Kawartha Conservation

Miskwaa Ziibi River Floodplain Mapping Study
Final Report

February 29, 2024

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WE 23058

Mr. Matthew Mantle
Director, Planning and Development Services
Kawartha Conservation
277 Kenrei Road
Lindsay, ON
K9V 4R1

Dear Mr. Mantle:

RE: Miskwaa Ziibi River Floodplain Mapping Study – *Draft Report*

1. Introduction

Water's Edge was authorized by the Kawartha Conservation (KC) to conduct flood hazard mapping for the Miskwaa Ziibi River in the Municipality of Trent Lakes. This is a summary report of this mapping project, which was completed according to the RFP issued by KC (dated November 2023) and the proposal submitted by Water's Edge, dated November 17, 2023.

2. Streams Mapped

The following watercourse was included in this project:

- Miskwaa Ziibi River – 4.5 km

3. Guidelines Followed

The floodplain mapping was done in accordance with the following Provincial and Federal guidelines:

- *MNR (2002). Technical Guide – River & Stream systems: Flooding Hazard Limit. Ontario Ministry of Natural Resources, Water Resources Section, Peterborough, Ontario, 2002.*

- *Natural Resources Canada (2019). Federal Hydrologic and Hydraulic Procedures for Flood Hazard Version 1.0. Natural Resources Canada, 2019. (https://doi.org/10.4095/299808)*

Moreover, the following documents were also consulted for general conformity:

- *Conservation Ontario (2005). Guidelines for Developing Schedules of Regulated Areas. October 2005.*

- *MNR (1986). Flood Plain Management in Ontario – Technical Guidelines. Ontario Ministry of Natural Resources, Conservation Authorities and Water Management Branch, Toronto.*

- *Natural Resources Canada (2019). Federal Geomatics Guidelines for Flood Mapping Version 1.0. Natural Resources Canada, 2019. (https://doi.org/10.4095/299810)*

- *Natural Resources Canada (2018). Case Studies on Climate Change in Floodplain Mapping Volume 1. Natural Resources Canada, 2018. (https://doi.org/10.4095/306436)*

- *MMAH (2020). Provincial Policy Statement, 2020 – Under the Planning Act. Ontario Ministry of Municipal Affairs and Housing, Queen's Printer for Ontario, 28 February 2020. (https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf)*

Additionally, as required by the RFP, the following documents were consulted when necessary:

- *Federal Flood Mapping Framework (Version 2.0) (available at https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=308128)*
- *Federal Airborne LiDAR Data Acquisition Guideline (Version 3.1) (available at https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=330330)*
- *Bibliography of Best Practices and References for Flood Mitigation (Version 2.0) (available at https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=308380)*
- *Federal Flood Damage Estimation Guidelines for Buildings and Infrastructure (Version 1.0) (available at https://doi.org/10.4095/327001)*
- *OpenGIS Implementation Specification for Geographic information (#06-103r4) (available at https://www.ogc.org/standards/sfa).*
- *Technical Guide for Great Lakes – St. Lawrence River Shorelines, Flooding, Erosion and Dynamic Beaches (2001) for the Great Lakes, St. Lawrence and interconnecting channels. Ontario MNR.*
- *Technical Guide for Large Inland Lakes Shorelines (1996). Ontario MNR.*

To ensure maps can be used for regulatory purposes, the Province's technical guidance, standards and policies will take precedence where any conflicts arise.

We have also followed the official manuals of all models used (HEC-HMS and HEC-RAS) and contemporary industry standards.

4. Overview of the Project

The main three steps of floodplain mapping are (a) flow estimation, (b) flood level calculation, and (c) flood line plotting. For this project, we have estimated the flood flows via hydrologic modeling using the HEC-HMS model, calculated the flood levels via hydraulic modeling using the HEC-RAS model, and then plotted the flood lines against the LIDAR topography using RAS Mapper and GIS software.

The modeling was done for a total of twelve (12) storm events: 2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios (high emission, mid and end of century projections).

It was found that the Regional or Timmins Storm produced higher flows and flood levels than the 100 year storm event. Therefore, Timmins Storm was taken as the governing flood event.

This summary report includes background information of the watershed, hydrologic modeling, hydraulic modeling, and floodplain delineation.

There is no existing flood hazard mapping for this watercourse.

A one-zone floodplain policy approach is assumed for this study. All models and mapping produced under this project were done on the one-zone policy approach.

5. Background Review and Data Collection

5.1 Information Collected and Reviewed

We have completed this project in accordance with the approved project Terms of Reference. We have collected and reviewed all available background materials and data. Specifically, it includes data sources for the analysis such as the following:

- Geospatial data: KC
- LiDAR: KC

- Soil data: KC – same as Soil survey index (GeoHub)
- Landcover: KC – same as SOLRIS 3.0
- IDF curves: Environment Canada and Climate Change (ECCC)
- Climate Change projection: Environment Canada and Climate Change (ECCC)
- Time of concentration: HEC-HMS manual/website
- Watershed delineation: HEC-HMS
- Initial stream shapefile: OHN watercourse
- SCS curve number: Developed internally in HEC-HMS
- Impervious data: estimated based on aerial photographs
- Bridge/culvert data – KC
- Cross-section data – KC
- Water level data of Pigeon Lake at Buckhorn Lock – KC
- Discussions with KC

5.2 Datum

5.2.1 Vertical Datum:

All data was surveyed and modelled using CGVD2013 datum.

5.2.2 Horizontal Datum:

CSRS(NAD83) UTM Zone 17N was used for the horizontal datum/projection.

5.3 Structure and Cross-sections

A total of two (2) road crossings (bridge/culvert) and three (3) weirs were surveyed by KC (or their contractor) during the summer of 2023. We scrutinize the collected information to ensure that it was sufficient for hydraulic modeling. The crossings are:

- Highway 36
- Weir 1
- Weir 2
- Weir 3
- Northern Avenue

Many cross-sections of the river were also provided by KC, which supplemented the LiDAR in HEC-RAS to provide more accurate bathymetry at road crossings and elsewhere.

5.4 Terrain Pre-processing

The following data was provided by KC, with the following specifications:
Geospatial Reference Systems
Projection system: UTM Zones 15, 16, 17 and 18
Geometric reference system: Ex.: NAD83(CSRS)
Height reference system: CGVD2013
Geospatial File Formats: Gridded raster files must be in the GeoTIFF format. Vector files must be in the Esri Shapefile, Esri File Geodatabase or Geopackage format.

The LIDAR data provided by KC has the following technical specifications:
Minimum aggregate nominal pulse density >= 8.0 pls/m2
The point cloud data shall meet the following accuracy benchmarks:
Non-Vegetated Vertical Accuracy (NVA): 95% Confidence level <= 9.8 cm
Vegetated Vertical Accuracy (VVA): 95th percentile <= 14.7 cm

The digital terrain model (DTM) used for watershed delineation was based on LiDAR data provided by KC. Additional manipulations of the DTM were necessary to prepare the surface for use in the hydrologic model. The LIDAR was resampled in GIS to a reduced 5m horizontal and 0.5m vertical cell size in order to allow reasonable computation. Following this, the rest of the pre-processing was completed in HEC-HMS (version

4.11). The first step was to ensure that flow paths were accurately represented in the DTM. This was accomplished using a shapefile of creek centerlines (KC/OHN watercourse) and burning in a channel through structures such as bridges and culverts (info/layer provided by KC). The next step was to fill in depressions without apparent outlets. The catchment was then delineated.

This step ensures that every cell within the watershed contributes flow to the outlet and that there is no depression storage to attenuate peak flows, resulting in a more conservative representation of surface conditions. Following the above steps, a linear workflow was followed that started with creating a flow direction raster that indicated which direction a given cell would drain to. Next, a flow accumulation raster was created that represented the number of upstream cells contributing to a given cell.

A stream network was then defined based on the minimum number of drainage areas. This was done for reasonable values to achieve a number of subcatchments suitable for each size of river. The subcatchments were delineated based on the flow change locations and to provide a logical output into the hydraulic model.

6. Hydrologic Modelling

6.1 Overall Methodology

Based on a review of available data and their limitations and in consultation with KC, it was decided that a lumped modelling approach will be taken to estimate the design flows. Thus, the entire watershed will be treated as a single unit in the hydrological model (HEC-HMS), which would require the parameters to reflect the combined effect of watershed's characteristics (topography, soil, vegetation, and land use) as well as numerous inland lakes, watercourses, and wetlands (especially their routing and flood attenuation functions). ***Version 4.11*** of HEC-HMS Model was used.

It was also decided that the results will be compared to past studies and information from other areas to check their reasonableness.

The approach yielded design flows at only one point, i.e., the outlet of the watershed. This flow was used throughout the whole length of the river/creek that was modelled in HEC-RAS. Since the drainage area associated with this lower-most reach was only about 5% of the whole watershed, the flows at the upper-most end of this reach were also only marginally lower (less than 5%) than the outlet flows. This justifies the use of a single flow throughout the entire reach.

6.2 Model Inputs

6.2.1 Catchment characteristics

In the absence of long-term streamflow data in this area, the single-event hydrologic modelling approach was taken to estimate peak flood flows corresponding to specified storm hyetograghs. The HEC-HMS model of United States Army Corps of Engineers (USACE) was chosen, as it is widely used worldwide and in Canada. It also offers many options/modules for various hydrologic phenomena.

A new HEC-HMS model was set up for the Miskwaa Ziibi River watershed. Given appropriate pour points (or catchment outlets), HMS can delineate the basin and sub-basins based on the LIDAR-based topography.

Following the preprocessing steps, HEC-HMS calculates many parameters based on the surface properties. Some of the pertinent parameters are shown in **Table 1** below. Information on Nogies Creek, which is being studied concurrently, is also included for comparison.

Table 1 Watershed Characteristics

	Miskwaa Ziibi River Watershed	Nogies Creek Watershed
Drainage Area (km2)	201.01	187.62
Longest Flowpath Length (km)	72.98	69.44
Longest Flowpath Slope (m/m)	0.00148	0.00135
Centroidal Flowpath Length (km)	38.77	28.84
Centroidal Flowpath Slope (m/m)	0.00096	0.00098
10-85 Flowpath Length (km)	54.73	52.08
10-85 Flowpath Slope (m/m)	0.00118	0.00119
Basin Slope (m/m)	0.11285	0.11479
Basin Relief (m)	128.53	124.26
Relief Ratio	0.00176	0.00179
Elongation Ratio	0.21922	0.22259
Drainage Density (km/km2)	0.39933	0.24946

A review of the Official Plan (OP) of Township of Galway-Cavendish and Harvey, approved by the Municipality of Trent Lakes, does not indicate significant development in the foreseeable future (Township of Galway-Cavendish and Harvey, 2011). Therefore, the current land use was used in the hydrologic modelling.

6.2.2 Precipitation data and design storms

Once the basin had been set up in the model, the precipitation data were entered. The rainfall and IDF curves at Peterborough Airport were collected from ECCC website. They were used to obtain the hyetographs for the area of interest, and the ordinates were used to determine rainfall volumes for the SCS distribution (**Table 2**).

Table 2 Rainfall Depth for Various Modelling Events

Event	AEP	total rainfall	areal reduction factor	adjusted rainfall
	(%)	(mm)		(mm)
2 year	0.5	49.03	0.94	46.09
5 year	0.2	65.02	0.94	61.12
10 year	0.1	75.61	0.94	71.08
20 year	0.05	85.77	0.94	80.62
50 year	0.02	98.92	0.94	92.99
100 year	0.01	108.77	0.94	102.25
200 year	0.005	118.59	0.94	111.48
500 year	0.002	131.54	0.94	123.65
1000 year	0.001	141.33	0.94	132.85
Timmins	n/a	193.00	0.84	162.12
100ccHiEmMidCen	n/a	126.18	0.94	118.61
100ccHiEmEndCen	n/a	142.49	0.94	133.94

For SCS design storms, 24hour storms were used for the SCS method because past experience indicates that the 24 hour storms yield conservative (higher) flows compared to shorter duration storms. Considering the size and shape of the watershed, an areal reduction factor of **0.94** was used for all AEP storm events, as per MNR (2002) Guidelines (Figure D.6 Areal Reduction Curves, page 40). For the Timmins storm, an areal reduction factor of **0.84** was used (Table D.5 Timmins – Areal Reduction, Page 36).

The modeling was done for a total of twelve (12) storm events: 2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios (high emission; mid and end of century projections).

6.2.3 Climate Change Considerations

The 2020 Provincial Policy Statement of Ontario (MMAH, 2020) states: “Planning authorities shall prepare for the impacts of a changing climate that may increase the risk associated with natural hazards.” (Section 3.1.3).

NRCan (2018) encourages incorporating the effect of future climate change on floodplain mapping. They did not prescribe any specific methodology but have presented three case studies that are typical of the emerging practice. The methodologies presented are as follows:

1. Continuous long-term simulation (HSPF) with projected future climatic variables.
2. Continuous long-term simulation (VIC) with projected future climatic variables and see level rise.
3. Single event simulation (HEC-HMS) with projected future IDF curves.

The use of projected IDF curves is simple, suitable for single event hydrologic modeling, and cost effective. Moreover, such information is readily available from several sources in Ontario. This approach has been used in this project.

For estimating the 100 year hyetograph under future climatic condition, we used the CIMP6 based, climate-scaled IDF curves at Peterborough Airport, available from EC website (https://climatedata.ca/explore/variable/?coords=62.5325943454858,-98.48144531250001,4&delta=&dataset=cmip6&geo-select=&var=idf&var-group=station-data&mora=null&rcp=ssp126&decade=2040s&sector=). For different emission scenarios and time scale, we calculated the following multipliers (**Table 3**):

Table 3 Climate Scenarios

existing	future CMIP6	future CMIP6
1971_2006	2051_2080	2071_2200
medium emission	1.07	1.11
high emission	1.16	1.31

It appears that the projected increase at Peterborough is small compared to other locations in Ontario. Therefore, the high emission scenarios were chosen for this project. The mid-century (2051-2080) and the end of century (2071-2200) hyetographs can be obtained by multiplying the current 100 year hyetograph by 1.16 and 1.31 respectively.

These two future projections will be roughly equivalent to the existing 350 and 1000 year events. We anticipate that this timeframe will roughly correspond to significant updating of IDF curve as well as the next iteration of flood mapping update.

6.2.4 SCS Curve Number Grid

A curve number grid was created by in-house staff using Q-GIS to assign a curve number to each raster cell based on the soil and land cover characteristics at that point. Curve numbers were selected based on the TR-55 document from the NRCS (NRCS, 1986). Both Provincial Landcover and Open Canada Landcover were considered. It was determined that the Provincial Landcover dataset was similar to the

NRCS lookup table and best represented different infiltration classifications. This ensures accurate geospatial representation of runoff characteristics. Soil hydrologic characteristics were defined using the Ontario Soil Survey Index. The landuse categories were assigned based on the NRCS landuse classifications to facilitate the assignment of curve numbers.

Following the preparation of the soil and landuse data (obtained from KC), the layers were combined to create a layer that included both landuse and soil data. A lookup table was created to assign a curve number based on the land use type and the hydrologic soil group. The lookup table is shown in **Appendix A**. The output yielded a curve number raster that was used to determine a weighted-average curve number for the watershed, which was then recorded in the attribute table of the catchment shapefile.

6.2.5 Percent Impervious

Information pertaining to imperviousness was not available. It was therefore visually estimated from aerial photographs. It was conservatively estimated to be at 1%.

Curve Number (CN) and associated parameters are given in **Table 4**. Information on Nogies Creek, which is being studied concurrently, is also included for comparison.

Table 4 Curve Number and Other Parameters

	Miskwaa Ziibi River Watershed	Nogies Creek Watershed
Drainage Area (km2)	201.01	187.62
CN	72.2	70.1
Initial Abstraction (mm)	19.6	21.7
% Impervious	1	1
Time of Concentration (hour)	20	19.25
Storage Coefficient (hour)	20	19.25
Duration of Simulation (hour)	144	144
Time Step (min)	15	15

7. HEC-HMS Model

The main components of the hydrologic model are the loss method and the transform method. Each of these components are discussed below. Initial estimates of each parameter are shown in **Appendix A**.

