

## 6. Low Risk Communities

Municipalities and communities with minor flood issues related to infrastructure such as flooding of roads, ditches and culverts which impact mainly farmlands and few residents have been classified as low risk. Figure 6-0 shows low flood risk municipalities, towns and hamlets. The following sections provide summaries of stakeholder identified flood issues.

### 6.1 Birch Hills County

Birch Hills County is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of Birch Hills County on Figure 6-1-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A. The Hamlets of Wanham, Eaglesham and Tangent reported no flood issues.

Minor annual flooding is experienced throughout the county in low lying areas where infrastructure including bridge crossings, culverts, ditches, drainage projects, and rural roads are flooded due to spring snowmelt. Annual maintenance to flood affected infrastructure throughout the entire County was reported to cost approximately \$20,000 to \$30,000. Mostly farmlands were affected by minor flooding and no homes were reported to be affected. Additionally, power generation stations in Birch Hills County were reported not to be at risk of flooding. The County experienced major flooding due to spring snowmelt in April 2012 and was granted disaster relief. The 2012 event only affected roads and culverts throughout the county; no homes or residents were reported to be impacted.

Doreen Drainage Project (ditch) alleviates Highway 49 drainage and discharges into a creek connected to the Smoky River. Most roads crossing Doreen Drainage Project experience minor flooding annually due to snowmelt. Bouchard Drainage Project (ditch) is located north of the Hamlet of Tangent and discharges into Smoky River creating a large crevasse due to high flow velocities.

### 6.2 County of Grande Prairie No. 1

The County of Grande Prairie is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of the County of Grande Prairie No. 1 on Figure 6-2-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

The Town of Wembley reported not to be at risk of flooding since it is located at a high elevation. The Town of Beaverlodge reported some overland flow due to heavy spring snowmelt, but indicated that they are generally not impacted by flooding. The Village of Hythe reported no flood issues. Sections 6.2.1 and 6.2.2 below describe the flood risk and historical flooding issues for the City of Grande Prairie and the Hamlet of Clairmont, respectively.

The County experiences minor flooding of infrastructure such as township roads, culverts and ditches due to rainfall, snowmelt and a high water table in an area approximately 50 km wide located south of the City of Grande Prairie. Some township roads are upgraded periodically, for example, Highway 40 washed out several times due to spring runoff and heavy snow fall (where Smoky River joins the Wapiti River). Additionally, the Wapiti River Bridge was closed due to flooding caused by heavy rainfall in 1988, 1997 and 2011.

The area around Bear Lake is relatively flat and a Hutterite colony to the south and farmlands to the north of the Lake are impacted by flooding due to heavy rainfall and snowmelt. Township Road 720 crossing the Bear River floods annually due to spring snowmelt and residents are inconvenienced with a detour. Bear Creek golf course located northwest of City of Grande Prairie floods every spring (Hole 16). One resident erected a berm and was not affected by flooding from the Bear River.

A large ditch starting from south of Kleskun Lake travels south to Highway 43, then proceeds east along Highway 43 and continues south where it discharges into the Wapiti River. A large catchment area on the west and east side of the ditch contributes to significant erosion in the area due to rainfall and snowmelt runoff. The ditch fills, overflows its banks and was identified as a major waterway.

The County's power and water supply were reported not to be at risk of flooding. No flood mitigation projects are currently being undertaken in the County.

### 6.2.1 City of Grande Prairie

The City of Grande Prairie is classified as a low flood risk community since reported flood impacts to infrastructure and residents in the City are minor. Flood risk locations identified by stakeholders are presented on an overview map of the City of Grande Prairie on Figure 6-2-2. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

The City experiences minor flooding of infrastructure such as roads, culverts and ditches due to rainfall and snowmelt. The storm system is designed for a two or five year return period. A trailer camp located east of Highway 40 and directly north of College Park floods annually due to snowmelt (Figure 6-2-2 #118). Flooding encroaches onto a few camp stalls, but no damages are incurred. An undersized ditch located in the southeast part of the city (Figure 6-2-2 #116) caused flooding of the adjacent roads due to snowmelt runoff. No flooding has occurred after installation of stormwater ponds and ditch upgrades in 2007. Some erosion due to spring snowmelt runoff occurs at a creek in the northwest part of the city at 116 Street, but does not flood. High water levels are frequently observed in a ditch travelling into Canfor industrial site; however, no flooding has occurred.

The 2007 Flood Risk Mapping Study conducted by Northwest Hydraulics Consultants indicates that the City of Grande Prairie has experienced flooding in 1935, 1963, 1965 and 1990. It is believed that the Bear River was heavily eroded after the 1963 and 1965 flood. As a result, the City placed riprap and gabions at many bridge crossings upstream and downstream of Grand Prairie Dam to mitigate major erosion in 1965 to 1967. At the time of the 2007 study, the City had not developed an Emergency Preparedness Plan (EPP) or Emergency Response Plan (ERP).

### 6.2.2 Hamlet of Clairmont

The Hamlet of Clairmont is classified as a low flood risk community since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of the Hamlet of Clairmont on Figure 6-3-3. Each issue can be found by the corresponding map I.D. in Table A-1 in Appendix A.

The Hamlet of Clairmont is located in a large flat area where rainfall and snowmelt runoff gradually builds up and spreads out. Residential areas west and northwest of Clairmont Lake experience street and lawn flooding annually; however, homes and trailers are not affected. Undersized culverts cause overland flooding which results in standing water in the area, but traffic flow is not impeded. An area surrounding a fire hall located west of Clairmont floods annually; however, the roads remain drivable and the fire hall is not impacted. There is some insignificant localized flooding in commercial and industrial areas of Clairmont located southwest of Clairmont Lake. Stormwater ponds fill

and drain into Clairmont Lake and when the lake fills, it drains south through a ditch and across Highway 43X. Agricultural lands south of Highway 43X experiences flooding of between 0.60 to 0.90 m (2 to 3 ft.) of standing water which remains for weeks. Farmers may not be able to farm the land until July.

### **6.3 M.D. of Greenview No.16**

The M.D. of Greenview is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of the M.D. of Greenview No. 16 on Figure 6-3-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A. The Town of Valleyview reported no flood risk. Additionally, the Town of Fox Creek reported not to be at flood risk since it is located at a high elevation.

Minor flooding of roads, culverts and bridge crossings is experienced throughout the M.D. Additionally, some flooding due to beaver dams occur. Large flood events were caused by rainfall in 1997, 1988 and June/July 2011; however, some localized flooding was caused by snowmelt. River flooding due to ice jams have not been an issue in the M.D. Flooding has historically not affected residents and has resulted in little to no repairs. Traffic has been detoured and short road closures were necessary in a few cases. O'Brien Provincial Park floods annually due to overtopping of the Smoky River banks caused by spring snowmelt; however, no people have been at risk. The flood water has typically drained in one to two weeks.

The M.D. currently has no flood mitigation studies, strategies or projects planned and no emergency evacuation or flood preparedness plan is in place. Power stations and water treatment plants were reported not to be at risk of flooding in the M.D.

#### **6.3.1 Town of Grande Cache**

The Town of Grande Cache appears to have no risk of flooding since it is located approximately 150 m (500 ft.) above the Smoky and Muskeg River.

The AT bridge that crosses the Smoky River is at risk of flooding and is primarily used by oil and gas industry. A bridge washout would have minimal impact to Grande Cache and was washed out once in the 1970s. Additionally, the Muskeg and Smoky River flooded Highway 40 in the 1980s due to late May rain and snowmelt; however, no flooding has occurred since. Some river bank erosion was reported below the Grande Cache Coal plant located on the south side of the Smoky River approximately 12 km north of the Town of Grande Cache.

### **6.4 Saddle Hills County No.20**

Saddle Hills County is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of Saddle Hills County No. 20 on Figure 6-4-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A. Flood issues in the Hamlet of Woking can be found in Section 6.4.1.

There was various minor flooding resulting from the June/July 2011 rainfall event throughout the County. Notably, a bridge pipe was washed out at Economy Creek which resulted in a road closure lasting for three years increasing commuting time and significantly inconveniencing agricultural traffic. Furthermore, Josephine crossing was washed out and repairs were abandoned resulting in an additional 48 km (30 miles) detour for four residents.

Erosion on steep road side slopes was observed during the June/July 2011 rainfall event at Doe Creek crossing, Township Road 134 crossing the Poucecoupe River and along Highway 719 crossing Henderson Creek; however, there was no impact to traffic flow.

Bonanza is a locality that experienced flooding due to rainfall in 2011 and spring snowmelt in 2003. A ditch along Highway 719 overflowed and caused overland flooding from the southeast. The basement of the Bonanza store flooded; however, no other residents were affected by the flood.

#### 6.4.1 Hamlet of Woking

The Hamlet of Woking is classified as a low flood risk community since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of the Hamlet of Woking on Figure 6-4-2. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

Flooding occurred in 2009 and 2011 due to rainfall and snowmelt. The community hall, located south/southwest of the railway, was flooding with approximately 0.15 m (6 inches) of standing water in 2009 due to undersized culverts along the railway tracks; however, no other property was damaged. The culverts crossing the railway tracks were upgraded and runoff from the 2011 flood event was able to reach the lift station downstream of the culverts much faster. The lift station flooded and was overwhelmed. As a result, residents were unable to use the sewer and flush toilets for six hours. No basements flooded since most homes were equipped with sewer back up valves.

### 6.5 County of Northern Lights No. 22

The County of Northern Lights is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Flood risk locations identified by stakeholders are presented on an overview map of the County of Northern Lights No. 22 on Figure 6-5-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

The communities situated along the banks of the Peace River are small and mostly include cabins, recreation areas and farmlands. The County experiences minor flooding of infrastructure such as roads, culverts and ditches due to rainfall and snowmelt. Additionally, farmlands are impacted by flooding. The most recent flood event impacted a few residents of Carcajou in 2006. Carcajou is a rural community with a total population of 20 (2001 census). The locality of Hotchkiss reported some landslides and moving hills that resulted in Highway issues. The road leading into Notikewin Provincial Park was washed out and rebuilt two years ago. It was reported that banks of the new road are not stable and have a potential to fail.

Sunny Valley is located within an oxbow of the Peace River banks between the Hamlet of North Star and the Hamlet of Deadwood. Major flooding was reported due to a combination of rainfall and river ice jamming in 1996/1997. Two properties were destroyed as a result of the Peace River overtopping the banks at the oxbow. The residents have since moved to a safer location. Whitemud Flats is located along the banks of the Peace River just north of where the Whitemud River meets the Peace River. The camp grounds consist mostly of recreational cabins. The cabins were reported to be flooded during the 2006 and 2008 flood events. Flood issues in the Hamlets of Dixonville, Deadwood and the Town of Grimshaw are found in Sections 6.5.1 through 6.5.3, respectively.

### 6.5.1 Hamlet of Dixonville

The Hamlet of Dixonville is classified as a low flood risk community since reported flood issues are minor. It was reported that the Hamlet of Dixonville's water source is an old water well and has the potential to be impacted by drought. The river intake for water supply could be an issue if the water levels are too low or high. The water supply has not been interrupted due to intake flooding since the water reservoir has been built.

### 6.5.2 Hamlet of Deadwood

The Hamlet of Deadwood is classified as a low flood risk community since reported flood impacts to residents and infrastructure are minor. Some rural residents east of the Hamlet of Deadwood reported ice-jams in the Peace River located at an oxbow. This resulted in moving residents to higher grounds. Road flooding and damages were also reported due to flooding caused by beaver dams.

