



**MOSQUITO CREEK
FLOODPLAIN MAPPING UPDATE STUDY
GENERAL REPORT**

DRAFT – REV B

KGS Group 19-3065-001
March 2020

PREPARED BY:

Chen Jin, P.Eng.
Water Resources Engineer

APPROVED BY:

Fuad Curi, P.Eng.
Water Resources Department Head

TABLE OF CONTENTS

STATEMENT OF LIMITATIONS AND CONDITIONS.....	iii
THIRD PARTY USE OF REPORT	iii
1.0 INTRODUCTION.....	1
1.1 OBJECTIVES OF THE STUDY.....	1
1.2 CRITERIA FOR FLOODPLAIN AND FILL LINE	2
1.3 GENERAL DESCRIPTION OF WATERSHED AND STUDY AREA	3
1.4 HISTORY OF FLOODING	5
1.5 PREVIOUS STUDIES.....	5
2.0 DATA USED IN THE ANALYSIS.....	6
2.1 LIDAR AND TOPOGRAPHIC DATA	6
3.0 HYDROLOGIC ANALYSES.....	8
4.0 HYDRAULIC ANALYSIS	12
5.0 FLOOD AND FILL LINE MAPPING	15
6.0 STUDY RESULTS AND COMPARISON WITH PREVIOUS FLOODPLAIN MAPS.....	16
6.1 SPILL AREAS AND FLOOD VULNERABLE LOCATIONS.....	18
7.0 SUMMARY AND CONCLUSIONS.....	22
7.1 PROJECT SUMMARY.....	22
7.2 RECOMMENDATIONS.....	23
8.0 REFERENCES.....	24

TABLES
FIGURES
APPENDICES

LIST OF TABLES

1. LiDAR Acquisition Specifications
2. Hydrologic Characteristics Mosquito Creek Watershed (From OFAT III)
3. Regional Frequency Analyses for the Mosquito Creek Watershed
4. Recommended Mosquito Creek Peak Flows at the Location of Confluence with Kaministiquia River
5. Hydraulic Model Input Flows and Locations
6. Quantity of Flood Affected Infrastructure for All Floods

LIST OF FIGURES

1. Mosquito Creek Reaches
2. Comparison of Regional Storm Flood Peak Flows for Watersheds Near Mosquito Creek
3. Affected Infrastructure – Regional Storm Flood

LIST OF APPENDICES

- A. Infrastructure Located within the Flood Hazard Limit

DRAFT

STATEMENT OF LIMITATIONS AND CONDITIONS

THIRD PARTY USE OF REPORT

This report has been prepared for the Lakehead Region Conservation Authority, to whom this report has been addressed, and any use a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

DRAFT

1.0 INTRODUCTION

1.1 OBJECTIVES OF THE STUDY

This study was commissioned to KGS Group by the Lakehead Region Conservation Authority (LRCA), with the objective of updating the existing floodplain mapping of Mosquito Creek and its tributaries within the City of Thunder Bay. The study included:

- The collection and processing of topographic data using LiDAR technology and ground surveys, as well as bathymetric data for the creek and tributaries.
- The preparation of mapping base data, including the development of a digital elevation model (DEM) with the topographic data obtained.
- Hydrologic analysis and modelling to obtain flows for representative flood events along the Mosquito Creek system.
- Hydraulic analysis and modelling to calculate the conditions (water levels and flow velocities) across the creek system, associated with the flows estimated for the various flood events.
- The preparation of floodplain maps depicting the flood hazard limits and the administrative fill lines along the reaches of Mosquito Creek and its tributaries included in the scope of project.
- The presentation of the study results to stakeholders and to the public in an open house, which will take place in March 2020.

Separate technical reports have been submitted to describe, in detail, the data used, the methodology applied, and the results obtained during the execution of the project. These reports include:

- Pennock Creek Floodplain Mapping and Kaministiquia River Floodplain Mapping Study LiDAR Report (KGS Group, 2019a).
- Mosquito Creek Floodplain Mapping Update Study, Hydrologic Report (KGS Group, 2019b).
- Mosquito Creek Floodplain Mapping Update Study, Hydraulics Report (Draft KGS Group, 2019c).

This report provides a summary of the findings of the study described in the above noted technical reports.

1.2 CRITERIA FOR FLOODPLAIN AND FILL LINE

To minimize the risk of flooding to people and property, the Province of Ontario has established policies and flood standards to restrict development within floodplains.

The Lakehead Region is located within Zone 3, as defined in the Technical Guide – River and Stream Systems: Flooding Hazard Limit (Technical Guide, OMNR, 2002)¹. For all watersheds within this zone, the flooding hazard limit is defined as the greater of the flood resulting from:

- a. the Regional Storm (which for this area is the Timmins Storm of 1961), transposed and centred over the watershed and combined with the local conditions;
- b. the 100-Year flood;
- c. a flood which is greater than a) or b), which was actually experienced on a particular watershed or portion thereof, for example as a result of ice jams, and which has been approved as the standard for that specific area by the Minister of Natural Resources.

No specific storm, with the characteristics indicated in item “c”, has been approved by the MNRF for the study area, so the criterion used in this study corresponds to the maximum from the conditions described in items “a” and “b”.

The definition of the fill line, for administrative purposes, was based on the “Guidelines for Developing Schedules of Regulated Areas” (2006). The criteria described in that document includes consideration of the river valley characteristics and in particular stability of the bank slopes. LRCA indicated that, for this watershed, bank slopes with a horizontal to vertical ratio of 2:1 or greater are considered stable. The criteria for definition of the fill line applied for the Mosquito Creek mapping can be summarized as follows:

- In areas with gradual banks at the contact of the flood line with the terrain (bank slope flatter than 2H:1V), the fill line was set 15 m from the flood hazard line.

¹ The Ministry of Natural Resources and Forestry (MNRF) was named Ontario Ministry of Natural Resources (OMNR) at the time of release of the guidelines, Technical Guide – River and Stream Systems: Flooding Hazard Limit.

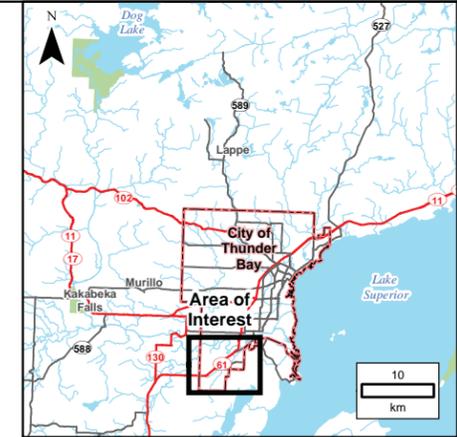
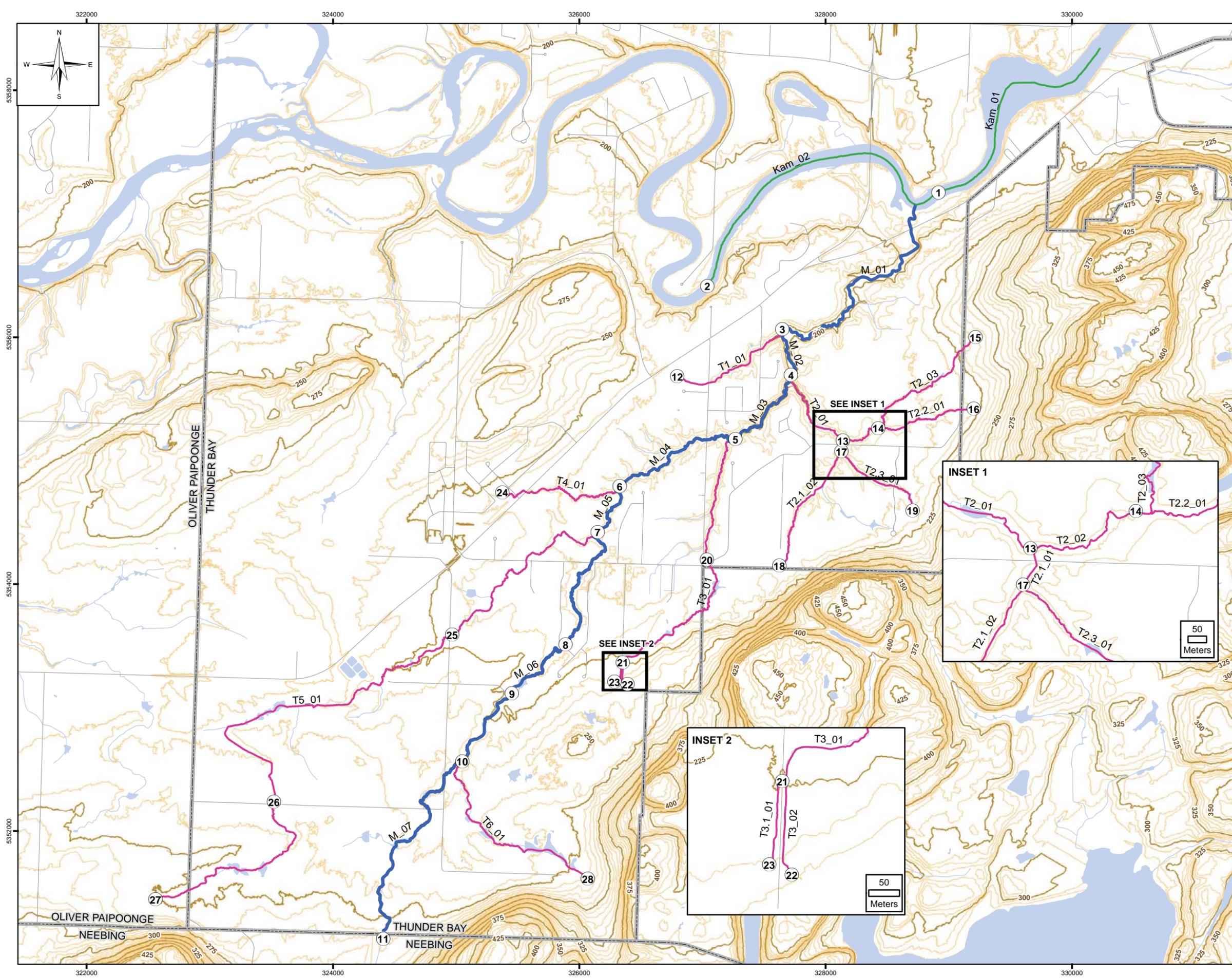
- In areas where a defined river bank was present, and the bank slope was flatter than 2H:1V, the fill line was set 15 m from the top of the bank.
- In areas with steep banks at the contact of the flood line with the terrain (bank slope equal or steeper than 2H:1V), the fill line was set 15 m from the point where the projection, from the flood line, of a 2H:1V slope would daylight.

1.3 GENERAL DESCRIPTION OF WATERSHED AND STUDY AREA

The Mosquito Creek watershed is shown in Figure 1. The creek is a major tributary of the Kaministiquia River. It originates from the Municipality of Neebing, and flows northeast into the Kaministiquia River at a location downstream of the Hwy 61 crossing in Thunder Bay. The main branch of the creek is approximately 15 km long and its channel width is typically 2 to 8 m. The drainage area of the Mosquito Creek watershed is approximately 31 km² as delineated with GIS tools.

The labelling system shown in Figure 1 was used to identify the river branches and tributaries in the hydraulic model prepared as part of this study. In Figure 1, the main branch of Mosquito Creek has been labelled as “M”. The labels assigned to the tributaries of Mosquito Creek include the letter “T” and a number indicating the order in which they join the creek. The ordering numbers were assigned in the direction from downstream to upstream. There are also a few second order tributaries, which are identified by the name given to the tributary that they join, followed by a dot and a consecutive number.

