5	1	h

Note: [1]- Historical Resource Value, a--archaeological; p-paleontological, h- historic period

4.2.3 Wildlife and Species at Risk

Within the 20 km search radius of the Town of Peace River AOI 7 birds, one mammal and two insects were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 7). In total, there are 10 species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and two species listed with a SARA status of "Special Concern", "Threatened" or "Endangered".

Table 7: Listed Species within 20 km of the Town of Peace River Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
Birds						
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive	-	Not At Risk	-	-
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Cape May Warbler	*Dendroica tigrina*	Sensitive	-	-	-	-
Great Gray Owl	*Strix nebulosa*	Sensitive	-	Not At Risk	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
Short-eared Owl	*Asio flammeus*	May Be At Risk	-	Special Concern	Special Concern	Schedule 1
Mammals						
Woodland Caribou	*Rangifer tarandus caribou*	At Risk	Threatened	Threatened	Threatened	Schedule 1
Insects						
Alberta Arctic	*Oeneis alberta*	Sensitive	-	-	-	-
Old World Swallowtail	*Papilio machaon*	Sensitive	-	-	-	-

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.2.4 Fisheries

The Town of Peace River AOI is bordered by the Peace River on the west, Pat's Creek to the northwest, and Heart River to the South. The proposed flood mitigation project for this community, at the time of this report, involves three re-alignments of the Pat's Creek storm pipe that discharges into the Peace River. Because the Pat's Creek storm pipe alignment is identified as a watercourse, all re-alignment options would likely be considered a diversion. Both the Northern Alternative and 96th Avenue Alternative will discharge into the Peace River, while the Southern Alternative will discharge into Heart River.

The Peace River and the Heart River are Mapped Class C Water Bodies with a RAP of April 16th to July 15th. Pat's Creek is a mapped Class D stream, with no RAP. However, the proposed AOI for Pat's Creek is within 2 km of the Peace River and is considered a Class C water body with a RAP of April 16th to July 15th as per the AESRD COP (AESRD 2015b).

Brook Stickleback is the only fish species documented in Pat's Creek while 29 species of fishes have been documented in the Peace River, representing sportfish, minnows, suckers, trout-perch, and sculpins (Table 8). Nineteen species of fishes have been documented in the Heart River, representing sportfish, minnows, suckers, trout-perch, and sculpins (Table 9).

Table 8: Fish Species that have been documented in the Peace River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
SPORTFISH					
Arctic Grayling	*Thymallus arcticus arcticus*	May-June	Sensitive	Not Listed	Not Listed
Bull Trout	*Salvelinus confluentus*	Fall	Special Concern	Threatened	Not Listed
Burbot	*Lota lota*	Winter	Secure	Not Listed	Not Listed
Goldeye	*Hiodon alosoides*	Spring	Secure	Not Listed	Not Listed
Kokanee Sockeye Salmon	*Oncorhynchus nerka*	Summer	Exotic/Alien	Endangered[4]	No Status
Lake Trout	*Salvelinus namaycush*	Fall	Sensitive	Not Listed	Not Listed
Lake Whitefish	*Coregonus clupeaformis*	Fall-Winter	Secure	Not Listed	Not Listed
Mountain Whitefish	*Prosopium williamsoni*	Fall	Secure	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Spring	Secure	Not Listed	Not Listed
Rainbow Trout	*Oncorhynchus mykiss*	Spring-Summer	Secure	Not Listed	Not Listed
Walleye	*Sander vitreum*	Winter-Spring	Secure	Not Listed	Not Listed
Yellow Perch	*Perca flavescens*	Spring	Secure	Not Listed	Not Listed
NON-SPORTFISH					
Brook Stickleback	*Culaea inconstans*	April-July	Secure	Not Listed	Not Listed
Emerald Shiner	*Notropis atherinoides*	Spring-Summer	Secure	Not Listed	Not Listed
Flathead Chub	*Hybopsis gracilis*	Summer	Secure	Not Listed	Not Listed
Finescale Dace	*Phoxinus neogaeus*	April-June	Undetermined	Not Listed	Not Listed
Fathead Minnow	*Pimephales promelas*	Summer	Secure	Not Listed	Not Listed
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
Longnose Dace	*Rhinichthys cataractae*	Spring-Summer	Secure	Not Listed	Not Listed
Longnose Sucker	*Catostomus catostomus*	Spring	Secure	Not Listed	Not Listed
Largescale Sucker	*Catostomus macrocheilus*	Spring	Sensitive	Not Listed	Not Listed
Ninespine Stickleback	*Pungitius pungitius*	Summer	Undetermined	Not Listed	Not Listed
Northern Pikeminnow	*Ptychocheilus oregonensis*	Spring	Sensitive	Not Listed	Not Listed
Northern Redbelly Dace	*Phoxinus eos*	Summer	Sensitive	Not Listed	Not Listed
Pearl Dace	*Margariscus margarita*	Spring-Summer	Undetermined	Not Listed	Not Listed
Prickly Sculpin	*Cottus asper*	Spring	Not Assessed	Not Listed	Not Listed
Redside Shiner	*Richardsonius balteatus*	Spring	Secure	Not Listed	Not Listed
Slimy Sculpin	*Cottus cognatus*	Spring	Secure	Not Listed	Not Listed
Spoonhead Sculpin	*Cottus ricei*	Spring	May Be at Risk	Not at Risk	Not Listed
Spotfin Shiner	*Cyprinella spiloptera*	Summer	-	Not Listed	Not Listed
Trout-Perch	*Percopsis omiscomaycus*	Spring-Summer	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes:1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015), 4= BC population only

Table 9: Fish Species that have been documented in the Heart River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
SPORTFISH					
Burbot	*Lota lota*	Winter	Secure	Not Listed	Not Listed
Goldeye	*Hiodon alosoides*	Spring	Secure	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Spring	Secure	Not Listed	Not Listed
Rainbow Trout	*Oncorhynchus mykiss*	Spring-Summer	Secure	Not Listed	Not Listed
Walleye	*Sander vitreum*	Winter-Spring	Secure	Not Listed	Not Listed
Yellow Perch	*Perca flavescens*	Spring	Secure	Not Listed	Not Listed
NON-SPORTFISH					
Brook Stickleback	*Culaea inconstans*	April-July	Secure	Not Listed	Not Listed
Emerald Shiner	*Notropis atherinoides*	Spring-Summer	Secure	Not Listed	Not Listed
Flathead Chub	*Hybopsis gracilis*	Summer	Secure	Not Listed	Not Listed
Fathead Minnow	*Pimephales promelas*	Summer	Secure	Not Listed	Not Listed
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
Longnose Dace	*Rhinichthys cataractae*	Spring-Summer	Secure	Not Listed	Not Listed
Longnose Sucker	*Catostomus catostomus*	Spring	Secure	Not Listed	Not Listed
Northern Pikeminnow	*Ptychocheilus oregonensis*	Spring	Sensitive	Not Listed	Not Listed
Northern Redbelly Dace	*Phoxinus eos*	Summer	Sensitive	Not Listed	Not Listed
Pearl Dace	*Margariscus margarita*	Spring-Summer	Undetermined	Not Listed	Not Listed
Redside Shiner	*Richardsonius balteatus*	Spring	Secure	Not Listed	Not Listed
Trout-Perch	*Percopsis omiscomaycus*	Spring-Summer	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes:1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015), 4= BC population only

The Arctic Grayling are listed as “Sensitive” within Alberta because their population has been on a decline due to climate change factors such as habitat fragmentation, overharvesting, and increased water temperatures (AESRD, 2005). This species has also been determined an “intermediate priority candidate” in 2004 by COSEWIC.

Bull Trout are listed as “Threatened” by COSEWIC, which indicates that the species is facing imminent extirpation or extinction. Bull Trout are listed provincially as “Special Concern” and “Sensitive” by AESRD (2011). Sensitive species are not at risk of extinction, but may require special attention or protection. Overharvesting and habitat loss have led to the decline in the population. Some stocking has occurred historically.

As Bull Trout are protected species, project limitations such as timing windows and habitat replacement are anticipated within the Town of Peace River AOI. The Peace River is a very important recreational fishery in northern Alberta and any disruption to migration, spawning, and water quality could have detrimental impacts.

Sockeye Salmon are considered an “Exotic/Alien” species to Alberta. COSEWIC has listed their British Columbia population as “Endangered” as over 75% of their population has shown decline due to reduced marine survival, climate change, overharvesting, and some logging impacts (Levy, 2006).