Version 4.11 of HEC-HMS Model was used.

The modeling was done for a total of twelve (12) storm events: 2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios.

7.1 Loss Method

The loss method selected was the SCS curve number approach due to its relatively small data requirements and ease of calibration. The development of the curve number grid has been described above. In addition to the curve number and percent impervious areas determined previously, initial abstraction was also calculated automatically in HEC-HMS. This calculation used the SCS method:

$$I_a = \left(0.2 * \frac{1000}{CN} - 10\right) * 25.4 = \text{(mm)}$$

7.2 Transform Method

The Clark Unit Hydrograph was used as the transform method in the model. This method uses linear reservoir storage calculations to determine how the input hydrograph is translated and attenuated through a subcatchment. The two input parameters needed for these calculations are the time of concentration and a storage coefficient. The initial estimate of the time of concentration in each subcatchment was determined using the following equation recommended by the HEC-HMS manual.

$$Tc = 2.2\left(\frac{L \cdot Lc}{\sqrt{S_{10-85}}}\right)^{0.3}$$

Where T_c is the time of concentration (hrs), L is the longest flow path (mi), Lc is the centroidal flow path (mi), S_{10-85} is the average slope of the flow path represented by 10 to 85 percent of the longest flow path (ft/mi). The SI units were converted to imperial units while using the above equation. The storage coefficient is dependent on the time of concentration and was calculated using the following equation recommended in the HEC-HMS manual:

$$\frac{R}{R + Tc} = 0.5$$

Where R is the storage coefficient. These calculations were calculated internally in HEC-HMS.

7.3 Flow Comparison

Suitable data for meaningful calibration was not available in this watershed, as is the case for most small catchments. Under such circumstances, indirect methods are employed to gain confidence in hydrologic and hydraulic models.

In this study, the calculated flows (for Timmins Storm) were compared with the Creager Envelop Curve. This curve with a coefficient of 30 fits best to Canadian data (Watt et al., 1989). Values for both Nogies Creek and Miskwaa Ziibi River were plotted as “Kawartha” in this figure.

The comparison is shown in **Figure 1**. It appears that the computed flows are well below the Creager Curve and the observed large floods (Canadian Extremes) used to derive this curve. This curve is considered the upper limit of floods in Canada. The data from our study also line up well with the observed large floods in Ontario (Ontario Extremes), which were taken from MNRF (2014). Considering all, we conclude that the estimated flows for this study are reasonable.

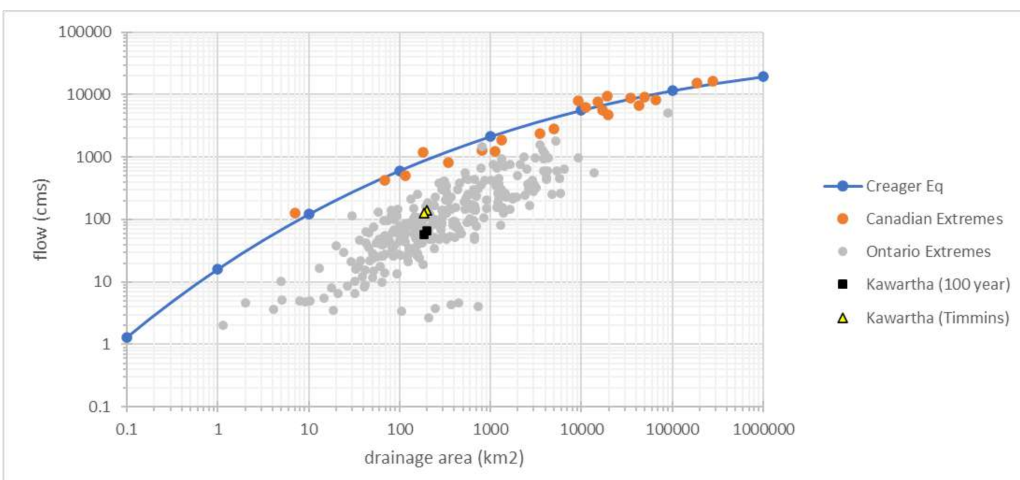

Figure 1 Flow Comparison

7.4 Sensitivity Analysis of Flow

In addition to flow comparison within the Creager framework, we also conducted a sensitivity analysis of the computed flows to important parameters (initial abstraction, time to peak and the curve number). It was found that the flow was mildly sensitive to initial abstraction and time to peak (**Figure 2**). Even a 40% variation causes less than 15% change in computed flows. However, the flows were very sensitive to the curve number (**Figure 3**). Since CN was based on high-quality soil and land cover information, it can hardly be considered a 'free' parameter that can or should be adjusted during calibration. We therefore conclude that the estimated values of the calibration parameters (initial abstraction and time to peak) are reasonable and will not greatly influence the computed flows.

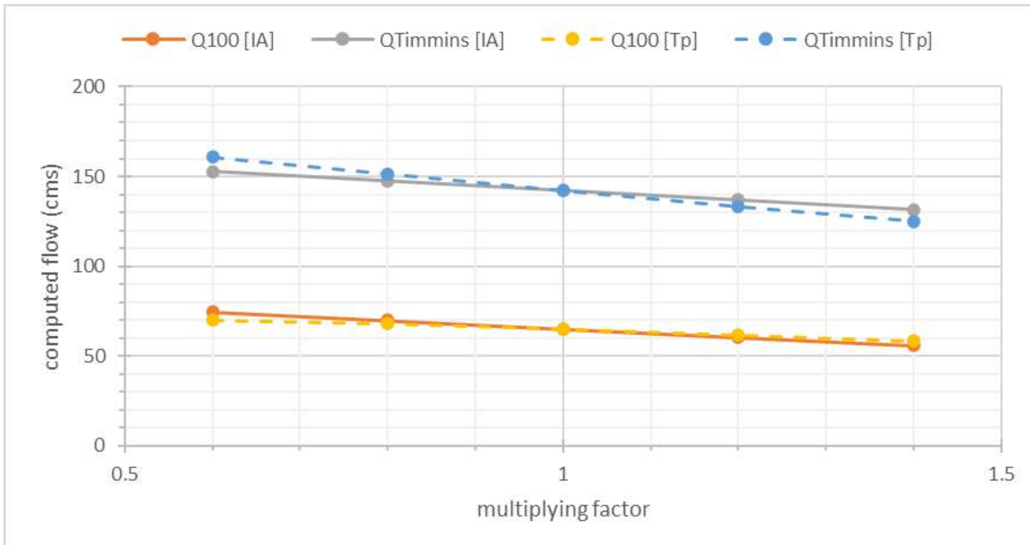

Figure 2 Sensitivity of Flow to IA and Tp

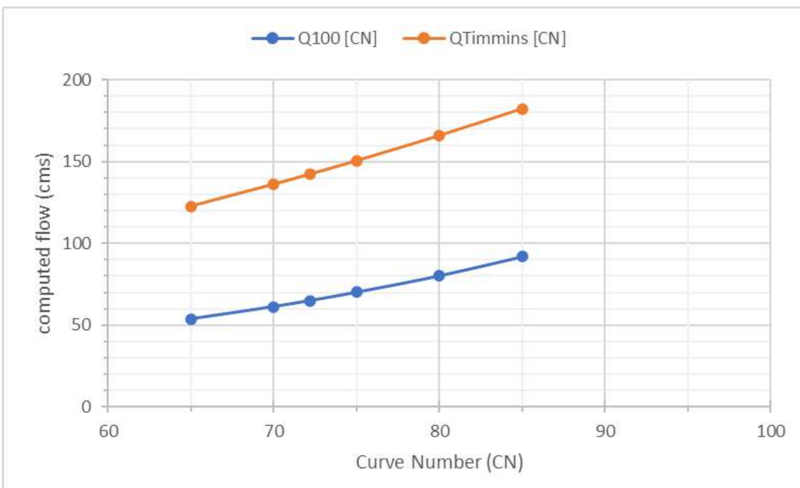

Figure 3 Sensitivity of Flow to CN

7.5 Design Flows for Hydraulic Modeling

The primary purpose of the hydrological model is to determine flow rates for use in hydraulic modelling. **Table 5** displays the HEC-HMS outputs used for hydraulic modelling. Again, information on Nogies Creek, which is being studied concurrently, is also included for comparison.

Table 5 Peak Flow and Runoff Summary

	storm	Miskwaa Watershed			Nogies Watershed		
	depth	peak flow	runoff	runoff	peak flow	runoff	runoff
	(mm)	(cms)	(m3)	(mm)	(cms)	(m3)	(mm)
2 year	46.09	10.0	1216200	6.05	7.8	919000	4.90
5 year	61.12	21.5	2585200	12.86	17.7	2068000	11.02
10 year	71.08	30.7	3675700	18.29	25.8	3005000	16.02
20 year	80.62	40.4	4827500	24.02	34.5	4006000	21.35
50 year	92.99	54.1	6448000	32.08	47.0	5430000	28.94
100 year	102.25	65.0	7738700	38.50	57.0	6572000	35.03
200 year	111.48	76.4	9080800	45.18	67.4	7766000	41.39
500 year	123.65	92.0	10922100	54.34	81.9	9413000	50.17
1000 year	132.85	104.2	12360300	61.49	93.2	10704000	57.05
Timmins	157.26	142.2	16331400	81.25	129.2	14290000	76.16
100ccHiEmMidCen	118.61	85.5	10150400	50.50	75.8	8722000	46.49
100ccHiEmEndCen	133.94	105.7	12533000	62.35	94.6	10860000	57.90

8. Hydraulic Modelling

Following current mapping guidelines, HEC-RAS manuals, and the contemporary industry standards, a 1D HEC-RAS model was set up. The design flows determined from the HEC-HMS model were used as the input to the HEC-RAS model. The purpose of the hydraulic model is to determine the water surface elevations (WSEL), energy grade, velocity, and other hydraulic parameters corresponding to design flows. The results of this modelling exercise will determine the elevations that will be used for flood plain mapping. ***Version 6.4.1*** of HEC-RAS Model was used.

8.1 Input Data

The data needed to create an accurate hydraulic model include channel geometry, structure geometry (i.e., bridges and culverts), design flow rates, Manning's roughness coefficients for the main channel and floodplains, expansion and contraction coefficients, and the boundary conditions.

8.1.1 Geometry and Structures

A finer grid 1m horizontal and 0.5m vertical cell size was used for hydraulic modeling. In total, 67 cross-sections were used. The cross-sections generated this way were further modified based on field measurements provided by KC.

The location and alignment of river cross-sections, as well as the spacing between them, were based on engineering judgment as related to the expected flow conditions during high flood events.

Appendix B shows a schematic of HEC-RAS models.

To improve the accuracy of the underwater portion of the channel cross-section, adjustments were made based on field observations provided by KC. To correct the geometry data and accurately represent the low flow channel, the model cross-sections were manually adjusted to match the channel inverts that were surveyed at each structure. While the entire low flow channel geometry is not as precise as the rest of the terrain data, the small differences in conveyance will not have a significant impact on the results or floodplain maps, as the flow within the low flow channel is a small fraction of the regulatory flows used to define the floodplain.

For each structure in the model, expansion and contraction reaches were included to assess the energy losses associated with flow entering and exiting a structure, caused by changes in geometry between cross-sections and at structures. The coefficients are higher when the transition is more abrupt, such as at crossings. The contraction and expansion coefficients used for crossings were 0.3 and 0.5, respectively, and for all other cross-sections, 0.1 and 0.3 were used. These values were recommended in the HEC-RAS manual for typical bridge sections with subcritical flow. The expansion and contraction reach lengths were determined by comparing the bankfull width of the channel to the bridge opening size, following the guidelines in the HEC-RAS manual. The use of expansion and contraction reaches (i.e., two cross-sections up- and downstream of structures) ensures that flow transitions are gradual as the flow narrows when approaching a structure and expands after one. The cross-sections immediately adjacent to the structures typically have more abrupt transitions as the flow is constrained by a culvert.

Ineffective flow areas were used in the model, primarily immediately upstream and downstream of hydraulic structures, so expansion and contraction losses could be accurately modelled. Ineffective flow areas were also used in shallow floodplain with stagnant flow.

When modelling crossings (bridge/culvert/weir), the HEC-RAS manuals were meticulously followed. Deck elevations were taken from the LiDAR for the bridges.

8.1.2 Design Flows

The flow rates were determined from the HEC-HMS hydrologic model. **Table 5** lists the estimated design flows for return periods ranging from 2 to 1000 years and Timmins Storm. Each reach in HEC-RAS can have multiple flows corresponding to multiple events.

The modeling was done for a total of twelve (12) storm events: 2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios.

8.1.3 Manning's Roughness Coefficient

Manning's roughness coefficients will vary based on flood stage and season. Therefore, the values were selected to represent typical summer conditions.

Manning's roughness coefficient (Manning's n) was assigned to the main channel as well as the left and right overbank areas. Estimates of Manning's n were determined by analyzing the reach characteristics including riparian vegetation to determine the most appropriate roughness coefficient from open channel hydraulics (Chow, 1959). The initial values of Manning's n were selected as 0.04 for the main channel and 0.07 for the left- and right-overbank areas, as almost all riparian areas included some trees or dense brush that would provide similar degrees of roughness. For the cross sections largely within the influence of the Pigeon Lake, 0.001 was used as the expected resistance is negligible.

8.1.4 Boundary Conditions

Downstream boundary conditions are needed for HEC-RAS models. Known or estimated water levels are usually used as the downstream boundary condition.

According to Section 4.3 of MNR (2002, p.17-18), for rivers flowing into large lakes, where the high water conditions at the confluence are generated by two independent flood events, the flood standard should be based on the higher of:

- mean annual flood level in the river and/or stream and the flood hazard limit in the connecting channel, (See The Great Lakes – St. Lawrence River System and Large Inland Lakes Technical Guide.)
- the flood hazard limit (Hurricane Hazel, Timmins Storms, observed or the 100 year event) in the mean monthly levels in the connecting channel or lake.

Accordingly, the following boundary conditions have been used for this project:

- For High flow events in the creek (Timmins Storm, 100 year, or higher events), we used the typical high summer lake level (**246.3** m).
- For smaller events in the creek (50 year, or lower events), we used the 1:100 year lake water level (**246.9** m). This level is currently being used by KC for regulation around the lake.

This lake level values for Pigeon Lake were based on our discussion with KC and about 10 years of water level data at Buckhorn Lock (2014-2023).

9. HEC-RAS Model

Once the model was set up, the computed profiles and other parameters were scrutinized to assess whether the model outputs were reasonable. Special attention was given to the computed water levels and energy profiles near road crossings. Adjustments of model parameters, primarily the channel resistance and contraction and expansion coefficients, were made as necessary.

Version 6.4.1 of HEC-RAS Model was used.

Suitable data for meaningful calibration was not available in this watershed, as is the case in most small catchments. Under such circumstances, indirect methods, such as sensitivity analysis, are employed to gain confidence in hydrologic and hydraulic models.

9.1 Sensitivity Analysis

A sensitivity analysis is used to determine the effect that parameters have on the model results. In HEC-RAS, Manning’s n is the primary calibration parameter. The expansion and contraction coefficients can also have a significant impact on model results, but there is a smaller range of reasonable values. To determine the impact of parameter adjustments, the Manning’s n was adjusted up and down by 10%, with corresponding multiplying factors of 0.9 and 1.1. The results are plotted to determine the relationship between the parameter adjustment factors and computer water levels.

Graphical representation of the sensitivity analysis is shown in **Figures 4 and 5**. The slope of each line in the graph represents the influence that the parameter has on water surface elevations.

It was found that the sensitivity of water level to Manning roughness is within the expected range and may be explained by local conditions. For example, at x-3924, the variation of 16 cm may be attributed to the presence of a bridge and a mild slope, where roughness plays a relatively prominent role. At x-1572, the effect of roughness is almost imperceptible because of the steep stream slope. We conclude that the roughness coefficients used in this study are reasonable.