### 6.5.3 Town of Grimshaw

The Town of Grimshaw reported no flood issues. Grimshaw and the locality of Warrentown withdraw water from a large aquifer located where the municipal boundaries of M.D. 21, 22, 135 and 136 meet. The aquifer was reported not be at risk of flooding and no drought issues have been reported.

## 6.6 M.D. of Mackenzie No. 23

The M.D. of Mackenzie is classified as a low flood risk municipality since there are few reported flood impacts to residents. Impacts to farm land, roads, culverts and bridge crossings are more severe. Flood risk locations identified by stakeholders are presented on an overview map of the M.D. of Mackenzie No. 23 on Figure 6-6-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

The 1934 ice-jam flood produced the highest flood levels in the history of Fort Vermilion resulting in flooding of homes and commercial establishments where the airport is now located on the south side of the Peace River. The flood risk has been mitigated with the construction of Bennett Dam on Peace River in northern British Columbia.

Flooding was reported north of the Hamlet of Fort Vermilion in June 2011, due to a major rainfall event which resulted in evacuation of residents just north of the Peace River and sand bags were used to protect homes. Flooding was also reported in Beaver Ranch area due to overtopping of Beaver Ranch Creek. The Beaver Ranch area is located northeast of Fort Vermilion and north of the Peace River and consists mostly of farm land. It takes approximately two to three days for flood water to recede.

Farm land approximately 3 km west of Fort Vermilion floods occasionally floods. Mackenzie County has submitted a grant application to build a storm water channel to mitigate overland flooding.

The river intake at the water treatment plant located south of the Peace River was damaged due to flooding twice in the last twenty years due to heavy rainfall. Service was not interrupted but the ability to recharge the reservoir was affected. The sewage lagoon has not been affected by floods as it is protected by dikes.

ATCO transmission lines and power generating station located approximately 10 km west of Fort Vermilion were reported to be affected by flooding caused by ice-jams in the past.

The area of Blue Hills is relatively flat and experiences annual flooding due to spring snowmelt and rainfall events. The culverts are removed and replaced annually.

Alberta Transportation (AT) maintains a winter road (Highway 697) crossing the Peace River and also operates a ferry during spring/summer as part of Alberta's Highway network over the Peace River. The crossing was reported to be affected by changing water levels in the Peace River.

A causeway located approximately 7 km west of Fort Vermilion and south of the Peace River was reported to be flooded and was inundated by one to two meters of water.

## **6.7 M.D. of Smoky River No. 130**

The M.D. of Smoky River is classified as a low flood risk municipality since reported flood impacts to residents are minor; however, some impacts to roads, bridge crossings and farmlands are more severe. Flood risk locations identified by stakeholders are presented on an overview map of the M.D. of Smoky River on Figure 6-7-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A. Photos of flooding in the M.D. are shown on Figure 6-7-2. There was no flooding reported in the Town of McLennan and the Hamlet of Jean Cote. Flood issues for other communities within the M.D. were already discussed in the previous sections.

The M.D. experiences minor annual flooding of infrastructure such as roads, culverts and ditches due to rainfall and snowmelt. Additionally, an area consisting of farmland located downstream of Peavine Creek floods annually due to snowmelt and undersized culverts. Doran and Slims Creek Bridge crossings located on Peavine Creek flooded in April 2007, June 2011 and April 2013 and contributed to flooding farmlands located downstream of Peavine Creek.

The bridge deck came down at both Doran and Slims Creek bridge crossings and bridge piers at Doran bridge crossing were damaged resulting in \$65,000 in repairs. The flooded farmlands east drains into a creek and was designated a flood hazard area. Building restrictions are in place within the flood hazard area.

The Hamlet of Guy is downstream of Chaibos Drainage Project (ditch) which contributed to flood damage of Wolf Honey store on June 24, 2011 due to spring snowmelt. Additionally, a lift station was damaged and streets experienced minor manholes flooding. Power or water treatment plants were reported not to be at risk of flooding in the M.D.

An intake was installed on the Smoky River in 2006 to supply the Town of Falher, the Villages of Donnelly and Girouville, and the Hamlet of Guy and Jean Cote with potable water. The area around the intake is flooded annually due to rainfall and snowmelt causing siltation and damage due to log jams. The intake is also affected if the City of Grande Cache experiences a heavy rainfall. The water supply has not been interrupted due to intake flooding since the water reservoir has an 18 month capacity.

A drainage canal runs east starting at the Town of McLennan past the Village of Donnelly, the Town of Falher and the Village of Girouville where the canal discharges into Hunting Creek. Additionally, the canal discharges into Winagami, Kimiwan and Rat Lake. The canal receives drainage flows from the Donnelly, Falher, Girouville and Desilets Drainage Project (ditch).

An ACRP grant application was submitted by the M.D. of Smoky River No. 130 to AESRD for funding of a project that focuses on rehabilitation and upgrades to stormwater conveyance channels within the M.D. The overall aim of the project is to create a long term solution to manage the issues in the drainage network.

## 6.8 Northern Sunrise County No.131

Northern Sunrise County is classified as a low flood risk municipality since reported flood impacts to infrastructure and residents are minor. Northern Sunrise County experienced large flood events due to rainfall and snowmelt in 1997, 2011, 2013 and 2014. Localized flooding occurred during the 2013 event where several bridge culverts failed. Spring runoff often causes varying amounts of minor flooding throughout the County impacting mostly infrastructure such as roads, culverts and bridge crossings. Occasionally, heavy rainfall alone can cause flooding. Flood affected communities include the Hamlets of Marie Reine and St. Isidore where 14 homes were reported to be in danger of flooding during historical flood events.

An ACRP grant application was submitted by Northern Sunrise County in 2014 for funding of a project that focuses on repairing and upgrading the existing drainage ditch network and infrastructure in the Marie Reine area. The overall aim of the project is to create a long term solution to manage the issues in the drainage network.

Some flood mitigation projects are underway and the 2014 Northern Sunrise County Hydrologic Drainage Study conducted by MPA Engineering identified \$5 million in recommended works for 2015. The county has both emergency management plans and evacuation plans in place.

Issues that were identified from the Northern Sunrise County Hydrologic Drainage Study Report are (MPA Engineering Ltd., 2012):

- NE 28-84-20-W5M: A frozen culvert is causing flows over TWP Road 845
- Address: 84270 HWY 688: Frozen approach culvert is causing water to flow over home owner's driveway. AT owned ditch.
- RR 202 was overtopped at the intersection of TWP Road 850 due to damaged culvert and at the intersection of TWP Road 844 was predominantly caused by ice blockage.
- NW 31-83-20-W5M: After RR210 was widened and paved in 1997-1998; all water was diverted through the east ditch. This water flowing at high volume and speed is causing ditch erosion north of the home owners approach. Undersize centreline culverts crossing RR210 cause annual flooding. Water typically overtops the 5 feet fence and floods farm buildings.
- TWP Road 840 just east of RR 205, RR 205, some distance south of TWP 842, TWP 842 between RR 210 and RR 205, intersection of TWP 840 and RR 204 were overtopped due to inadequately sized culverts.
- TWP Road 832, RR 20: Flow overtops the road annually. Ditch does not drain properly.
- Frozen culvert is causing home owners yard to flood and water to flow over RR 205, south of HWY 688.
- Frozen and/or undersized culverts are causing flow over and erosion through RR 204, south of North Harmon Valley Road annually. The south ditch along North Harmon Valley Road is over capacity and floods every year. The home owner's driveway was washed out in 2014.
- TWP Road 832.5, RR 204: Flow overtops the road annually. Ditch does not drain properly and there are large flows in the ditch.
- BF83343 RR 210: Frozen or debris filled culvert is causing flooding to start on home owner's property.
- RR 210 was overtopped at 5 culverts, north of HWY 2 and south of HWY 688 due to either inadequately sized culverts or iced culverts.
- BF85255 EE 200: Driveway culvert is frozen and needs to be steamed. Water flows over and erodes home owner's driveway, and backs up into field.
- TWP Road 814, East of RR 223: Ditches are overcapacity and do not adequately convey flows. Flow directed into fields.
- Intersection of RR 224 and TWP Road 812: Flow overtops the road due to inadequately sized culvert.
- Landowner at TWP Road 821.5 and a mile east of Peace River: A large washout (15' x 20' deep) cuts across the field and divides the property in two.

- Roadway overtopping is an issue at the intersection of CN Railway and TWP Road 820, TWP Road 820 and RR 215, RR 215 and HWY 683.
- There are additional areas where the road ditches are not designed to convey much or any flow.
- Water management infrastructures are overwhelmed by changes in land use over the years.

Several drainage projects have been completed in past years to convey water into the natural watercourses. Many issues arise at locations where the drainage projects and the natural water courses connect. Most of these drainage projects are at capacity or slightly overcapacity. The natural watercourses downstream are generally too small to accommodate the flows from the drainage projects and cause flooding on the upstream side.

## 6.9 M.D. of Spirit River No. 133

The M.D. of Spirit River is classified as a low flood risk municipality since there are few reported flood impacts to residents. Impacts to roads, culverts and bridge crossings are more severe. Flood risk locations identified by stakeholders are presented on an overview map of the M.D. of Smoky River on Figure 6-9-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A. Photos of flooding in the M.D. are shown on Figure 6-9-2. There was no flooding reported in the Town of Spirit River since it is located at a high elevation. Flood issues in the Village of Rycroft have been discussed earlier.

Generally the roads in the rural areas of the M.D. are in service unless a large rainfall or snowmelt occurs. There is minor annual flooding throughout the M.D. involving roads and culverts and traffic may be detoured. The M.D. approximately spends \$35,000 to \$50,000 annually on upgrading existing culverts to maintain drainage infrastructure. Early snow melt can cause ice jams in canals which is the primary cause of flooding in spring.

The M.D. experiences annual flooding of a large area of farmland east of the Village of Rycroft and localized flooding of farmlands in the northeast of the M.D. due to rainfall and snowmelt runoff. Farmers are impacted but no homes or residents are flooded in the area. Large dirt hills were installed in the vicinity of a home for construction purposes. These dirt hills changed the normal flow paths and caused the home and garage to flood during spring snowmelt. When the dirt hills were removed, the home was no longer at risk of flooding (i.e. a one-time event). Any elevation changes in the large flat area northeast of the M.D. can easily change flow paths and cause flooding in areas normally safe. A rail transloading facility was recently built along the railway north of Prestville and was reported to potentially be at future flood risk since it is located in a low lying area (Figure 6-9-1, #63).