Lake Trout are currently listed as “Sensitive” by AESRD. This species is at risk for population decline due to limited available habitat and overharvesting. Lake Trout angling is closely regulated in an attempt to recover the population (AESRD 2014e).

Northern Redbelly Dace, Northern Pikeminnow, and Largescale Sucker are listed as “Sensitive” by AESRD and Spoonhead Sculpin are listed as “May Be At Risk”. Status reports for these species have not been developed at the time of this report.

4.2.5 Applicable Legislation

4.2.5.1 Canadian Environmental Assessment Act

Under the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, the following is listed as a designated activity:

“The construction, operation, decommissioning and abandonment of a new structure for the diversion of 10,000,000 m^3/year or more of water from a natural water body into another natural water body.”

The yearly flow rate of the proposed diversion is not currently known. If the final design diverts 10,000,000 m^3/year or more, it is recommended that a project description is provided to CEAA to determine if a federal EA will be required.

4.2.5.2 Fisheries Act

The proposed project design for the Town of Peace River AOI in the Peace River, Pat’s Creek and Heart River has the potential to negatively impact fish and fish habitat. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. The proposed flood mitigation works for this community involve re-aligning a stormwater pipe, which can be considered a watercourse diversion. The outfalls associated with this work are located on the Peace River or the Heart River, with the intake pipe on Pat’s Creek. Proposed works have the potential to impact Fish and Fish Habitat in the Peace River, Pat’s Creek, and Heart River, and depending on the final design, location, and mitigation measures chosen for the final project, may require:

- Approvals or COP notifications under the Water Act
- A Request for review from the minister of Fisheries and Oceans
- An Application for Authorization under the Fisheries Act

4.2.5.3 Navigation Protection Act

The Peace River is a scheduled waterway under the NPA. A notification under the NPA is not required for projects that are considered a Minor Work, and meet the assessment criteria of the Minor Works Order. Outfalls are listed as a class of Minor Works; therefore, a notice to the Minister under the NPA would not be required, as long as the works meet the criteria established under the Minor Works Order. If proposed works do not adhere to these criteria, then a Notice of Works application will be required.

4.2.5.4 Migratory Birds Convention Act

Environment Canada’s Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Town of Peace River AOI (Environment Canada 2014). Within Zone B5, Environment

Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.2.5.5 Species at Risk Act

One SARA listed species, Woodland Caribou, was identified within the 20 km buffer of the AOI. Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated, endangered, or a threatened species listed under Schedule 1.

4.2.5.6 Alberta Environmental Protection and Enhancement Act

The proposed flood mitigation is not listed as a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor does it require an approval under the *Activities Designation Regulation.* Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.2.5.7 Water Act

Proposed flood mitigation involves the re-alignment of the Pat's Creek storm pipe. Any work on associated outfalls will require a COP Notification for Outfall Structures on Water Bodies under the *Water Act*. If proposed flood mitigation does not meet the criteria under the COP for Outfall Structures on Water Bodies, then a *Water Act* approval will be required.

4.2.5.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. Three areas of open water were identified from the Alberta Merged Wetland Inventory: Peace River, Pat's Creek, and the Heart River (Figure 3).

4.2.5.9 Historical Resources Act

The recommendation for this project is that a Historical Resources Overview be conducted based on final project designs, with a submission of a Statement of Justification for either a *Historical Resources Act* Clearance, or to conduct a HRIA, if the area has not been previously cleared under the *Historical Resources Act*.

4.2.6 Conclusion

Table 10 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 10: Summary Table of Elements Identified within the Town of Peace River Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	HRVs of 1, 4, and 5	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land. Construction on land with HRV values of 1 will likely require a HRIA, and activity restrictions may be required.
ESAs	None	-	-
Parks	None	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	Open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation.
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	Key Wildlife and Biodiversity Zone	Alberta Wildlife Act	Follow recommended Industrial Use Guidelines. See Section 2.2
Fisheries and Aquatic Resources	Peace River, Heart River & Pat's Creek (Section 2km upstream from Peace River) - Class C	Fisheries Act, Water Act	Restricted Activity Period April 16 – July 15 -DFO self-assessment to determine if request for review or approval will be required. COP Notification for Outfall Structures or Water Act Approval Application. Should aquatic habitat destruction occur, compensation will be required.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 10 (AESRD General Status), 2 (SARA) Fish - 7 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st.
Designated Activities	10 000 000 m^3/year or more diversion of water	Canadian Environmental Assessment Act	Submit a project description to the Canadian Environmental Assessment Agency to determine if an EA is required if the project diverts10 000 000 m^3/year or more.

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Appendix D
Town of Peace River Area of Interest
Environmental Overview
Wetlands

AECOM

Figure: 3

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Peace River Basin Flood Mitigation Feasibility Study

Alberta Environment and Sustainable Resource Development

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Appendix D

Town of Peace River Area of Interest

Environmental Overview

HRVs

AECOM

Figure: 4

4.3 Town of Sexsmith

Databases identified in Section 1 were searched to identify environmental factors within the Sexsmith AOI. There were two proposed flood mitigation options examined for this AOI:

1. Upsizing the ditch and culvert on the southeast end of town
2. Raising 106 Street (or increasing ditch size) and upsizing the culvert crossing on the northeast end of the road

Figure 5 shows the Town of Sexsmith AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.3.1 Background

The Town of Sexsmith is located in the County of Grande Prairie No. 1 within the Peace River Country region of Alberta, one of the most fertile growing areas in the province. Many residents of the Town of Sexsmith commute to and from Grande Prairie for work (Discover the Peace Country 2015b). The town is mainly an agricultural service centre (Sexsmith Alberta 2014).

4.3.2 Wildlife and Species at Risk

Within the 20 km search radius of the Town of Sexsmith AOI, 13 birds, six mammals, and three amphibians were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 11). In total, there are 21 species listed with an AESRD general status of “At Risk”, “May be At Risk”, or “Sensitive”, and six species listed with a SARA status of “Special Concern”, “Threatened” or “Endangered”.

Table 11: Listed Species within 20 km of the Town of Sexsmith Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Bay-breasted Warbler	*Dendroica castanea*	Sensitive	-	-	-	-
Black-throated Green Warbler	*Dendroica virens*	Sensitive	-	-	-	-
Brown Creeper	*Certhia americana*	Sensitive	-	-	-	-
Canada Warbler	*Wilsonia canadensis*	Sensitive	-	Threatened	Threatened	Schedule 1
Cape May Warbler	*Dendroica tigrina*	Sensitive	-	-	-	-
Common Yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-	-
Eastern Phoebe	*Sayornis phoebe*	Sensitive	-	-	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Northern Pygmy-owl	*Glaucidium gnoma*	Sensitive	-	-	-	-
Piping Plover	*Charadrius melodus*	At Risk	Endangered	Endangered	Endangered	Schedule 1
Sora	*Porzana carolina*	Sensitive	-	-	-	-
Western Tanager	*Piranga ludoviciana*	Sensitive	-	-	-	-
MAMMALS						
Grizzly Bear	*Ursus arctos*	At Risk	Threatened	Special Concern	-	-
Hoary Bat	*Lasiurus cinereus*	Sensitive	-	-	-	-
Little Brown Bat	*Myotis lucifugus*	Secure	-	Endangered	Endangered	Schedule 1
Northern Long-eared Bat	*Myotis septentrionalis*	May Be At Risk	-	Endangered	Endangered	Schedule 2
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive	-	-	-	-
Woodland Caribou	*Rangifer tarandus caribou*	At Risk	Threatened	Threatened	Threatened	Schedule 1
AMPHIBIANS						
Canadian Toad	*Anaxyrus hemiophrys*	May Be At Risk	-	Not At Risk	-	-
Northern Leopard Frog	*Lithobates pipiens*	At Risk	Threatened	Special Concern	Special Concern	Schedule 1
Western Toad (Boreal Toad ssp.)	*Anaxyrus boreas boreas*	Sensitive	-	Special Concern	-	-

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.3.3 Fisheries

The proposed flood mitigation strategies for the Town of Sexsmith AOI involve works in an unmapped, Class D stream which runs through the Town of Sexsmith. This stream has no Restricted Activity Period. No fish species have been recorded within this watercourse. The stream flows towards an unnamed lake approximately 10 km to the east of the Town of Sexsmith, which also has no recorded fish species.

4.3.4 Applicable Legislation

4.3.4.1 Canadian Environmental Assessment Act

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, activities included in this project are not likely to require an environmental assessment.