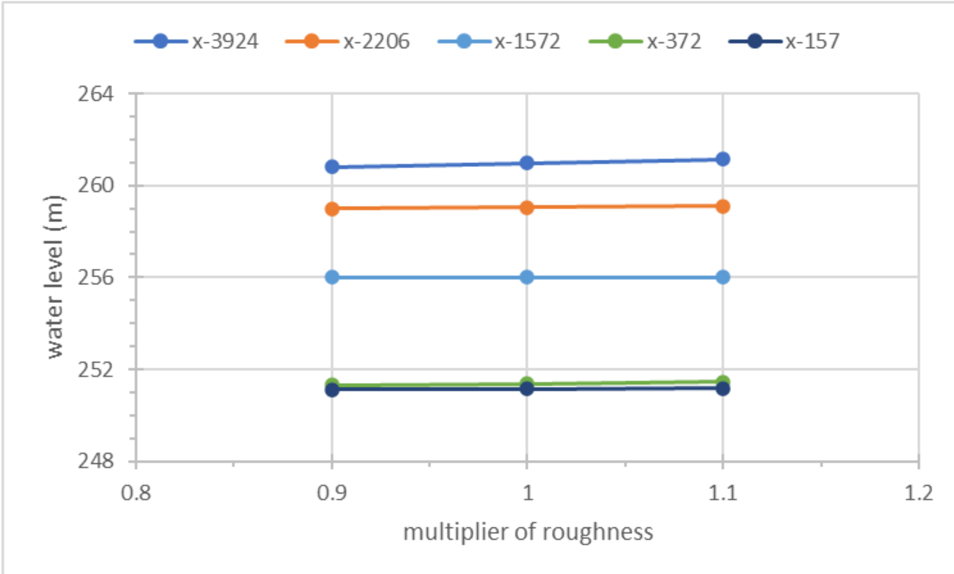

Figure 4 Sensitivity of Water Level to Manning Roughness

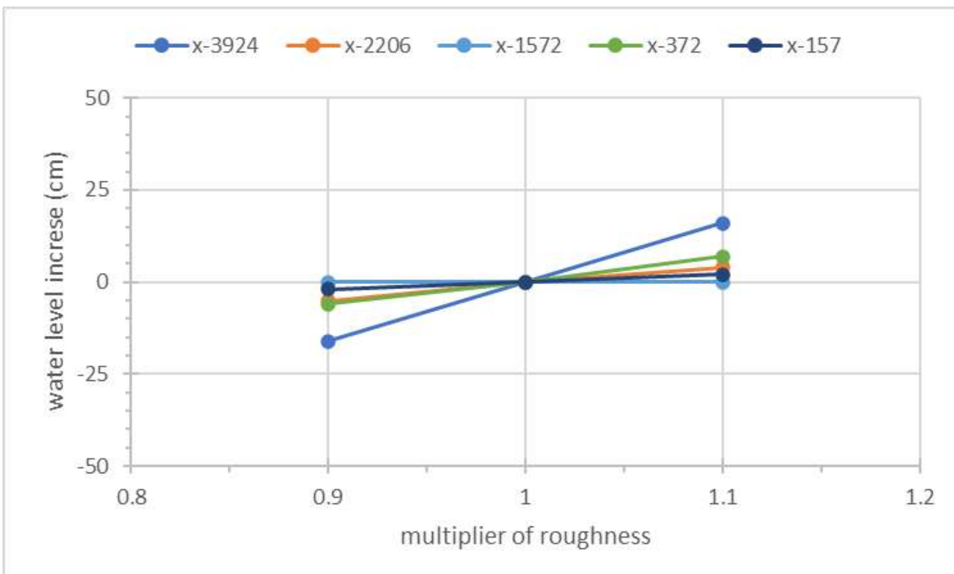

Figure 5 Variation of Water Level Increase with Manning Roughness

9.2 Regulatory Flood Levels (RFLs)

As per Section 2.3 of MNR (2002) guidelines, the regulatory flood in Zone 3, which includes the study area, is the greater of the 1:100 year and Timmins Storm floods.

It was found that Timmins Storm produced higher flows and flood levels than the 100 year storm event.

For the present study, the regulatory flood levels were set equal to the computed water surface elevation as computed from the HEC-RAS models.

As specified in the RFP, the return period flows and the corresponding water levels have been summarized for all storm events (2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios). This is in **Appendix B**. Detailed HEC-RAS output tables are also included.

10. Floodplain Mapping

10.1 Floodline Delineation

Once the RFLs are established, the plotting of flood lines or flood risk limits is a relatively straight forward matter. Given the topographical information in the form of LIDAR, the inundated area below the RFLs can be easily delineated manually or by using automated computer programs.

For this project, KC indicated that they would produce the flood risk maps in-house. As such, we provided them the HEC-RAS model files, which they would use for this purpose.

10.2 Spill Sections

Several spill sections were identified during this study. They were minor in nature and are expected to be contained within close proximity of the floodplain.

10.3 Flood Maps

As indicated above, KC will produce the flood maps in-house.

10.4 Risk Assessment

A Flood Hazard Assessment for the Miskwaa Ziibi River has been done. This includes water surface elevation, flood depth, flood velocity, and depth*velocity analysis.

Output of this exercise consists of large-scale maps. The maps are not included in this report but will be transferred to KC separately.

11. Deliverables

The key deliverables for this project, as per the RFP, include the following:

1. Final Floodplain Mapping with technical appendices [3 hard copies and a PDF]
2. Hydrologic (HEC-HMS) and hydraulic (HEC-RAS) model data files
3. Engineered floodline shape files
4. Record of Public Information Sessions

It is understood that all the data collected, and mapping materials produced under this project will become the property of Kawartha Conservation (KC).

12. Summary and Recommendations

12.1 Summary

The flood hazard mapping for the Miskwaa Ziibi River has been completed. This was done according to the RFP issued by KC (dated November, 2023) and the proposal submitted by Water's Edge, dated November 17, 2023.

The floodplain mapping was done in accordance with applicable Provincial and Federal guidelines.

HEC-HMS model was used to estimate design flows and HEC-RAS model was used to estimate flood levels.

The modeling was done for a total of twelve (12) storm events: 2, 5, 10, 20, 50, 100, 200, 500 and 1000 year storm events; Timmins Storm; two climate change scenarios (high emission; mid and end of century).

It was found that Timmins Storm produced higher flows and flood levels than the 100 year storm event. Therefore, Timmins Storm was taken as the governing flood event.

12.2 Recommendations

Based on the data, modeling, analyses, and results of this study, we recommend the following.

1. The 1D HEC-RAS model built here should be used as the model of record for the purposes of flood plain mapping.
2. A data collection program may be undertaken if more rigorous calibration or validation is envisaged in future. This will include rainfall, stream flow, and water level. This will also be helpful in future analysis of the hydrology and hydraulics of this watershed.
3. Relevant data, analysis, drawings, and reports of all structures (bridge/culvert/weir) should be collected and archived, preferably in digital format.
4. The flood mapping done here may be refined and updated as additional information becomes available.
5. The knowledge generated during this study may be used for the flood forecasting and warning program.

Respectfully submitted,

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Ferdous Ahmed, Ph.D., P. Eng.
Sr. Water Resources Engineer

Asal Montakhab, Ph.D.
River Scientist

Tim Antonio, P.Eng., B.A.Sc.
Water Resources Engineer

Water's Edge Environmental Solutions Team Ltd.

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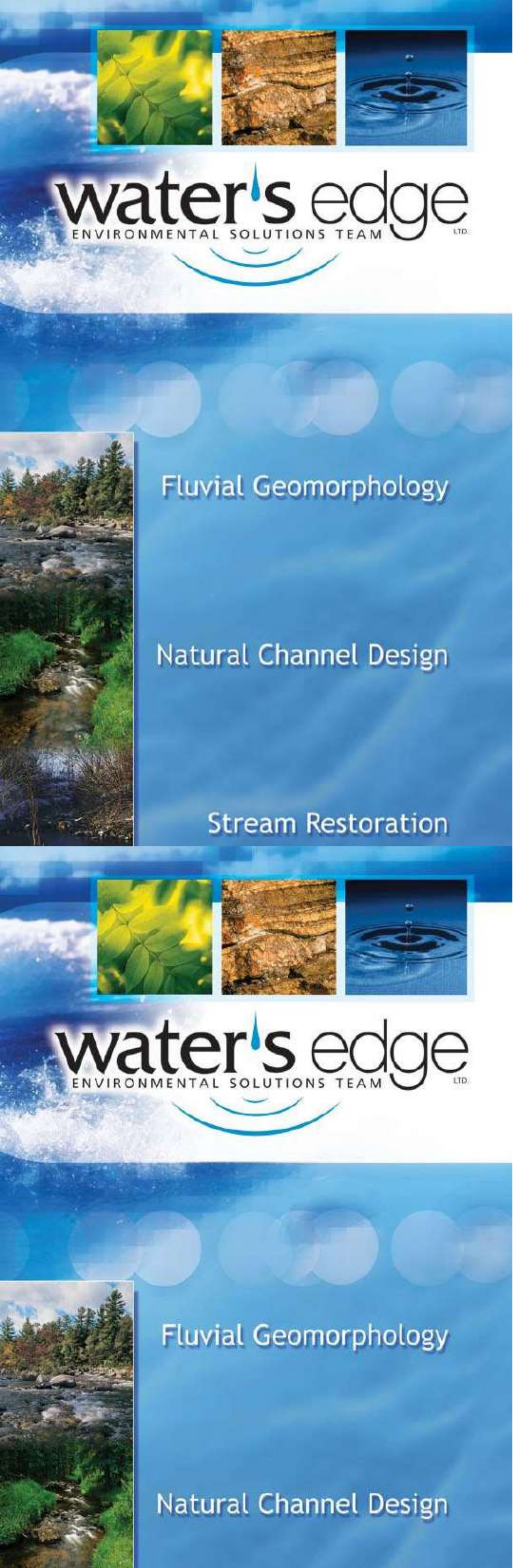


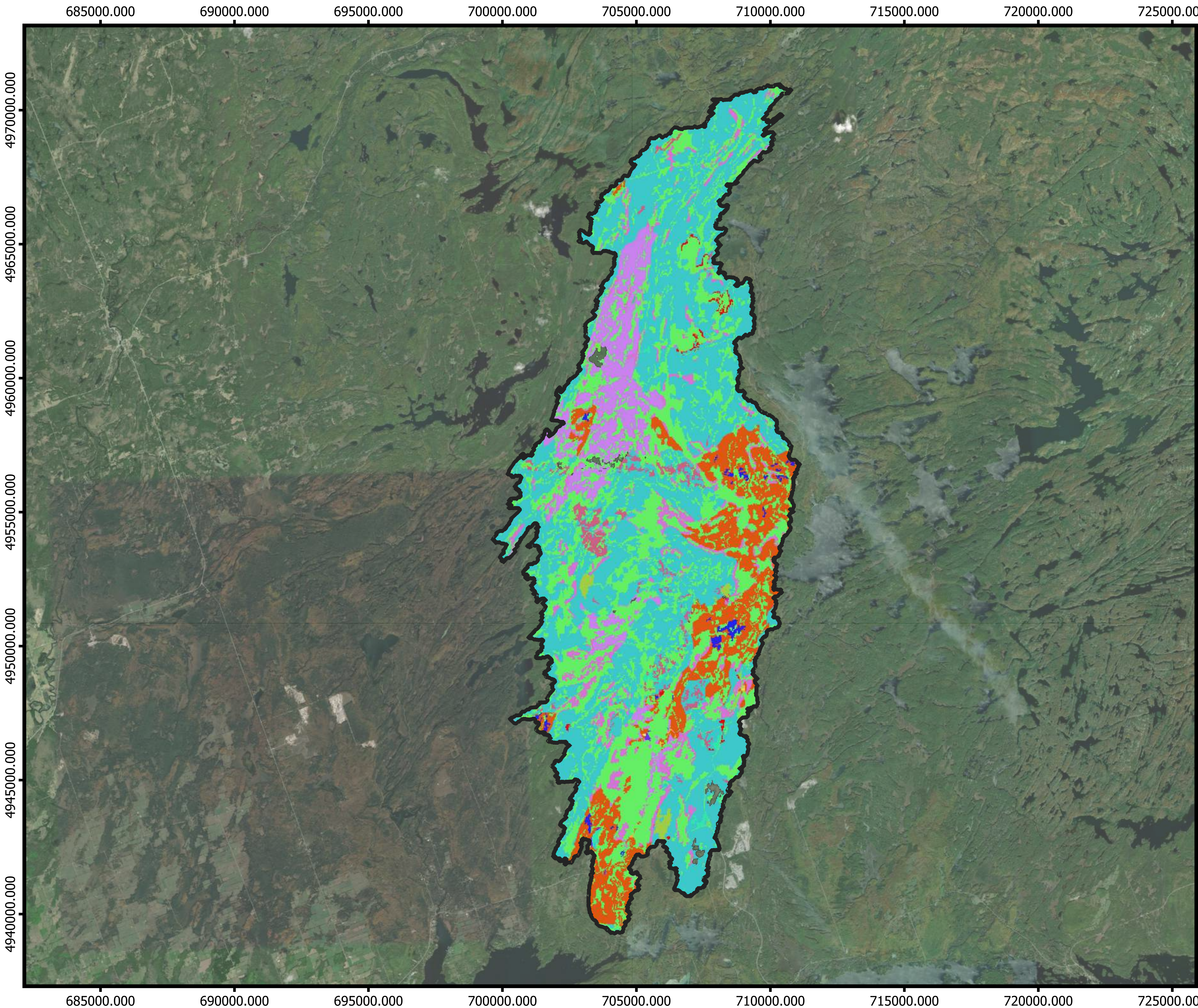
APPENDIX A:

Hydrological Model

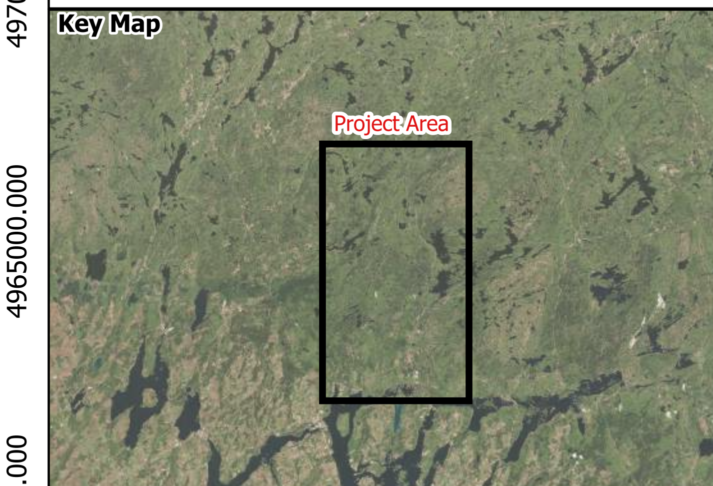
Map 1

Miskwaa Ziibi Watershed

Curve Numbers



Key Map



Legend

Subbasin

Curve Numbers

- 31
- 36
- 39
- 42
- 54
- 60
- 61
- 70
- 74
- 77
- 79
- 80
- 81
- 82
- 85
- 90
- 92
- 98

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water's edge ENVIRONMENTAL SOLUTIONS TEAM LTD.