It must be noted that there are numerous small tributaries in the watershed that are not labelled in Figure 1. This is because only the tributaries with drainage areas larger than 125 ha were included in the hydraulic model, as per the requirements of this study.



LEGEND:

- 15 Model Flow Input Location (Reference ID in Table 4)
- Kaministiquia River
- Mosquito Creek Main Channel
- Mosquito Creek Tributaries
- 25m Index Contour
- 5m Contour
- Road
- Watercourse
- Waterbody
- Municipal/Township Boundary

NOTES:

1. Topographic data was derived from the Northwestern Ontario Orthophotography Project (NWOOP) DEM obtained from Land Information Ontario (LIO).

DRAFT



SCALE: 1:30,000 METRIC 11"x17"

All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 16 Elevations are in metres above sea level (MSL)

A	19/12/09 ISSUED WITH DRAFT REPORT	FC	MSW
NO.	YY/MM/DD	DESCRIPTION	ISSUED BY / CHECK BY

KGS GROUP
CONSULTING ENGINEERS

LAKEHEAD REGION
CONSERVATION AUTHORITY

MOSQUITO CREEK FLOODPLAIN MAPPING PROJECT GENERAL REPORT

MOSQUITO CREEK REACHES

DECEMBER 2019	FIGURE 01	REV: A
---------------	-----------	--------

1.4 HISTORY OF FLOODING

There are no hydrometric records available for Mosquito Creek or documentation of previous flood events in this watershed. Previous studies (Lathem, 1984) indicate that the urbanized areas near Mosquito Creek have experienced only minor flooding in the past.

It must be noted that the present urban development in the Mosquito Creek watershed is largely restricted to the downstream areas of the watershed and along Highway 61, where valleys are deep and well-defined and the creek channel has a relatively large discharge capacity.

1.5 PREVIOUS STUDIES

The Mosquito Creek watershed has been studied in the past for the purpose of floodplain mapping. In 1984, The Lathem Group (Lathem) undertook a floodplain study that included hydrologic analyses and modelling and hydraulic modelling of Mosquito Creek. The peak flow obtained in that study for the Regional Storm, was used as the basis for the previous floodplain maps.

In 1996, Fenco MacLaren Inc. carried out the Mosquito Creek Post-Development Study, which included an assessment of the impacts of rapid and continuing urban development that took place in the area along Hwy 61. A hydrologic model was prepared as part of that study and used to evaluate the flood resulting from the Regional Storm. The results with in the same range as those obtained in the 1984 study. The peak flow for the Regional Storm event, indicated in both 1984 and 1996 reports, was found in this study to be proportionally too large. This is further discussed in Section 3.0.

2.0 DATA USED IN THE ANALYSIS

2.1 LIDAR AND TOPOGRAPHIC DATA

The topographic data used in this study is referenced to the 6-degree Universal Transverse Mercator (UTM), North American Datum 1983 (NAD83CSRS) Zone 16 grid projection system and Canadian Geodetic Vertical Datum (CGVD28).

As part of the study, LiDAR (Light Detection and Ranging) data along Mosquito Creek was obtained by KGS Group and its sub-consultant ATLAS Geomatics. LiDAR and aerial imagery acquisition were completed by ATLAS on May 17th and 18th 2019. The data capturing, processing, and quality control are reported in the Pennock Creek Floodplain Mapping and Kaministiquia River Floodplain Mapping Study LiDAR Project Report by KGS (2019b). The specifications of the LiDAR capture are summarized in Table 1.

TABLE 1
LIDAR ACQUISITION SPECIFICATIONS

LiDAR Acquisition Specifications	
Flying Height (metres AGL)	805 to 1100m
Aircraft Ground Speed (knots)	105
Pulse Rate (KHz)	482
Scan Rate (Hz)	47
Full Field of View (degrees)	40
Multi-Pulse	YES
Nominal Swath Width (Metres)	1025
Swath Overlap (percentage)	30%
Nominal Point Spacing Across Track (Metres)	0.3
Nominal Point Spacing Along Track (Metres)	0.3
Average Pulse Density (points per m ²)	8.7
Vertical Accuracy	5 cm or less RMSE
Horizontal Accuracy	25 cm or less RMSE

Topographic surveys were carried out by KGS Group as part of the Pennock Creek, Kaministiquia River, and Mosquito Creek projects in October and November of 2018 and in May, June, July and August of 2019. The surveys allowed developing a control network to support LiDAR acquisition, provide baseline coverage, and perform quality control on the LiDAR data. The LiDAR data was then used to develop a Digital Elevation Model (DEM) with the program Model Builder in ArcGIS v10.4. This DEM is the basis for the derivation of the cross sections used in this study for the preparation of the hydraulic model of Mosquito Creek.

Topographic and bathymetric surveys were carried out in June, July and August of 2019 for Mosquito Creek, to supplement the LiDAR data. This work included localized survey of river bed elevations focused at the crossing locations. The data collected at the crossings also included measurements of the size and elevations of the water passages, top of road elevation as well as photo documentation. A total of 69 locations were surveyed, including: 12 bridges, 50 culverts and 7 inline structure. Data sheets summarizing the data collected at all locations surveyed are provided in the hydraulic technical report (KGS, 2019c).

3.0 HYDROLOGIC ANALYSES

The drainage area of the Mosquito Creek watershed is approximately 31 km² as delineated with GIS tools. It includes the main branch of the creek, as well as several smaller tributaries. The headwaters of the creek are located north of Little Norway Road, in the Municipality of Neebing, and are situated at approximately El. 250 m. The confluence with the Kaministiquia River is located at approximately El. 184 m. Characteristic parameters of the Mosquito Creek watershed, obtained using the MNRF’s Ontario Flow Assessment Tool OFAT III², are listed in Table 2.

**TABLE 2
 HYDROLOGIC CHARACTERISTICS MOSQUITO CREEK WATERSHED (FROM OFAT III)³**

Drainage Area	30.3 km ²
Shape Factor	7.99
Mean Elevation	264.8 m
Maximum Elevation	460.5 m
Mean Slope	10.1 %
Length of Main Channel	15.5 km
Slope of Main Channel	1.7 %
Annual Mean Temperature	3.4 °C
Annual Precipitation	702 mm
Area of Lakes	1.5 km ²
Area of Wetlands	1.4 km ²

The existing land use in the Mosquito Creek Watershed is predominantly rural areas and forests, with some suburban settlements and pockets of commercial and institutional land use.

As part of this study, a hydrologic analysis of the Mosquito Creek watershed was carried out by KGS Group and it was reported in the Hydrology Report KGS (2019b). It included Regional Flood Frequency Analysis and hydrologic modelling.

² The Ontario Flow Assessment Tool (OFAT), version 3, is an online spatially-based application which includes a number of tools that allow conducting hydrologic tasks. It was developed by the Ontario Ministry of Natural Resources and Forestry.

³ The drainage area shown in Table 2 was obtained with OFAT III. It is slightly less than what was measured independently with GIS tools.

KGS carried out the Regional Flood Frequency Analyses (using the Index Flood Method) with the formulas developed in the McIntyre River Floodplain Mapping Study (HMM, 2015) and the McVicar Creek Floodplain Mapping Study (KGS, 2018). The results obtained from both formulas are very similar, but the results obtained with the formula from the McIntyre River Study were slightly greater and, therefore, were adopted in this study (KGS, 2019b).

The Regional Flood Frequency Analysis allows estimating flows for a watershed, based on those obtained from a watershed of similar characteristics located in the same region. In this study, the flood frequency values obtained for the Neebing River, based on data collected at the Water Survey Canada (WSC) Station 02AB008 due to its longer period of flow records, (KGS, 2018) were used to derive peak flow values for the Mosquito Creek watershed. The results are shown in Table 3.

TABLE 3
REGIONAL FREQUENCY ANALYSES OF THE MOSQUITO CREEK WATERSHED

Return Period	Index Flow Method using flood frequency values for the Neebing River
2	5.4
5	9.5
10	12.5
25	16.4
50	19.4
100	22.5

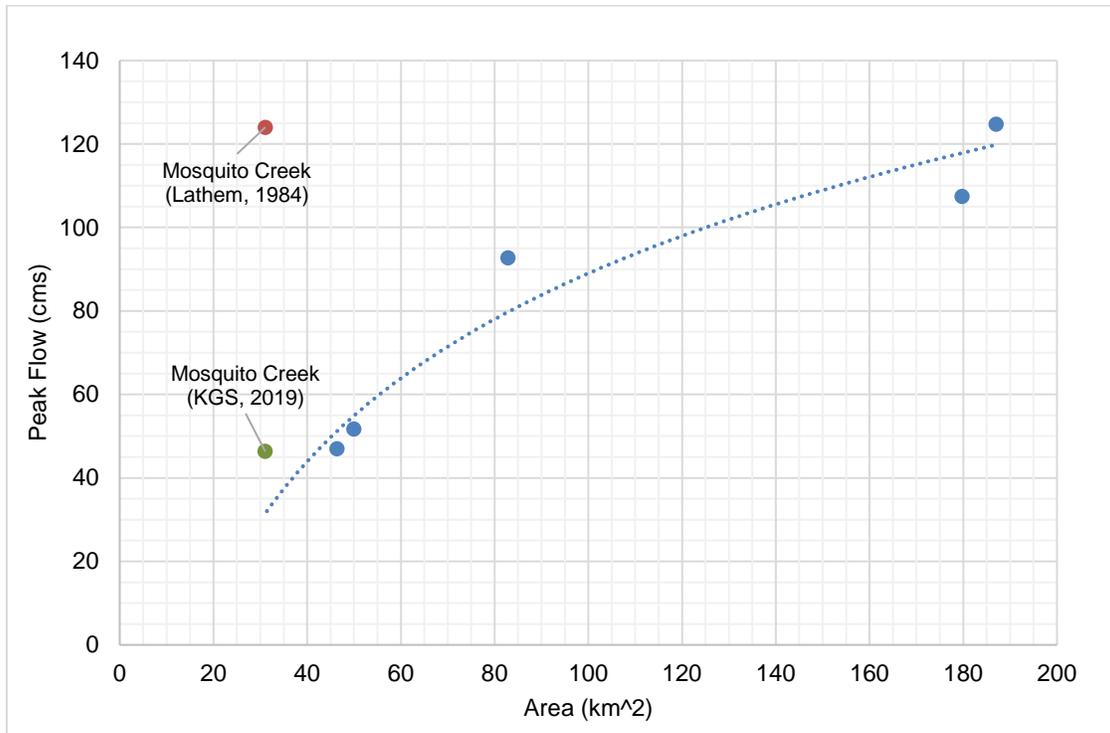
The program Visual OTTHYMO Version 5.0 (VO 5) was used in this study to develop a hydrologic model of the Mosquito Creek watershed. The model elements used to represent the various watershed features include: sub-catchments, routing channels and reservoirs. The hydrologic model was developed based on topographic data available as well as the characteristics of the various sub-catchments, as obtained from OFAT III and from the Ontario Agricultural Information Atlas. The hydrologic model domain extends through the entire Mosquito Creek watershed, from the headwaters of the river branches and tributaries to the confluence with the Kaministiquia River.

For the hydrologic model representing present conditions, the watershed was divided into nineteen sub-catchments. Seventeen sub-catchments correspond to rural areas and two to suburban catchments. The hydrologic model also includes ten river reaches to simulate the routing of runoff flows as they travel through the river system from upstream to downstream. A separate hydrologic model was prepared for future conditions. This model was prepared based on future development plans, and included sixteen rural sub-catchments and three suburban sub-catchments. The results of both models were very similar. The details of the model discretization are described in the study's hydrologic report (KGS, 2019d).