4.3.4.2 Fisheries Act

The proposed flood mitigation efforts for the Town of Sexsmith AOI, do not appear to impact fish or fish habitat. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. If sufficient habitat information is available which suggests the impacted waterbodies are non-fish bearing, and is not connected to a fish bearing waterbody, then DFO approval will not be required. When a detailed project design becomes available, self-assessment should be performed to determine if a request for review will be required.

- Approvals or COP notifications under the Water Act
- A Request for Review from the minister of Fisheries and Oceans

4.3.4.3 Navigation Protection Act

A notification will not be required by Transport Canada as the stream running through the Town of Sexsmith is not included in the Schedule of the Act. Proponents are still required to ensure that no proposed works restrict the navigability of a water body.

4.3.4.4 Migratory Birds Convention Act

Environment Canada's Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Town of Sexsmith AOI (Environment Canada 2014). Within Zone B5, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.3.4.5 Species at Risk Act

Six SARA listed species were identified within 20 km of the proposed Town of Sexsmith AOI (Canada warbler, piping plover, little brown bat, northern long-eared bat, woodland caribou, and northern leopard frog). Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species listed under Schedule 1. Basic prohibitions of SARA do not apply to species listed as "Special Concern" (northern leopard frog).

4.3.4.6 Alberta Environmental Protection and Enhancement Act

The proposed flood mitigation works are not listed as mandatory activities under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor do they require an approval under the *Activities Designation Regulation.* Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.3.4.7 Water Act

Proposed flood mitigation may involve the upsizing of culverts and/or increasing drainage ditch size. Any work on culverts will require a COP Notification for Outfall Structures on Water Bodies under the *Water Act*. If proposed works do not meet the criteria under the COP for Outfall Structures on Water Bodies, then a *Water Act* approval will be required. If proposed works involving increasing ditch size result in the alteration the flow, level or location of water, a *Water Act* approval will be required.

4.3.4.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. Areas of open water and marsh were identified from the Alberta Merged Wetland Inventory within the Town of Sexsmith AOI (Figure 5).

4.3.4.9 Historical Resources Act

No lands with HRV values were discovered in the Town of Sexsmith AOI. If work will be impacting undisturbed land or expanding existing infrastructure, it is recommended that a Statement of Justification for a *Historical Resources Act* Clearance be submitted to Alberta Culture.

4.3.5 Conclusion

Table 12 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 12: Summary Table of Elements Identified within the Town of Sexsmith Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Parkland - Peace River Parkland	-	-
Listing of Historical Resource	None	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land.
ESAs	None	-	-
Parks	None	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	Open water, marshes	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	None	Alberta Wildlife Act	-
Fisheries and Aquatic Resources	Unmapped Stream - Class D	Fisheries Act, Water Act	No Restricted Activity Period. DFO self-assessment to determine if request for review will be required. Water Act COP notification.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 21 (AESRD General Status), 6 (SARA) Fish - 0 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st.

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Appendix D
Town of Sexsmith Area of Interest
Environmental Overview
Wetlands and HRVs

AECOM

Figure: 5

4.4 Town of Manning

Databases identified in Section 1 were searched to identify environmental factors within the Manning AOI. The proposed works for the Manning AOI includes constructing a dyke along the east bank of the Peace River, in order to prevent river flooding within the town of Manning. Figure 6 and Figure 7 show the Town of Manning AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.4.1 Background

The Town of Manning lies within the County of Northern Lights. Manning acts as a service center for the local agriculture, forestry, and gas industries. Land use in the county is defined by agricultural operations, with the Towns of Manning and Peace River holding the majority of the population and development. There are over 12,000 km of streams and rivers within the County of Northern Lights, most of which drain into Peace River or Hay River (County of Northern Lights, 2012).

The Notikewin River is a tributary of the Peace River originating in the Clear Hills in northern Alberta and joining the Peace River at Notikewin Provincial Park. This river flows through the middle of the Town of Manning, Alberta. Flooding is generally a result of snowmelt and spring rainfall events (AESRD, 2014f).

4.4.2 Historical Resources

A database search of the *Listing of Historic Resources* (current to March 2015) in GIS format revealed land with HRVs of 1 and 5 occurring in the Town of Manning AOI (Table 13, Figure 7). Two areas were identified with HRVs of 5, with primary resource categories of paleontological and archaeological. One legal subdivision was identified with an HRV value of 1, indicating that it is protected under the Alberta *Historical Resources Act* as a Provincial Historic Resource, World Heritage Site, or owned by ACCS.

Table 13: Historic Resource Value of Land within the Town of Manning Search Area

Alberta Township System (Meridian-Rge-Twp-Sec-QtrSec)	HRV[1]	Category
5-23-91-28-9	1	h
5-23-91-28-1-12,14-16	5	p
5-23-91-28-1-12,14-16	5	a

Note: [1]- Historical Resource Value, a--archaeological; p-paleontological, h- historic period

4.4.3 Wildlife and Species at Risk

Within the 20 km search radius of the Town of Manning AOI 6 birds, four mammals, and one reptile were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 14). It should be noted that Bison are considered livestock unless within Alberta's Bison Management Area. The Town of Manning AOI does not fall within this Management Area and as such, impacts to this sensitive species would not be of concern. In total, there are 10 species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and two species listed with a SARA status of "Special Concern", "Threatened" or "Endangered".

Table 14: Listed Species within 20 km of the Town of Manning Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Great Gray Owl	*Strix nebulosa*	Sensitive	-	Not At Risk	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
Trumpeter Swan	*Cygnus buccinator*	At Risk	Threatened	Not At Risk	-	-
MAMMALS						
American Bison	*Bison bison bison*	Extirpated	Endangered*	Threatened	-	No Schedule
American Bison	*Bison bison athabascae*	At Risk	Endangered*	Special Concern	Threatened	Schedule 1
Wolverine	*Gulo gulo*	May Be At Risk	-	Special Concern	-	-
Woodland Caribou (Boreal Population)	*Rangifer tarandus caribou*	At Risk	Threatened	Threatened	Threatened	Schedule 1
REPTILES						
Red-sided Garter Snake	*Thamnophis sirtalis*	Sensitive	-	-	-	-

*Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015), * Range restriction on status-Bison are not protected if outside Alberta's Bison Management Area*

4.4.4 Fisheries

The Town of Manning AOI includes the Notikewin River. The Notikewin River is a Mapped Class C Water Body with a RAP of April 16th to July 15th as per the AESRD COP (AESRD 2015b). Fifteen species of fishes have been captured that have the potential to exist within the watershed including five species of sportfish: Arctic Grayling, Burbot, Golneye, Northern Pike, and Walleye (Table 15).

Table 15: Fish Species that have been documented in the Notikewin River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
SPORTFISH					
Arctic Grayling	*Thymallus arcticus arcticus*	Spring	Sensitive	Not Listed	Not Listed
Burbot	*Lota lota*	Winter	Secure	Not Listed	Not Listed
Goldeye	*Hiodon alosoides*	Spring	Secure	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Spring	Secure	Not Listed	Not Listed
Walleye	*Sander vitreum*	Winter-Spring	Secure	Not Listed	Not Listed
NON-SPORTFISH					
Flathead Chub	*Hybopsis gracilis*	Summer	Secure	Not Listed	Not Listed
Finescale Dace	*Phoxinus neogaeus*	April-June	Undetermined	Not Listed	Not Listed
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
Longnose Dace	*Rhinichthys cataractae*	Spring-Summer	Secure	Not Listed	Not Listed
Longnose Sucker	*Catostomus catostomus*	Spring	Secure	Not Listed	Not Listed
Slimy Sculpin	*Cottus cognatus*	Spring	Secure	Not Listed	Not Listed
Spoonhead Sculpin	*Cottus ricei*	Spring	May Be at Risk	Not at Risk	Not Listed
Spotfin Shiner	*Cyprinella spiloptera*	Summer	-	Not Listed	Not Listed
Trout-Perch	*Percopsis omiscomaycus*	Spring-Summer	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes:1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015)

The Arctic Grayling are listed as “Sensitive” within Alberta because their population has been on a decline due to climate change factors such as habitat fragmentation, overharvesting, and increased water temperatures (AESRD, 2005). This species has also been determined an “intermediate priority candidate” in 2004 by COSEWIC.

4.4.5 Applicable Legislation

4.4.5.1 Canadian Environmental Assessment Act

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, activities included in this project are not likely to require an environmental assessment.