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Project number: 23058
Date: Feb. 7, 2024

NAD83-UTM Zone 17
Size: 11*17

Scale: 1:140000

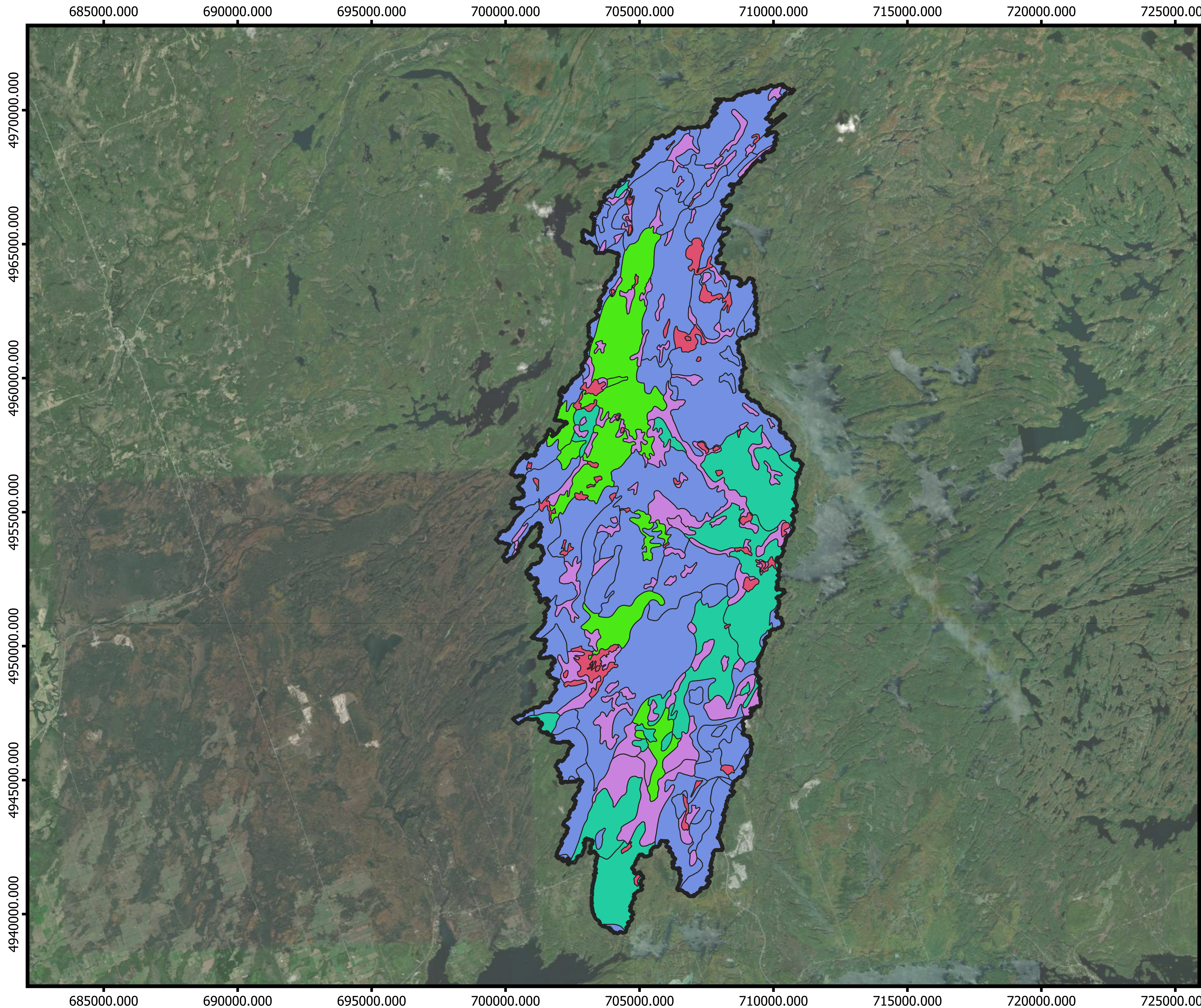
0 2 4 6 8 10 km

N

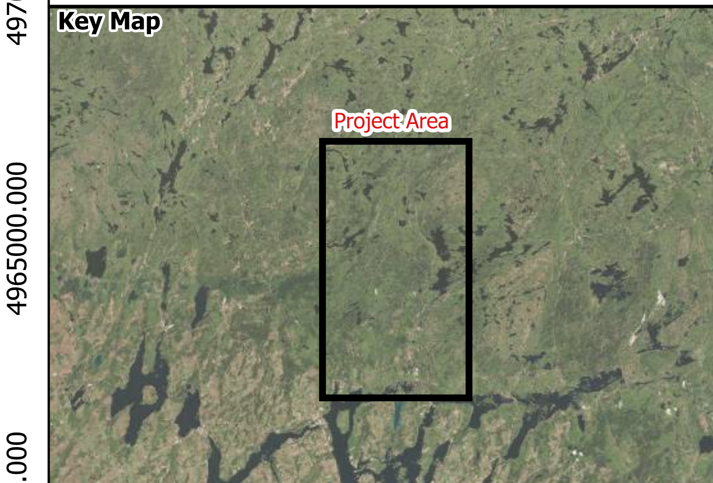
Map 2

Miskwaa Ziibi Watershed

Soil Survey Index



Key Map



Legend

Subbasin

Soil Hydrologic Group Index

- A
- B
- C
- D
- N

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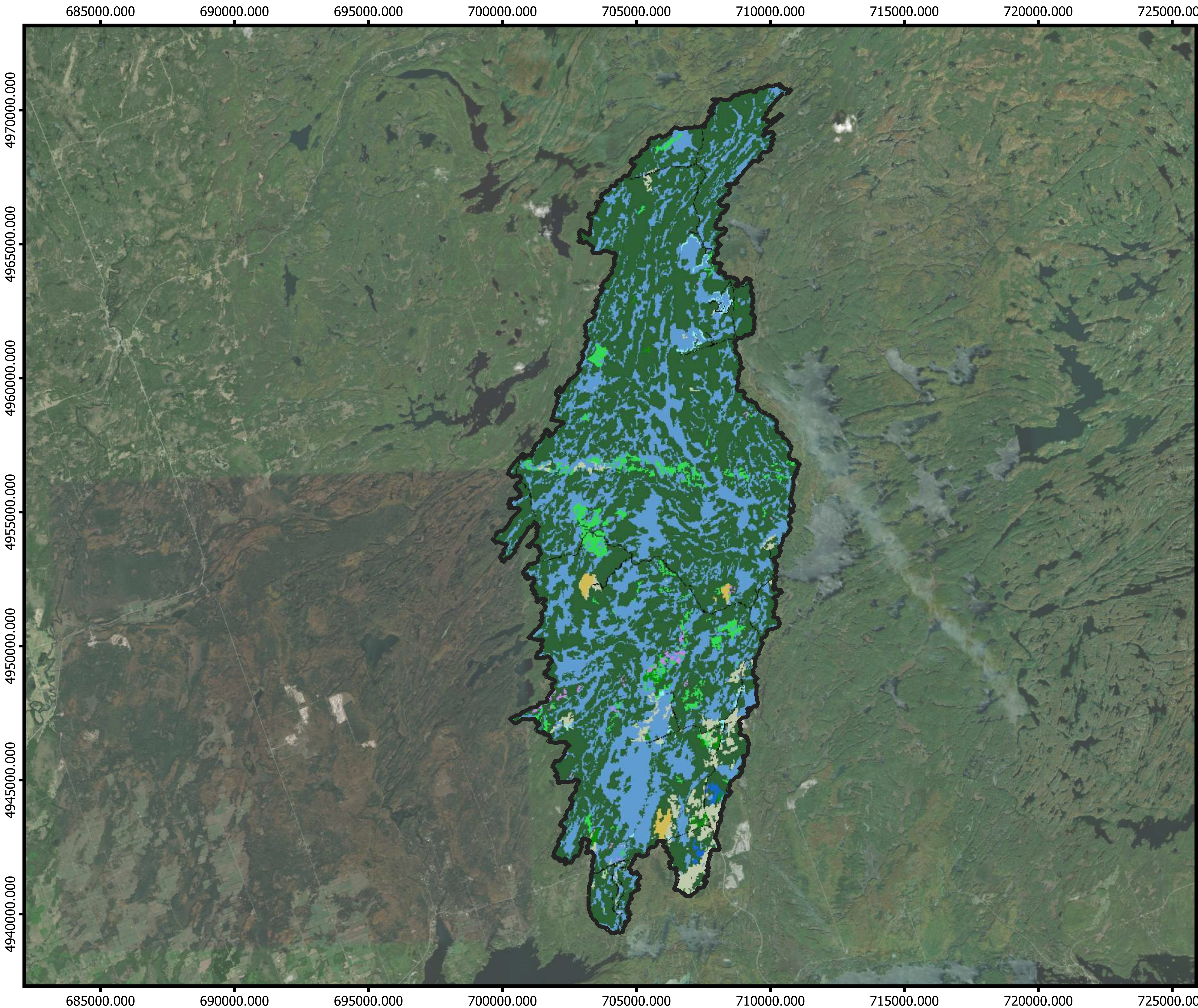
Project number: 23058 Date: Feb. 7, 2024	NAD83-UTM Zone 17 Size: 11*17

Scale: 1:140000

0 2 4 6 8 10 km

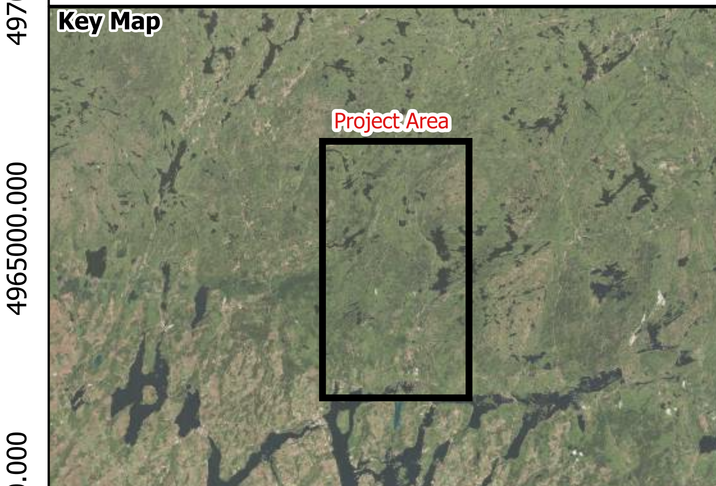
N



Map 3

Miskwaa Ziibi Watershed

Land Use



Legend

Subbasin

Land Use

- Open Cliff and Talus
- Alvar
- Open Bedrock
- Sparse Treed
- Forest
- Open Water
- Row Crops
- Transportation
- Built Up Area - Pervious
- Built Up Area - Impervious
- Undifferentiated

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Project number: 23058 Date: Feb. 7, 2024	NAD83-UTM Zone 17 Size: 11*17

Scale: 1:140000

0 2 4 6 8 10 km

N

SOLRIS Land Use		TR-55						
		Cover description			Curve numbers for hydrologic soil group			
DN Value	**SOLRIS Land Use**	**Cover type and hydrologic condition**		**Average**	**A**	**B**	**C**	**D**
11	Open Beach	Natural desert landscaping (pervious areas only)4 . .	1		63	77	85	88
21	Open Sand Dune	Natural desert landscaping (pervious areas only)4 . .	1		63	77	85	88
23	Treed Sand Dune	Artificial desert landscaping (impervious weed	2		96	96	96	96
41	Open Cliff and Talus	Gravel (including right-of-way)	3		76	85	89	91
43	Treed Cliff and Talus	Gravel (including right-of-way)	3		76	85	89	91
51	Open Alvar	Newly graded areas (pervious areas only,	4		77	86	91	94
52	Shrub Alvar	Newly graded areas (pervious areas only,	4		77	86	91	94
53	Treed Alvar	Poor condition (grass cover < 50%)	5		68	79	86	89
64	Open Bedrock	Paved; curbs and storm sewers (excluding	6		98	98	98	98
65	Sparse Treed	WOODS Fair (woods are grazed but not burned, and some forest litter covers the soil)	7		36	60	73	79
81	Open Tallgrass	Poor condition (ground cover <50% or heavily grazed with no mulch) 68 79 86 89	8		69	79	86	89
82	Tallgras Savannah	Fair condition (ground cover 50% to 75% and not heavily grazed) 49 69 79 84	9		49	69	79	84
83	Tallgras Woodland	Good condition (ground cover >75% and lightly or only occasionally grazed) 39 61 74 80	10		39	61	74	80
90	Forest	Goodwoods (woods are protected from grazing, and litter and brush adequately cover the soil)	10		30	55	70	77
91	Coniferous Forest	Goodwoods (woods are protected from grazing, and litter and brush adequately cover the soil)	10		30	55	70	77
92	Mixed Fores	Goodwoods (woods are protected from grazing, and litter and brush adequately cover the soil)	10		30	55	70	77
93	Deciduous Forest	Goodwoods (woods are protected from grazing, and litter and brush adequately cover the soil)	10		30	55	70	77
131	Treed Swamp	Open Water	11		98	98	98	98
135	Thicket Swamp	Open Water	11		98	98	98	98
140	Fen	Open Water	11		98	98	98	98
150	Bog	Open Water	11		98	98	98	98
160	Marsh	Open Water	11		98	98	98	98
170	Open Water	Open Water	11		98	98	98	98
191	Plantations -Tree Cultivated	Row Crops (good), e.g., corn, sugar beets, soy beans	12		31	42	82	85
192	Hedge Rows	Row Crops (good), e.g., corn, sugar beets, soy beans	12		31	42	82	85
193	Tilled		12		31	42	82	85
201	Transportation	Paved; curbs and storm sewers (excluding	13		98	98	98	98
202	Built Up Area - Pervious	1/2 acre	14	25	54	70	80	85
203	Built Up Area Impervious	1/8 acre or less (town houses)	15	65	77	85	90	92
204	Extraction -Aggregate	Gravel (including right-of-way)	3		76	85	89	91
205	Extraction Peat / Topsoil	Row Crops (good), e.g., corn, sugar beets, soy beans	12		31	42	82	85
250	Undifferentieated	Good condition (ground cover >75% and lightly or only occasionally grazed)	16		39	61	74	80

TR-55 Curve Numbers

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	**Average percent impervious area2**	**A**	**B**	**C**	**D**
WOODS Fair (woods are grazed but not burned, and some forest litter covers the soil)		36	60	73	79
Goodwoods (woods are protected from grazing, and litter and brush adequately cover the soil)		30	55	70	77
Fully developed urban areas					
Open space (lawns, parks, golf courses, cemeteries, etc.)3:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc.		98	98	98	98
(excluding right-of-way)					
Streets and roads:					
Paved; curbs and storm sewers (excluding		98	98	98	98
right-of-way)					
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)4 . .		63	77	85	88
Artificial desert landscaping (impervious weed		96	96	96	96
barrier, desert shrub with 1- to 2-inch sand					
or gravel mulch and basin borders)					
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acre	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only,		77	86	91	94
no vegetation)5					
Open Water		100	100	100	100
Cultivated Agricultural Lands:					
Row Crops (good), e.g., corn, sugar beets, soy beans		31	42	82	85
Small Grain (good), e.g., wheat, barley, flax		60	82	80	84
Meadow (continuous grass, protected from grazing, and generally mowed for hay):		30	58	71	78
Pasture, Grassland, or Range – Continuous Forage for Grazing:					
Poor condition (ground cover <50% or heavily grazed with no mulch) 68 79 86 89		69	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed) 49 69 79 84		49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed) 39 61 74 80		39	61	74	80