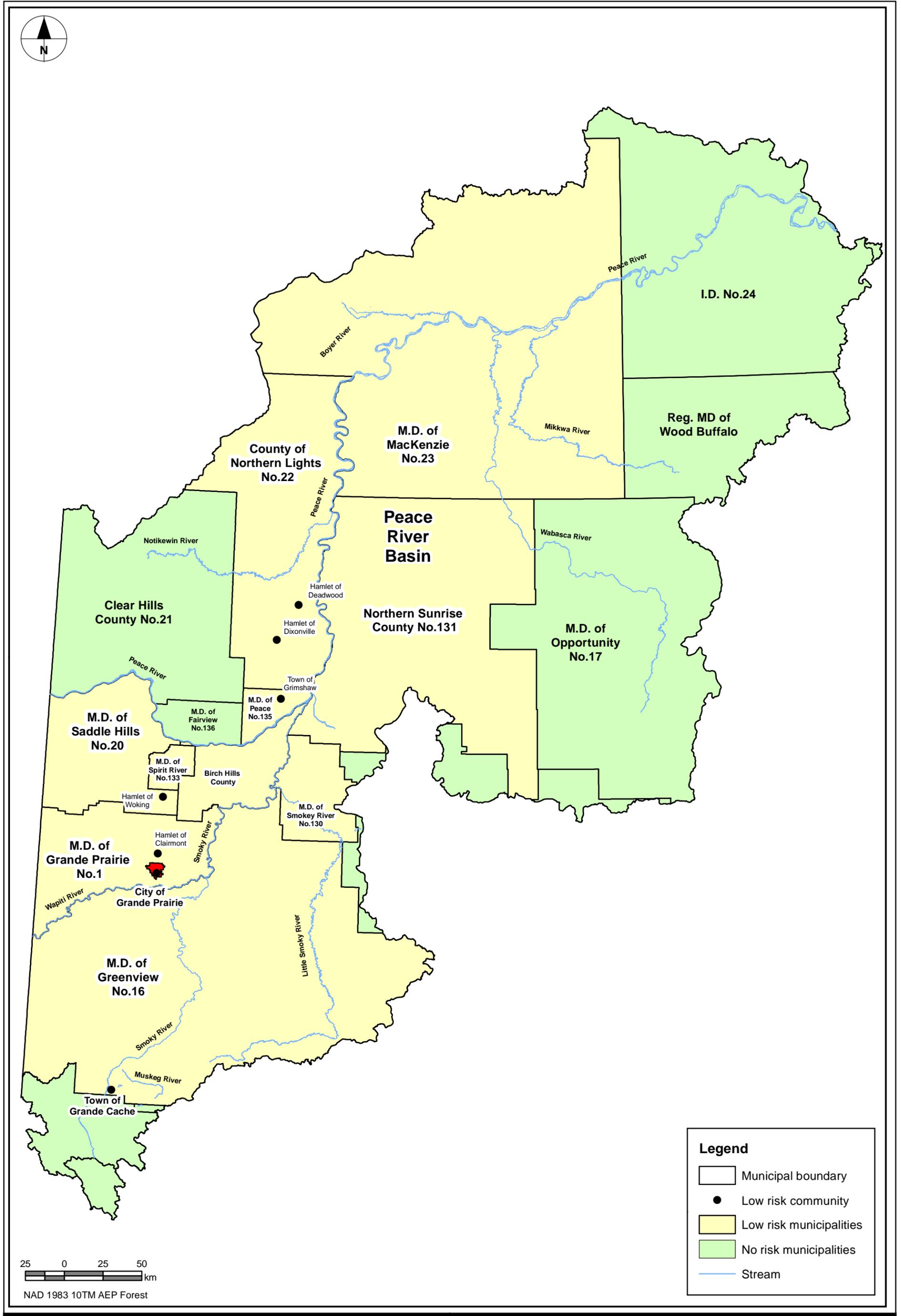
A low level crossing over the Saddle (Burnt) River on Highway 45 consists of a cement structure with pipes. Flooding and major damage was incurred to the structure during the March 2014 snowmelt. Large blocks of ice jammed the crossing blocking the pipes. Eventually, the ice blocks were pushed up and over the road/bridge deck by the river approach flow. The large ice blocks damaged the downstream end of the cemented pipes as the ice blocks landed. Highway 45 was out of service for seven days and traffic was detoured. The valley upstream of the low level crossing flooded approximately six to nine metres (20 to 30 ft.) above the road deck on the low level crossing and approximately 12 m (40 ft.) above the river bed.

Erosion occurs due to fast flowing snowmelt runoff (approximately 1 – 1.2 m deep) annually on a steep section of land with an elevation drop of approximately 24 m (80 ft.) and is located approximately 4 km west of the Town of Spirit River. Water flows towards Bailey Creek which floods its banks and eventually drains into Dunvegan Creek which discharges into the Peace River. Additionally, the Spirit River Valley (Figure 6-9-1, #55) north of the Town of Spirit River floods annually due to spring snowmelt or heavy rain. Road ditches and culverts in the valley fill with water and flood farmlands up to approximately 31 m (100 ft.) on each side.

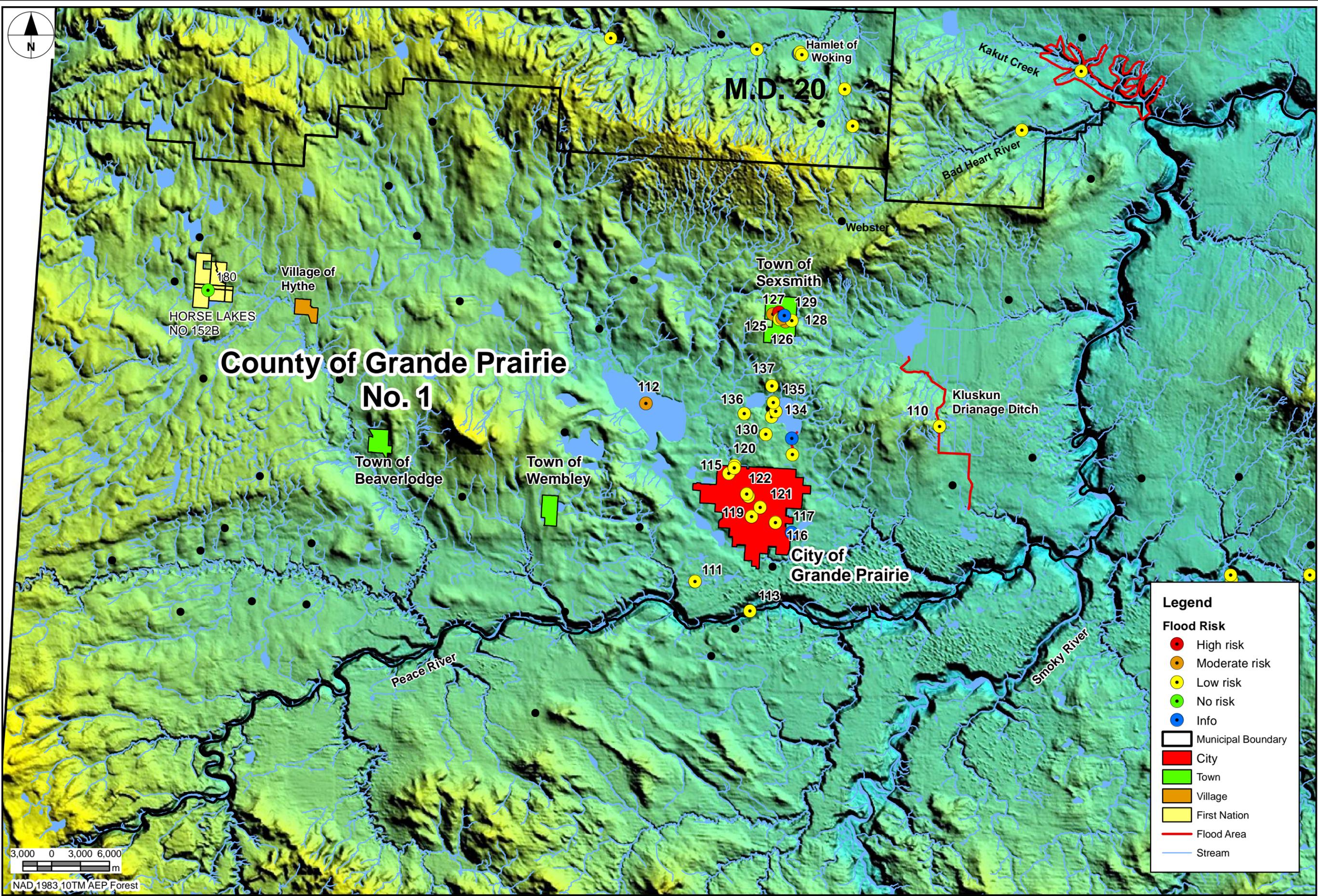
## **6.10 M.D. of Peace No. 135**

The M.D. of Peace No. 135 is classified as a low flood risk community due to reported flood issues and impacts to structures and few residents. Flood risk locations identified by stakeholders are presented on an overview map of the M.D. of Peace No. 135 on Figure 6-10-1. Each issue can be found by the corresponding map ID in Table A-1 in Appendix A.

Historically, the M.D. experiences flooding from spring snowmelt. Parts of the M.D. were flooded during April/May of 2007 and 2013 flood events. Basement flooding was reported by 5 to 10 homeowners throughout the M.D. Flooding is experienced in low lying areas and has resulted in water overtopping roads, culverts, eroded land on private properties and has resulted in a road closure for up to two weeks inconveniencing residents. The drainage issues within the M.D. were addressed by constructing drainage ditches in 1970's but no new construction has taken place in recent years. The water treatment plant located in Hamlet of Brownvale is at a high elevation and has no risk of flooding.