4.4.5.2 Fisheries Act

The proposed flood mitigation design for this community includes building a dyke along the Notikewin River to prevent the Town of Manning from flooding. It is not anticipated that this design will involve significant in-stream works, and should therefore have minimal impact on fish and fish habitat within the river. Depending on the final design and location of the mitigation measures chosen, and the expected impact to fish and fish habitat, proposed projects may still require:

- Approvals or COP notifications under the Water Act
- A Request for Review from the minister of Fisheries and Oceans
- An Application for Authorization under the Fisheries Act

4.4.5.3 Navigation Protection Act

Review will not be required by Transport Canada as the Notikewin River is not included in the Schedule of the Act. The amendment to the act still allows proponents of works in non-scheduled waters to opt-in and seek approval of their proposed works.

4.4.5.4 Migratory Birds Convention Act

Environment Canada's Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Town of Manning AOI (Environment Canada 2014). Within Zone B5, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.4.5.5 Species at Risk Act

One SARA listed species, Woodland Caribou, was identified within 20 km of the Town of Manning AOI. Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated, endangered, or a threatened species listed under Schedule 1.

4.4.5.6 Alberta Environmental Protection and Enhancement Act

The proposed project design is not listed as a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor does it require an approval under the *Activities Designation Regulation.* Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.4.5.7 Water Act

The proposed works have the potential to alter the flow, level or location of water, and do not fall under the criteria for a *Water Act* COP Notification so *Water Act* approval is required.

4.4.5.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. Two areas of open water were identified from the Alberta Merged Wetland Inventory, with one being the Notikewin River (Figure 6).

4.4.5.9 Historical Resources Act

The recommendation for this project is that a Historical Resources Overview be conducted based on final project designs, with a submission of a Statement of Justification for either a *Historical Resources Act* Clearance, or to conduct a HRIA.

4.4.6 Conclusion

Table 16 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 16: Summary Table of Elements Identified within the Town of Manning Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	HRVs of 1 and 5	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land. Construction on land with HRV values of 1 will likely require a HRIA, and activity restrictions may be required.
ESAs	none	-	-
Parks	none	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation.
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	Key Wildlife and Biodiversity Zone	Alberta Wildlife Act	Follow recommended Industrial Use Guidelines See Section 2.2.
Fisheries and Aquatic Resources	Notikewin River - Class C	Fisheries Act, Water Act	Restricted Activity Period April 16 – July 15 DFO self-assessment to determine if request for review or approval will be required. Water Act Approval Application. Should aquatic habitat destruction occur, compensation will be required.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 10 (AESRD General Status), 2 (SARA) Fish - 2 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st.

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Appendix D
Town of Manning Area of Interest
Environmental Overview
Key Ranfe Layers and Wetlands

AECOM

Figure: 6

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Appendix D

Town of Manning Area of Interest

Environmental Overview

HRVs

Figure: 7

AECOM

4.5 Hamlet of Fort Vermilion

Databases identified in Section 1 were searched to identify environmental factors within the Hamlet of Fort Vermilion AOI. The proposed flood mitigation works for this AOI includes building a dyke along Peace River, or alternatively raising River Road to contain river flooding. Figure 8 and Figure 9 show the Fort Vermilion AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.5.1 Background

The Hamlet of Fort Vermilion was established in 1788 and is one the oldest settlements in Alberta (Mackenzie County, 2010). The Hamlet of Fort Vermilion is in Mackenzie County.

Fort Vermilion is located along the Peace River. The Peace River basin covers an area of 323,000 km^2 across both British Columbia and Alberta (Government of British Columbia, 2003). The river is 1,923 km long and a principal tributary of the Mackenzie River System (The Canadian Encyclopedia, 2014). It flows from the east arm of Williston Lake, through the Rocky Mountains, cutting across the northwestern Alberta prairies, meandering through northern Alberta, flowing into Wood Buffalo National Park. The river flows into the Slave River where the waters are carried to Great Slave Lake, which eventually drains into the Mackenzie. The Peace River contributes 58 billion cubic metres of water per year into Alberta from British Columbia, three times the flow of all rivers in southern Alberta combined (AESRD, 2015).

4.5.2 Historical Resources

A database search of the *Listing of Historic Resources* (current to March 2015) revealed land with HRVs of 1 through 5 in the Hamlet of Fort Vermilion AOI (Table 17, Figure 9). Fourteen areas were identified with HRVs of 5, with primary resource categories of historic period and/or archaeological. Two areas were identified with HRVs of 4, and two with HRVs of 3, all with archaeological categories. One area was identified with an HRV of 2, which is designated under the *Historical Resources Act.* One area was identified with an HRV value of 1, indicating that it is protected under the Alberta *Historical Resources Act* as a Provincial Historic Resource, World Heritage Site, or owned by ACCS.

Table 17: Historic Resource Value of Land within the Hamlet of Fort Vermilion Area of Interest

Alberta Township System (Meridian-Rge-Twp-Sec-QtrSec)	HRV[1]	CATEGORY
5-12-108-19-13,14	1	h
5-13-108-24-7	2	h
5-12-108-19-11,13,14	3	a
5-13-108-25-11-14	3	a
5-13-108-25-5,6	4	a
5-13-108-29-10,11	4	a
5-12-108-19-12	5	a
5-12-108-19-5-7,10-15	5	a, h
5-12-108-29-13	5	a
5-12-108-30-2-4	5	a, h
5-12-108-30-3,9-12	5	a
5-13-108-21-10,14	5	a
5-13-108-22-1-3	5	a
5-13-108-24-8,9,16	5	a, h
5-13-108-25-1	5	a, h
5-13-108-25-3-7,10,15	5	a
5-13-108-27-3,4	5	a
5-13-108-28-1,5-7,12	5	a
5-13-108-29-6,7,9,12	5	a
5-13-108-30-9-14	5	a

Note: [1]- Historical Resource Value, a--archaeological; h- historic period

4.5.3 Vegetation and Rare Plants

A search of ACIMS for rare species (or species of conservation concern) identified occurrences of two plants in the Hamlet of Fort Vermilion project AOI. These are Cary's Arctic (*Oeneis chryxus caryi*) and Palaeno Sulphur (*Colias palaeno*).

It is possible that other rare plant species may exist and as such, rare plant surveys will be required prior to construction. The presence of rare plants can cause delays to construction if the plants have to be relocated or may require modifications to construction methodologies and/or location if the rare plants species are listed as Species at Risk.

4.5.4 Wildlife and Species at Risk

Within a 20 km search radius of the Hamlet of Fort Vermilion AOI, 36 birds, one mammal, one reptile and two amphibians were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 18). In total, there are 31 species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and seven species listed with a SARA status of "Special Concern", "Threatened", or "Endangered".

Table 18: Listed species within 20 km of the Hamlet of Fort Vermilion Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive	-	Not At Risk	-	-
Baltimore Oriole	*Icterus galbula*	Sensitive	-	-	-	-
Barn Swallow	*Hirundo rustica*	Sensitive	-	Threatened	-	-
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Bay-breasted Warbler	*Dendroica castanea*	Sensitive	-	-	-	-
Black Tern	*Chlidonias niger*	Sensitive	-	Not At Risk	-	-
Black-backed Woodpecker	*Picoides arcticus*	Sensitive	-	-	-	-
Blackburnian Warbler	*Dendroica fusca*	Sensitive	-	-	-	-
Black-throated Green Warbler	*Dendroica virens*	Sensitive	-	-	-	-
Broad-winged Hawk	*Buteo platypterus*	Sensitive	-	-	-	-
Canada Warbler	*Wilsonia canadensis*	Sensitive	-	Threatened	Threatened	Schedule 1
Cape May Warbler	*Dendroica tigrina*	Sensitive	-	-	-	-
Common Nighthawk	*Chordeiles minor*	Sensitive	-	Threatened	Threatened	Schedule 1
Common Yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-	-
Great Blue Heron	*Ardea herodias*	Sensitive	-	-	-	-
Great Gray Owl	*Strix nebulosa*	Sensitive	-	Not At Risk	-	-
Green-winged Teal	*Anas crecca*	Sensitive	-	-	-	-
Horned Grebe	*Podiceps auritus*	Sensitive	-	Special Concern	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Lesser Scaup	*Aythya affinis*	Sensitive	-	-	-	-
Northern Goshawk	*Accipiter gentilis*	Sensitive	-	Not At Risk	-	-
Northern Harrier	*Circus cyaneus*	Sensitive	-	Not At Risk	-	-
Northern Pintail	*Anas acuta*	Sensitive	-	-	-	-
Olive-sided Flycatcher	*Contopus cooperi*	May Be At Risk	-	Threatened	Threatened	Schedule 1
Peregrine Falcon	*Falco peregrinus*	At Risk	Threatened	Special Concern	Special Concern	Schedule 1
Pileated Woodpecker	*Dryocopus pileatus*	Sensitive	-	-	-	-
Sandhill Crane	*Grus canadensis*	Sensitive	-	-	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
Short-eared Owl	*Asio flammeus*	May Be At Risk	-	Special Concern	Special Concern	Schedule 1
Sora	*Porzana carolina*	Sensitive	-	-	-	-
Western Grebe	*Aechmophorus occidentalis*	Sensitive	-	Special Concern	Special Concern	No Schedule
Western Tanager	*Piranga ludoviciana*	Sensitive	-	-	-	-
Western Wood-pewee	*Contopus sordidulus*	Sensitive	-	-	-	-