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2022/10/31

===

PETERBOROUGH A ON 6166418

Latitude: 44 14'N Longitude: 78 22'W Elevation/Altitude: 191 m

Years/Années : 1971 - 2006 # Years/Années : 33

===

****

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1971	4.3	5.8	7.4	11.7	17.5	24.6	30.7	34.8	34.8
1972	5.8	6.1	8.1	10.2	13.2	16.5	22.9	41.4	44.2
1973	6.9	13.2	18.0	19.3	20.8	26.7	48.0	48.3	58.2
1974	7.6	13.5	14.0	16.0	20.1	25.7	43.9	49.8	49.8
1975	6.3	9.9	13.7	21.8	39.6	55.1	55.1	67.8	67.8
1976	5.3	8.4	11.9	15.0	16.3	16.5	22.6	24.6	37.6
1977	8.4	12.7	13.7	19.6	24.9	24.9	52.3	62.2	62.5
1978	7.2	12.4	17.3	19.2	21.7	27.7	43.9	45.6	45.8
1979	10.1	13.8	15.3	17.5	26.2	31.6	33.3	33.7	33.7
1980	8.8	16.0	21.6	29.0	32.0	48.3	61.8	62.2	83.2
1981	9.7	18.6	27.9	42.3	52.2	53.2	53.4	53.4	54.1
1982	5.3	7.6	7.8	9.9	11.7	15.4	30.3	34.1	34.1
1983	11.3	18.3	23.3	25.1	26.1	36.3	56.8	57.1	77.5
1984	8.9	14.2	17.3	18.9	25.3	29.4	35.5	37.8	39.2
1985	7.6	10.4	12.0	19.7	22.7	26.8	36.4	53.6	53.6
1986	12.5	15.8	19.3	19.7	19.7	23.2	35.8	42.0	44.8
1987	17.9	21.3	22.7	23.2	23.2	23.2	23.2	26.0	29.0
1988	7.8	11.5	14.5	20.7	23.2	24.4	27.0	28.8	30.4
1989	9.9	14.2	15.7	18.7	20.2	26.3	46.1	47.8	52.8
1990	8.9	13.4	17.8	23.2	23.7	23.7	42.2	43.4	44.8
1991	4.1	6.8	7.6	8.8	9.2	12.2	17.1	21.2	29.6
1992	8.6	9.3	12.8	20.4	25.8	31.7	38.9	45.0	51.2
1993	9.1	10.9	14.1	20.4	21.9	23.3	29.9	34.2	42.0
1994	8.8	14.4	17.4	19.8	22.2	24.1	24.1	33.6	41.5
1995	9.3	12.1	18.1	32.2	49.0	82.5	89.8	90.1	90.1
1996	6.8	8.6	10.5	13.9	16.5	22.0	38.3	40.8	41.0

1997	3.6	7.2	7.6	9.2	17.8	30.6	35.0	35.2	35.2
1998	11.4	15.7	16.5	18.7	28.1	32.4	60.0	65.1	76.2
1999	8.4	11.4	13.5	18.6	23.2	32.5	39.9	46.8	55.6
2000	6.4	10.0	12.7	16.6	18.8	23.5	47.8	61.2	61.2
2002	7.3	9.6	10.4	13.8	23.4	35.1	50.9	73.6	73.6
2004	6.2	10.9	15.2	22.0	26.5	41.6	65.9	80.1	97.8
2006	7.4	11.1	12.5	14.2	15.0	17.8	22.0	34.0	42.5
# Yrs. Années	33	33	33	33	33	33	33	33	33
Mean Moyenne	8.1	12.0	14.8	19.1	23.6	30.0	41.2	47.1	52.0
Std. Dev. Écart-type	2.7	3.7	4.8	6.7	9.1	13.7	15.5	16.4	18.1
Skew. Dissymétrie	1.33	0.45	0.55	1.30	1.66	2.13	0.92	0.75	0.92
Kurtosis	7.16	3.29	3.67	6.74	6.80	9.09	4.68	3.45	3.35

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité
pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1981	30 min	42.3	40.1
1981	1 h	52.2	52.0
1987	5 min	17.9	16.7
1995	2 h	82.5	72.9

****

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	7.7	10.1	11.7	13.7	15.2	16.7	33
10 min	11.4	14.6	16.8	19.5	21.5	23.5	33
15 min	14.0	18.3	21.1	24.7	27.4	30.0	33
30 min	18.0	23.9	27.8	32.8	36.4	40.1	33
1 h	22.1	30.1	35.4	42.1	47.1	52.0	33
2 h	27.7	39.8	47.8	57.9	65.4	72.9	33
6 h	38.7	52.4	61.5	72.9	81.4	89.9	33
12 h	44.4	58.9	68.5	80.6	89.5	98.4	33
24 h	49.0	65.0	75.6	88.9	98.9	108.7	33

****

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	92.0	121.0	140.2	164.4	182.3	200.2	33
	+/- 10.3	+/- 17.3	+/- 23.3	+/- 31.5	+/- 37.7	+/- 43.9	33
10 min	68.2	87.7	100.7	117.0	129.1	141.1	33
	+/- 6.9	+/- 11.7	+/- 15.7	+/- 21.2	+/- 25.4	+/- 29.6	33
15 min	56.0	73.1	84.5	98.8	109.4	120.0	33
	+/- 6.1	+/- 10.2	+/- 13.8	+/- 18.6	+/- 22.3	+/- 26.0	33
30 min	35.9	47.8	55.6	65.5	72.9	80.2	33
	+/- 4.2	+/- 7.1	+/- 9.6	+/- 12.9	+/- 15.4	+/- 18.0	33
1 h	22.1	30.1	35.4	42.1	47.1	52.0	33
	+/- 2.8	+/- 4.8	+/- 6.5	+/- 8.7	+/- 10.4	+/- 12.1	33
2 h	13.9	19.9	23.9	29.0	32.7	36.4	33
	+/- 2.1	+/- 3.6	+/- 4.9	+/- 6.6	+/- 7.9	+/- 9.2	33
6 h	6.4	8.7	10.2	12.2	13.6	15.0	33
	+/- 0.8	+/- 1.4	+/- 1.8	+/- 2.5	+/- 3.0	+/- 3.5	33
12 h	3.7	4.9	5.7	6.7	7.5	8.2	33
	+/- 0.4	+/- 0.7	+/- 1.0	+/- 1.3	+/- 1.6	+/- 1.8	33
24 h	2.0	2.7	3.1	3.7	4.1	4.5	33
	+/- 0.2	+/- 0.4	+/- 0.5	+/- 0.7	+/- 0.9	+/- 1.0	33

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

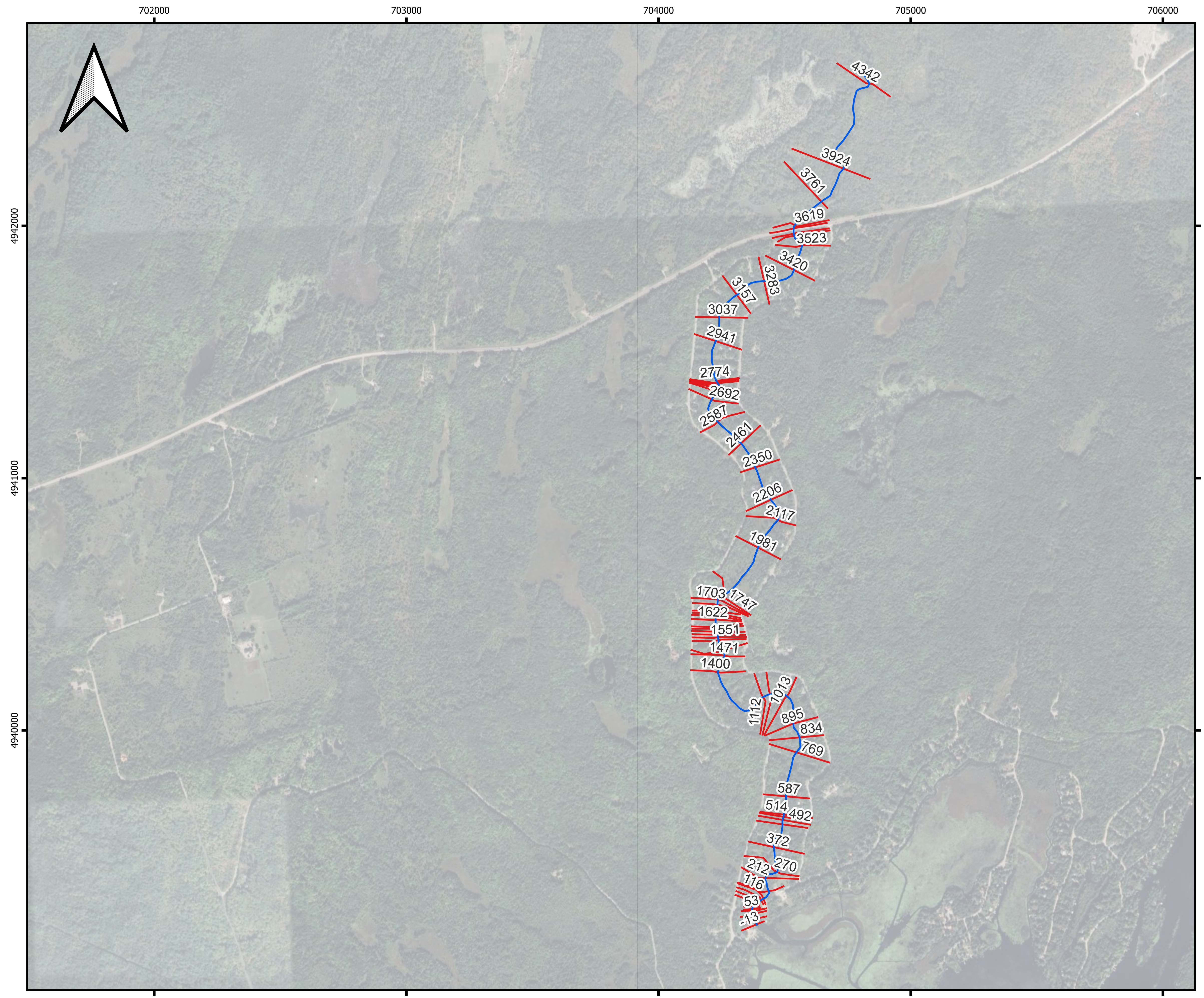
Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	33.4	44.0	51.0	59.9	66.5	73.1
Std. Dev. /Écart-type (RR)	32.1	41.8	48.1	56.2	62.2	68.1
Std. Error/Erreur-type	7.4	10.0	11.7	14.0	15.6	17.2
Coefficient (A)	20.5	27.4	31.9	37.7	41.9	46.1
Exponent/Exposant (B)	-0.680	-0.675	-0.672	-0.670	-0.669	-0.668
Mean % Error/% erreur moyenne	8.4	10.1	10.8	11.4	11.7	12.0

APPENDIX B:

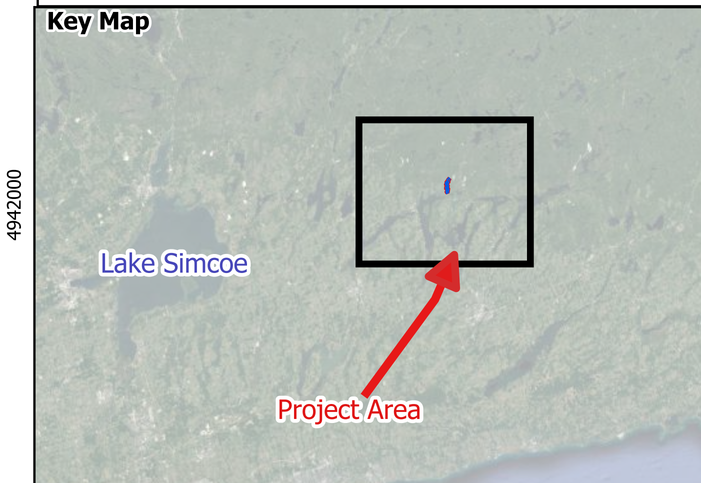
Hydraulic Model

Kawartha Conservation, Ontario

Miskawaa Ziibi River
HEC-RAS Schematic



Key Map



Legend

- HEC-RAS Cross Sections
- HEC-RAS River

water's edge
ENVIRONMENTAL SOLUTIONS TEAM

Map produced by Water's Edge. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of Water's Edge. The basemap is from Google Maps.

Project number: 23058 Date: Feb. 1, 2024	NAD83-UTM Zone 17 Size: 11*17

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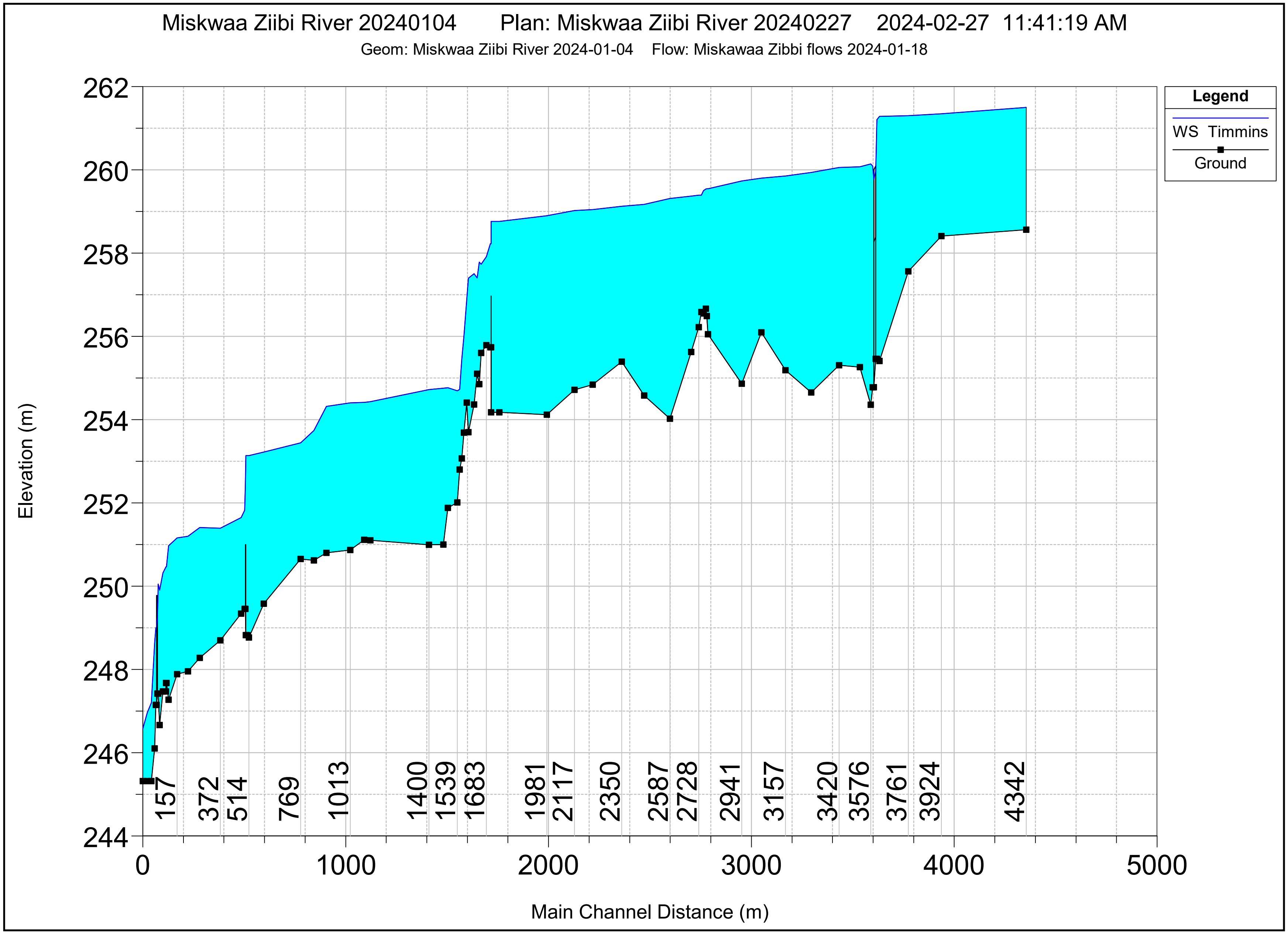
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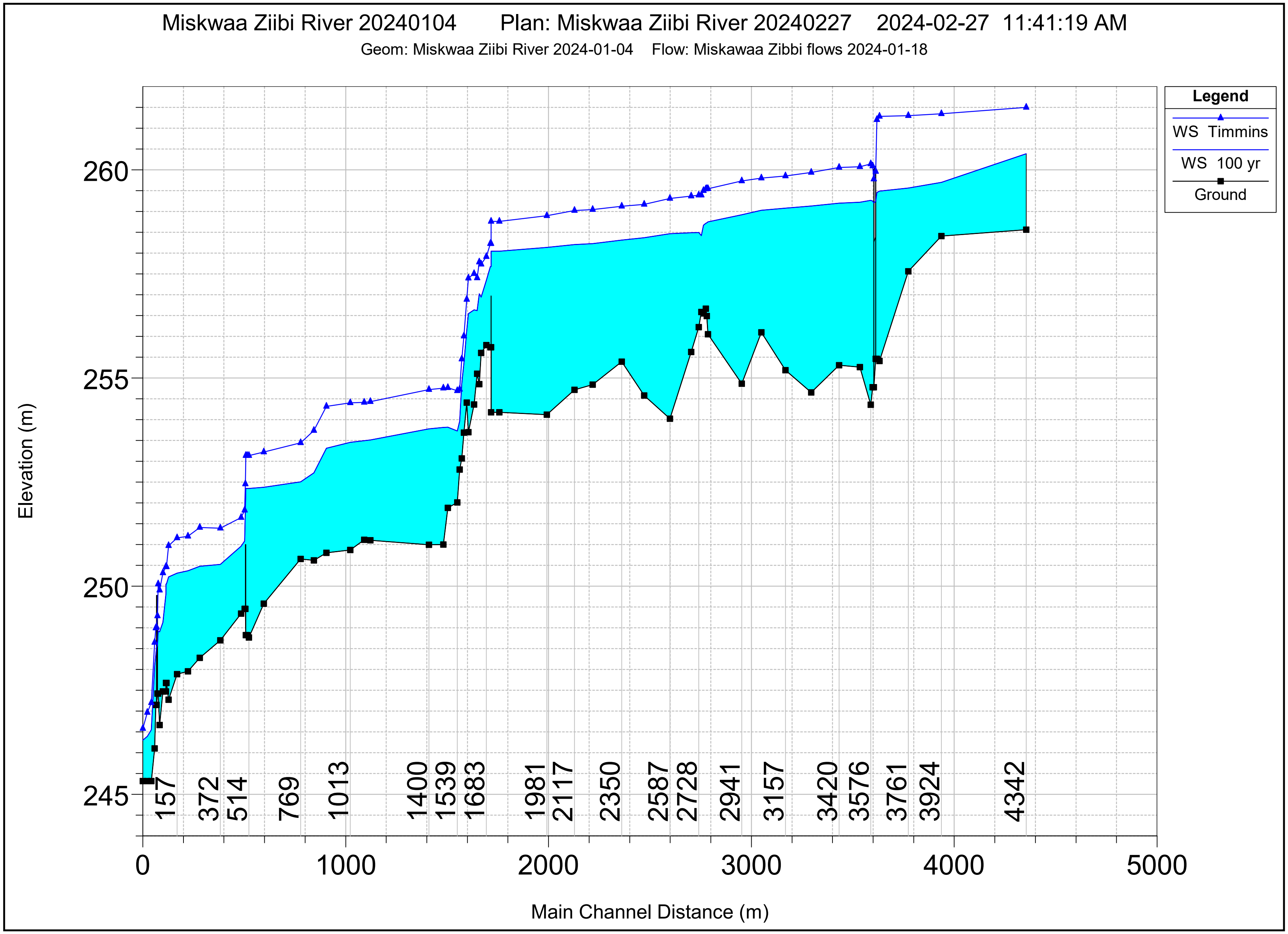
Geom: Miskwaa Ziibi River 2024-01-04 Flow: Miskawaa Zibbi flows 2024-01-18
Legend
WS Timmins
Ground
Elevation (m)
Main Channel Distance (m)
262
260
258
256
254
252
250
248
246
244
0
1000
2000
3000
4000
5000
157
372
514
769
1013
1400
1539
1683
1981
2117
2350
2587
2728
2941
3157
3420
3576
3761
3924
4342