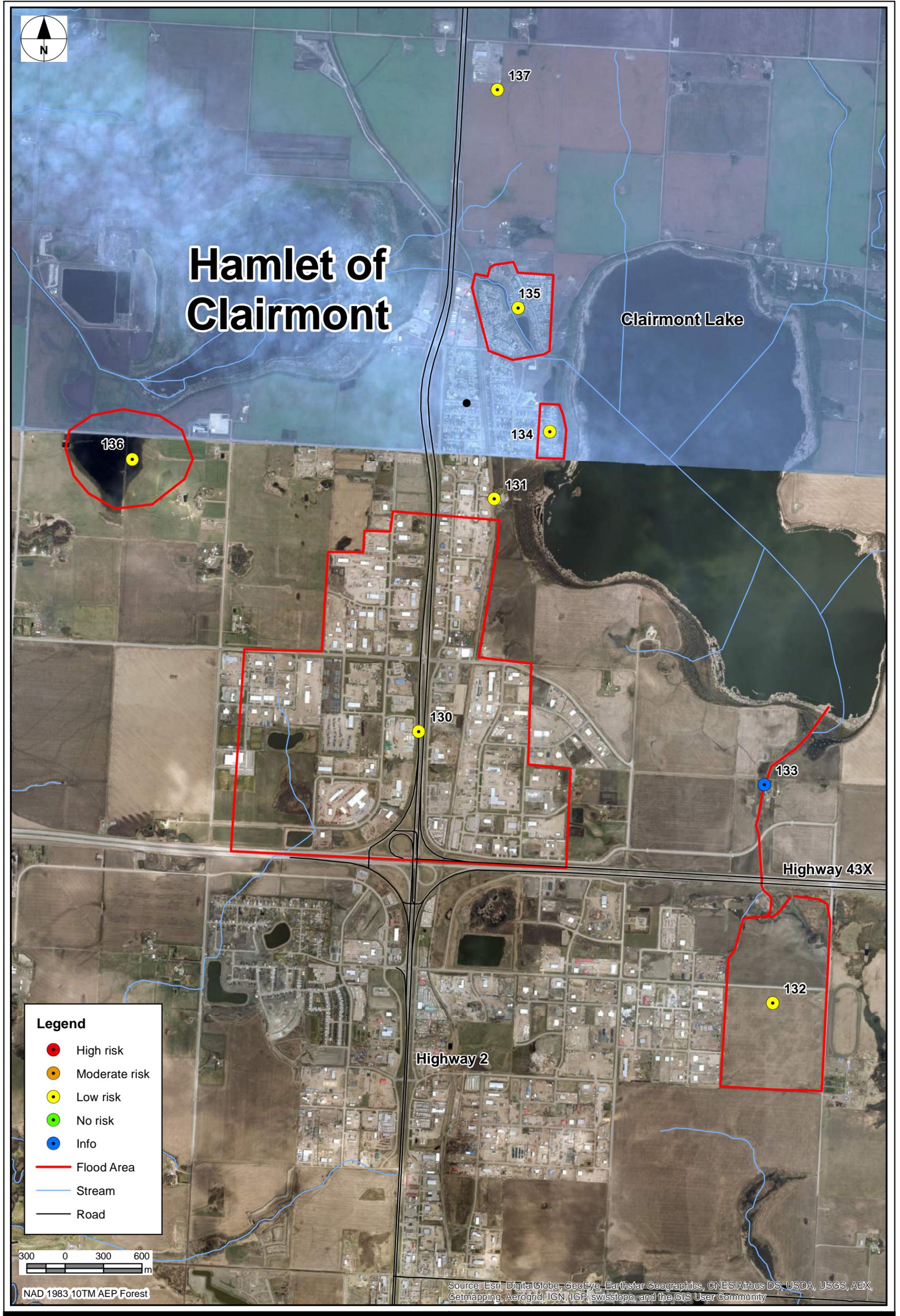


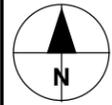




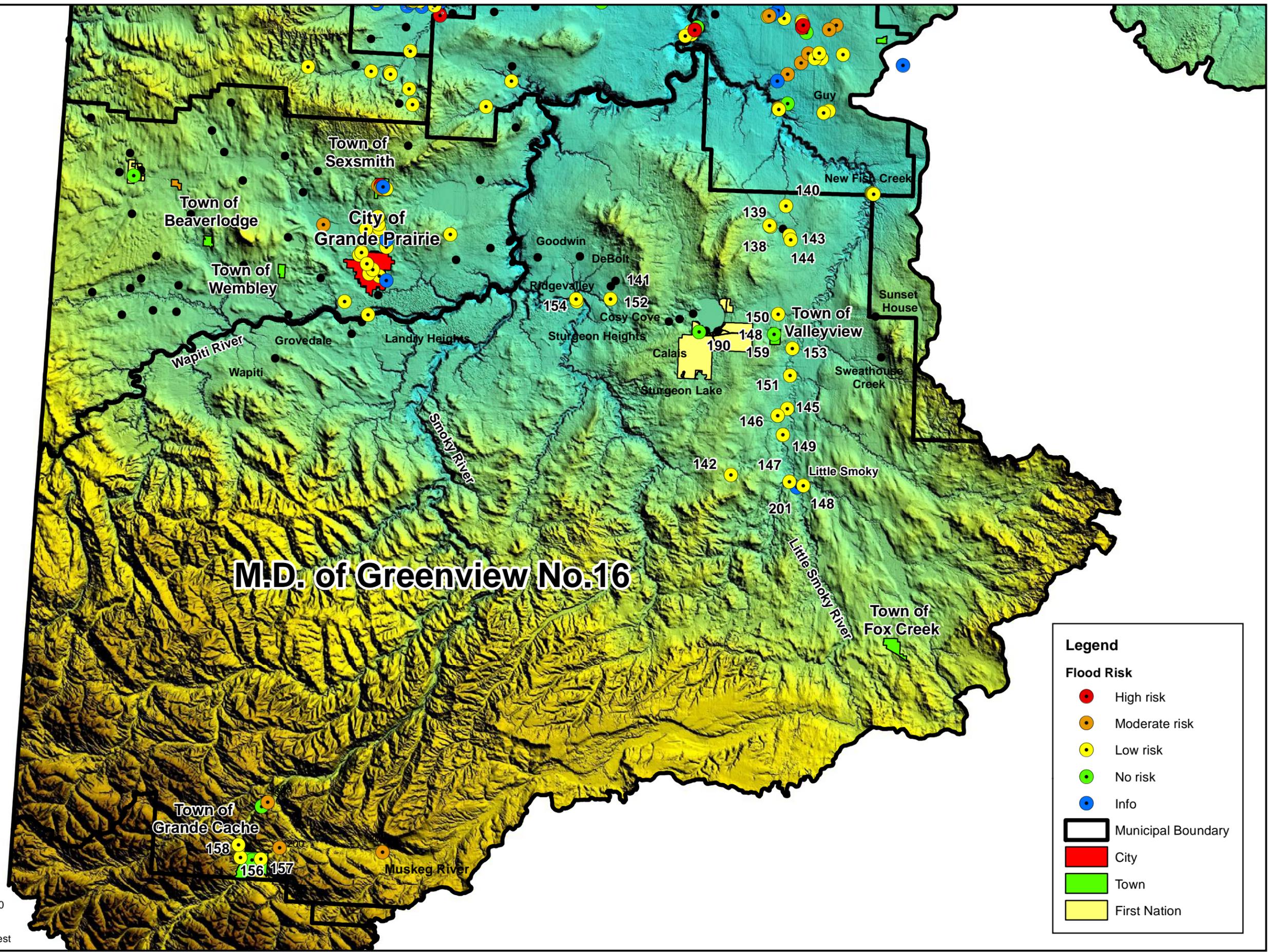
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# M.D. of Greenview No.16