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
White-winged Scoter	*Melanitta fusca*	Sensitive	-	-	-	-
Whooping Crane	*Grus americana*	At Risk	Endangered	Endangered	Endangered	Schedule 1
MAMMALS						
Wolverine	*Gulo gulo*	May Be At Risk	-	Special Concern	-	-
REPTILES						
Red-sided Garter Snake	*Thamnophis sirtalis*	Sensitive	-	-	-	-
AMPHIBIANS						
Boreal Toad	*Bufo boreas boreas*	Sensitive	-	Special Concern	-	-
Canadian Toad	*Anaxyrus hemiophrys*	May Be At Risk	-	Not At Risk	-	-

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2015), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.5.5 Fisheries

The Hamlet of Fort Vermilion AOI includes the Peace River. The Peace River is a Mapped Class C Water Body with a RAP of April 16th to July 15th as per the AESRD COP (AESRD 2015b). Twenty-nine species of fishes have been captured that have the potential to live within the AOI representing sportfish, minnows, suckers, trout-perch, and sculpins (Table 19).

Table 19: Fish Species that have been documented in the Peace River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
SPORTFISH					
Arctic Grayling	*Thymallus arcticus arcticus*	May-June	Sensitive	Not Listed	Not Listed
Bull Trout	*Salvelinus confluentus*	Fall	Special Concern	Threatened	Not Listed
Burbot	*Lota lota*	Winter	Secure	Not Listed	Not Listed
Goldeye	*Hiodon alosoides*	Spring	Secure	Not Listed	Not Listed
Kokanee Sockeye Salmon	*Oncorhynchus nerka*	Summer	Exotic/Alien	Endangered[4]	No Status
Lake Trout	*Salvelinus namaycush*	Fall	Sensitive	Not Listed	Not Listed
Lake Whitefish	*Coregonus clupeaformis*	Fall-Winter	Secure	Not Listed	Not Listed
Mountain Whitefish	*Prosopium williamsoni*	Fall	Secure	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Spring	Secure	Not Listed	Not Listed
Rainbow Trout	*Oncorhynchus mykiss*	Spring-Summer	Secure	Not Listed	Not Listed
Walleye	*Sander vitreum*	Winter-Spring	Secure	Not Listed	Not Listed
Yellow Perch	*Perca flavescens*	Spring	Secure	Not Listed	Not Listed
NON-SPORTFISH					
Brook Stickleback	*Culaea inconstans*	April-July	Secure	Not Listed	Not Listed
Emerald Shiner	*Notropis atherinoides*	Spring-Summer	Secure	Not Listed	Not Listed
Flathead Chub	*Hybopsis gracilis*	Summer	Secure	Not Listed	Not Listed
Finescale Dace	*Phoxinus neogaeus*	April-June	Undetermined	Not Listed	Not Listed
Fathead Minnow	*Pimephales promelas*	Summer	Secure	Not Listed	Not Listed
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
Longnose Dace	*Rhinichthys cataractae*	Spring-Summer	Secure	Not Listed	Not Listed
Longnose Sucker	*Catostomus catostomus*	Spring	Secure	Not Listed	Not Listed
Largescale Sucker	*Catostomus macrocheilus*	Spring	Sensitive	Not Listed	Not Listed
Ninespine Stickleback	*Pungitius pungitius*	Summer	Undetermined	Not Listed	Not Listed
Northern Pikeminnow	*Ptychocheilus oregonensis*	Spring	Sensitive	Not Listed	Not Listed
Northern Redbelly Dace	*Phoxinus eos*	Summer	Sensitive	Not Listed	Not Listed
Pearl Dace	*Margariscus margarita*	Spring-Summer	Undetermined	Not Listed	Not Listed
Prickly Sculpin	*Cottus asper*	Spring	Not Assessed	Not Listed	Not Listed
Redside Shiner	*Richardsonius balteatus*	Spring	Secure	Not Listed	Not Listed
Slimy Sculpin	*Cottus cognatus*	Spring	Secure	Not Listed	Not Listed
Spoonhead Sculpin	*Cottus ricei*	Spring	May Be at Risk	Not at Risk	Not Listed
Spotfin Shiner	*Cyprinella spiloptera*	Summer	-	Not Listed	Not Listed
Trout-Perch	*Percopsis omiscomaycus*	Spring-Summer	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes: 1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015), 4 = BC population only

The Arctic Grayling are listed as “Sensitive” within Alberta because their population has been on a decline due to climate change factors such as habitat fragmentation, overharvesting, and increased water temperatures (AESRD, 2005). This species has also been determined an “intermediate priority candidate” in 2004 by COSEWIC.

Bull Trout are listed as “Threatened” by COSEWIC, which indicates that the species is facing imminent extirpation or extinction. Bull Trout are listed provincially as “Special Concern” and “Sensitive” by AESRD (2011). Sensitive species are not at risk of extinction, but may require special attention or protection. Overharvesting and habitat loss have led to the decline in the population. Some stocking has occurred historically. As Bull Trout are protected species, project limitations such as timing windows and habitat replacement are anticipated within the Fort Vermilion AOI. The Peace River is also a very important fishery in northern Alberta and any disruption to migration, spawning, and water quality could have detrimental impacts.

Sockeye Salmon are considered an “Exotic/Alien” species to Alberta. COSEWIC has listed their British Columbia population as “Endangered” as over 75% of their population has shown decline due to reduced marine survival, climate change, overharvesting, and some logging impacts (Levy, 2006).

Lake Trout are currently listed as “Sensitive” by AESRD. This species is at risk for population decline due to limited available habitat and overharvesting. Lake Trout angling is closely regulated in an attempt to recover the population (AESRD 2014).

Northern Redbelly Dace, Northern Pikeminnow, and Largescale Sucker are listed as “Sensitive” by AESRD and Spoonhead Sculpin are listed as “May Be At Risk”. Status reports for these species have not been developed at the time of this report.

4.5.6 Applicable Legislation

4.5.6.1 Canadian Environmental Assessment Act

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, activities included in this project are not likely to require an environmental assessment.

4.5.6.2 Fisheries Act

The proposed flood mitigation design for this community includes building a dyke along the Peace River or raising River Road to act as a dyke, in order to prevent the Hamlet of Fort Vermilion from flooding. It is not anticipated that this design will involve significant in-stream works, and should therefore, have minimal impact on fish and fish habitat within the river. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. When a detailed project design becomes available, self-assessment should be performed to determine if a request for review will be required.

- Approvals or COP notifications under the Water Act
- A Request for review from the minister of Fisheries and Oceans
- An Application for Authorization under the Fisheries Act

4.5.6.3 Navigation Protection Act

The Peace River is listed in the Schedule of the NPA. While the current project design is not listed as a Minor Works, the project does not intend to affect the navigability of Peace River in any way and as such, approval is not likely required. Proponents are still required to ensure that no proposed works restrict the navigability of a water body. Consultation with Transport Canada is recommended once final flood mitigation design is complete.

4.5.6.4 Migratory Birds Convention Act

Environment Canada's map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Fort Vermilion area (Environment Canada 2014). Within Zone B6, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds, are prohibited between April 30th and August 15th. In atypical nesting areas within the B6 zone where nesting could occur earlier or later, an extreme timing window of April 19th to August 31st is enforced. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.5.6.5 Species at Risk Act

Seven SARA listed species were identified within the 20 km search radius of the Hamlet of Fort Vermilion AOI (Canada Warbler, Common Nighthawk, Olive-sided Flycatcher, Peregrine Falcon, Short-eared Owl, Western Grebe, and Whooping Crane). Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species (Whooping Crane) or a threatened species (Canada Warbler, Common Nighthawk, and Olive-sided Flycatcher) listed under Schedule 1. Basic prohibitions of SARA do not apply to species listed as "Special Concern". This includes the Peregrine Falcon, Short-eared Owl, and Western Grebe within the Hamlet of Fort Vermilion AOI.