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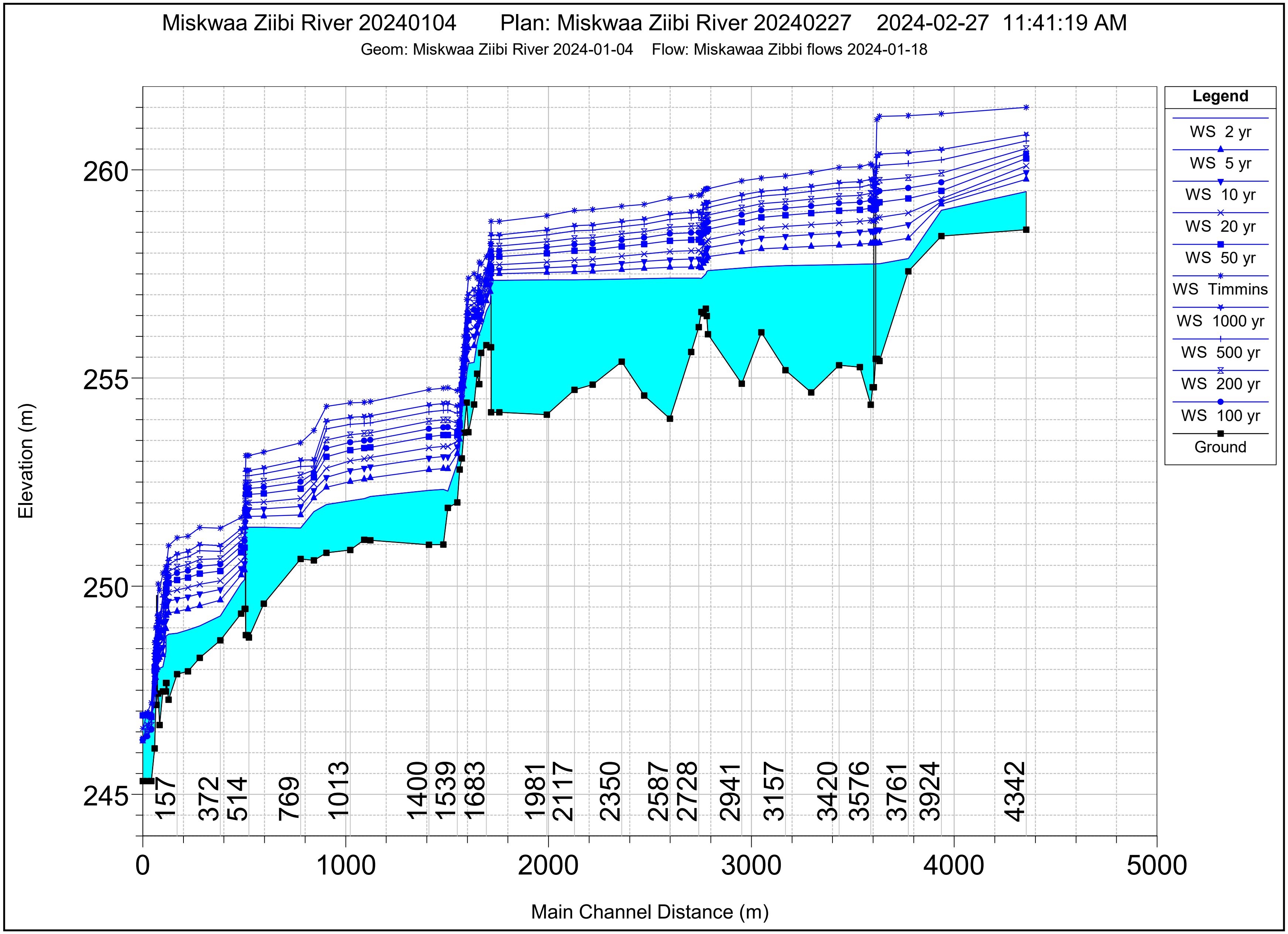
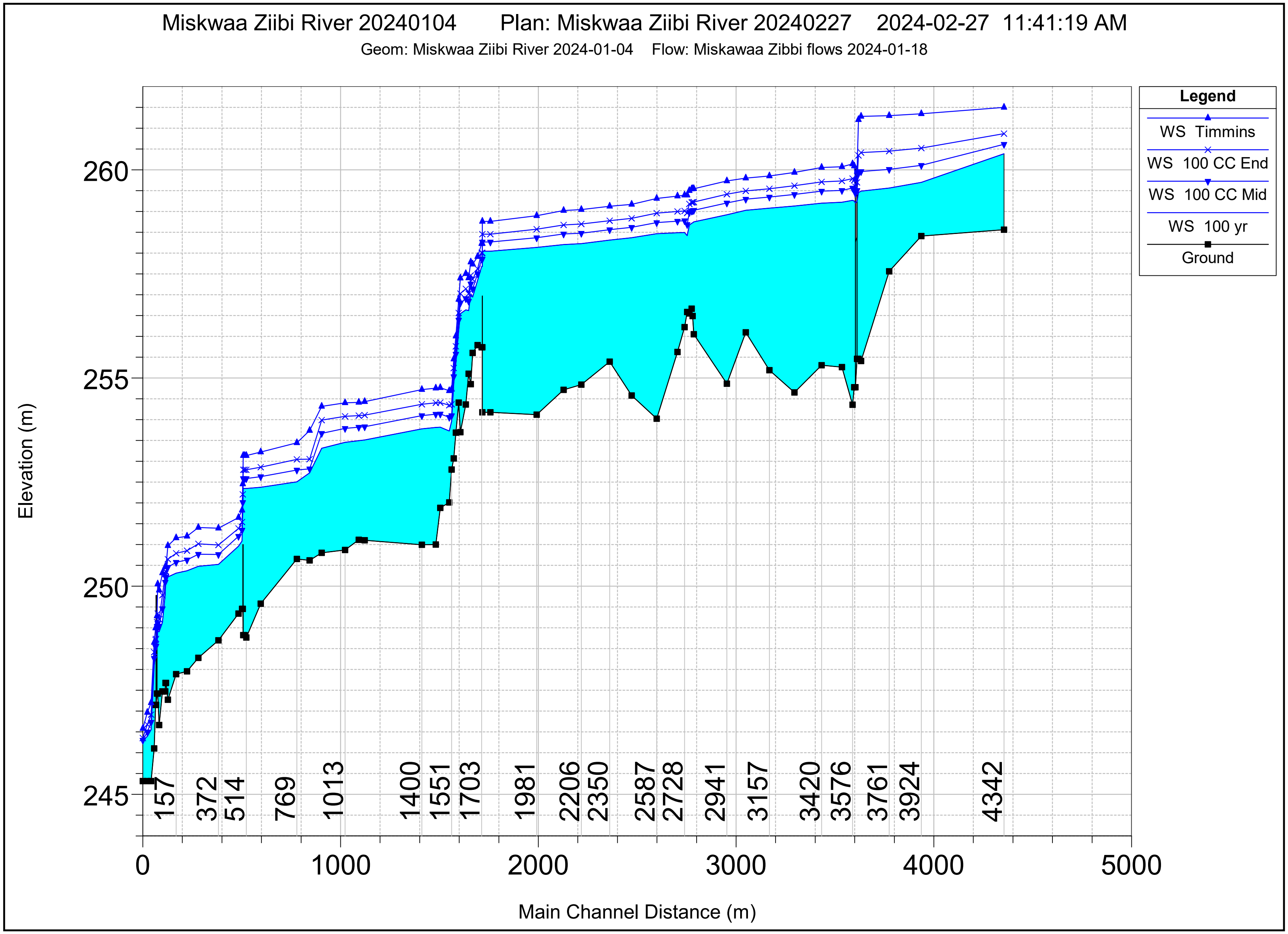
Geom: Miskwaa Ziibi River 2024-01-04 Flow: Miskawaa Zibbi flows 2024-01-18
Legend
WS Timmins
WS 100 yr
Ground
Elevation (m)
Main Channel Distance (m)
245
250
255
260
0
1000
2000
3000
4000
5000
157
372
514
769
1013
1400
1539
1683
1981
2117
2350
2587
2728
2941
3157
3420
3576
3761
3924
4342


Miskwaa Ziibi River 20240104 Plan: Miskwaa Ziibi River 20240227 2024-02-27 11:41:19 AM
Geom: Miskwaa Ziibi River 2024-01-04 Flow: Miskawaa Zibbi flows 2024-01-18
Legend
WS 2 yr
WS 5 yr
WS 10 yr
WS 20 yr
WS 50 yr
WS Timmins
WS 1000 yr
WS 500 yr
WS 200 yr
WS 100 yr
Ground
Elevation (m)
Main Channel Distance (m)
157
372
514
769
1013
1400
1539
1683
1981
2117
2350
2587
2728
2941
3157
3420
3576
3761
3924
4342
245
250
255
260
0
1000
2000
3000
4000
5000



Miskwaa Ziibi River 20240104 Plan: Miskwaa Ziibi River 20240227 2024-02-27 11:41:19 AM
Geom: Miskwaa Ziibi River 2024-01-04 Flow: Miskawaa Zibbi flows 2024-01-18
Legend
WS Timmins
WS 100 CC End
WS 100 CC Mid
WS 100 yr
Ground
Elevation (m)
Main Channel Distance (m)
245
250
255
260
0
1000
2000
3000
4000
5000
157
372
514
769
1013
1400
1551
1703
1981
2206
2350
2587
2728
2941
3157
3420
3576
3761
3924
4342