**Legend**

**Flood Risk**

- High risk
- Moderate risk
- Low risk
- No risk
- Info

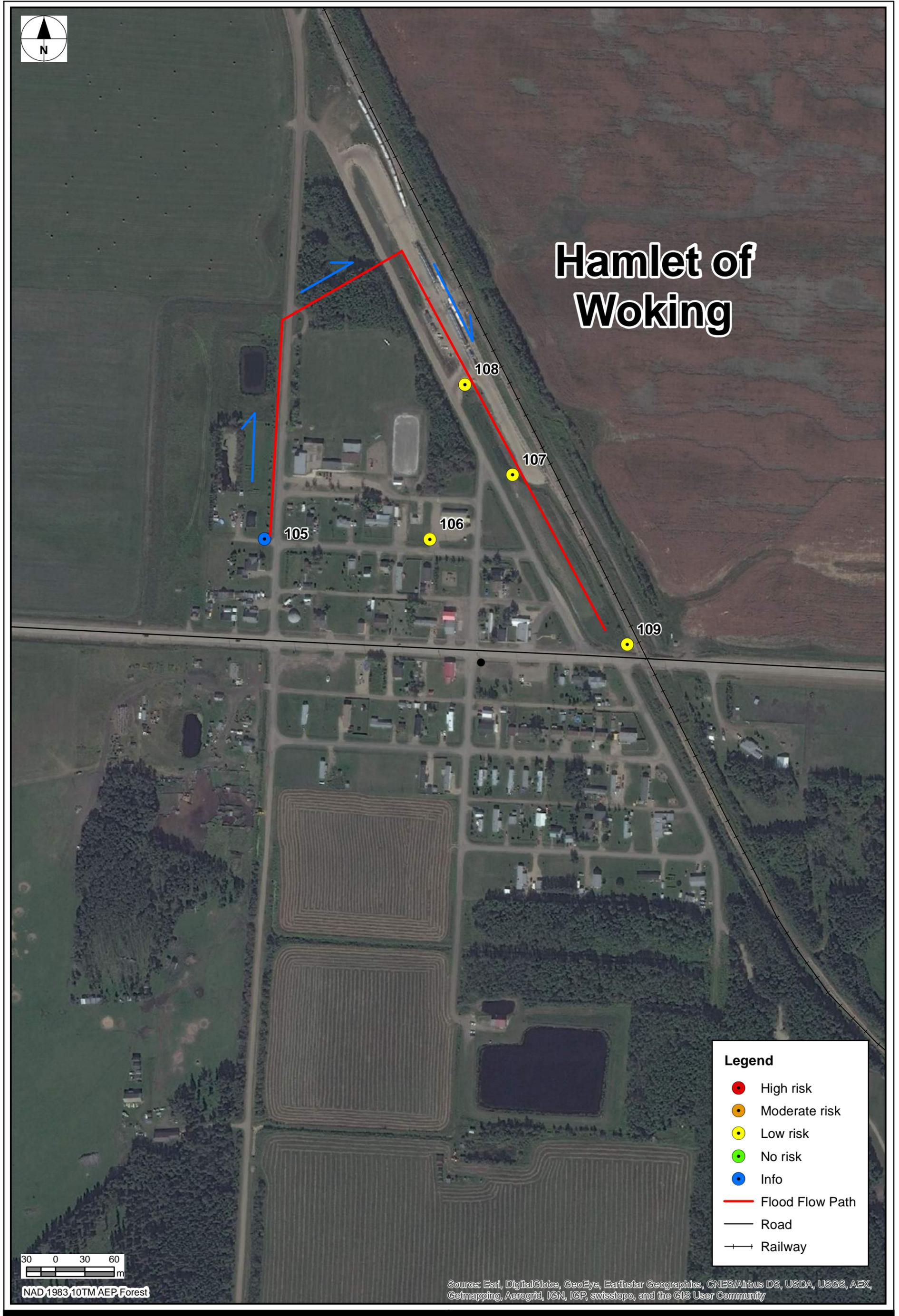
Municipal Boundary

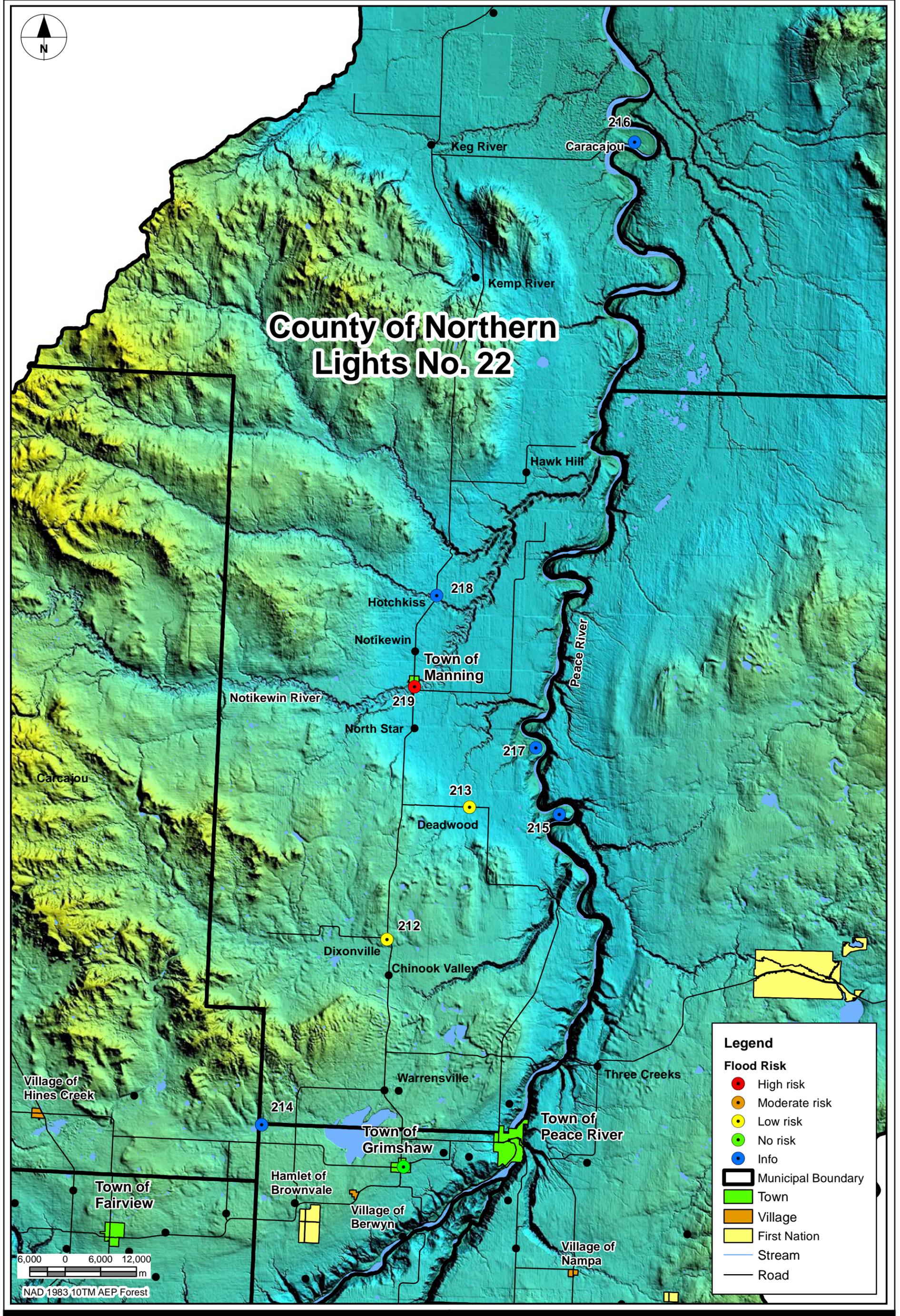
City

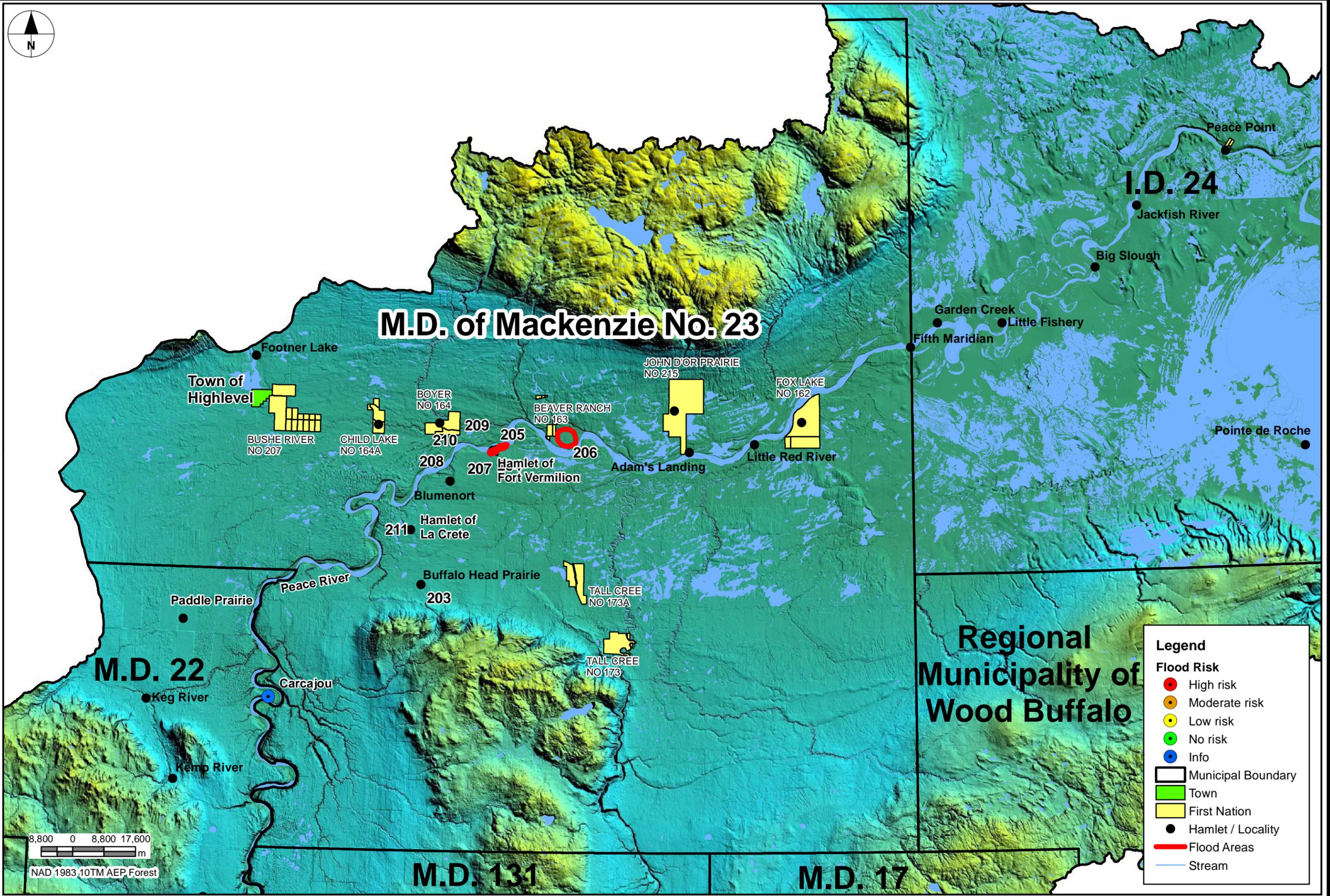
Town

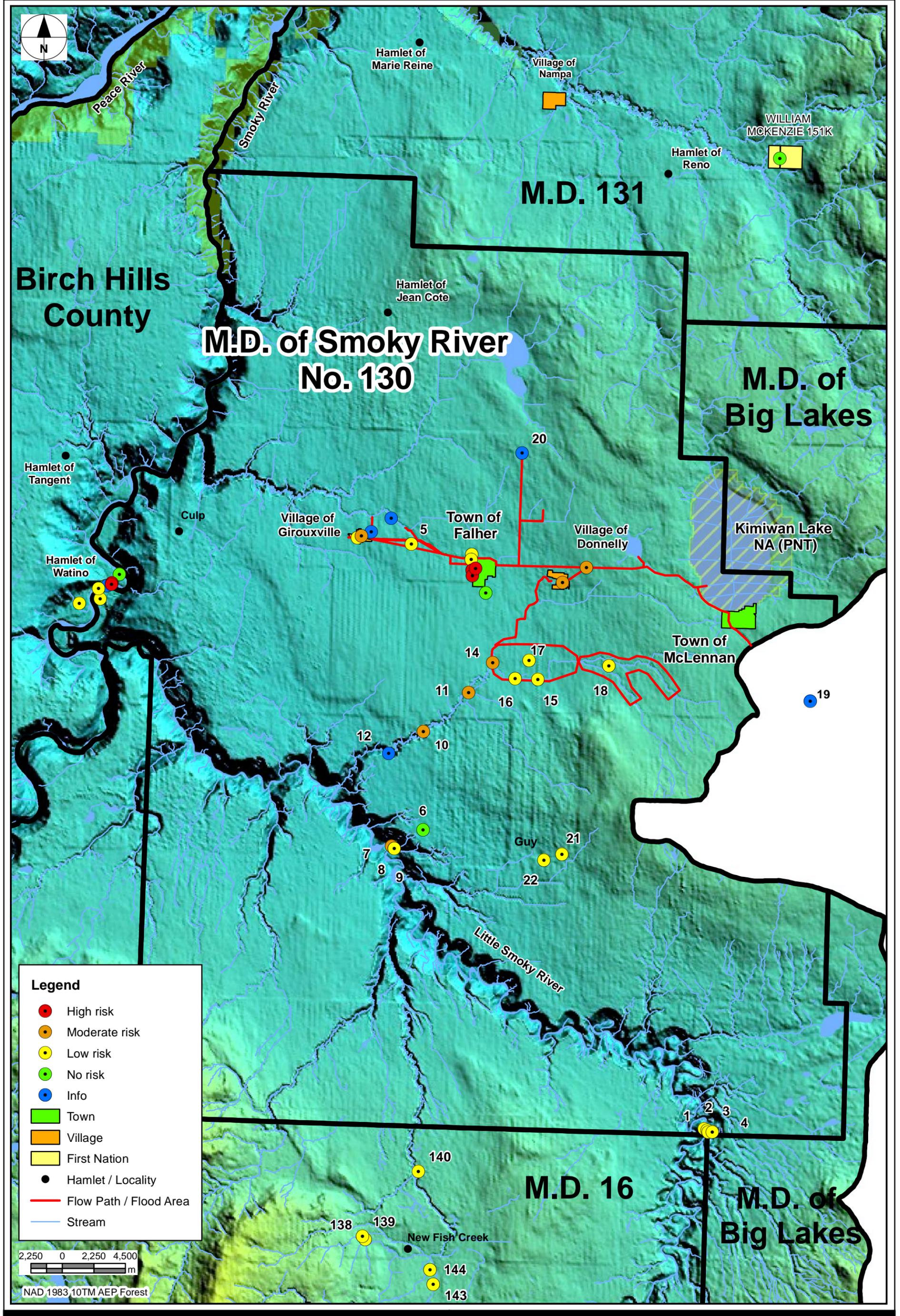
First Nation













Springmelt flooding in the M.D. of Smoky River No. 130, in April 2013



Springmelt flooding in the M.D. of Smoky River No. 130, in April 2013

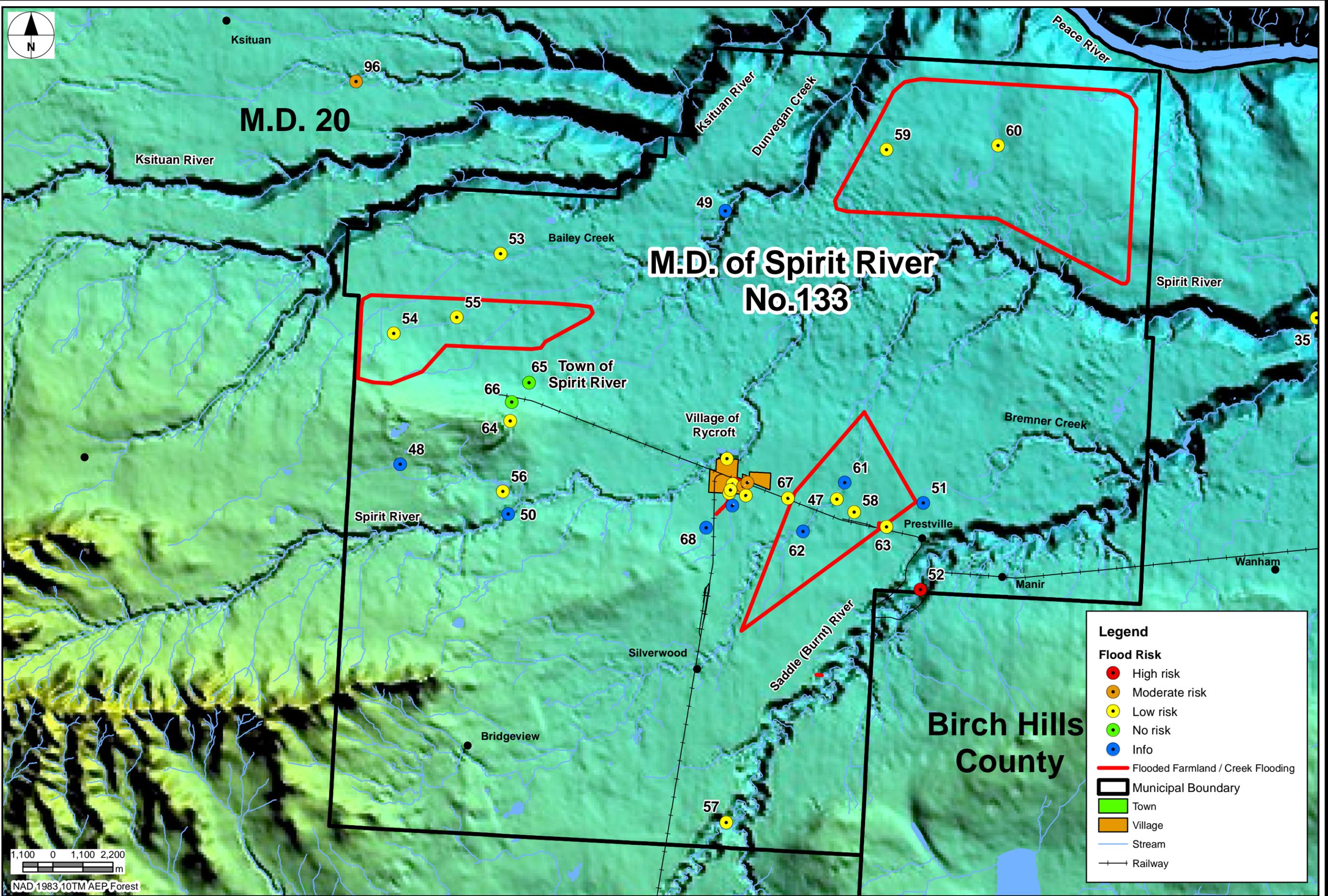


Springmelt flooding in the M.D. of Smoky River No. 130, in April 2013



Springmelt flooding in the M.D. of Smoky River No. 130, in April 2013

Image Source: M.D. of Smoky River No. 130





Springmelt flooding in the M.D. of Spirit River No. 133, in April 2013

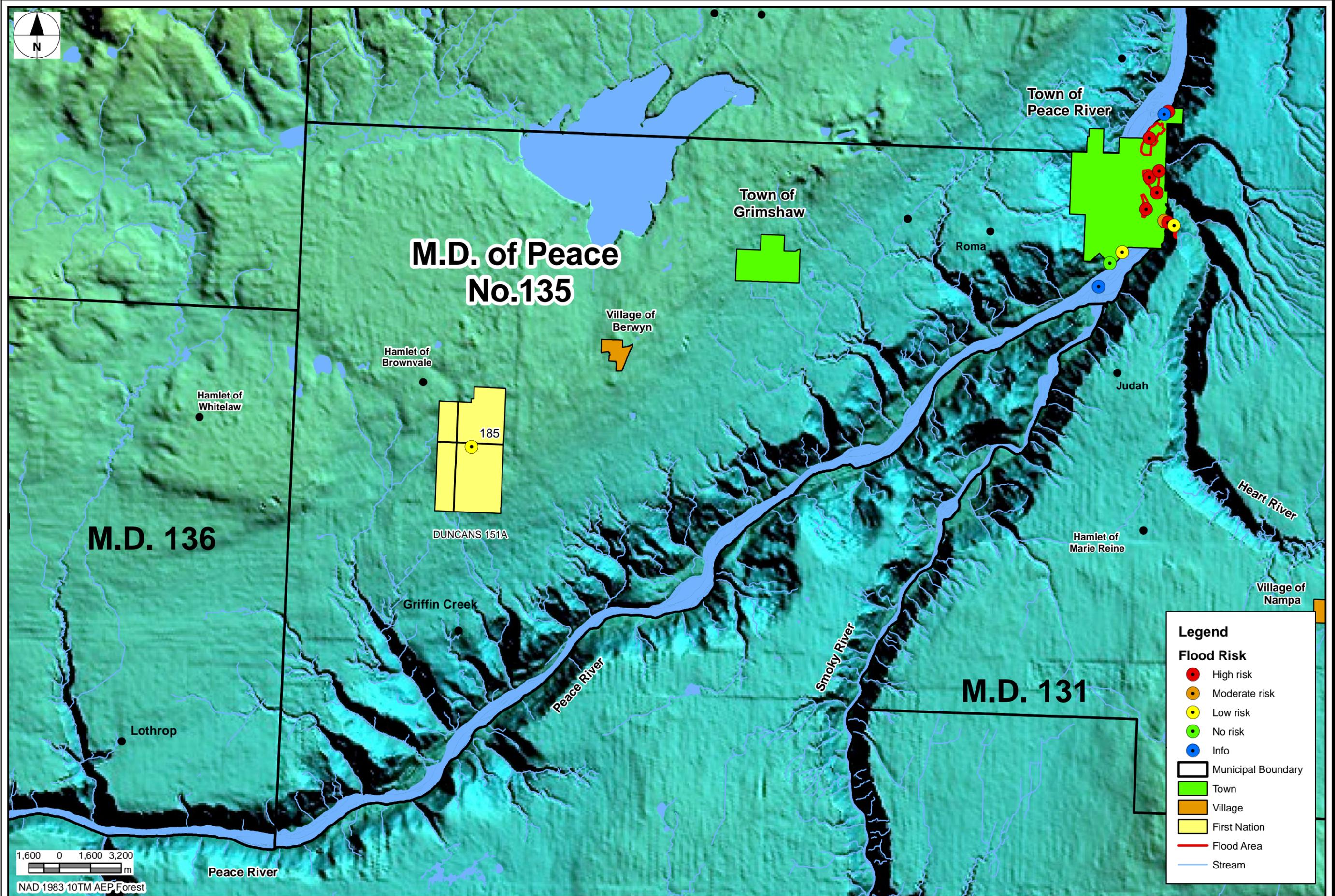


Springmelt flooding in the M.D. of Spirit River No. 133, in April 2013



Springmelt flooding in the M.D. of Spirit River No. 133, in April 2013

Image Source: M.D. of Spirit River No. 133



## 7. Campgrounds at Risk

Locations of provincial government owned campgrounds within the Peace River Basin were obtained from Parks Capital Planning and Infrastructure (PCPI). There are approximately 70 provincially owned campgrounds located in the Peace River Basin based on spatial information provided by PCPI. It should be noted that some of the campgrounds are closed or are short term camp sites such as day camps. Campgrounds were classified as high, moderate, low or no flood risk based on their proximity to rivers and flood affected areas identified by stakeholders. It should be noted that many campgrounds are located in areas which were not specifically discussed or mentioned during the stakeholder consultation process; therefore, flood risk could not be classified for these campgrounds. Only five of approximately 70 campgrounds were classified at risk of flooding. Figure-7-1 shows provincial government owned campgrounds located within the Peace River basin and indicates which are at risk of flooding. Sections 7.1 through 7.3 below summarize campgrounds classified as high, moderate and low risk of flooding.