4.5.6.6 Alberta Environmental Protection and Enhancement Act

The proposed project design is not listed as a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor does it require an approval under the *Activities Designation Regulation.* Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.5.6.7 Water Act

The proposed flood mitigation works have the potential to alter the flow, level or location of water, and do not fall under the criteria for a *Water Act* COP Notification so a *Water Act* approval is required.

4.5.6.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. Areas of marshes, swamps and open water were identified from the Alberta Merged Wetland Inventory, with the open water area recorded as Peace River.

4.5.6.9 Historical Resources Act

The recommendation for this project is that a Historical Resources Overview be conducted based on final project designs, with a submission of a Statement of Justification for either a *Historical Resources Act* Clearance, or to conduct a HRIA, if the area has not been previously cleared under the *Historical Resources Act*.

4.5.7 Conclusion

Table 20 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 20: Summary Table of Elements Identified within the Hamlet of Fort Vermilion Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	HRVs of 1 , 2, 3, 4, and 5	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land. Construction on land with HRV values of 1 will likely require a HRIA, and activity restrictions may be required.
ESAs	none	-	-
Parks	none	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	marsh, swamp, open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	Key Wildlife and Biodiversity Zone	Alberta Wildlife Act	Follow recommended Industrial Use Guidelines. See Section 2.2
Fisheries and Aquatic Resources	Peace River - Class C	Fisheries Act, Water Act	Restricted Activity Period April 16 – July 15. DFO self-assessment to determine if request for review or approval will be required. Water Act Approval Application. Should aquatic habitat destruction occur, compensation will be required.
Sensitive Species	Vegetation - 2 listed (ACIMS) Wildlife - 40 (AESRD General Status), 7 (SARA) Fish - 7 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B6	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 30th and August 15th.

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Peace River Basin Flood Mitigation Feasibility Study
Alberta Environment and Sustainable Resource Development
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Appendix D
Hamlet of Fort Vermilion Area of Interest
Environmental Overview
Rare Plants and Wetlands

Figure: 8

AECOM

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Peace River Basin Flood Mitigation Feasibility Study

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Appendix D

Hamlet of Fort Vermilion Area of Interest

Environmental Overview

Key Range Layers and HRVs

Figure: 9

AECOM

4.6 Town of Falher

Databases identified in Section 1 were searched to identify environmental factors within the Town of Falher AOI. The proposed flood mitigation for the Town of Falher AOI includes upsizing the flash flood drainage ditch that drains the town's stormwater pipes to the Winagami Canal, which will then drain into Huntington Creek. Figure 10 shows the Town of Falher AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.6.1 Background

Falher is a town in Peace Country, within the municipal district of Smoky River No. 130. Top industries within the Town of Fahler include agriculture and related services. The Town of Falher is known as the "Honey Capital of Canada" as it contributes approximately 40% of the total yield of honey produced within all of Canada (Discover the Peace Country 2015c).

4.6.2 Wildlife and Species at Risk

Within the 20 km search radius of the Town of Falher AOI, four birds and two mammals were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 21). Woodland Caribou are listed by AESRD as "At Risk" under general status and as "Threatened" under the *Alberta Wildlife Act*. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the *Species at Risk* Act (SARA) list Woodland Caribou, as "Threatened". The AOI is near, but not within, the Caribou Range Key Range Layer. Occurrences of this species within the AOI are unlikely because it is within town limits. In total, there are six species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and one species listed with a SARA status of "Threatened" or "Endangered".

Table 21: Listed Species within 20 km of the Town of Falher Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Northern Harrier	*Circus cyaneus*	Sensitive	-	Not At Risk	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
MAMMALS						
Bobcat	*Lynx rufus*	Sensitive	-	-	-	-
Woodland Caribou (Boreal Population)	*Rangifer tarandus caribou*	At Risk	Threatened	Threatened	Threatened	Schedule 1

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.6.3 Fisheries

Flood mitigation design in the Town of Falher involves the Winagami-Girouxville Canal and Huntington Creek which are unmapped waterbodies with no RAPs as per the AESRD COP (AESRD 2015b). There are no records of fish species present in either waterbody (AESRD 2013).

4.6.4 Applicable Legislation

4.6.4.1 Canadian Environmental Assessment Act

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, activities included in this project are not likely to require an environmental assessment.

4.6.4.2 Fisheries Act

The proposed flood mitigation design for the Town of Falher, at the time of this overview report, includes upsizing a drainage ditch that will empty into Winagami-Girouxville Canal which then will flow to Huntington Creek. It is not anticipated that this design will involve any in-stream works, and should therefore have minimal impact on fish and fish habitat as there are no other major waterbodies near the AOI. It is not anticipated that the project will need to be reviewed by DFO as drainage ditches are exempt from review. Measures must still be taken to avoid harm to fish and fish habitat. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. If sufficient habitat information is available which suggests the impacted waterbodies are non-fish bearing, and is not connected to a fish bearing waterbody, then DFO approval will not be required. When a detailed project design becomes available, self-assessment should be performed to determine if a request for review will be required.

4.6.4.3 Navigation Protection Act

A notification will not be required as the Winagami-Girouxville Canal and Huntington Creek are not included in the Schedule of the NPA. Proponents are still required to ensure that no proposed works restrict the navigability of a water body.

4.6.4.4 Migratory Birds Convention Act

Environment Canada's Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Town of Falher AOI (Environment Canada 2014). Within Zone B5, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.6.4.5 Species at Risk Act

Woodland Caribou are listed as "Threatened" by SARA. They are the only SARA listed species identified within the 20 km search radius of the AOI. The AOI is near, but not within, the Caribou Range Key Range Layer. Occurrences of this species within the AOI are unlikely because it is within town limits. Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species (Woodland Caribou) listed under Schedule 1.

4.6.4.6 Alberta Environmental Protection and Enhancement Act

The proposed ditch design in the Town of Falher AOI is not considered a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* nor does it require an approval under the *Activities Designation Regulation.* The proposed flood mitigation may also include installing a stormwater retention pond. This activity would require authorization under EPEA to ensure works meet provincial standards for stormwater ponds. Should the final project design change, it will need to be reviewed to determine if the project is considered a designated activity.

4.6.4.7 Water Act

The proposed flood mitigation activities have the potential to alter the flow, level or location of water, and do not fall under the criteria for a *Water Act* COP Notification so *Water Act* approval is required.

4.6.4.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. While none were identified from the Alberta Merged Wetland Inventory, it is still possible that temporary wetlands could occur within the Town of Falher AOI.

4.6.4.9 Historical Resources Act

No lands with HRV values were discovered in the Town of Falher AOI. If work will be impacting undisturbed land or expanding existing infrastructure, it is recommended that a Statement of Justification for a *Historical Resources Act* Clearance be submitted to Alberta Culture.

4.6.5 Conclusion

Table 22 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 22: Summary Table of Elements within the Town of Falher Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	none	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land.
ESAs	none	-	-
Parks	none	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	none	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation.
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	none	-	-
Fisheries and Aquatic Resources	none	Water Act	Water Act Approval Application. Should aquatic habitat destruction occur, compensation will be required.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 16 (AESRD General Status), 1 (SARA) Fish - 0 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st.
Designated Activity	Stormwater Pond	EPEA	Submit project description for approval

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Peace River Basin Flood Mitigation Feasibility Study
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Appendix D
Town of Falher Area of Interest Environmental Overview

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Figure: 10

4.7 Village of Rycroft

Databases identified in Section 1 were searched to identify environmental factors within the Village of Rycroft AOI. The proposed flood mitigation involves diverting 3 m^3/s of flow from an unnamed creek south of Township Road 784 through a by-pass channel running west, then north into the Spirit River. Sustained flow of 1.4 m^3/s will continue to move through the unnamed creek.

Figure 11 shows the Village of Rycroft AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.7.1 Background

The Village of Rycroft is located within the Municipal District of Spirit River No. 133 and was originally situated for the Northern Alberta Railroad. Agriculture is now the main contributor to the area's economy (The Village of Rycroft 2015).