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 Profile: Timmins

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	4342	Timmins	142.20	258.56	261.50		261.52	0.000256	0.74	299.52	146.78	0.15
Reach 1	3924	Timmins	142.20	258.41	261.35		261.38	0.000457	1.06	258.38	163.21	0.20
Reach 1	3761	Timmins	142.20	257.56	261.30		261.33	0.000222	0.88	283.38	115.77	0.15
Reach 1	3619	Timmins	142.20	255.41	261.29		261.30	0.000118	0.72	409.22	179.80	0.11
Reach 1	3606	Timmins	142.20	255.46	261.20	258.40	261.29	0.000426	1.38	120.83	175.30	0.21
Reach 1	3600		Bridge									
Reach 1	3585	Timmins	142.20	254.78	260.09	258.14	260.23	0.001149	1.64	87.28	163.75	0.31
Reach 1	3576	Timmins	142.20	254.36	260.14		260.16	0.000193	0.82	335.74	175.42	0.13
Reach 1	3523	Timmins	142.20	255.26	260.08		260.14	0.000531	1.33	181.72	108.48	0.22
Reach 1	3420	Timmins	142.20	255.31	260.06		260.09	0.000351	1.03	257.40	140.17	0.18
Reach 1	3283	Timmins	142.20	254.65	259.94		260.02	0.000596	1.44	153.54	74.17	0.23
Reach 1	3157	Timmins	142.20	255.19	259.85	257.94	259.94	0.000695	1.49	153.27	106.02	0.25
Reach 1	3037	Timmins	142.20	256.09	259.80	258.10	259.86	0.000572	1.21	202.30	185.90	0.22
Reach 1	2941	Timmins	142.20	254.86	259.73		259.79	0.000804	1.36	208.25	168.96	0.25
Reach 1	2774	Timmins	142.20	256.05	259.55		259.64	0.000969	1.59	164.71	136.20	0.29
Reach 1	2769	Timmins	142.20	256.49	259.55		259.63	0.001155	1.56	167.01	140.93	0.31
Reach 1	2764	Timmins	142.20	256.67	259.54		259.62	0.001267	1.58	166.93	144.33	0.32
Reach 1	2752	Timmins	142.20	256.55	259.50		259.61	0.001496	1.73	147.75	123.86	0.35
Reach 1	2741	Timmins	142.20	256.59	259.39		259.58	0.002685	2.25	118.06	140.83	0.46
Reach 1	2728	Timmins	142.20	256.22	259.39		259.54	0.001625	1.93	126.61	134.27	0.37
Reach 1	2692	Timmins	142.20	255.62	259.37		259.48	0.000943	1.66	154.84	149.36	0.29
Reach 1	2587	Timmins	142.20	254.02	259.31		259.40	0.000561	1.39	144.73	89.47	0.23
Reach 1	2461	Timmins	142.20	254.58	259.17		259.30	0.001051	1.76	117.50	66.22	0.30
Reach 1	2350	Timmins	142.20	255.39	259.12		259.19	0.000670	1.39	185.79	122.18	0.25
Reach 1	2206	Timmins	142.20	254.84	259.05		259.10	0.000558	1.27	233.12	182.27	0.22
Reach 1	2117	Timmins	142.20	254.72	259.02		259.05	0.000350	1.01	263.69	144.36	0.18
Reach 1	1981	Timmins	142.20	254.12	258.90		258.98	0.000623	1.45	155.02	83.44	0.24
Reach 1	1747	Timmins	142.20	254.18	258.76	257.23	258.83	0.000645	1.33	174.30	104.65	0.24
Reach 1	1709		Inl Struct									
Reach 1	1703	Timmins	142.20	255.74	258.23	258.23	258.82	0.012580	3.61	49.76	48.26	0.94
Reach 1	1683	Timmins	142.20	255.79	257.91	257.91	258.52	0.010677	3.59	48.26	44.87	0.89
Reach 1	1657	Timmins	142.20	255.60	257.73	257.57	258.24	0.008209	3.30	53.54	43.48	0.79
Reach 1	1648	Timmins	142.20	254.85	257.78		258.14	0.004343	2.71	60.70	39.32	0.59
Reach 1	1637	Timmins	142.20	255.10	257.41	257.31	258.04	0.009947	3.64	45.18	33.87	0.86
Reach 1	1622	Timmins	142.20	254.36	257.50		257.87	0.004146	2.79	61.89	38.71	0.58
Reach 1	1594	Timmins	142.20	253.70	257.40		257.76	0.003732	2.83	65.53	42.00	0.55
Reach 1	1586	Timmins	142.20	254.41	256.89	256.89	257.67	0.010830	4.19	45.39	36.13	0.93
Reach 1	1572	Timmins	142.20	253.69	256.00	256.00	256.66	0.012123	3.86	47.84	44.67	0.95
Reach 1	1561	Timmins	142.20	253.07	255.45	255.45	256.03	0.012060	3.55	51.00	53.61	0.93
Reach 1	1551	Timmins	142.20	252.80	254.73		255.08	0.006976	2.74	61.94	55.82	0.71
Reach 1	1539	Timmins	142.20	252.01	254.69		255.00	0.004883	2.48	64.23	50.01	0.60
Reach 1	1493	Timmins	142.20	251.88	254.77		254.85	0.000844	1.33	121.56	64.94	0.27
Reach 1	1471	Timmins	142.20	251.00	254.75		254.84	0.000598	1.31	127.28	67.87	0.23
Reach 1	1400	Timmins	142.20	251.00	254.72		254.79	0.000572	1.31	160.62	82.89	0.23
Reach 1	1112	Timmins	142.20	251.10	254.43	253.26	254.56	0.001193	1.76	126.91	131.37	0.32
Reach 1	1082	Timmins	142.20	251.11	254.41	253.19	254.52	0.001030	1.59	126.44	128.49	0.30
Reach 1	1013	Timmins	142.20	250.87	254.40	253.10	254.45	0.000523	1.19	225.92	212.70	0.21
Reach 1	895	Timmins	142.20	250.80	254.32		254.38	0.000701	1.39	208.69	142.61	0.25
Reach 1	834	Timmins	142.20	250.62	253.74	253.74	254.24	0.005710	3.40	69.40	87.53	0.69
Reach 1	769	Timmins	142.20	250.65	253.44		253.57	0.002126	2.00	138.70	127.90	0.42
Reach 1	587	Timmins	142.20	249.58	253.22		253.33	0.000854	1.59	127.25	66.53	0.28
Reach 1	514	Timmins	142.20	248.77	253.14		253.27	0.000784	1.65	104.58	42.20	0.27
Reach 1	505	Timmins	142.20	248.83	253.14	251.01	253.26	0.000732	1.57	102.70	34.91	0.26
Reach 1	500		Inl Struct									
Reach 1	492	Timmins	142.20	249.45	251.82		252.14	0.004363	2.56	61.53	38.88	0.59
Reach 1	474	Timmins	142.20	249.34	251.65		252.04	0.005316	2.86	59.56	44.42	0.65
Reach 1	372	Timmins	142.20	248.70	251.39	250.70	251.60	0.002740	2.21	98.47	133.07	0.46
Reach 1	270	Timmins	142.20	248.28	251.41	249.98	251.45	0.000490	1.11	223.55	225.77	0.21
Reach 1	212	Timmins	142.20	247.95	251.20	250.05	251.39	0.001812	1.96	79.14	59.48	0.39
Reach 1	157	Timmins	142.20	247.89	251.16	249.81	251.29	0.001292	1.66	115.14	150.48	0.33
Reach 1	116	Timmins	142.20	247.27	250.97	249.86	251.21	0.002144	2.26	78.98	120.74	0.43
Reach 1	106	Timmins	142.20	247.68	250.47	250.39	251.13	0.008134	3.82	48.57	101.20	0.79
Reach 1	100		Inl Struct									
Reach 1	88	Timmins	142.20	247.47	250.32	249.58	250.60	0.003637	2.40	64.98	56.94	0.53
Reach 1	71	Timmins	142.20	246.67	249.90		250.44	0.007194	3.25	43.81	22.08	0.73
Reach 1	64	Timmins	142.20	247.42	250.05	249.33	250.33	0.002971	2.48	70.90	46.99	0.50
Reach 1	55		Bridge									
Reach 1	53	Timmins	142.20	247.15	248.99	248.99	249.73	0.013498	3.87	39.78	29.23	0.98
Reach 1	46	Timmins	142.20	246.10	248.65	248.65	249.28	0.015753	3.51	40.48	32.46	1.00
Reach 1	30	Timmins	142.20	245.32	247.20	247.20	247.81	0.015168	3.48	40.88	33.30	1.00
Reach 1	10	Timmins	142.20	245.32	246.97	246.46	247.22	0.004261	2.24	65.63	45.96	0.56
Reach 1	-13	Timmins	142.20	245.32	246.58	246.58	247.19	0.000009	3.45	41.41	35.83	1.00

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	4342	100 yr	65.00	258.56	260.39		260.40	0.000479	0.69	144.08	131.69	0.18
Reach 1	4342	Timmins	142.20	258.56	261.50		261.52	0.000256	0.74	299.52	146.78	0.15
Reach 1	3924	100 yr	65.00	258.41	259.70		259.90	0.005902	2.12	42.15	71.18	0.63
Reach 1	3924	Timmins	142.20	258.41	261.35		261.38	0.000457	1.06	258.38	163.21	0.20
Reach 1	3761	100 yr	65.00	257.56	259.56		259.60	0.000701	1.02	103.40	87.47	0.23
Reach 1	3761	Timmins	142.20	257.56	261.30		261.33	0.000222	0.88	283.38	115.77	0.15
Reach 1	3619	100 yr	65.00	255.41	259.49		259.52	0.000401	0.95	120.42	129.38	0.18
Reach 1	3619	Timmins	142.20	255.41	261.29		261.30	0.000118	0.72	409.22	179.80	0.11
Reach 1	3606	100 yr	65.00	255.46	259.46	257.52	259.51	0.000509	1.09	67.21	126.91	0.21
Reach 1	3606	Timmins	142.20	255.46	261.20	258.40	261.29	0.000426	1.38	120.83	175.30	0.21
Reach 1	3600		Bridge									
Reach 1	3585	100 yr	65.00	254.78	259.25	257.20	259.31	0.000669	1.05	61.84	118.73	0.22
Reach 1	3585	Timmins	142.20	254.78	260.09	258.14	260.23	0.001149	1.64	87.28	163.75	0.31
Reach 1	3576	100 yr	65.00	254.36	259.27		259.28	0.000172	0.65	185.62	163.50	0.12
Reach 1	3576	Timmins	142.20	254.36	260.14		260.16	0.000193	0.82	335.74	175.42	0.13
Reach 1	3523	100 yr	65.00	255.26	259.22		259.27	0.000407	0.98	92.44	98.12	0.18
Reach 1	3523	Timmins	142.20	255.26	260.08		260.14	0.000531	1.33	181.72	108.48	0.22
Reach 1	3420	100 yr	65.00	255.31	259.20		259.22	0.000327	0.82	140.77	131.86	0.16
Reach 1	3420	Timmins	142.20	255.31	260.06		260.09	0.000351	1.03	257.40	140.17	0.18
Reach 1	3283	100 yr	65.00	254.65	259.13		259.18	0.000360	0.96	96.20	68.94	0.17
Reach 1	3283	Timmins	142.20	254.65	259.94		260.02	0.000596	1.44	153.54	74.17	0.23
Reach 1	3157	100 yr	65.00	255.19	259.08	257.09	259.12	0.000434	1.00	91.45	73.44	0.19
Reach 1	3157	Timmins	142.20	255.19	259.85	257.94	259.94	0.000695	1.49	153.27	106.02	0.25
Reach 1	3037	100 yr	65.00	256.09	259.03	257.43	259.07	0.000474	0.90	100.80	110.98	0.19
Reach 1	3037	Timmins	142.20	256.09	259.80	258.10	259.86	0.000572	1.21	202.30	185.90	0.22
Reach 1	2941	100 yr	65.00	254.86	258.92		259.00	0.001152	1.30	77.24	136.64	0.29
Reach 1	2941	Timmins	142.20	254.86	259.73		259.79	0.000804	1.36	208.25	168.96	0.25
Reach 1	2774	100 yr	65.00	256.05	258.75		258.82	0.000915	1.26	71.75	82.78	0.27
Reach 1	2774	Timmins	142.20	256.05	259.55		259.64	0.000969	1.59	164.71	136.20	0.29
Reach 1	2769	100 yr	65.00	256.49	258.73		258.82	0.001620	1.43	68.41	93.58	0.35
Reach 1	2769	Timmins	142.20	256.49	259.55		259.63	0.001155	1.56	167.01	140.93	0.31
Reach 1	2764	100 yr	65.00	256.67	258.72		258.81	0.001954	1.48	67.81	90.34	0.38
Reach 1	2764	Timmins	142.20	256.67	259.54		259.62	0.001267	1.58	166.93	144.33	0.32
Reach 1	2752	100 yr	65.00	256.55	258.67		258.78	0.002168	1.57	61.26	82.85	0.40
Reach 1	2752	Timmins	142.20	256.55	259.50		259.61	0.001496	1.73	147.75	123.86	0.35
Reach 1	2741	100 yr	65.00	256.59	258.42	258.06	258.72	0.006401	2.45	27.26	28.95	0.66
Reach 1	2741	Timmins	142.20	256.59	259.39		259.58	0.002685	2.25	118.06	140.83	0.46
Reach 1	2728	100 yr	65.00	256.22	258.50		258.63	0.002029	1.65	46.18	50.46	0.39
Reach 1	2728	Timmins	142.20	256.22	259.39		259.54	0.001625	1.93	126.61	134.27	0.37
Reach 1	2692	100 yr	65.00	255.62	258.49		258.57	0.000836	1.27	61.01	59.98	0.26
Reach 1	2692	Timmins	142.20	255.62	259.37		259.48	0.000943	1.66	154.84	149.36	0.29
Reach 1	2587	100 yr	65.00	254.02	258.46		258.50	0.000337	0.91	76.64	52.35	0.17
Reach 1	2587	Timmins	142.20	254.02	259.31		259.40	0.000561	1.39	144.73	89.47	0.23
Reach 1	2461	100 yr	65.00	254.58	258.37		258.44	0.000696	1.21	66.28	57.27	0.24
Reach 1	2461	Timmins	142.20	254.58	259.17		259.30	0.001051	1.76	117.50	66.22	0.30
Reach 1	2350	100 yr	65.00	255.39	258.31		258.36	0.000607	1.09	94.02	103.43	0.22
Reach 1	2350	Timmins	142.20	255.39	259.12		259.19	0.000670	1.39	185.79	122.18	0.25
Reach 1	2206	100 yr	65.00	254.84	258.23		258.28	0.000604	1.10	100.53	141.41	0.22
Reach 1	2206	Timmins	142.20	254.84	259.05		259.10	0.000558	1.27	233.12	182.27	0.22

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	2117	100 yr	65.00	254.72	258.21		258.23	0.000326	0.80	148.09	139.16	0.16
Reach 1	2117	Timmins	142.20	254.72	259.02		259.05	0.000350	1.01	263.69	144.36	0.18
Reach 1	1981	100 yr	65.00	254.12	258.14		258.18	0.000379	0.98	93.36	77.85	0.18
Reach 1	1981	Timmins	142.20	254.12	258.90		258.98	0.000623	1.45	155.02	83.44	0.24
Reach 1	1747	100 yr	65.00	254.18	258.05	256.22	258.08	0.000439	0.93	103.93	92.09	0.19
Reach 1	1747	Timmins	142.20	254.18	258.76	257.23	258.83	0.000645	1.33	174.30	104.65	0.24
Reach 1	1709		Inl Struct									
Reach 1	1703	100 yr	65.00	255.74	257.68	257.68	258.08	0.014176	2.84	25.79	40.17	0.93
Reach 1	1703	Timmins	142.20	255.74	258.23	258.23	258.82	0.012580	3.61	49.76	48.26	0.94
Reach 1	1683	100 yr	65.00	255.79	257.35	257.23	257.70	0.010250	2.65	26.27	30.31	0.82
Reach 1	1683	Timmins	142.20	255.79	257.91	257.91	258.52	0.010677	3.59	48.26	44.87	0.89
Reach 1	1657	100 yr	65.00	255.60	256.94	256.94	257.38	0.014275	2.96	23.72	31.08	0.94
Reach 1	1657	Timmins	142.20	255.60	257.73	257.57	258.24	0.008209	3.30	53.54	43.48	0.79
Reach 1	1648	100 yr	65.00	254.85	257.02		257.21	0.004071	1.96	35.41	28.97	0.53
Reach 1	1648	Timmins	142.20	254.85	257.78		258.14	0.004343	2.71	60.70	39.32	0.59
Reach 1	1637	100 yr	65.00	255.10	256.62	256.62	257.11	0.015500	3.10	21.66	25.00	0.98
Reach 1	1637	Timmins	142.20	255.10	257.41	257.31	258.04	0.009947	3.64	45.18	33.87	0.86
Reach 1	1622	100 yr	65.00	254.36	256.64		256.86	0.004462	2.12	33.74	27.90	0.56
Reach 1	1622	Timmins	142.20	254.36	257.50		257.87	0.004146	2.79	61.89	38.71	0.58
Reach 1	1594	100 yr	65.00	253.70	256.54		256.75	0.003237	2.05	35.65	26.96	0.48
Reach 1	1594	Timmins	142.20	253.70	257.40		257.76	0.003732	2.83	65.53	42.00	0.55
Reach 1	1586	100 yr	65.00	254.41	256.14	256.14	256.67	0.012231	3.31	22.66	25.18	0.92
Reach 1	1586	Timmins	142.20	254.41	256.89	256.89	257.67	0.010830	4.19	45.39	36.13	0.93
Reach 1	1572	100 yr	65.00	253.69	255.36	255.36	255.82	0.015167	3.12	23.61	28.34	0.98
Reach 1	1572	Timmins	142.20	253.69	256.00	256.00	256.66	0.012123	3.86	47.84	44.67	0.95
Reach 1	1561	100 yr	65.00	253.07	254.87	254.87	255.27	0.015409	2.89	24.99	32.95	0.97
Reach 1	1561	Timmins	142.20	253.07	255.45	255.45	256.03	0.012060	3.55	51.00	53.61	0.93
Reach 1	1551	100 yr	65.00	252.80	253.96	253.96	254.32	0.016640	2.71	25.13	34.79	0.98
Reach 1	1551	Timmins	142.20	252.80	254.73		255.08	0.006976	2.74	61.94	55.82	0.71
Reach 1	1539	100 yr	65.00	252.01	253.73	253.73	254.10	0.017478	2.71	24.08	33.33	1.00
Reach 1	1539	Timmins	142.20	252.01	254.69		255.00	0.004883	2.48	64.23	50.01	0.60
Reach 1	1493	100 yr	65.00	251.88	253.82		253.87	0.000940	1.02	64.93	47.66	0.26
Reach 1	1493	Timmins	142.20	251.88	254.77		254.85	0.000844	1.33	121.56	64.94	0.27
Reach 1	1471	100 yr	65.00	251.00	253.81		253.85	0.000430	0.88	76.19	47.75	0.19
Reach 1	1471	Timmins	142.20	251.00	254.75		254.84	0.000598	1.31	127.28	67.87	0.23
Reach 1	1400	100 yr	65.00	251.00	253.78		253.82	0.000474	0.95	89.49	65.86	0.20
Reach 1	1400	Timmins	142.20	251.00	254.72		254.79	0.000572	1.31	160.62	82.89	0.23
Reach 1	1112	100 yr	65.00	251.10	253.51	252.40	253.61	0.001254	1.42	58.94	61.57	0.31
Reach 1	1112	Timmins	142.20	251.10	254.43	253.26	254.56	0.001193	1.76	126.91	131.37	0.32
Reach 1	1082	100 yr	65.00	251.11	253.49	252.49	253.56	0.001043	1.23	69.73	61.84	0.28
Reach 1	1082	Timmins	142.20	251.11	254.41	253.19	254.52	0.001030	1.59	126.44	128.49	0.30
Reach 1	1013	100 yr	65.00	250.87	253.45	252.14	253.50	0.000679	1.07	99.13	147.41	0.23
Reach 1	1013	Timmins	142.20	250.87	254.40	253.10	254.45	0.000523	1.19	225.92	212.70	0.21
Reach 1	895	100 yr	65.00	250.80	253.31		253.39	0.001174	1.40	78.84	97.63	0.30
Reach 1	895	Timmins	142.20	250.80	254.32		254.38	0.000701	1.39	208.69	142.61	0.25
Reach 1	834	100 yr	65.00	250.62	252.72	252.54	253.20	0.009219	3.06	22.21	18.78	0.80
Reach 1	834	Timmins	142.20	250.62	253.74	253.74	254.24	0.005710	3.40	69.40	87.53	0.69
Reach 1	769	100 yr	65.00	250.65	252.50		252.69	0.004788	2.14	43.76	61.25	0.57
Reach 1	769	Timmins	142.20	250.65	253.44		253.57	0.002126	2.00	138.70	127.90	0.42