The hydrologic model for the Mosquito Creek watershed was validated, using results of Regional Flood Frequency Analysis, and was used to simulate the runoff resulting from the Regional Storm Flood as well as from recurrent storms ranging from 2 to 100 years return periods. The Regional Storm for the area is the Timmins Storm. Hyetographs for this storm were prepared for the Mosquito Creek watershed using an area reduction factor of 94%. This factor was based on the equivalent circular area of the watershed in adherence with the Technical Guide (MNR, 2002). For the recurrent events, synthetic storm hyetographs were developed from the most current Intensity-Duration-Frequency curves for the City of Thunder Bay.

The peak flow values for the Regional Storm Flood previously obtained (124 m³/s in the 1984 study and 122 m³/s in the 1996 study) are too large when compared with the results obtained in this study. To put these values in perspective, KGS Group compared to the results obtained in recent studies of the McIntyre River (HMM, 2015), Neebing River (KGS, 2018) and McVicar Creek (KGS, 2018), as well as those for the Slate River, obtained as part of the Kaministiquia River study (KGS, 2019d). In all these studies the hydrologic models were calibrated and validated using recorded flow data at various gauging stations. The comparison clearly showed the peak flows from previous studies of the Mosquito Creek as outliers. Figure 2 shows a graphical representation of peak flows for the Regional Storm Flood as related to drainage area for watersheds in the region. It shows the results obtained for Mosquito Creek in the previous studies, as well as those obtained in this study.

FIGURE 2
COMPARISON OF REGIONAL STORM FLOOD PEAK FLOWS FOR WATERSHEDS NEAR MOSQUITO CREEK



The peak flow values obtained in this study for the Regional Storm Flood align better with those obtained for other watersheds in the region, and therefore were adopted. The values recommended as representative of peak flood flows for Mosquito Creek at the confluence with the Kaministiquia River are listed in Table 4. They correspond to the maximum of two values: the results obtained with the hydrologic modelling and those obtained with Regional Flood Frequency Analyses. Details are provided in the study’s hydrologic report (KGS, 2019b).

TABLE 4
RECOMMENDED MOSQUITO CREEK PEAK FLOWS AT THE LOCATION OF CONFLUENCE WITH KAMINISTQUIA RIVER

2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional Storm
5.4	9.5	12.5	16.4	19.7	23.2	46.3

4.0 HYDRAULIC ANALYSIS

The computer program HEC-RAS, Version 5.0.7, was used in this study to prepare a hydraulic model of the Mosquito Creek system. The hydraulic model was used to simulate the recurrent events with return periods from 2 to 100 years, as well as the Regional Storm Flood.

The model includes all the river reaches highlighted in Figure 1. Cross sections were extracted from the DEM and localized survey data described in Section 2.1. The cross sections were spaced at maximum intervals of 200 m, but in most cases with a more detailed discretization, particularly at locations of observed changes in geometry and at crossings.

The downstream boundary condition for the model was the water levels at the Kaministiquia River, derived from the Kaministiquia River Study (KGS, 2019d). For the Regional Storm Flood, the water levels obtained for the 2-year flood event were used, so that the probability of an extreme event on Mosquito Creek was not combined with that of a large event centered in the Kaministiquia River watershed. It was considered that such combination of extreme event probabilities would be overly conservative. It must be noted, nonetheless, that the effect of the Kaministiquia River level on the water levels at Mosquito Creek are limited, and so is the influence of this boundary condition. A sensitivity analysis, carried out in this study, indicated that the influence of the downstream boundary condition on the Mosquito Creek hydraulic model results did not propagate beyond a location 500 m upstream from the mouth of the creek.

Input flows were provided to the model at the upstream section of each river branch and tributary reach, based on the results obtained with the hydrologic analysis. These inflows are summarized in Table 5.

TABLE 5
HYDRAULIC MODEL INPUT FLOWS AND LOCATIONS

Model Location		Figure 1 Reference ID	Flow (m ³ /s)						
Branch	Station (km)		Regional Flood	100 Year	50 Year	25 year	10 Year	5 Year	2 Year
Kam_01	9800	1	477	477	477	477	477	477	477
Kam_02	12432	2	477	477	477	477	477	477	477
M_01	2137	3	46.21	23.18	19.66	16.4	12.5	9.5	5.4
M_02	399	4	45.63	22.87	19.39	16.18	12.33	9.37	5.33
M_03	809	5	32.54	22.53	19.38	16.42	12.98	10.37	6.31
M_04	1233	6	28.15	22.07	19	16.11	12.76	10.21	6.24
M_05	503	7	22.86	11.93	10.11	8.4	6.37	4.8	2.56
M_06	1248	8	11.84	6.02	5.14	4.37	3.46	2.76	1.63
M_06	2008	9	11.79	5.61	4.75	3.92	2.93	2.17	1.1
M_06	2812	10	11.01	5.24	4.44	3.66	2.74	2.03	1.03
M_07	2105	11	5.26	2.57	2.16	1.78	1.33	0.98	0.5
T1_01	1100	12	0.58	0.31	0.26	0.22	0.17	0.13	0.07
T2_01	807	13	12.93	6.09	5.08	4.16	3.05	2.23	1.09
T2_02	384	14	5.16	2.31	1.91	1.54	1.11	0.79	0.37
T2_03	1301	15	2.3	1.04	0.86	0.69	0.5	0.36	0.17
T2.2_01	875	16	2.68	1.19	0.98	0.79	0.56	0.4	0.18
T2.1_01	96	17	6.87	3.31	2.77	2.27	1.69	1.25	0.63
T2.1_02	1157	18	3.66	1.91	1.62	1.36	1.04	0.79	0.42
T2.3_01	847	19	3.24	1.42	1.17	0.94	0.67	0.47	0.22
T3_01	1126	20	6.56	3.26	2.75	2.28	1.71	1.28	0.65
T3_01	2618	21	5.47	2.68	2.26	1.86	1.39	1.03	0.52
T3_02	157	22	2.19	1.08	0.9	0.75	0.56	0.41	0.21
T3.1_01	141	23	0.65	0.32	0.27	0.22	0.16	0.12	0.06
T4_01	1251	24	14.87	13.65	11.71	9.87	7.67	6.01	3.43
T5_01	7034	25	5.55	2.6	2.17	1.77	1.3	0.95	0.47
T5_01	5130	26	8.46	4.24	3.57	2.97	2.25	1.7	0.9
T5_01	1928	27	10.22	5.2	4.4	3.66	2.79	2.11	1.13
T6_01	1831	28	3.91	1.82	1.52	1.23	0.91	0.66	0.32

The Manning n-values used in the model to represent surface roughness were selected based on typical values obtained in the literature for rivers and floodplains with similar characteristics (surface type, vegetation coverage) to those observed in aerial imagery and the photographs collected during the ground survey for the various reaches of Mosquito Creek. In the lower reaches of the Mosquito Creek, the main channel is generally clean of vegetation and features

uniform sections and gravels, a Manning n-value of 0.03 was adopted for these areas. In the upper reaches of Mosquito Creek, the channel features gravels, small cobbles and weeds on the river bed, and sections of shallow flow, so a higher Manning n-value of 0.035 was used. For the overbanks, generally covered by grass and medium to even dense brush and trees, the selected n-values ranged from 0.07 to 0.1; except at farmlands and residential lands, where the adopted Manning n-values were 0.04 and 0.05.

The model includes the culverts, bridges and hydraulic structures surveyed in this study, as described in Section 2.1.

There was no data for calibration or validation of the hydraulic model. Recognizing the inherent uncertainty of numerical modelling, sensitivity analyses were carried out to evaluate the effect of the Kaministiquia River levels and the adopted roughness parameters. The results showed that the model results are largely independent of the assumptions made for these two parameters, within the range of values normally acceptable for the site conditions. The adopted calibrated model is considered appropriate for the analyses carried out in this study to define flood hazard limits along Mosquito Creek. The adopted hydraulic model was used to simulate recurrent events corresponding to 2, 5, 10, 25, 50, and 100-Year return periods and the Regional Storm Flood.

5.0 FLOOD AND FILL LINE MAPPING

The proposed flood hazard limits for the Mosquito Creek system are the water levels obtained from the simulation of the Timmins Storm, which is the Regional Storm for this watershed. These limits were plotted in floodplain maps that were prepared using a Geographic Information System (GIS). These results were reviewed for consistency and adequacy by inspection of model results and terrain levels throughout the study area. Subsequently, the fill lines were generated based on the criteria described in Section 1.2 and refined after review and discussions with LRCA.

A set of floodplain maps were produced to display the flood hazard line and the fill line. The base mapping data for preparation of these maps includes:

- Imagery supplied by LRCA as part of the North West Ontario Orthophotography Project – 2017 (NWOOP), acquired through Land Information Ontario (LIO).
- Municipal boundaries, municipal parcels, and road network supplied by LRCA.
- Tile Index followed the City of Thunder Bay 1:2000 scale maps (1 km x 1 km) non-overlapping tiles. The tile index data was provided by LRCA.
- 0.5 m and 1 m interval contours were developed from the LiDAR digital elevation model (DEM) by KGS Group.
- Cross sections, thalweg, and Regional Floodline were imported into GIS format from HEC-RAS by KGS Group.
- Fill line, prepared by KGS Group following the criteria described in Section 1.2.

6.0 STUDY RESULTS AND COMPARISON WITH PREVIOUS FLOODPLAIN MAPS

A general comparison of the results of the present study with the previous flood lines provided by LRCA, shows good agreement. In general, the present study shows less extensive flooding when compared to the previous study.

The following are locations where both the present study and the 1984 study show overbank flooding. These are described in detail in the hydraulic report (2019c).

- At the Mountain Rd crossing located west of the intersection with Foothill Dr (Tributary T2.1_01) both the previous floodplain maps and the updated model results show spill over Mountain Rd. This area is shown in Map Sheet Number 471.
- At the Mountain Rd crossing located near the intersection with 15th Side Rd (Tributary T3_01) both the previous floodplain maps and the updated model results show overtopping of Mountain Rd. This area is shown in Map Sheet Number 492.
- Along 15th Side Rd, North of Mountain Rd (Tributary T3_01) both the previous floodplain maps and the updated model results show overtopping of two private driveways. The updated model results generally have more extensive flooding in this area and also show spilling over the 15th Side Rd. This area is shown in Map Sheet Number 492.
- At the Fort William Country Club (Tributary T2.1_01, T2.1_02, and T2.3_01) both the previous floodplain maps and the updated model results show spill over at least seven private crossings within the golf course. This area is shown in Map Sheets Number 471, 492 and 493.
- Along Feaver Rd (Tributary T2.1_02), both the previous floodplain maps and the updated results show overtopping two private driveways. This area is shown in Map Sheet Number 492.
- Along Tusedo Dr, south of Mountain Rd, (Branch M_06) both the previous floodplain maps and the updated model results show flooding of an ancillary building between Tusedo Dr and the Mosquito Creek. This area is shown in Map Sheet Number 512.
- At Gregor Rd located east of the intersection with Loch Lomond Rd (Branch M_06), both the updated model results and previous floodplain maps show flooding of the private crossing off Gregor Rd. This area is shown in Map Sheet Number 512.