### 7.1 High Risk Campgrounds

The Smoky River south campground is a general public use campground located north of the Town of Grande Cache and south of the Wyandie West Métis settlement. Sheep Creek campground is located along the Smoky River and north of the Wyandie West Métis Settlement. Both campgrounds appear to be located on flat ground adjacent to the Smoky River. The Smoky River south and Sheep Creek campgrounds have 22 and 9 campsites respectively. Public safety is potentially at significant risk if flood waters overtop the Smoky River banks at both campgrounds. Information about infrastructure and the type of facilities present at the campgrounds was unavailable at the time of the study; therefore, potential flood damages at the campsites could not be quantified. It is recommended to create and implement a flood preparedness and emergency evacuation plan at the Smoky River south campground in order to protect the campground and its residents in the event of a flood.

### 7.2 Moderate Risk Campgrounds

Losegun River campground is located south of the Waskahigan River, east of the Waskahigan River Bridge and north of Highway 43. The Waskahigan River Bridge deck and an area around the Losegun River Bridge flooded in July 2011 and were classified as low flood risk locations during stakeholder consultations. The Losegun River Bridge is located approximately 300 m east of the campground. The campground has 20 campsites and the topography around the campsites was unknown at the time of the study. Many campsites appear to be located close to the north bank of the Waskahigan River. The Losegun River campground is classified as moderate flood risk, since flood waters from the Waskahigan River could potentially reach many campsites if the area around the campgrounds is relatively flat during a large flood event. The type of infrastructure and facilities present at the campground unavailable at the time of the study; therefore, potential flood damages at the campsites could not be quantified.

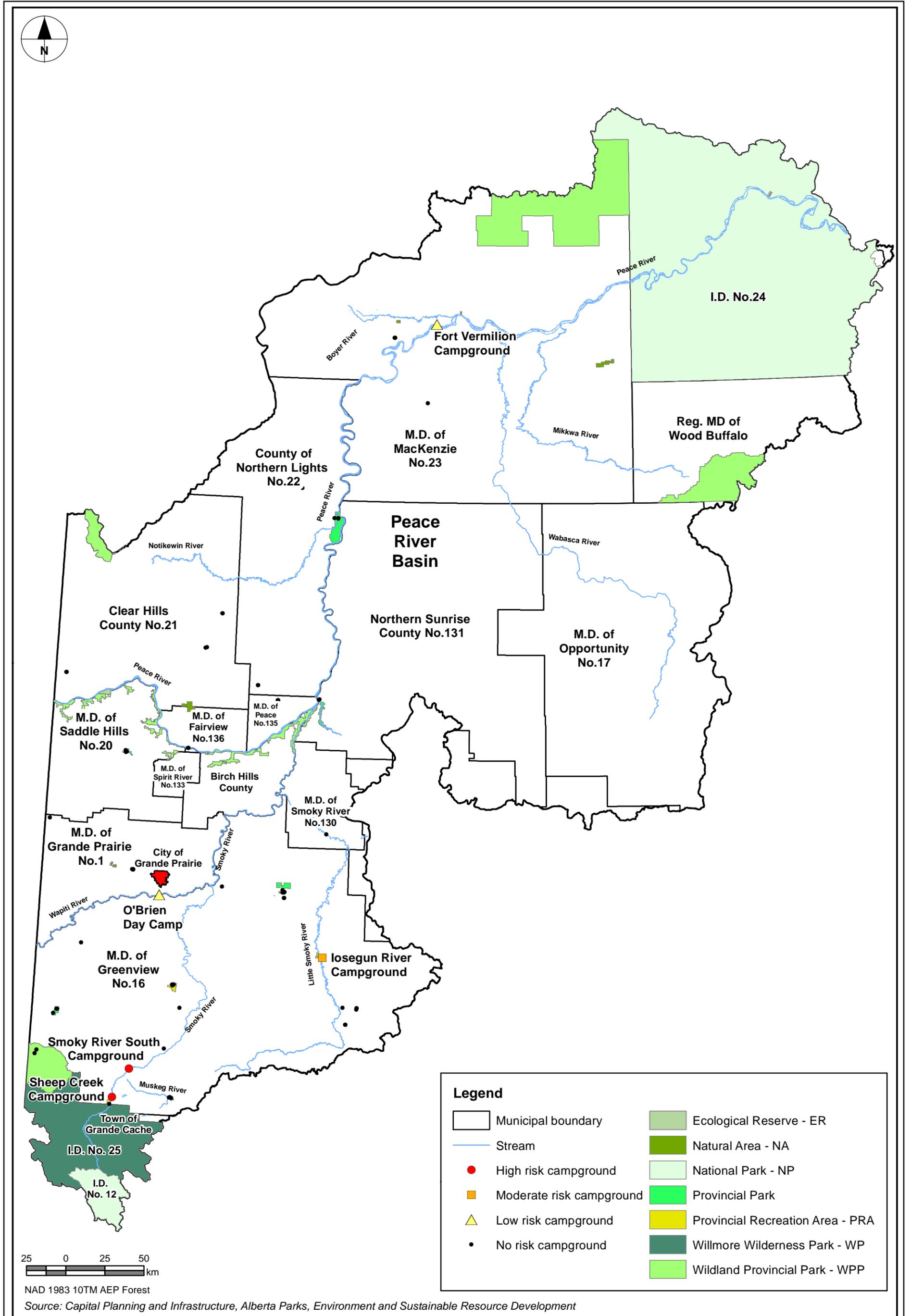
### 7.3 Low Risk Campgrounds

The O'Brien day camp is located south of the City of Grande Prairie and on the south side of the Wapiti River. It is located near the Wapiti Bridge, which flooded in 1988, 1997 and in 2011. The bridge has been classified as a low flood risk site since impact to people, traffic flow and infrastructure was determined to be minor. The day camp appears to be located on a hill at a significantly greater elevation than the Wapiti River; therefore, is classified as low flood risk.