4.7.2 Wildlife and Species at Risk

Within the 20 km search radius of the Village of Rycroft AOI 2 birds and one mammal and several species at risk were listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 23). In total, there are three species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and one species listed with a SARA status of "Special Concern", "Threatened" or "Endangered".

Table 23: Listed Species within 20 km of the Rycroft Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Trumpeter Swan	*Cygnus buccinator*	At Risk	Threatened	Not At Risk	-	-
MAMMALS						
Woodland Caribou	*Rangifer tarandus caribou*	At Risk	Threatened	Threatened	Threatened	Schedule 1

Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015)

4.7.3 Fisheries

The unnamed stream running through the Village of Rycroft AOI is an unmapped Class D stream with no Restricted Activity Period (AESRD 2015b). The Spirit River is a mapped Class D stream, which also has no RAP (AESRD 2015b). No fish species were documented in the unnamed stream. Two non-sportfish species have been documented in the Spirit River (Table 24).

Table 24: Fish Species that have been documented in the Spirit River

Common Name	Scientific Name	Spawning Season	Provincial Status[1]	COSEWIC[2]	SARA[3]
Lake Chub	*Couesius plumbeus*	Spring	Secure	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Spring	Secure	Not Listed	Not Listed

Notes: 1 = AESRD 2011, 2 = COSEWIC 2015, 3 = Species at Risk Public Registry (Government of Canada 2015)

4.7.4 Applicable Legislation

4.7.4.1 Canadian Environmental Assessment Act

Under the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b) under CEAA, the following is listed as a designated activity:

"The construction, operation, decommissioning and abandonment of a new structure for the diversion of 10,000,000 m^3/year or more of water from a natural water body into another natural water body."

The yearly flow rate of the proposed diversion is not currently known. If the final design diverts 10,000,000 m^3/year or more, it is recommended that a project description is provided to CEAA to determine if a federal EA will be required.

4.7.4.2 Fisheries Act

Proposed flood mitigation of diverting the stream into the Spirit River could impact fish and fish habitat. Potential impacts include: passage issues, sedimentation, erosion, habitat loss, and habitat alteration. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. Depending on the final design, location, mitigation measures chosen, and the expected impact to fish and fish habitat, proposed projects may still require:

- Approvals or COP notifications under the Water Act
- A Request for Review from the minister of Fisheries and Oceans
- An Application for Authorization under the Fisheries Act

4.7.4.3 Navigation Protection Act

A notification will not be required by Transport Canada as neither impacted water body is included in the Schedule of the NPA. The amendment to the act still allows proponents of works in non-scheduled waters to opt-in and seek approval of their proposed works.

4.7.4.4 Migratory Birds Convention Act

Environment Canada's Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Village of Rycroft area (Environment Canada 2014). Within Zone B5, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 15th and August 31st, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.7.4.5 Species at Risk Act

Woodland Caribou are listed as "Threatened" by SARA. They are the only SARA listed species identified within the 20 km search radius of the AOI. Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated, endangered, or a threatened species listed under Schedule 1.

4.7.4.6 Alberta Environmental Protection and Enhancement Act

Under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* the following requires an Environmental Impact Assessment (EIA):

"a water diversion structure and canals with a capacity greater than 15 cubic metres per second"

The proposed diversion works for the Village of Rycroft AOI have an estimated peak discharge of 3.0 m_3/s, and are therefore, not likely to require an EIA.

4.7.4.7 Water Act

The proposed diversion flood mitigation will alter the flow, level or location of water, and does not fall under the criteria for a *Water Act* COP Notification; therefore, a *Water Act* approval is required.

The proposed culvert and ditch upsizing flood mitigation through the Village of Rycroft AOI may require multiple approvals under the *Water Act*. Any work on outfalls will require a COP Notification for Outfall Structures on Water Bodies under the *Water Act* (AESRD 2015b). If proposed works do not meet the criteria under the COP for Outfall Structures on Water Bodies, then a *Water Act* approval will be required. Any upsizing of the water body will require a Water Act approval, as work will alter the flow, level or location of water.

4.7.4.8 Alberta's Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. One area of open water was identified from the Alberta Merged Wetland Inventory within the Village of Rycroft AOI; however, it could not be identified on Google Earth Aerial imagery from 2013.

4.7.4.9 Historical Resources Act

No lands with HRV values were found in the Village of Rycroft AOI. If work will be impacting undisturbed land or expanding existing infrastructure, it is recommended that a Statement of Justification for a *Historical Resources Act* Clearance be submitted to Alberta Culture.

4.7.5 Conclusion

Table 25 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 25: Summary Table of Elements Identified within the Village of Rycroft Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
County/Municipal District	Municipal District of Spirit River No.133	Land Use Bylaw No. 77-07-	-
Natural Region/Subregion	Parkland - Peace River Parkland	-	-
Listing of Historical Resource	None	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land.
ESAs	None	-	-
Parks	None	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	Open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	None	Alberta Wildlife Act	-
Fisheries and Aquatic Resources	Spirit River - Class D, Rycroft Stream - Unmapped Class D	Fisheries Act, Water Act	No Restricted Activity Periods for unnamed creek or Spirit River. -DFO self-assessment to determine if request for review or approval will be required. Water Act Approval Application. COP notification for outfall structures. Should aquatic habitat destruction occur, compensation will be required
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 3 (AESRD General Status), 1 (SARA) Fish - 0 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B5	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 15th and August 31st.
Designated Activities	10 000 000 m^3/year or more diversion of water	Canadian Environmental Assessment Act	Submit a project description to the Canadian Environmental Assessment Agency to determine if an EA is required if the project diverts10 000 000 m^3/year or more.

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Peace River Basin Flood Mitigation Feasibility Study
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Appendix D
Village of Rycroft Area of Interest Environmental Overview

Figure: 11

AECOM

4.8 Hamlet of La Crete / Buffalo Head Prairie

Databases identified in Section 1 were searched to identify environmental factors within the Buffalo Head Prairie AOI. Flooding is a common occurrence in the Buffalo Head Prairie area during snowmelt, which has worsened since the opening of new agricultural lands in the area. To remedy the drainage issues in this area, and to reduce runoff to the northeast, a flood control channel running west from Highway 697 to Steephill Creek was proposed. This will result in diverting 51.5 m^3/s of flow to Steephill Creek. A retention pond is also recommended at the outlet of the channel, to minimize the impact of peak flows. Figure 12 shows the Buffalo Head Prairie AOI, proposed flood mitigation schemes, and environmental factors identified in the area.

4.8.1 Background

Buffalo Head Prairie is an unincorporated community within Mackenzie County.

4.8.2 Wildlife and Species at Risk

Within the 20 km search radius of the Buffalo Head Prairie AOI, several species at risk were identified from the provided FWMIS dataset including 36 birds, two mammals, one reptile and two amphibians listed by AESRD, Alberta Wildlife Act, COSEWIC, and/or SARA (Table 26). It should be noted that Bison are considered livestock unless within Alberta's Bison Management Area. The Buffalo Head Prairie AOI does not fall within this Management Area and as such, impacts to this sensitive species would not be of concern. In total, there are 41 species listed with an AESRD general status of "At Risk", "May be At Risk", or "Sensitive", and six species listed with a SARA status of "Special Concern", "Threatened" or "Endangered".

Table 26: Listed Species within 20 km of the Buffalo Head Prairie Area of Interest

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
BIRDS						
American Kestrel	*Falco sparverius*	Sensitive	-	-	-	-
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive	-	Not At Risk	-	-
Baltimore Oriole	*Icterus galbula*	Sensitive	-	-	-	-
Barn Swallow	*Hirundo rustica*	Sensitive	-	Threatened	-	-
Barred Owl	*Strix varia*	Sensitive	-	-	-	-
Bay-breasted Warbler	*Dendroica castanea*	Sensitive	-	-	-	-
Black Tern	*Chlidonias niger*	Sensitive	-	Not At Risk	-	-
Black-backed Woodpecker	*Picoides arcticus*	Sensitive	-	-	-	-
Blackburnian Warbler	*Dendroica fusca*	Sensitive	-	-	-	-
Black-throated Green Warbler	*Dendroica virens*	Sensitive	-	-	-	-
Broad-winged Hawk	*Buteo platypterus*	Sensitive	-	-	-	-
Canada Warbler	*Wilsonia canadensis*	Sensitive	-	Threatened	Threatened	Schedule 1
Cape May Warbler	*Dendroica tigrina*	Sensitive	-	-	-	-
Common	*Chordeiles minor*	Sensitive	-	Threatened	Threatened	Schedule 1