- Along Highway 61 (Tributary T4_01), east of Southcliff Ave, the updated model results and previous floodplain maps show flooding of a private crossing off the Highway 61. This area is shown in Map Sheet Number 490.
- North of Mountain Rd, close to the intersection with Kettle Creek Dr (Tributary T5_01) both the previous floodplain maps and the updated model results show flooding of six private crossings and one ancillary building north of the Mountain Rd. The previous floodplain maps show more extensive flooding in the area south of Mountain Rd. This area is shown in Map Sheet Number 490.
- At Loch Lomond Rd, south of the intersection with Hwy 61, (Tributary T5_01), the previous floodplain maps and the updated model results, both, show spilling over Loch Lomond Rd and one private crossing downstream of it. This area is shown in Map Sheet Number 511 and 512.

The present study has a larger domain than the previous floodplain maps, so it revealed locations of overtopping of banks and crossing that had not been previously identified. These are shown in the hydraulic report (KGS, 2019c) and summarized below.

- At of 15th Side Rd, north of Brookeview Pl, (Tributary T1_01), the updated model results shows overtopping of 15th Side Rd and two private bridges upstream of it. This area is shown in Map Sheet Number 470.
- Along Feaver Rd (Tributary T2.1_02), the updated results show overtopping four private driveways and flooding of two ancillary buildings. This area is shown in Map Sheet Number 492.
- Along Loch Lomond Rd (Branch M_06), south of intersection with Gregor Rd, the updated model results show spilling over one private crossing off Loch Lomond Rd. This area is shown in Map Sheet Number 534.
- At Highway 61 (Tributary T4_01), east of Southcliff Ave, the updated model results show spilling over Highway 61. This area is shown in Map Sheet Number 490.
- At Trendiak Rd, west of intersection with Loch Lomond Rd, (Branch M_07), the model results indicate overtopping of Trendiak Rd and one private crossing upstream. This area is shown in Map Sheet Number 533.

- Along Loch Lomond Rd, within the Loch Lomond Ski Area, (Tributary T6_01), the updated model results show overtopping of five private crossings, spilling over the embankment of one pond, as well as flooding of one dwelling. This area is shown in Map Sheet Number 556.
- At Trendiak Rd, west of intersection with Little Norway Rd, (Tributary T5_01), the updated model results show overtopping of Trendiak Rd and a private driveway upstream of Trendiak Rd. This area is shown in Map Sheet Number 532.
- At Little Norway Rd, south of intersection with Trendiak Rd (Tributary T5_01), the updated model results show overtopping of Little Norway Rd, as well as flooding of two private driveways and one ancillary building west of Little Norway Rd. This area is shown in Map Sheet Number 553.
- Along Mountain Rd, at east end of the Mosquito Creek watershed, (Tributary T2_03), the updated model results show flooding of nine private crossings off Mountain Rd. This area is shown in Map Sheet Number 471 and 472.
- At Coppin Rd (Tributary T3_02 and T3_1.1), the updated model results show spilling over Coppin Rd at multiple locations and over six private crossings off Coppin Rd, as well as flooding of one ancillary building. This area is shown in Map Sheet Number 513.

6.1 SPILL AREAS AND FLOOD VULNERABLE LOCATIONS

Spill areas in Mosquito Creek, identified in the analysis, include the areas of Loch Lomond Rd south of intersection with Hwy 61, Loch Lomond Rd near the ski area, and Coppin Rd.

In the area of Loch Lomond Rd and Hwy 61, the results showed that flood overtopped of the left banks of Tributary T5 and spilled into lower areas between the Creek and Hwy 61. The flood waters then overtop Loch Lomond Rd, and flows through a ditch eventually discharge back into the creek downstream of Loch Lomond Rd. The ensuing flooding extended to the Loch Lomond road, several driveways and ancillary buildings. This area is shown in Map Sheet Number 511 and 512, in Appendix M.

The results also showed overtopping at various locations along the south end of Coppin Rd. Tributary (T3_02) runs as a ditch along the east side of the road. Another tributary (T3.1) runs along the opposite side of Coppin Rd and joins Tributary T3_02 through a culvert underneath Coppin Rd. The model results show overtopping of this culvert and several locations over Coppin

Road, it also shows the spill will flow along the Coppin Rd in north direction during the Regional Storm Flood and even recurrent flood events. Flooding in this area extends to several private crossings, and ancillary buildings. This area is shown in Map Sheet Number 513, in Appendix M.

Another notable area of bank overtopping, identified by the model results, is within the Loch Lomond Ski Area. Map Sheet 556 shows that the creek spill over the embankments of these farm ponds at multiple locations, and flows downstream and re-join to the river system. This spill occurs for the Regional Flood event and even recurrent flood events.

A full list of areas where the model identified risk of flooding and vulnerable infrastructure, not only for the Regional Storm flood but also for recurrent events, is provided in Appendix A. The tables in that appendix show water depths, flow velocities and depth-velocity products, obtained from the hydraulic model simulations. The tables highlight the areas where potential risk to people and access restrictions were identified based on the criteria required by LRCA (flow depths in excess of 0.3 m, flow velocities in excess of 1.7 m/s and depth velocity products in excess of 0.4 m²/s). These criteria are based on the conditions that could pose hazard to population and affect access and egress during a flood, as defined in MNR (2002).

The features identified in Appendix A were classified in the following categories:

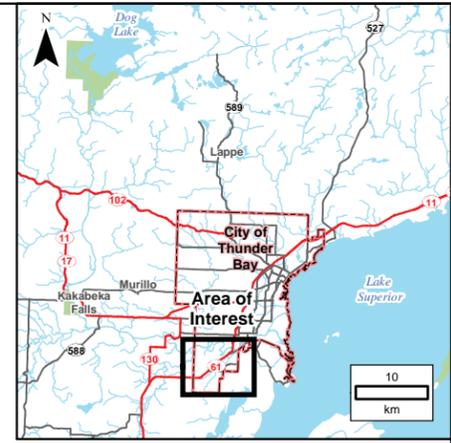
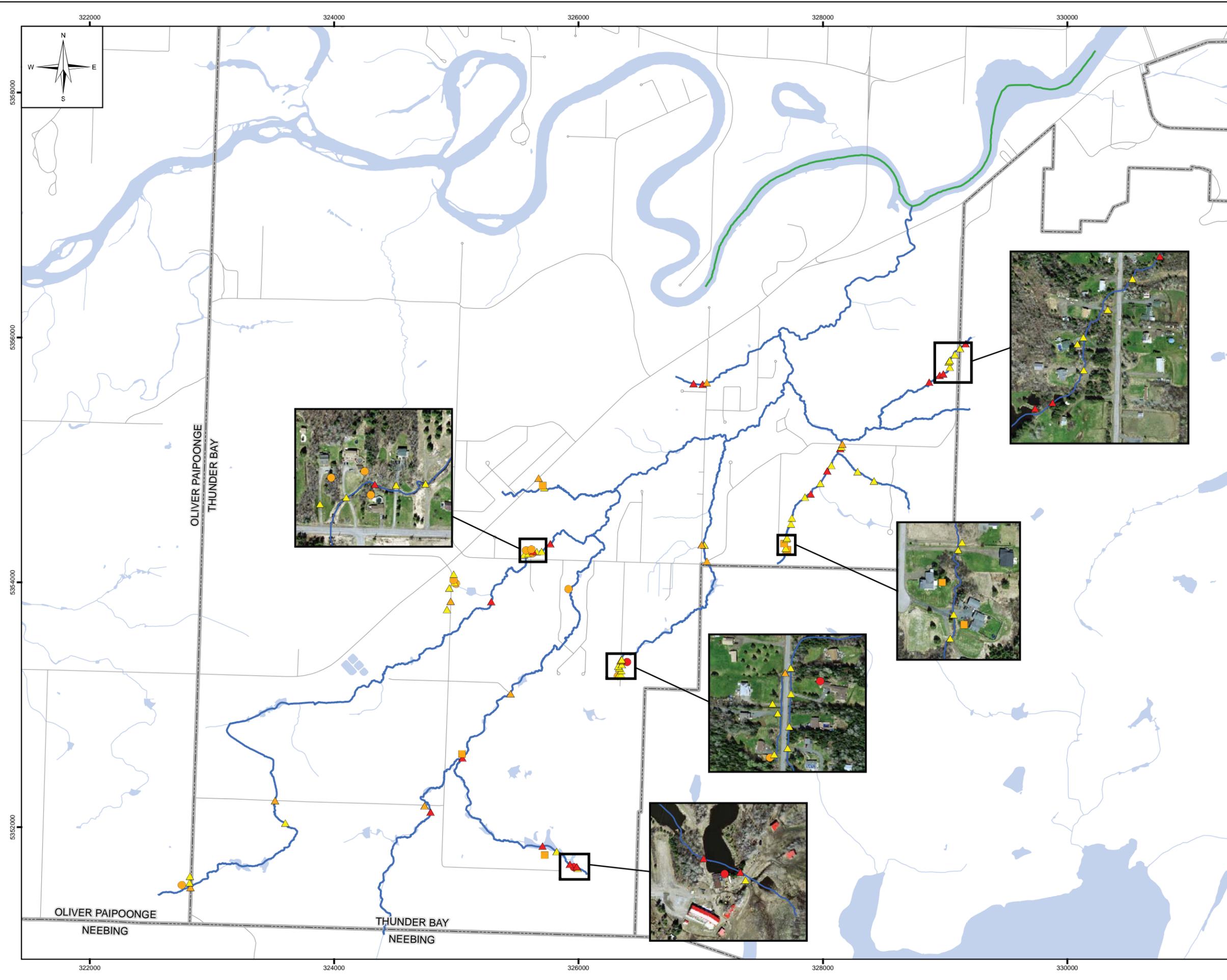
- Dwellings
- Ancillary buildings
- Lots
- Bridges/Culverts
- Roads
- Driveways

A summary of the number of affected infrastructures for all floods is provided in Table 6. The location of the features affected by the Regional Flood is summarized in Figure 3.

TABLE 6
QUANTITY OF FLOOD AFFECTED INFRASTRUCTURE FOR ALL FLOODS

		FLOOD MAGNITUDE						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
QUANTITY OF AFFECTED INFRASTRUCTURE	Dwelling	0	1	1	1	1	1	1
	Ancillary Building	1	2	2	2	2	2	7
	Bridge/Culvert	7	13	14	14	15	16	17
	Driveway	5	12	15	18	22	24	38
	Road	1	3	4	4	5	5	11
	Lot	1	2	2	2	4	4	6

DRAFT



LEGEND:

- Dwelling
- Ancillary Building
- ▲ Bridge; Culvert
- ▲ Road
- ▲ Driveway
- Lot
- Mosquito Creek & Tributaries
- Kaministiquia River
- Road
- Watercourse
- Waterbody
- Municipal/Township Boundary

NOTES:

1. Aerial Photography, dated 2017, was provided by Land Information Ontario (LIO) as part of the North West Ontario Orthophotography Project (NWOOP).