A campground at the Hamlet of Fort Vermilion is located on the north side of the Peace River. The campground is located approximately 12 m above the river bank elevation according to digital elevation data and approximately 60 m from the flood hazard area extents based on flood hazard mapping delineated in 2000 by AESRD. The last

time that the area surrounding Fort Vermilion area was flooded due to ice jams occurred in 1934. Ice jam flooding may potentially flood the river banks beyond the flood extents determined in 2000; therefore, the campground could be at risk of flooding in the event of an ice jam. The campground is classified as low flood risk, since it is located at a significantly greater elevation than the Peace River and no ice jam flooding has occurred since 1934.

The campground has ten campsites and the type of infrastructure and facilities present at the campground and O'Brien day camp was unavailable at the time of the study; therefore, potential flood damages at the both campsites could not be quantified. It is recommended to create and implement a flood preparedness and emergency evacuation plan in order to protect the campground and its residents at the Hamlet of Fort Vermilion and O'Brien day camp in the event of a flood.



## 8. Water Management Plan

A Water Management Plan has been prepared for the Peace River Basin which provides alternatives to mitigate flood issues within the basin. The Water Management Plan consists of implementing a combination of structural and non-structural flood mitigation alternatives for communities impacted by flooding.

### 8.1 Plan Description

Table 8-1 provides a summary of the Water Management Plan for the Peace River Basin for the communities which are classified as being at risk of flooding. Figure 8-1 shows the locations of the communities included in the summary.

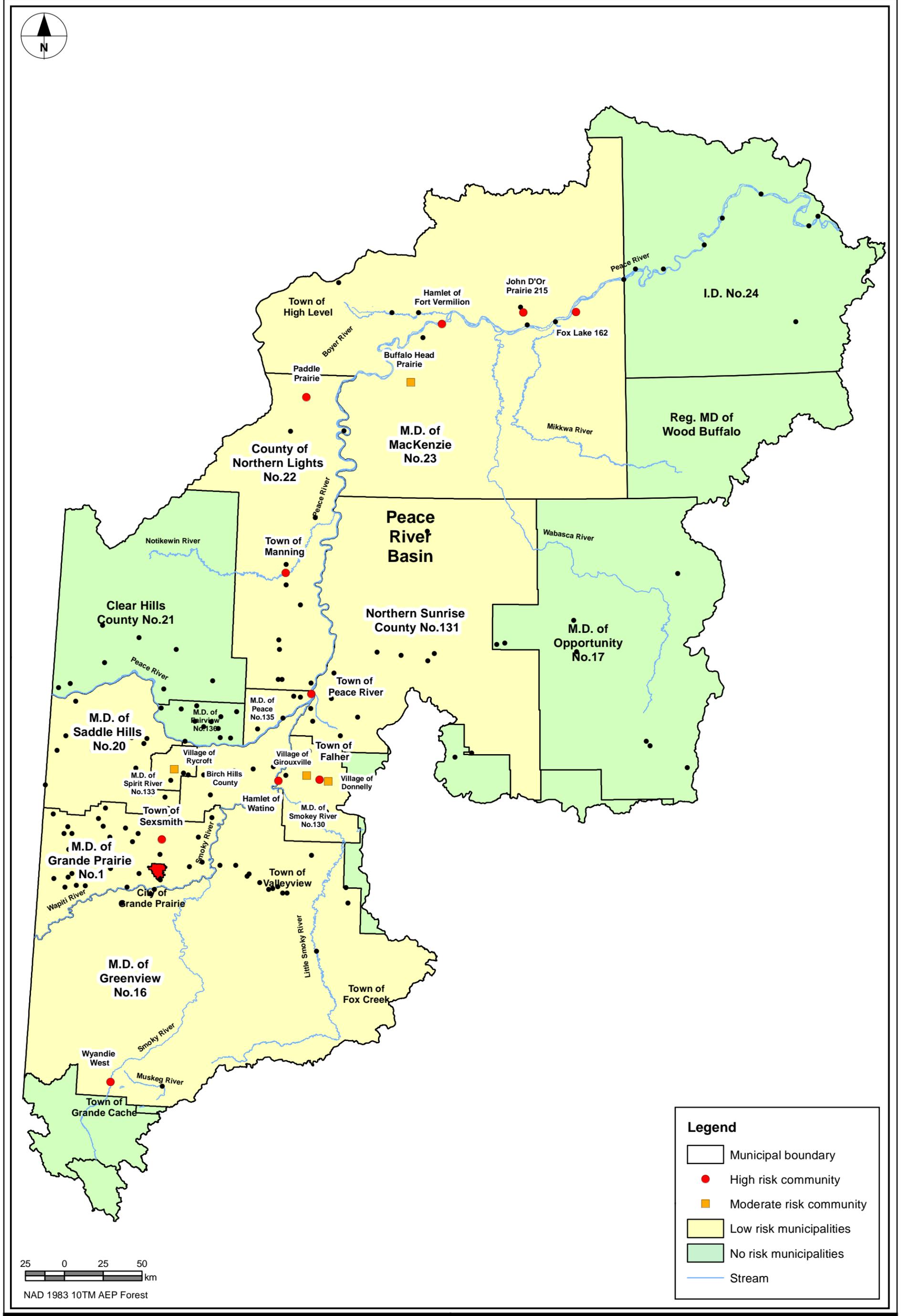
**Table 8-1: Summary of Water Management Plan for Peace River Basin**

Community	Population*	Flood Risk	Structural / Non-Structural Flood Mitigation	Flood Alternative Cost Estimate (Million)	Responsibility	Discussion / Recommendations
Town of Falher	1,075	High	<ul style="list-style-type: none"> <li>Upgrade flash flood control ditch located on the west side of town to convey flow from heavy rainfall events.</li> <li>Replace and upsize culverts along flash flood ditch to prevent water back-up.</li> </ul>	\$6.1	Town of Falher	<ul style="list-style-type: none"> <li>The system will be able to convey the peak flow by implementing upgrades to the flash flood control ditch and culverts and should prevent the Town's stormwater system from surcharging, reducing flooding of basements and homes in the town.</li> <li>It is recommended that an assessment of the Winagami-Girouxville canal be completed prior to proceeding with preliminary design. Back-up from this canal has previously initiated flooding of the flash flood control ditch.</li> </ul>
Town of Manning	1,164	High	<ul style="list-style-type: none"> <li>Implementation of a flood protection dike along the east bank of the Notikewin River.</li> <li>Another alternative is to relocate all residents outside of the flood hazard area.</li> <li>Restrict residential development in the flood hazard area.</li> <li>Development of an emergency flood preparedness and evacuation plan for the residents within the flood hazard area.</li> </ul>	\$2.2	Town of Manning	<ul style="list-style-type: none"> <li>The dike would prevent approximately 200 lots west of Main Street and east of the Notikewin River from flooding during the updated 1:1000 year flood. The implementation of the flood protection dike would require the relocation of four homes and its residents. Two homes would remain unprotected from flood waters during the interim 1:100 year (determined in 2000 by AESRD) and updated 1:1000 year flood.</li> <li>Relocating approximately 200 homes and its residents out of the flood hazard area, instead of implementing a flood protection dike, may not be a cost effective alternative due to the large amount of residents and the associated relocation costs.</li> </ul>
Town of Peace River	6,745	High	<ul style="list-style-type: none"> <li>Realign Pat's Creek, or improve existing Pat's Creek alignment.</li> <li>Construction of a ditch along the east side of the rail track (Judah Hill area) to capture runoff from the hill is recommended.</li> <li>It is recommended to conduct stormwater studies for the Shaftesbury Estates area, area south of the WWTP, and the area south of the Heart River Bridge.</li> <li>Implementation of erosion control methods on the steep side slopes of Highway 744 is recommended.</li> </ul>	\$10.8 - 67.9	Town of Peace River, Alberta Transportation	<ul style="list-style-type: none"> <li>The existing Pat's Creek under the Town of Peace River is in poor working condition and significant repairs or the realignment is recommended. The realignment of Pat's Creek will mitigate flooding in the downtown area.</li> <li>BC hydro relief wells are currently being installed to lower the water table in areas prone to flooding due to a high water table.</li> <li>The implementation of erosion control measures will provide protection to side slopes of Highway 744.</li> </ul>
Town of Sexsmith	2,418	High	<ul style="list-style-type: none"> <li>Upgrade 106 Street ditch and size up/downstream culverts to convey peak flow from a combination of spring snowmelt and rainfall event.</li> <li>Development of an emergency flood preparedness and evacuation plan for residents located in areas where annual flooding occurs.</li> </ul>	\$1.0	Town of Sexsmith	<ul style="list-style-type: none"> <li>The proposed ditch and culvert upgrades mitigate annual flooding of 106 Street as the existing ditch appears to be undersized and is unable to convey the peak flow.</li> <li>It is recommended a stormwater management study is conducted in order to develop structural or non-structural alternatives to mitigate local flooding of homes and inundation of infrastructure.</li> <li>Assessment of the ponds storage and flow capacity of the CN culvert is recommended if the proposed ditch is taken to the preliminary design phase.</li> </ul>
Hamlet of Fort Vermilion	727	High	<ul style="list-style-type: none"> <li>Flooding will not occur in the town during the 1:100 year flood event.</li> <li>A dike along the south bank of the Peace River may be considered to protect against flooding in the case of an ice jam near Fort Vermilion.</li> </ul>	N/A	Hamlet of Fort Vermilion	<ul style="list-style-type: none"> <li>Ice jams, and their impact on water surface elevations are difficult to predict; a detailed analysis is recommended before proceeding with preliminary design of an ice jam protection dike. It should be noted that the construction of a dike is not required for the current 1:100 year peak flow.</li> </ul>
Hamlet of Watino	No data	High	<ul style="list-style-type: none"> <li>Implementation of a dike along the north bank of the Smoky River located northeast of Smoky River Bridge.</li> <li>Another alternative is to relocate all residents outside of the flood hazard area.</li> <li>Restrict residential development in the flood hazard area.</li> <li>Development of an emergency flood preparedness and evacuation plan for the residents within the flood hazard area.</li> </ul>	\$1.3	Hamlet of Watino	<ul style="list-style-type: none"> <li>The dike would prevent approximately 16 homes from flooding. The implementation of the flood protection dike would require the relocation of four homes and its residents. Three homes would remain unprotected from flood waters during the 1:100 year flood due to dike placement constraints.</li> <li>Relocating approximately 16 homes and its residents out of the flood hazard area, instead of implementing a flood protection dike may be a more cost effective alternative due to the low amount of homes and the associated relocation costs.</li> </ul>
Fox Lake 162 Reserve	1,875	High	<ul style="list-style-type: none"> <li>Development of an emergency flood preparedness and evacuation plan for the residents within the flood area.</li> </ul>	N/A	Fox Lake Reserve / Little Red Cree First Nation	<ul style="list-style-type: none"> <li>Flood information was gathered from stakeholder consultation meetings with a First Nations field officer from AEMA. The population was reported to be approximately 3000. Fox Lake is classified as high flood risk since it is located in an isolated area with a high population, river flooding was reported and preparations are in place to fly people out in case of flooding.</li> <li>The development of structural or non-structural flood mitigation alternatives requires more detailed information about exact river flood location/extent and the number of homes located within the river flood area including potential flood damages. It is recommended to contact a representative of Fox Lake reserve directly to obtain the required information.</li> </ul>
John d'Or Prairie 215 Reserve	1,123	High	<ul style="list-style-type: none"> <li>Development of an emergency flood preparedness and evacuation plan for the residents within the flood area.</li> </ul>	N/A	John d'Or Prairie / Little Red Cree First Nation	<ul style="list-style-type: none"> <li>Flood information was gathered from stakeholder consultation meetings with a First Nations field officer from AEMA. The population was reported to be approximately 1000. John d'Or Prairie is classified as high flood risk since it is located in an isolated area with a high population, river flooding and flood issues were reported for Tiger Dam in 2013. Three homes flooded along the Peace River and residents were evacuated.</li> <li>The development of structural or non-structural flood mitigation alternatives requires more detailed information about exact river flood location/extent and the number of homes located within the river flood area including potential flood damages. It is recommended to contact a representative of John d'Or Prairie reserve directly to obtain the required information.</li> </ul>
Paddle Prairie Métis Settlement	No data	High	<ul style="list-style-type: none"> <li>Development of an emergency flood preparedness and evacuation plan for the residents within the flood area.</li> </ul>	N/A	Paddle Prairie Métis	<ul style="list-style-type: none"> <li>Flood information was gathered from a stakeholder consultation meeting with a representative of Paddle Prairie. Boyer Creek floods annually due to spring snowmelt. Fifteen homes were flooded in 2012 and some experienced basement flooding due to sewer back up. Roads flooded but remained drivable. The population was reported to be approximately 1000 people (or approximately 200 homes).</li> <li>The development of structural or non-structural flood mitigation alternatives requires more detailed information about exact river flood location/extent and the number of homes located within the river flood area including potential flood damages. It is recommended to contact additional representatives of Paddle Prairie to obtain more detailed flood information.</li> <li>It is recommended a stormwater management study is conducted in order to develop structural or non-structural alternatives to mitigate basement sewer back up flooding and inundation of infrastructure.</li> </ul>