Common Name	Scientific Name	AESRD[1]	Alberta Wildlife Act[2]	COSEWIC[3]	SARA[4]	Schedule
Nighthawk						
Common Yellowthroat	*Geothlypis trichas*	Sensitive	-	-	-	-
Eastern Phoebe	*Sayornis phoebe*	Sensitive	-	-	-	-
Golden Eagle	*Aquila chrysaetos*	Sensitive	-	Not At Risk	-	-
Great Gray Owl	*Strix nebulosa*	Sensitive	-	Not At Risk	-	-
Green-winged Teal	*Anas crecca*	Sensitive	-	-	-	-
Horned Grebe	*Podiceps auritus*	Sensitive	-	Special Concern	-	-
Least Flycatcher	*Empidonax minimus*	Sensitive	-	-	-	-
Lesser Scaup	*Aythya affinis*	Sensitive	-	-	-	-
Northern Goshawk	*Accipiter gentilis*	Sensitive	-	Not At Risk	-	-
Northern Harrier	*Circus cyaneus*	Sensitive	-	Not At Risk	-	-
Northern Pintail	*Anas acuta*	Sensitive	-	-	-	-
Olive-sided Flycatcher	*Contopus cooperi*	May Be At Risk	-	Threatened	Threatened	Schedule 1
Peregrine Falcon	*Falco peregrinus*	At Risk	Threatened	Special Concern	Special Concern	Schedule 1
Pileated Woodpecker	*Dryocopus pileatus*	Sensitive	-	-	-	-
Red-necked Phalarope	*Phalaropus lobatus*	Secure	-	Special Concern	-	-
Sandhill Crane	*Grus canadensis*	Sensitive	-	-	-	-
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Sensitive	-	-	-	-
Sora	*Porzana carolina*	Sensitive	-	-	-	-
Western Grebe	*Aechmophorus occidentalis*	Sensitive	-	Special Concern	Special Concern	No Schedule
Western Tanager	*Piranga ludoviciana*	Sensitive	-	-	-	-
Western Wood-pewee	*Contopus sordidulus*	Sensitive	-	-	-	-
White-winged Scoter	*Melanitta fusca*	Sensitive	-	-	-	-
MAMMALS						
American Bison	*Bison bison bison*	Extirpated	Endangered*	Threatened	-	No Schedule
	Bison bison athabascae	At Risk	Endangered*	Special Concern	Threatened	Schedule 1
Wolverine	*Gulo gulo*	May Be At Risk	-	Special Concern	-	-
REPTILES						
Red-sided Garter Snake	*Thamnophis sirtalis*	Sensitive	-	-	-	-
AMPHIBIANS						
Boreal Toad	*Bufo boreas boreas*	Sensitive	-	Special Concern	-	-
Canadian Toad	*Anaxyrus hemiophrys*	May Be At Risk	-	Not At Risk	-	-

*Notes: 1 = Provincial General Status (AESRD 2011), 2 = Government of Alberta (2014e), 3 = COSEWIC (2015), 4 = Species at Risk Public Registry (Government of Canada 2015), * Range restriction on status-Bison are not protected if outside Alberta's Bison Management Area*

4.8.3 Fisheries

The Buffalo Head Prairie AOI includes Steephill Creek which is a Mapped Class C Water Body with a RAP of April 16th to July 15th (AESRD 2015b). There are no records of fish occurring within Steephill Creek. This, however, does not mean that fish cannot occur within Steephill Creek. An aquatic investigation should be conducted prior to construction, to ensure proper management techniques for the fish and fish habitat observed.

4.8.4 Applicable Legislation

4.8.4.1 Canadian Environmental Assessment Act

Diverting overland run-off does not require CEAA review or approval under the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2014b).

4.8.4.2 Fisheries Act

The proposed flood mitigation for the Buffalo Head Prairie AOI does not appear to directly impact fish or fish habitat. These conclusions are based on this desktop overview only, and are not a substitute for an on-site habitat assessment. If sufficient habitat information is available which suggests the impacted waterbodies are non-fish bearing, and is not connected to a fish bearing waterbody, then DFO approval will not be required. When a detailed project design becomes available, self-assessment should be performed to determine if a request for review will be required.

4.8.4.3 Navigation Protection Act

Review will not be required by Transport Canada as Steephill Creek is not included in the Schedule of the Act. The amendment to the act still allows proponents of works in non-scheduled waters to opt-in and seek approval of their proposed works.

4.8.4.4 Migratory Birds Convention Act

Environment Canada's Map of the nesting zones in Canada was reviewed to determine general migratory bird nesting windows in the Buffalo Head Prairie AOI (Environment Canada 2014). Within Zone B6, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in areas attractive to migratory birds are prohibited between April 30th and August 15th, without a survey first being performed by a qualified avian biologist. Migratory birds may be encountered at the project site; therefore, mitigation to avoid construction (e.g. tree clearing and/or potential nest habitat destruction) during migratory bird restricted timing windows will be required. It should be noted that any time nests containing eggs or young are discovered, the immediate area should be avoided until the young have naturally left the vicinity of the nest. Buffer zones and setback distances will vary with the species discovered.

4.8.4.5 Species at Risk Act

Six species, Canada Warbler, Common Nighthawk, Olive-sided Flycatcher, Peregrine Falcon, Western Grebe, and American Bison, listed as "Threatened" by SARA were identified within the 20 km search radius of the Buffalo Head Prairie AOI. Under the Act, no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species listed under Schedule 1.

Basic prohibitions of SARA do not apply to species listed as “Special Concern”. This includes the Peregrine Falcon and Western Grebe within the Buffalo Head Prairie AOI.

4.8.4.6 Alberta Environmental Protection and Enhancement Act

Under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* the following requires an EIA:

“a water diversion structure and canals with a capacity greater than 15 cubic metres per second”

The proposed diversion works for the Buffalo Head Prairie AOI have an estimated peak discharge of 51.5 m^3/s, and are therefore likely to require an EIA.

4.8.4.7 Water Act

Because the proposed works have the potential to alter the flow, level or location of water, and do not fall under the criteria for a *Water Act* COP Notification, a *Water Act* approval is required.

4.8.4.8 Alberta’s Wetland Policy

Wetland compensation will be required for any wetlands impacted by the final design of this project. Areas of fens, marshes, open water, and swamps were identified from the Alberta Merged Wetland Inventory.

4.8.4.9 Historical Resources Act

No lands with HRV values were discovered in the Buffalo Head Prairie AOI. If work will be impacting undisturbed land or expanding existing infrastructure, it is recommended that a Statement of Justification for a *Historical Resources Act* Clearance be submitted to Alberta Culture.

4.8.5 Conclusion

Table 27 summarizes the elements identified in each database, and applicable legislation. Required permitting and approvals are subject to change based on final project design.

Table 27: Summary Table of Elements Identified within Buffalo Head Prairie Area of Interest

Criteria/Dataset	Elements Identified	Applicable Legislation	Project Considerations
Natural Region/Subregion	Boreal Forest - Dry Mixedwood	-	-
Listing of Historical Resource	none	Historical Resources Act	Historic Resource Clearance must be obtained if impacting undisturbed land.
ESAs	14	-	-
Parks	none	Provincial Parks Act; Wilderness Areas Ecological Reserves, Natural Areas and Heritage Rangelands Act	-
Wetlands	fen, marsh, swamp, open water	Water Act, Alberta Wetland Policy	Impacts to wetlands will require compensation.
Land Ownership	-	Public Lands Act	Public Lands Disposition will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Wildlife Sensitivity Data Sets – Key Wildlife Layers	none	-	-
Fisheries and Aquatic Resources	Steephill Creek-Class C	Fisheries Act, Water Act	Restricted Activity Period April 16 to July 15. DFO self-assessment to determine if request for review or approval will be required. Water Act Approval Application. Should aquatic habitat destruction occur, compensation will be required.
Sensitive Species	Vegetation - 0 listed (ACIMS) Wildlife - 41 (AESRD General Status), 6 (SARA) Fish - 0 (AESRD General Status)	Alberta Wildlife Act	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.
Migratory Birds	Zone B6	Migratory Birds Convention Act	Habitat destruction in areas attractive to migratory birds restricted from April 30th and August 15th.
Designated Activities	Peak discharge of 40 $m^{3/}$second	Environmental Protection and Enhancement Act	Submit a project description to determine if an EIA will be required.

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Appendix D
Hamlet of La Crete / Buffalo Head Prairie Area of Interest
Environmental Overview

AECOM

Figure: 12

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