DRAFT



SCALE: 1:30,000 METRIC 11"x17"

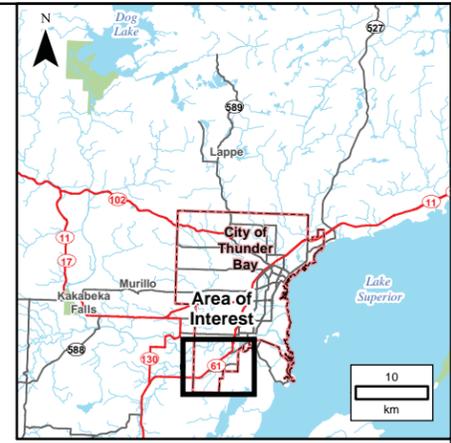
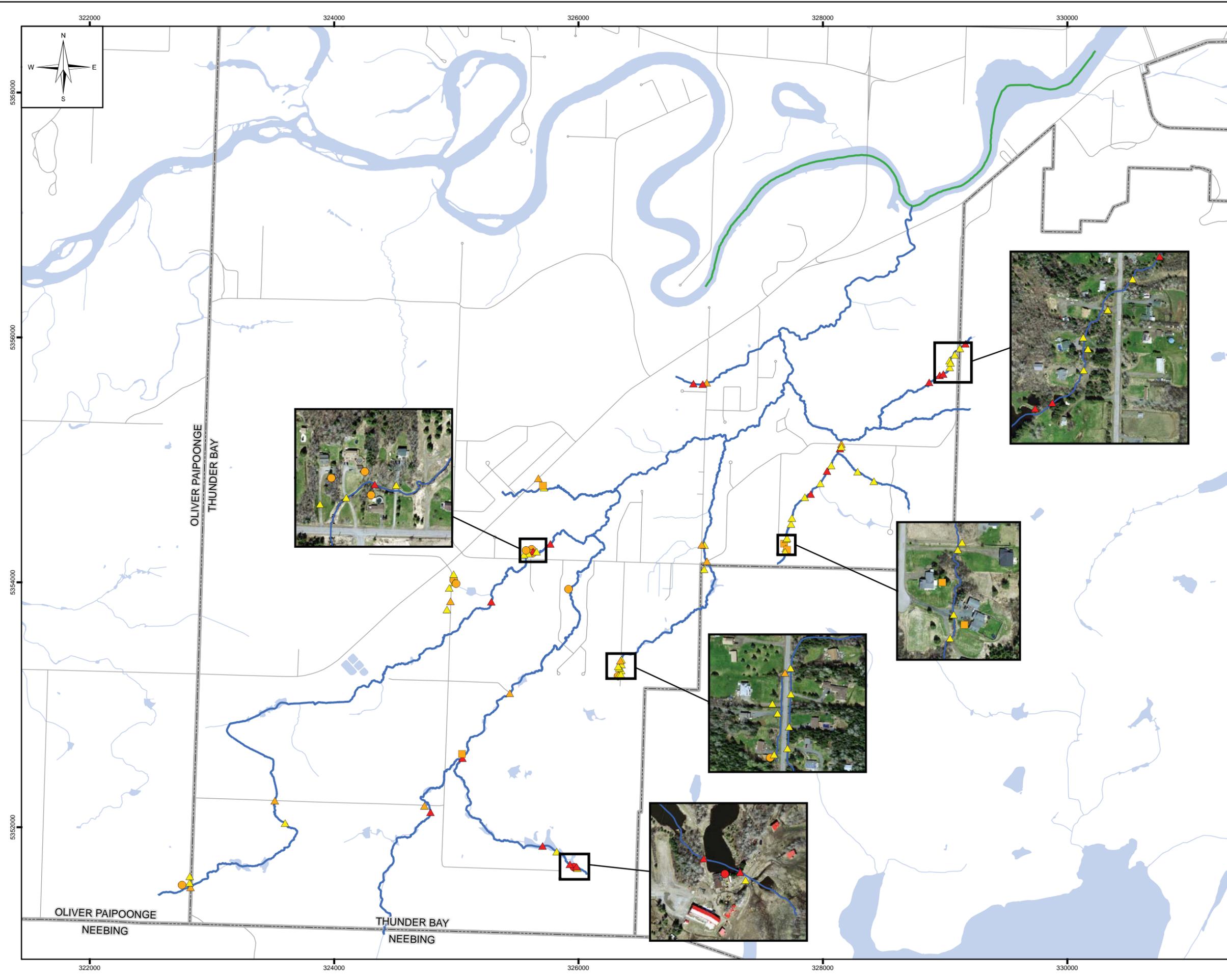
All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 16. Elevations are in metres above sea level (MSL).

A	20/01/22 ISSUED WITH DRAFT REPORT	FC	MSW
NO	YY/MM/DD	DESCRIPTION	ISSUED BY / CHECK BY

REVISIONS / ISSUE

MOSQUITO CREEK FLOODPLAIN MAPPING PROJECT GENERAL REPORT

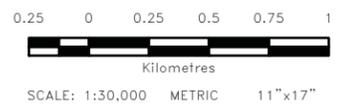
AFFECTED INFRASTRUCTURE – REGIONAL STORM FLOOD



- LEGEND:**
- Dwelling
 - Ancillary Building
 - ▲ Bridge; Culvert
 - ▲ Road
 - ▲ Driveway
 - Lot
 - Mosquito Creek & Tributaries
 - Kaministiquia River
 - Road
 - Watercourse
 - Waterbody
 - Municipal/Township Boundary

NOTES:
1. Aerial Photography, dated 2017, was provided by Land Information Ontario (LIO) as part of the North West Ontario Orthophotography Project (NW00P).

DRAFT



All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 16. Elevations are in metres above sea level (MSL)

NO.	YY/MM/DD	DESCRIPTION	ISSUED BY	CHECK BY
B	20/03/11	UPDATED & RE-ISSUED AS DRAFT	FC	MSW
A	20/01/22	ISSUED WITH DRAFT REPORT	FC	MSW

REVISIONS / ISSUE

MOSQUITO CREEK FLOODPLAIN MAPPING PROJECT GENERAL REPORT

AFFECTED INFRASTRUCTURE – REGIONAL STORM FLOOD

7.0 SUMMARY AND CONCLUSIONS

7.1 PROJECT SUMMARY

KGS Group was retained by the LRCA to update the floodplain mapping for the Mosquito Creek system. A summary of the project tasks and findings is provided below:

- New LiDAR, topographic and bathymetric data was obtained for the Mosquito Creek watershed and used to prepare a Digital Elevation Model (DEM) of the study area, in the City of Thunder Bay. This new data satisfied the criteria for accuracy and density that was established in the terms of reference for the study.
- The topographic data used in this study is referenced to the 6-degree Universal Transverse Mercator (UTM), North American Datum 1983 (NAD83CSRS) Zone 16 grid projection system and Canadian Geodetic Vertical Datum (CGVD28).
- A Regional Flood Frequency Analysis was carried out with formulas obtained in the McIntyre River Floodplain Mapping Study and using the flood frequency analysis carried out for flows at the WSC Station 02HC008 on the Neebing River.
- Storm hyetographs for return periods ranging from 2 to 100 years, developed using the most current IDF curves for Thunder Bay were used in this study to obtain corresponding flows from the hydrologic model. The hyetographs were prepared using a Chicago Storm distribution. The storms were developed for a 24-hour duration with a peak occurring at 1/3 of the storm duration ($r = 0.33$).
- The Regional Storm for the area is the Timmins Storm. Hyetographs for this storm were prepared for the Mosquito Creek watershed using an area reduction factor of 94%. This factor was based on the equivalent circular area of the watershed in adherence with the Technical Guide (MNR, 2002).
- A new hydrologic model was prepared for both present and future land use conditions. The model was validated with the results obtained from the Regional Flood Frequency Analysis, because there was no hydrometric data available for the Mosquito Creek watershed.
- The flows obtained with the hydrologic model for the Regional (Timmins) Storm, were significantly lower than those obtained in Lathem (1984) and Fenco MacLaren (1996) studies, which had been used for preparing the previous floodplain maps for the creek. The difference in results is likely due to the use of different modeling software and approaches for the hydrologic analysis. The values used in this study are considered to better represent the response of the watershed than those used in previous studies. This study results are in better agreement with those obtained for nearby watersheds, for which model results were calibrated with available hydrometric data.
- A new hydraulic model was prepared, with the program HEC-RAS, for the Mosquito Creek system, including the tributaries in of the creek that drain areas larger than 125 ha.

- The hydraulic model was used to simulate the hydraulic conditions during the Regional Storm Flood and recurrent flood events with return periods ranging from 2 to 100 years.
- Recognizing the uncertainty associated with numerical modelling, sensitivity analyses were carried out to evaluate the effect of the Kaministiquia River levels and the roughness parameters used in the model. The results showed that the model results are largely independent of the assumptions made for these two parameters, within the range of values normally acceptable for the site conditions. The values adopted in the model are considered appropriate for the analysis carried out to define flood hazard limits for Mosquito Creek.
- Floodplain maps were developed for Mosquito Creek based on the results obtained from the simulation of the Regional Storm Flood.
- A review of the updated floodplain maps, using this study report, indicates that in most parts the updated results were generally consistent with those previously obtained by Lathem (1984). However, the extent of the flooding obtained in the present study was less extensive.
- A review of the hydraulic model results was carried out to evaluate flow depth, velocity and depth-velocity product at the locations of buildings and infrastructure. These were compared with the hazard criteria required by LRCA. The results are listed for each building and infrastructure located within the flood hazard limit, in Appendix A.

7.2 RECOMMENDATIONS

Based on the investigations and analyses completed for this project, KGS Group has the following recommendations:

- Adopt the updated Mosquito Creek floodplain maps that show the flood hazard limits in accordance with provincial regulations and the fill lines to be used for administrative purposes.
- Evaluate the available monitoring system and program in place with respect to the need to provide timely and adequate information to agencies and the public in the event of a flood in the Mosquito Creek watershed. This evaluation could include a review of the local sources, the means to obtain and process the information from developing weather and flow forecasts, the tools (models, maps, tables) to forecast flood levels associated with the expected flows, and the system to disseminate warning and execute emergency response actions.
- The table of locations of flood vulnerable infrastructure provided in Appendix A can be used for the prioritization of potential improvements to crossings that provide limited conveyance. This can be carried out through a technical study with terms of reference that would be developed with the information obtained in this study.