Community	Population*	Flood Risk	Structural / Non-Structural Flood Mitigation	Flood Alternative Cost Estimate (Million)	Responsibility	Discussion / Recommendations
Wyandie West	No data	High	<ul style="list-style-type: none"> <li>It is recommended that the community develop a detailed emergency flood preparedness and evacuation plan due to its location in the flood hazard area.</li> </ul>	N/A	Wyandie West	<ul style="list-style-type: none"> <li>Structural mitigation alternatives such as a dike may present a viable flood mitigation alternative for the community.</li> <li>The development of any structural or non-structural flood mitigation methods requires more detailed information to be obtained from the community.</li> </ul>
Village of Donnelly	305	Moderate	<ul style="list-style-type: none"> <li>Recommended that the village develop a maintenance plan to inspect any culverts in the area to prevent flooding due to ice blockage.</li> </ul>	N/A	Village of Donnelly	<ul style="list-style-type: none"> <li>Reported historical flooding is infrequent and has occurred only due to overland flooding from an ice-blocked culvert.</li> </ul>
Village of Girouxville	266	Moderate	<ul style="list-style-type: none"> <li>It is recommended that the community develop a stormwater management plan in order to mitigate flooding in the community due to spring snowmelt and runoff.</li> </ul>	N/A	Village of Girouxville	<ul style="list-style-type: none"> <li>Reported historical flooding is infrequent and has occurred following significant rainfall or snowmelt.</li> <li>A stormwater drainage assessment study is recommended to help determine limitations of the stormwater system.</li> </ul>
Village of Rycroft	628	Moderate	<ul style="list-style-type: none"> <li>Implementation of a by-pass channel to divert water from an unnamed tributary to Spirit River. Upgrade four existing culverts and install one new culvert along the channel alignment.</li> <li>Recommend improving the capacity of the unnamed tributary through the village and upgrading all culverts along the tributary to prevent backup.</li> </ul>	\$2.6	Village of Rycroft	<ul style="list-style-type: none"> <li>Rycroft experienced flooding of ditches and culverts in 1990, 2011 and 2013 along an unnamed tributary running north through the village. Three homes were damaged in 1990 and some businesses and homes were damaged during the 2013 flood. The by-pass channel would prevent flooding from the unnamed tributary running north through the Village.</li> <li>Further analysis and study of the flow conveyed to the Spirit River is recommended prior progressing to preliminary design of the by-pass channel.</li> <li>Improving the capacity of the existing unnamed tributary in order to convey the 1:100 year flow likely presents a more feasible flood mitigation alternative.</li> </ul>
Hamlet of La Crete/ Buffalo Head Prairie	No data	Moderate	<ul style="list-style-type: none"> <li>Construction of diversion channel to divert overland flow to Steephill Creek, to prevent flooding of Buffalo Head Prairie area.</li> <li>Retention pond at downstream end of the diversion channel in order to attenuate peak flows into Steephill Creek.</li> <li>Alignment developed by DCL Siemens Engineering (2014)</li> </ul>	\$19.7	Mackenzie County	<ul style="list-style-type: none"> <li>The diversion channel will mitigate flood issues in and around highways and the Buffalo Head Prairie School and make the land effective for agricultural use.</li> <li>The alignment presented by DCL (2014) is a valid alternative.</li> <li>Cross-sectional area of the diversion channel is required to be modified in order to convey peak flow from a combination of spring melt and rainfall event.</li> </ul>
Birch Hills County	1,582	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Birch Hills County	<ul style="list-style-type: none"> <li>Minor annual flooding occurs and floods bridge crossings, culverts, ditches, drainage projects and rural roads.</li> <li>Annual maintenance costs for flood repairs approximately \$20,000 to \$30,000.</li> </ul>
County of Grande Prairie	20,347	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans</li> </ul>	N/A	County of Grande Prairie	<ul style="list-style-type: none"> <li>Minor flooding of township roads, culverts, ditches, and farmlands.</li> </ul>
City of Grande Prairie	55,032	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	City of Grande Prairie	<ul style="list-style-type: none"> <li>Minor flooding of roads, culverts and ditches due to rainfall and snowfall.</li> </ul>
Hamlet of Clairmont	No data	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Hamlet of Clairmont	<ul style="list-style-type: none"> <li>Localized flooding in commercial, industrial areas, and farmlands.</li> <li>Annual flooding of area around fire hall.</li> </ul>
M.D. of Greenview No.16	5,299	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	M.D. of Greenview No. 16	<ul style="list-style-type: none"> <li>Minor flooding of roads, culverts, bridge crossings.</li> <li>Large flooding events have not affected residents.</li> </ul>
Saddle Hills County No. 20	2,288	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Saddle Hills County No. 20	<ul style="list-style-type: none"> <li>Minor flooding impacting residents and infrastructure minimally.</li> </ul>
Hamlet of Woking	No data	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Hamlet of Woking	<ul style="list-style-type: none"> <li>Improvements to culverts crossing railway tracks have been made and has aided in managing runoff to prevent flooding.</li> </ul>
County of Northern Lights No. 22	4,177	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	County of Northern Lights No. 22	<ul style="list-style-type: none"> <li>Minor flooding of roads, culverts, ditches and farmlands.</li> <li>Residents relocated since properties were destroyed due to major flooding in the past. Have since moved to safer locations.</li> </ul>
Hamlet of Dixonville	No data	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Hamlet of Dixonville	<ul style="list-style-type: none"> <li>Minor flood issues.</li> </ul>
Hamlet of Deadwood	No data	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	Hamlet of Deadwood	<ul style="list-style-type: none"> <li>Flooding of roads due to beaver dams.</li> <li>Ice-jams in the Peace River at an oxbow.</li> </ul>
M.D. of Mackenzie No. 23	10,927	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	M.D. of Mackenzie No. 23	<ul style="list-style-type: none"> <li>Minor to moderate flooding of roads, culverts, bridge crossings, and farmlands.</li> </ul>
M.D. of Smoky River No. 130	2,126	Low	<ul style="list-style-type: none"> <li>The Winagami-Girouxville canal, located in the M.D. of Smoky River, may require an assessment in order to determine whether it can convey peak flows without causing backup and flooding to connected drainage systems.</li> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	M.D. of Smoky River No. 130	<ul style="list-style-type: none"> <li>Minor to moderate annual flooding of roads, culverts, bridge crossings, ditches, and farmlands.</li> </ul>
Northern Sunrise County No. 131	1,791	Low	<ul style="list-style-type: none"> <li>County has both emergency management plans and evacuation plans already in place.</li> </ul>	N/A	Northern Sunrise County No. 131	<ul style="list-style-type: none"> <li>Minor flooding of roads, culverts bridge crossings and farmland.</li> <li>A number of drainage and infrastructure issues were identified by MPA in a Hydraulic Drainage Study Report (2014).</li> </ul>

Community	Population*	Flood Risk	Structural / Non-Structural Flood Mitigation	Flood Alternative Cost Estimate (Million)	Responsibility	Discussion / Recommendations
<b>M.D. of Spirit River No. 133</b>	713	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	M.D. of Spirit River No. 133	<ul style="list-style-type: none"> <li>Minor to moderate flooding of roads, culverts, bridge crossings, ditches, and farmland.</li> </ul>
<b>M.D. of Peace No. 135</b>	1,344	Low	<ul style="list-style-type: none"> <li>Implementation of non-structural flood mitigation alternatives, such as emergency flood preparedness and evacuation plans.</li> </ul>	N/A	M.D. of Peace No. 135	<ul style="list-style-type: none"> <li>Annual flooding of roads and culverts due to spring snow melt.</li> <li>Flooding has led to erosion issues on private properties.</li> </ul>

Notes: \*Source: Statistics Canada Census Data (2011)



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# **Peace River Basin Flood Mitigation Feasibility Study**

**Volume 2 of 2**

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