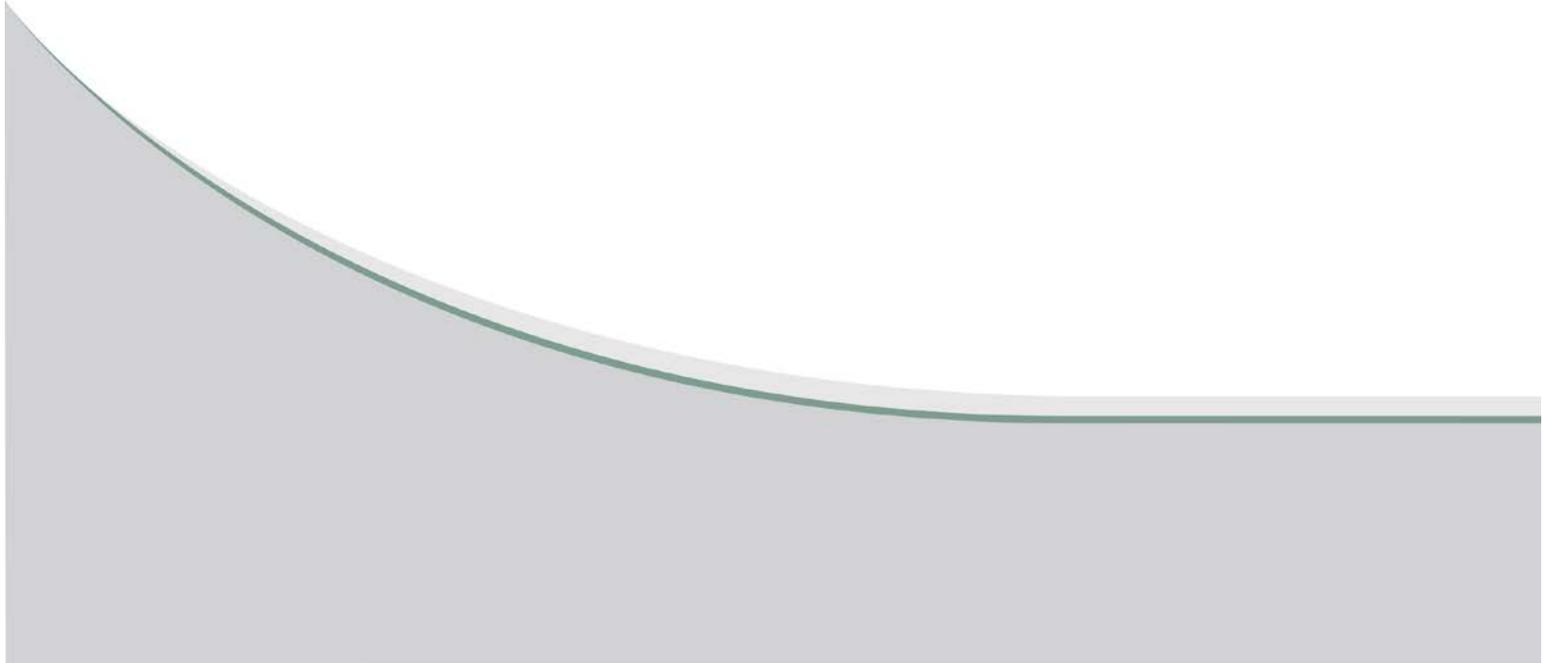
8.0 REFERENCES

1. The Lathem Group, 1984, Mosquito Creek Flood and Fill Line Mapping Study.
2. Fenco MacLaren Inc., 1996, Mosquito Creek Post Development Study
3. USACE, 2016, Hydraulic Reference Manual.
4. OMNR, 2002, Technical Guide River & Stream Systems: Flooding Hazard Limit.
5. MTO, 1997, Drainage Management Manual
6. USDA, 1986, Urban Hydrology for Small Watersheds – Technical Release 55
7. KGS 2018, Neebing River Floodplain Mapping Update – Final Hydrologic Report
8. KGS Group, 2019a, Mosquito Creek and Kaministiquia Floodplain Mapping Update Study, LiDAR Project Report.
9. KGS Group, 2019b, Mosquito Creek Floodplain Mapping Update Study, Hydrologic Report.
10. KGS Group, 2019c, Mosquito Creek Floodplain Mapping Update Study, Hydraulic Report.
11. KGS Group, 2019d, Kaministiquia River Floodplain Mapping Update Study, Hydrologic Report.
12. Hatch Mott MacDonald, HMM, 2015, McIntyre River Floodplain Mapping Study – Final Hydrology Report
13. KGS Group, 2018, McVicar Creek Floodplain Mapping Update Study, Hydrologic Report.
14. KGS Group, 2019e, Pennock Creek Floodplain Mapping Update Study, Hydrologic Report.

APPENDIX A

INFRASTRUCTURE LOCATED WITHIN THE FLOOD HAZARD LIMIT

DRAFT



Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
Regional Storm	46.3	Road	15TH SIDE RD	1	327050.41	5355630.12	0.05	1.24	0.06	15th Side Road overtopped	470	T1-01_827	C-069-T1_01	Both
		Bridge	1010 BROOKVIEW PL	2	327017.10	5355618.68	1.12	0.06	0.07	Private pedestrain bridge overtopped	470	T1-01_874		Both
		Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.24	0.86	0.21	Private pedestrain bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.12	1.54	0.18	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Bridge	955 MOUNTAIN RD	5	328956.44	5355691.84	0.10	0.00	0.00	Flows spill over left bank, and overtop a private crossing	471	T2-03_858		Left
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.23	0.88	0.20	Spill over a private crossing	471	T2-03_882		Both
		Driveway	925 MOUNTAIN RD	7	329038.78	5355756.79	0.21	2.19	0.46	Private driveway overtopped, flood spills over both banks	472	T2-03_961	C-013-T2_03	Both
		Driveway	915 MOUNTAIN RD	8	329045.77	5355792.68	0.06	2.23	0.13	Private driveway overtopped, flood spills over both banks	472	T2-03_1001	C-014-T2_03	Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.12	0.19	0.02	Flood water spill over the left bank the the pond, and impact on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	915 MOUNTAIN RD	9	329037.93	5355812.14	0.30	0.74	0.22	Private driveway overtopped, flood spills over both banks	472	T2-03_1017	C-015-T2_03	Both
		Driveway	885 MOUNTAIN RD	10	329079.43	5355858.72	0.01	1.24	0.01	Private driveway overtopped, flood spills over both banks	472	T2-03_1080	C-016-T2_03	Both
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.39	0.84	0.33	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Bridge	865 MOUNTAIN RD	12	329167.29	5355948.80	0.08	1.75	0.14	Private pedestrain bridge overtopped, flood spills over both banks	472	T2-03_1225	B-066-T2_03	Both
		Road	MOUNTAIN RD	13	328152.48	5355129.48	0.04	1.64	0.07	Mountain Rd overtopped	471	T2.1-01_32	C-045-T2.1_01	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	14	328151.60	5355106.65	3.21	0.10	0.31	Private driveway overtopped, flood spills over both banks	471	T2.1-01_57	C-046-T2.1_01	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	4.19	0.12	0.52	Private pedestrain bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Driveway	FORT WILLIAM COUNTRY CLUB	16	328069.10	5354955.12	2.36	0.10	0.24	Private driveway overtopped, flood spills over both banks	493	T2.1-02_118	C-047-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	2.11	0.11	0.24	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.54	0.37	0.20	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.46	0.67	0.31	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.36	1.15	0.41	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3236 FEAVER RD	21	327747.23	5354524.95	0.27	1.87	0.50	Private driveway overtopped, flood spills over both banks	492	T2.1-02_695	C-054-T2.1_02	Both
		Driveway	3240 FEAVER RD	22	327739.31	5354476.96	0.30	1.29	0.39	Private driveway overtopped, flood spills over both banks	492	T2.1-02_750	C-055-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.33	0.26	0.09	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.26	0.32	0.08	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.20	1.06	0.21	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.30	1.06	0.32	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Lot	3290 FEAVER RD	27	327708.41	5354265.95	0.06	0.12	0.01	Spill over the right river bank, and flood the front yard and approach to the building	492	T2.1-02_1000		Right
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.36	1.11	0.40	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	29	328284.06	5354903.46	0.27	1.38	0.37	Private driveway overtopped	493	T2.3-01_236	C-060-T2.3-01	Both

Flood Event	Flow at Confluence with Kaministiquia River (m³/s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m²/s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Driveway	FORT WILLIAM COUNTRY CLUB	30	328417.40	5354826.81	0.22	2.16	0.48	Private driveway overtopped	493	T2.3-01_391	C-063-T2.3_01	Both
		Driveway	2608 15TH SIDE RD	31	327031.91	5354304.59	1.43	0.16	0.23	Private driveway overtopped	492	T3-01_1010	C-020-T3_01	Both
		Road	15TH SIDE RD	32	327009.05	5354307.62	0.78	0.03	0.02	Spill over the left river bank, and overtop 15th Side Rd	492	T3-01_997		Left
		Road	MOUNTAIN RD	33	327050.92	5354172.25	0.16	0.52	0.08	Mountain Rd overtopped	492	T3-01_1154	C-021-T3_01	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.35	1.84	0.64	Private pedestrain bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.50	0.09	0.04	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4280 COPPIN RD	37	326353.14	5353329.50	0.15	0.75	0.11	Private pedestrain bridge overtopped, flood spills over both banks	513	T3-02_35	C-023-T3_01	Both
		Driveway	4290 COPPIN RD	38	326350.73	5353280.94	0.23	2.04	0.47	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_83	C-024-T3_01	Both
		Driveway	4300 COPPIN RD	39	326348.19	5353248.89	0.21	2.29	0.48	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_114	C-025-T3_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.17	0.16	0.03	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.19	0.26	0.05	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Driveway	4299 COPPIN RD	42	326331.42	5353241.75	0.07	0.54	0.04	Private driveway overtopped, flood spills over both banks	513	T3-1.1_138		Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.15	0.09	0.01	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Driveway	1950 HIGHWAY 61	44	325719.50	5354774.41	0.26	3.19	0.83	Private driveway overtopped	490	T4-01_808	C-026-T4_01	Both
		Lot	1950 HIGHWAY 61	45	325709.08	5354789.35	0.05	0.01	0.00	Flows spill over left bank, and flood the parking lot	490	T4-01_814		Left
		Road	HIGHWAY 61	46	325672.23	5354851.31	0.11	3.16	0.35	Hwy 61 overtopped	490	T4-01_986	C-027-T4_01	Both
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.55	1.78	0.98	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Driveway	1931 MOUNTAIN RD	49	325658.22	5354251.44	0.21	0.28	0.06	Private driveway overtopped, flood spills over both banks	490	T5-01_701	C-029-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	1.00	0.80	0.80	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Ancillary Building	1941 MOUNTAIN RD	51	325623.67	5354237.99	0.17	0.10	0.02	Spill over the right river bank, and impact on the ancillary building	490	T5-01_734		Right
		Lot	1947 MOUNTAIN RD	52	325615.00	5354270.00	0.21	0.79	0.17	Spill over the left river bank, and impact on the ancillary building	490	T5-01_741		Left
		Driveway	1947 MOUNTAIN RD	53	325590.15	5354234.41	0.18	1.76	0.32	Private driveway overtopped, flood spills over both banks	490	T5-01_778	B-031-T5_01	Both
		Driveway	1953 MOUNTAIN RD	54	325554.24	5354225.67	0.06	0.23	0.01	Flows spill over left bank, and overtop a private driveway	490	T5-01_808		Left
		Ancillary Building	1953 MOUNTAIN RD	55	325569.52	5354261.28	0.01	0.13	0.00	Spill over the left river bank, and impact on the ancillary building	490	T5-01_781		Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.31	1.28	0.40	Private crossing overtopped	512	T5-01_1455	c-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	1.54	0.01	0.02	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Driveway	2120 HIGHWAY 61	58	324943.37	5353954.74	1.84	0.02	0.03	Spill over the left river bank, and impact on the private driveway	511	T5-01_1972		Left
		Ancillary Building	2080 HIGHWAY 61	59	324997.02	5353989.73	0.82	0.52	0.43	Spill over the left river bank, and impact on the ancillary building	511	T5-01_1804		Left
		Driveway	2080 HIGHWAY 61	60	324984.53	5354001.52	1.20	0.52	0.63	Spill over the left river bank, and impact on the private driveway	489	T5-01_1848		Left
		Ancillary Building	2080 HIGHWAY 61	61	324977.65	5354018.76	1.69	0.01	0.01	Spill over the left river bank, and impact on the ancillary building	489	T5-01_1928		Left
		Driveway	2080 HIGHWAY 61	62	324979.18	5354067.45	0.19	0.00	0.00	Spill over the left river bank, and impact on the private driveway	489	T5-01_1928		Left
		Driveway	2120 HIGHWAY 61	63	324934.15	5353777.79	0.00	0.00	0.00	Spill over the left river bank, and impact on the private driveway	511	T5-01_1972		Left
		Road	TRENDIAK ROAD	64	323515.08	5352217.18	0.15	1.75	0.26	Trendiak Rd overtopped	532	T5-01_5156	C-035-T5_01	Both
		Driveway	2416 TRENDIAK RD	65	323599.92	5352033.61	0.15	1.62	0.24	Private driveway overtopped	532	T5-01_5410	C-036-T5_01	Both
		Road	169 LITTLE NORWAY RD	66	322825.79	5351508.75	0.17	1.05	0.18	Little Norway Rd overtopped	553	T5-01_6737	C-038-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.58	0.09	0.05	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Driveway	163 LITTLE NORWAY RD	68	322820.11	5351600.06	0.03	0.02	0.00	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.60	0.11	0.07	Flows spill over the left bank and flooded the ancillary building/temperary trailer	553	T5-01_6830		Left
		Ancillary Building	4074 TUXEDO DR	70	325917.69	5353945.33	0.14	1.29	0.17	Spill over the left river bank, and impact on the ancillary building	512	M-06_710		Left
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.21	0.99	0.21	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Lot	5200 LOCH LOMOND RD	72	325047.81	5352598.57	0.24	0.68	0.16	Flood water spill over the left bank, flood the lot and approaching to an ancillary building	534	M-06_2783		Left
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.52	1.02	0.53	Private pedestrain bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Road	LOCH LOMOND RD	74	324739.39	5352174.94	0.11	1.54	0.17	Trendiak Rd (close to Loch Lomond Rd) overtopped	533	M-07_674	C-008-M_07	Both
		Bridge	2176 TRENDIAK RD	75	324789.99	5352123.18	0.40	0.77	0.30	Private pedestrain bridge overtopped, flood spill over both banks	533	M-07_731		Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.07	0.23	0.02	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.92	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.14	0.08	0.01	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.28	0.97	0.27	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.38	0.75	0.29	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both
		Driveway	Unknown Street #, LOCH LOMOND ROAD	82	325992.50	5351665.14	0.11	0.57	0.06	Private driveway overtopped	556	T6-01_1732	C-044-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
100 Year	23.2	Bridge	1010 BROOKVIEW PL	2	327017.10	5355618.68	0.17	0.43	0.07	Private pedestrian bridge overtopped	470	T1-01_874		Both
		Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.14	0.71	0.10	Private pedestrian bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.08	1.25	0.10	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Bridge	955 MOUNTAIN RD	5	328956.44	5355691.84	0.03	0.00	0.00	Flows spill over left bank, and overtop a private crossing	471	T2-03_858		Left
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.18	1.02	0.18	Spill over a private crossing	471	T2-03_882		Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.07	0.09	0.01	Flood water spill over the left bank the the pond, and impact on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	915 MOUNTAIN RD	9	329037.93	5355812.14	0.16	1.42	0.23	Private driveway overtopped, flood spills over both banks	472	T2-03_1017	C-015-T2_03	Both
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.14	1.03	0.14	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	14	328151.60	5355106.65	0.20	0.44	0.09	Private driveway overtopped, flood spills over both banks	471	T2.1-01_57	C-046-T2.1_01	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	1.19	0.87	1.03	Private pedestrian bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Driveway	FORT WILLIAM COUNTRY CLUB	16	328069.10	5354955.12	0.14	0.90	0.13	Private driveway overtopped, flood spills over both banks	493	T2.1-02_118	C-047-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	0.26	0.78	0.20	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.22	0.32	0.07	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.37	0.39	0.14	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.26	0.89	0.23	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3236 FEAVER RD	21	327747.23	5354524.95	0.09	1.82	0.16	Private driveway overtopped, flood spills over both banks	492	T2.1-02_695	C-054-T2.1_02	Both
		Driveway	3240 FEAVER RD	22	327739.31	5354476.96	0.19	0.74	0.14	Private driveway overtopped, flood spills over both banks	492	T2.1-02_750	C-055-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.23	0.16	0.04	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.18	0.43	0.08	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.10	0.70	0.07	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.21	0.55	0.12	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.30	0.69	0.21	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	29	328284.06	5354903.46	0.12	1.78	0.21	Private driveway overtopped	493	T2.3-01_236	C-060-T2.3-01	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.33	1.25	0.41	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.27	0.05	0.01	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4280 COPPIN RD	37	326353.14	5353329.50	0.07	1.16	0.08	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-02_35	C-023-T3_01	Both
		Driveway	4290 COPPIN RD	38	326350.73	5353280.94	0.14	1.34	0.19	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_83	C-024-T3_01	Both
		Driveway	4300 COPPIN RD	39	326348.19	5353248.89	0.09	1.82	0.16	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_114	C-025-T3_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.13	0.04	0.00	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.13	0.14	0.02	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.11	0.01	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Driveway	1950 HIGHWAY 61	44	325719.50	5354774.41	0.26	3.12	0.81	Private driveway overtopped	490	T4-01_808	C-026-T4_01	Both
		Lot	1950 HIGHWAY 61	45	325709.08	5354789.35	0.05	0.01	0.00	Flows spill over left bank, and flood the parking lot	490	T4-01_814		Left
		Road	HIGHWAY 61	46	325672.23	5354851.31	0.09	3.25	0.29	Hwy 61 overtopped	490	T4-01_986	C-027-T4_01	Both
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.52	1.59	0.83	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	0.48	0.96	0.46	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.19	1.11	0.21	Private crossing overtopped	512	T5-01_1455	c-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	1.24	0.65	0.81	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Driveway	2416 TRENDIAK RD	65	323599.92	5352033.61	0.08	2.00	0.16	Private driveway overtopped	532	T5-01_5410	C-036-T5_01	Both
		Road	169 LITTLE NORWAY RD	66	322825.79	5351508.75	0.09	2.08	0.19	Little Norway Rd overtopped	553	T5-01_6737	C-038-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.51	0.05	0.03	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.53	0.06	0.03	Flows spill over the left bank and flooded the ancillary building/temporary trailer	553	T5-01_6830		Left
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.14	1.02	0.14	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Lot	5200 LOCH LOMOND RD	72	325047.81	5352598.57	0.10	0.42	0.04	Flood water spill over the left bank, flood the lot and approaching to an ancillary building	534	M-06_2783		Left
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.37	0.74	0.27	Private pedestrain bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Bridge	2176 TRENDIAK RD	75	324789.99	5352123.18	0.04	1.30	0.05	Private pedestrain bridge overtopped, flood spill over both banks	533	M-07_731		Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.04	0.16	0.01	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.89	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.09	0.04	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.21	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.34	2.46	0.84	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both
		Driveway	Unknown Street #, LOCH LOMOND ROAD	82	325992.50	5351665.14	0.02	0.41	0.01	Private driveway overtopped	556	T6-01_1732	C-044-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
50 Year	19.7	Bridge	1010 BROOKVIEW PL	2	327017.10	5355618.68	0.10	0.42	0.04	Private pedestrian bridge overtopped	470	T1-01_874		Both
		Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.13	0.64	0.08	Private pedestrian bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.08	1.21	0.10	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Bridge	955 MOUNTAIN RD	5	328956.44	5355691.84	0.01	0.00	0.00	Flows spill over left bank, and overtop a private crossing	471	T2-03_858		Left
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.17	0.91	0.16	Spill over a private crossing	471	T2-03_882		Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.05	0.08	0.00	Flood water spill over the left bank the the pond, and impact on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	915 MOUNTAIN RD	9	329037.93	5355812.14	0.12	1.43	0.17	Private driveway overtopped, flood spills over both banks	472	T2-03_1017	C-015-T2_03	Both
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.12	1.10	0.13	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	14	328151.60	5355106.65	0.10	0.77	0.08	Private driveway overtopped, flood spills over both banks	471	T2.1-01_57	C-046-T2.1_01	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	1.09	0.83	0.91	Private pedestrian bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Driveway	FORT WILLIAM COUNTRY CLUB	16	328069.10	5354955.12	0.12	0.76	0.09	Private driveway overtopped, flood spills over both banks	493	T2.1-02_118	C-047-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	0.21	0.71	0.15	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.19	0.28	0.05	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.35	0.34	0.12	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.24	1.27	0.30	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3240 FEAVER RD	22	327739.31	5354476.96	0.11	0.82	0.09	Private driveway overtopped, flood spills over both banks	492	T2.1-02_750	C-055-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.20	0.15	0.03	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.15	0.39	0.06	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.08	0.65	0.05	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.19	1.25	0.24	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.28	0.62	0.17	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	29	328284.06	5354903.46	0.05	1.66	0.08	Private driveway overtopped	493	T2.3-01_236	C-060-T2.3-01	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.28	1.43	0.40	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.25	0.28	0.07	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4280 COPPIN RD	37	326353.14	5353329.50	0.05	1.02	0.05	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-02_35	C-023-T3_01	Both
		Driveway	4290 COPPIN RD	38	326350.73	5353280.94	0.11	1.21	0.13	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_83	C-024-T3_01	Both
		Driveway	4300 COPPIN RD	39	326348.19	5353248.89	0.04	1.72	0.07	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_114	C-025-T3_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.11	0.94	0.10	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.11	0.09	0.01	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both

Flood Event	Flow at Confluence with Kaministiquia River (m³/s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m²/s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.11	0.00	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Driveway	1950 HIGHWAY 61	44	325719.50	5354774.41	0.24	2.94	0.71	Private driveway overtopped	490	T4-01_808	C-026-T4_01	Both
		Lot	1950 HIGHWAY 61	45	325709.08	5354789.35	0.03	0.01	0.00	Flows spill over left bank, and flood the parking lot	490	T4-01_814		Left
		Road	HIGHWAY 61	46	325672.23	5354851.31	0.02	3.09	0.06	Hwy 61 overtopped	490	T4-01_986	C-027-T4_01	Both
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.50	0.83	0.42	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	0.38	1.00	0.38	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.16	1.10	0.18	Private crossing overtopped	512	T5-01_1455	c-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	1.15	0.97	1.12	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Driveway	2416 TRENDIAK RD	65	323599.92	5352033.61	0.06	1.87	0.11	Private driveway overtopped	532	T5-01_5410	C-036-T5_01	Both
		Road	169 LITTLE NORWAY RD	66	322825.79	5351508.75	0.08	1.70	0.14	Little Norway Rd overtopped	553	T5-01_6737	C-038-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.50	0.04	0.02	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.51	0.05	0.03	Flows spill over the left bank and flooded the ancillary building/temperary trailer	553	T5-01_6830		Left
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.12	1.03	0.12	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Lot	5200 LOCH LOMOND RD	72	325047.81	5352598.57	0.07	0.37	0.02	Flood water spill over the left bank, flood the lot and approaching to an ancillary building	534	M-06_2783		Left
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.25	0.76	0.19	Private pedestrain bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.03	0.14	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.88	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.08	0.03	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.20	0.92	0.18	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.32	2.50	0.80	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
25 Year	16.4	Bridge	1010 BROOKVIEW PL	2	327017.10	5355618.68	0.07	0.40	0.03	Private pedestrian bridge overtopped	470	T1-01_874		Both
		Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.12	0.57	0.07	Private pedestrian bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.07	1.16	0.08	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.16	0.81	0.13	Spill over a private crossing	471	T2-03_882		Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.04	0.06	0.00	Flood water spill over the left bank the the pond, and impact on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	915 MOUNTAIN RD	9	329037.93	5355812.14	0.08	1.38	0.11	Private driveway overtopped, flood spills over both banks	472	T2-03_1017	C-015-T2_03	Both
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.10	1.08	0.11	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	0.95	0.81	0.78	Private pedestrian bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Driveway	FORT WILLIAM COUNTRY CLUB	16	328069.10	5354955.12	0.12	1.21	0.15	Private driveway overtopped, flood spills over both banks	493	T2.1-02_118	C-047-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	0.20	0.45	0.09	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.16	0.24	0.04	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.34	0.29	0.10	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.22	1.30	0.29	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.17	1.43	0.24	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.14	0.35	0.05	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.06	0.58	0.03	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.17	0.33	0.06	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.25	0.55	0.14	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.21	1.56	0.33	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.21	0.48	0.10	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4280 COPPIN RD	37	326353.14	5353329.50	0.05	1.01	0.05	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-02_35	C-023-T3_01	Both
		Driveway	4290 COPPIN RD	38	326350.73	5353280.94	0.09	1.10	0.10	Private driveway overtopped, spill over left bank and overtop Coppin Rd	513	T3-02_83	C-024-T3_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.11	0.92	0.10	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.10	0.80	0.08	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.10	0.00	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Driveway	1950 HIGHWAY 61	44	325719.50	5354774.41	0.20	2.78	0.56	Private driveway overtopped	490	T4-01_808	C-026-T4_01	Both
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.39	1.93	0.75	Private pedestrian bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	0.28	0.84	0.24	Private pedestrian bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.11	1.18	0.13	Private crossing overtopped	512	T5-01_1455	C-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	1.06	0.86	0.91	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Driveway	2416 TRENDIAK RD	65	323599.92	5352033.61	0.02	1.74	0.03	Private driveway overtopped	532	T5-01_5410	C-036-T5_01	Both

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Road	169 LITTLE NORWAY RD	66	322825.79	5351508.75	0.06	1.38	0.08	Little Norway Rd overtopped	553	T5-01_6737	C-038-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.48	0.04	0.02	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.49	0.04	0.02	Flows spill over the left bank and flooded the ancillary building/temperary trailer	553	T5-01_6830		Left
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.10	0.49	0.05	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.25	0.67	0.17	Private pedestrain bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.03	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.88	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.07	0.03	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.19	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.29	2.33	0.68	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
10 Year	12.5	Bridge	1010 BROOKVIEW PL	2	327017.10	5355618.68	0.02	0.36	0.01	Private pedestrain bridge overtopped	470	T1-01_874		Both
		Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.10	0.46	0.05	Private pedestrain bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.06	1.09	0.07	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.14	0.86	0.12	Spill over a private crossing	471	T2-03_882		Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.03	0.05	0.00	Flood water spill over the left bank the the pond, and impacpt on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	915 MOUNTAIN RD	9	329037.93	5355812.14	0.01	1.27	0.01	Private driveway overtopped, flood spills over both banks	472	T2-03_1017	C-015-T2_03	Both
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.08	1.05	0.08	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	0.69	0.94	0.65	Private pedestrain bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Driveway	FORT WILLIAM COUNTRY CLUB	16	328069.10	5354955.12	0.04	1.43	0.06	Private driveway overtopped, flood spills over both banks	493	T2.1-02_118	C-047-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	0.17	1.01	0.17	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.13	0.96	0.12	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.30	0.23	0.07	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.20	1.19	0.24	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.13	1.03	0.13	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.11	1.05	0.12	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.03	0.49	0.01	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.13	1.61	0.21	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.22	0.46	0.10	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.18	1.56	0.28	Private pedestrain bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.19	0.48	0.09	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.11	0.92	0.10	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.09	0.80	0.07	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.10	0.00	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Driveway	1950 HIGHWAY 61	44	325719.50	5354774.41	0.09	2.56	0.23	Private driveway overtopped	490	T4-01_808	C-026-T4_01	Both
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.39	1.19	0.46	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	0.15	1.15	0.17	Private pedestrain bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.08	1.09	0.09	Private crossing overtopped	512	T5-01_1455	c-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	0.93	0.86	0.80	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Road	169 LITTLE NORWAY RD	66	322825.79	5351508.75	0.02	1.02	0.02	Little Norway Rd overtopped	553	T5-01_6737	C-038-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.44	0.03	0.01	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.46	0.03	0.02	Flows spill over the left bank and flooded the ancillary building/temperary trailer	553	T5-01_6830		Left

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.10	1.02	0.10	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.23	0.84	0.19	Private pedestrain bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.02	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.87	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.06	0.02	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.17	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.21	1.57	0.33	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
5 Year	9.5	Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.09	0.38	0.03	Private pedestrian bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	4	328869.36	5355634.51	0.05	1.01	0.05	Pond embankment overtopped	471	T2-03_740	S-011-T2_03	Both
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.11	0.77	0.08	Spill over a private crossing	471	T2-03_882		Both
		Dwelling	Unknown Street #, LOCH LOMOND ROAD	8	325961.17	5351674.65	0.01	0.04	0.00	Flood water spill over the left bank the the pond, and impact on the dwelling building next to it.	472	T6-01_1715		Left
		Driveway	875 MOUNTAIN RD	11	329121.45	5355910.58	0.05	0.98	0.05	Private driveway overtopped, flood spills over both banks	472	T2-03_1159	C-018-T2_03	Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	0.53	0.92	0.48	Private pedestrian bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Culvert	FORT WILLIAM COUNTRY CLUB	17	328034.20	5354909.19	0.12	1.10	0.13	Private culvert overtopped, flood spills over both banks	493	T2.1-02_176	C-048-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	18	327980.29	5354808.60	0.06	0.78	0.05	Private driveway overtopped, flood spills over both banks	492	T2.1-02_291	C-049-T2.1_02	Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.26	0.19	0.05	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.17	1.55	0.26	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3266 FEAVER RD	23	327706.01	5354362.18	0.10	0.94	0.09	Private driveway overtopped, flood spills over both banks	492	T2.1-02_895	C-056-T2.1_02	Both
		Driveway	3276 FEAVER RD	24	327701.07	5354353.48	0.09	0.14	0.01	Private driveway overtopped, flood spills over both banks	492	T2.1-02_905	C-057-T2.1_02	Both
		Lot	3286 FEAVER RD	25	327682.88	5354315.55	0.00	0.39	0.00	Spill over the left river bank, and flood the backyard and approach to the ancillary building	492	T2.1-02_972		Left
		Driveway	3290 FEAVER RD	26	327696.09	5354277.97	0.10	1.04	0.10	Private driveway overtopped	492	T2.1-02_995	C-058-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.19	0.37	0.07	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	4260 COPPIN RD	34	326352.82	5353368.20	0.08	1.19	0.10	Private pedestrian bridge overtopped, flood spills over both banks	513	T3-01_2613	C-022-T3_01	Both
		Road	4259 COPPIN RD	35	326344.51	5353361.08	0.07	0.48	0.03	Coppin Rd overtopped	513	T3-1.1_8	MO-T3.1_01	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.08	0.77	0.06	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.07	0.96	0.07	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.08	0.00	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Bridge	1901 MOUNTAIN RD	47	325769.40	5354315.21	0.13	1.26	0.16	Private pedestrian bridge overtopped, flood spills over both banks	490	T5-01_545	B-067-T5_01	Both
		Bridge	1941 MOUNTAIN RD	50	325628.93	5354252.34	0.05	0.64	0.03	Private pedestrian bridge overtopped, flood spills over both banks	490	T5-01_731	B-030-T5_01	Both
		Culvert	2080 HIGHWAY 61	56	325287.46	5353842.17	0.04	1.09	0.04	Private crossing overtopped	512	T5-01_1455	c-033-T5_01	Both
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	0.84	0.59	0.50	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Driveway	169 LITTLE NORWAY RD	67	322817.76	5351545.54	0.13	0.37	0.05	Flows spill over the left bank and flooded the private driveway	553	T5-01_6749		Left
		Ancillary Building	169 LITTLE NORWAY RD	69	322754.24	5351527.88	0.16	0.05	0.01	Flows spill over the left bank and flooded the ancillary building/temporary trailer	553	T5-01_6830		Left
		Road	1950 GREGOR RD	71	325438.75	5353094.06	0.04	1.24	0.05	Gregor Rd overtopped	512	M-06_2033	B-005-M_06	Both
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.21	0.78	0.16	Private pedestrian bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.02	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.87	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.05	0.00	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.16	0.00	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	81	325984.43	5351677.03	0.07	1.11	0.08	Culvert overtopped	556	T6-01_1719	C-043-T6_01	Both

Lakehead Region Conservation Authority
 Mosquito Creek Floodplain Mapping Update Study, 2019
 Appendix L. Infrastructure Located Within the Flood Hazard Limit

Critical Flood Criteria: >0.3m, >1.7 m/s, depth × velocity > 0.4 m²/s

Shaded cells indicate infrastructure that exceeds Critical Flood Criteria (red font indicates exceeded parameter).

Flood Event	Flow at Confluence with Kaministiquia River (m ³ /s)	Structure Type	Address	Structure ID	UTM		Depth (m)	Velocity (m/s)	Depth × Velocity (m ² /s)	Comments	Map Sheet	HEC-RAS Model Station	HEC-RAS Structure ID	Bank
2 Year	5.4	Bridge	1030 BROOKVIEW PL	3	326940.45	5355622.69	0.07	0.26	0.02	Private pedestrian bridge overtopped	469	T1-01_950		Both
		Culvert	955 MOUNTAIN RD	6	328985.73	5355701.66	0.07	0.61	0.04	Spill over a private crossing	471	T2-03_882		Both
		Bridge	FORT WILLIAM COUNTRY CLUB	15	328141.36	5355092.69	0.31	0.77	0.24	Private pedestrian bridge overtopped, flood spills over both banks	471	T2.1-01_69		Both
		Culvert	FORT WILLIAM COUNTRY CLUB	19	327900.37	5354721.69	0.18	0.11	0.02	Private culvert overtopped, flood spills over both banks	492	T2.1-02_417	C-052-T2.1_02	Both
		Driveway	FORT WILLIAM COUNTRY CLUB	20	327852.91	5354696.36	0.09	1.41	0.13	Private driveway overtopped, flood spills over both banks	492	T2.1-02_473	C-053-T2.1_02	Both
		Driveway	3290 FEAVER RD	28	327691.94	5354250.35	0.09	0.33	0.03	Private driveway overtopped, flood spills over both banks	492	T2.1-02_1022	C-059-T2.1_02	Both
		Driveway	4279 COPPIN RD	40	326325.64	5353315.26	0.06	0.69	0.04	Private driveway overtopped, flood spills over both banks	513	T3-1.1_59	MO-T3.1_01	Both
		Driveway	4289 COPPIN RD	41	326333.32	5353300.97	0.01	0.87	0.01	Private driveway overtopped, flood spills over both banks	513	T3-1.1_73	MO-T3.1_01	Both
		Ancillary Building	4299 COPPIN RD	43	326321.96	5353234.91	0.06	0.00	0.00	Spill over the left river bank, and impact on the ancillary building	513	T3-1.1_138		Left
		Road	LOCH LOMOND ROAD	57	324953.28	5353846.36	0.62	0.48	0.30	Loch Lomond Rd overtopped at low point (lose to Hwy 61, north of the culvert with the creek)	511	T5-01_1959	C-034-T5_01	Both
		Bridge	5200 LOCH LOMOND RD	73	325050.96	5352565.29	0.15	0.64	0.10	Private pedestrian bridge overtopped, flood spill over both banks	534	M-06_2810	B-006-M_06	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	76	325705.84	5351846.58	0.01	0.07	0.00	Pond berm, also function as walkway, get overtopped	556	T6-01_1370	S-040-T6_01	Both
		Lot	1855 LOCH LOMOND RD	77	327027.99	5354107.17	0.86	0.00	0.00	Spill over the left embankment of the farm pond	556	T6-01_1378		Left
		Driveway	1855 LOCH LOMOND RD	78	325822.40	5351801.86	0.03	0.01	0.00	Pond berm, also function as driveway, get overtopped	556	T6-01_1501	S-041-T6_01	Both
		Culvert	Unknown Street #, LOCH LOMOND ROAD	79	325929.53	5351697.61	0.12	0.77	0.09	Pond berm, also function as walkway, get overtopped	556	T6-01_1640	S-042-T6_01	Both