HEC-RAS Plan: Miskwaa Ziibi River 20240227   River: Miskwaa Ziibi   Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	587	100 yr	65.00	249.58	252.38		252.42	0.000549	1.05	81.06	49.16	0.21
Reach 1	587	Timmins	142.20	249.58	253.22		253.33	0.000854	1.59	127.25	66.53	0.28
Reach 1	514	100 yr	65.00	248.77	252.34		252.39	0.000380	0.99	74.99	34.49	0.18
Reach 1	514	Timmins	142.20	248.77	253.14		253.27	0.000784	1.65	104.58	42.20	0.27
Reach 1	505	100 yr	65.00	248.83	252.34	250.27	252.39	0.000358	0.93	76.11	32.18	0.17
Reach 1	505	Timmins	142.20	248.83	253.14	251.01	253.26	0.000732	1.57	102.70	34.91	0.26
Reach 1	500		Inl Struct									
Reach 1	492	100 yr	65.00	249.45	251.08		251.27	0.004748	1.94	35.11	33.94	0.56
Reach 1	492	Timmins	142.20	249.45	251.82		252.14	0.004363	2.56	61.53	38.88	0.59
Reach 1	474	100 yr	65.00	249.34	250.96		251.18	0.004959	2.09	32.73	30.86	0.58
Reach 1	474	Timmins	142.20	249.34	251.65		252.04	0.005316	2.86	59.56	44.42	0.65
Reach 1	372	100 yr	65.00	248.70	250.52	249.97	250.72	0.004013	1.95	33.83	29.45	0.52
Reach 1	372	Timmins	142.20	248.70	251.39	250.70	251.60	0.002740	2.21	98.47	133.07	0.46
Reach 1	270	100 yr	65.00	248.28	250.48	249.32	250.53	0.000741	1.05	95.71	197.29	0.24
Reach 1	270	Timmins	142.20	248.28	251.41	249.98	251.45	0.000490	1.11	223.55	225.77	0.21
Reach 1	212	100 yr	65.00	247.95	250.37	249.38	250.46	0.001461	1.35	48.81	42.69	0.33
Reach 1	212	Timmins	142.20	247.95	251.20	250.05	251.39	0.001812	1.96	79.14	59.48	0.39
Reach 1	157	100 yr	65.00	247.89	250.31	249.18	250.39	0.001114	1.23	56.72	46.31	0.29
Reach 1	157	Timmins	142.20	247.89	251.16	249.81	251.29	0.001292	1.66	115.14	150.48	0.33
Reach 1	116	100 yr	65.00	247.27	250.22	248.95	250.33	0.001396	1.49	47.33	33.08	0.33
Reach 1	116	Timmins	142.20	247.27	250.97	249.86	251.21	0.002144	2.26	78.98	120.74	0.43
Reach 1	106	100 yr	65.00	247.68	250.05	249.34	250.30	0.003701	2.28	34.07	87.29	0.52
Reach 1	106	Timmins	142.20	247.68	250.47	250.39	251.13	0.008134	3.82	48.57	101.20	0.79
Reach 1	100		Inl Struct									
Reach 1	88	100 yr	65.00	247.47	249.13	248.82	249.43	0.007253	2.41	27.02	21.97	0.69
Reach 1	88	Timmins	142.20	247.47	250.32	249.58	250.60	0.003637	2.40	64.98	56.94	0.53
Reach 1	71	100 yr	65.00	246.67	248.90		249.28	0.008076	2.70	24.07	17.40	0.73
Reach 1	71	Timmins	142.20	246.67	249.90		250.44	0.007194	3.25	43.81	22.08	0.73
Reach 1	64	100 yr	65.00	247.42	248.92	248.59	249.20	0.005938	2.34	30.14	38.27	0.64
Reach 1	64	Timmins	142.20	247.42	250.05	249.33	250.33	0.002971	2.48	70.90	46.99	0.50
Reach 1	55		Bridge									
Reach 1	53	100 yr	65.00	247.15	248.36	248.36	248.81	0.016100	3.00	22.60	25.74	0.99
Reach 1	53	Timmins	142.20	247.15	248.99	248.99	249.73	0.013498	3.87	39.78	29.23	0.98
Reach 1	46	100 yr	65.00	246.10	248.08	248.08	248.50	0.018632	2.84	22.86	28.74	1.02
Reach 1	46	Timmins	142.20	246.10	248.65	248.65	249.28	0.015753	3.51	40.48	32.46	1.00
Reach 1	30	100 yr	65.00	245.32	246.55	246.55	246.99	0.016872	2.92	22.24	25.56	1.00
Reach 1	30	Timmins	142.20	245.32	247.20	247.20	247.81	0.015168	3.48	40.88	33.30	1.00
Reach 1	10	100 yr	65.00	245.32	246.39	246.00	246.52	0.003868	1.60	40.91	40.32	0.50
Reach 1	10	Timmins	142.20	245.32	246.97	246.46	247.22	0.004261	2.24	65.63	45.96	0.56
Reach 1	-13	100 yr	65.00	245.32	246.30	246.07	246.51	0.000005	2.04	31.83	33.33	0.67
Reach 1	-13	Timmins	142.20	245.32	246.58	246.58	247.19	0.000009	3.45	41.41	35.83	1.00

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	4342	2 yr	10.00	258.56	259.48		259.49	0.000500	0.41	34.04	94.06	0.16
Reach 1	4342	5 yr	21.50	258.56	259.77		259.78	0.000484	0.48	66.58	119.68	0.17
Reach 1	4342	10 yr	30.70	258.56	259.94		259.95	0.000468	0.54	86.63	125.08	0.17
Reach 1	4342	20 yr	40.40	258.56	260.09		260.11	0.000453	0.58	106.28	127.86	0.17
Reach 1	4342	50 yr	54.10	258.56	260.27		260.29	0.000457	0.64	129.38	130.58	0.18
Reach 1	4342	100 yr	65.00	258.56	260.39		260.40	0.000479	0.69	144.08	131.69	0.18
Reach 1	4342	200 yr	76.40	258.56	260.51		260.53	0.000478	0.73	160.68	133.68	0.19
Reach 1	4342	500 yr	92.00	258.56	260.69		260.71	0.000454	0.77	185.04	135.61	0.19
Reach 1	4342	1000 yr	104.20	258.56	260.85		260.87	0.000418	0.78	206.36	137.23	0.18
Reach 1	4342	Timmins	142.20	258.56	261.50		261.52	0.000256	0.74	299.52	146.78	0.15
Reach 1	4342	100 CC Mid	85.50	258.56	260.61		260.63	0.000468	0.76	174.56	134.95	0.19
Reach 1	4342	100 CC End	105.70	258.56	260.87		260.89	0.000413	0.78	209.18	137.61	0.18
Reach 1	3924	2 yr	10.00	258.41	259.03	258.75	259.07	0.002869	0.87	11.51	23.26	0.38
Reach 1	3924	5 yr	21.50	258.41	259.18		259.28	0.005975	1.44	15.36	28.23	0.57
Reach 1	3924	10 yr	30.70	258.41	259.24		259.42	0.008846	1.87	17.27	32.09	0.71
Reach 1	3924	20 yr	40.40	258.41	259.31	259.22	259.56	0.011285	2.24	19.44	34.70	0.81
Reach 1	3924	50 yr	54.10	258.41	259.49	259.37	259.75	0.009118	2.32	28.72	62.62	0.75
Reach 1	3924	100 yr	65.00	258.41	259.70		259.90	0.005902	2.12	42.15	71.18	0.63
Reach 1	3924	200 yr	76.40	258.41	259.92		260.08	0.003900	1.94	60.11	85.91	0.52
Reach 1	3924	500 yr	92.00	258.41	260.24		260.34	0.002188	1.67	93.90	124.03	0.41
Reach 1	3924	1000 yr	104.20	258.41	260.49		260.57	0.001439	1.48	127.70	139.79	0.34
Reach 1	3924	Timmins	142.20	258.41	261.35		261.38	0.000457	1.06	258.38	163.21	0.20
Reach 1	3924	100 CC Mid	85.50	258.41	260.11		260.23	0.002741	1.77	78.41	114.14	0.45
Reach 1	3924	100 CC End	105.70	258.41	260.52		260.59	0.001368	1.46	132.09	140.77	0.33
Reach 1	3761	2 yr	10.00	257.56	257.87	257.87	258.02	0.023852	1.72	5.80	19.34	1.00
Reach 1	3761	5 yr	21.50	257.56	258.36		258.45	0.004424	1.33	17.95	41.90	0.50
Reach 1	3761	10 yr	30.70	257.56	258.69		258.75	0.002172	1.19	34.46	69.99	0.37
Reach 1	3761	20 yr	40.40	257.56	258.96		259.01	0.001338	1.10	55.03	75.68	0.30
Reach 1	3761	50 yr	54.10	257.56	259.31		259.35	0.000888	1.04	81.99	83.09	0.26
Reach 1	3761	100 yr	65.00	257.56	259.56		259.60	0.000701	1.02	103.40	87.47	0.23
Reach 1	3761	200 yr	76.40	257.56	259.81		259.85	0.000567	0.99	126.38	95.26	0.21
Reach 1	3761	500 yr	92.00	257.56	260.15		260.18	0.000447	0.97	159.60	99.12	0.20
Reach 1	3761	1000 yr	104.20	257.56	260.42		260.45	0.000377	0.95	186.11	102.87	0.18
Reach 1	3761	Timmins	142.20	257.56	261.30		261.33	0.000222	0.88	283.38	115.77	0.15
Reach 1	3761	100 CC Mid	85.50	257.56	260.01		260.04	0.000497	0.98	145.73	97.93	0.20
Reach 1	3761	100 CC End	105.70	257.56	260.45		260.48	0.000369	0.95	189.48	103.27	0.18
Reach 1	3619	2 yr	10.00	255.41	257.74		257.76	0.000266	0.48	20.79	15.38	0.13
Reach 1	3619	5 yr	21.50	255.41	258.24		258.27	0.000491	0.74	29.22	21.18	0.18
Reach 1	3619	10 yr	30.70	255.41	258.56		258.60	0.000568	0.86	40.91	52.94	0.20
Reach 1	3619	20 yr	40.40	255.41	258.86		258.90	0.000531	0.92	58.66	73.68	0.20
Reach 1	3619	50 yr	54.10	255.41	259.22		259.26	0.000458	0.95	90.40	97.78	0.19
Reach 1	3619	100 yr	65.00	255.41	259.49		259.52	0.000401	0.95	120.42	129.38	0.18
Reach 1	3619	200 yr	76.40	255.41	259.75		259.78	0.000341	0.93	157.92	149.37	0.17
Reach 1	3619	500 yr	92.00	255.41	260.11		260.13	0.000257	0.87	212.75	156.54	0.15
Reach 1	3619	1000 yr	104.20	255.41	260.38		260.40	0.000210	0.83	256.08	161.28	0.14
Reach 1	3619	Timmins	142.20	255.41	261.29		261.30	0.000118	0.72	409.22	179.80	0.11
Reach 1	3619	100 CC Mid	85.50	255.41	259.96		259.99	0.000288	0.89	189.88	154.19	0.16
Reach 1	3619	100 CC End	105.70	255.41	260.42		260.44	0.000205	0.82	261.52	161.75	0.14
Reach 1	3606	2 yr	10.00	255.46	257.74	256.33	257.75	0.000232	0.44	22.73	17.54	0.12
Reach 1	3606	5 yr	21.50	255.46	258.24	256.67	258.26	0.000382	0.67	32.93	33.11	0.17
Reach 1	3606	10 yr	30.70	255.46	258.56	256.88	258.59	0.000439	0.79	40.98	64.32	0.18
Reach 1	3606	20 yr	40.40	255.46	258.85	257.09	258.89	0.000469	0.89	48.78	98.80	0.19
Reach 1	3606	50 yr	54.10	255.46	259.20	257.34	259.25	0.000495	1.01	59.46	113.16	0.20
Reach 1	3606	100 yr	65.00	255.46	259.46	257.52	259.51	0.000509	1.09	67.21	126.91	0.21
Reach 1	3606	200 yr	76.40	255.46	259.71	257.68	259.78	0.000514	1.16	75.01	136.37	0.21
Reach 1	3606	500 yr	92.00	255.46	260.05	257.87	260.13	0.000508	1.24	85.50	151.82	0.21
Reach 1	3606	1000 yr	104.20	255.46	260.32	258.00	260.39	0.000498	1.29	93.59	156.48	0.21
Reach 1	3606	Timmins	142.20	255.46	261.20	258.40	261.29	0.000426	1.38	120.83	175.30	0.21
Reach 1	3606	100 CC Mid	85.50	255.46	259.91	257.80	259.98	0.000512	1.21	81.17	149.12	0.21
Reach 1	3606	100 CC End	105.70	255.46	260.35	258.02	260.43	0.000497	1.30	94.59	157.64	0.21
Reach 1	3600		Bridge									
Reach 1	3585	2 yr	10.00	254.78	257.74	255.92	257.75	0.000139	0.37	27.26	18.02	0.10
Reach 1	3585	5 yr	21.50	254.78	258.23	256.34	258.25	0.000289	0.58	36.89	21.19	0.14
Reach 1	3585	10 yr	30.70	254.78	258.53	256.57	258.55	0.000381	0.71	43.48	27.21	0.16
Reach 1	3585	20 yr	40.40	254.78	258.78	256.77	258.82	0.000466	0.82	49.57	76.58	0.18
Reach 1	3585	50 yr	54.10	254.78	259.07	257.01	259.11	0.000579	0.95	56.89	106.36	0.21
Reach 1	3585	100 yr	65.00	254.78	259.25	257.20	259.31	0.000669	1.05	61.84	118.73	0.22
Reach 1	3585	200 yr	76.40	254.78	259.41	257.37	259.48	0.000762	1.15	66.51	130.00	0.24
Reach 1	3585	500 yr	92.00	254.78	259.61	257.58	259.69	0.000876	1.27	72.24	143.93	0.26
Reach 1	3585	1000 yr	104.20	254.78	259.74	257.73	259.83	0.000953	1.37	76.23	156.12	0.27
Reach 1	3585	Timmins	142.20	254.78	260.09	258.14	260.23	0.001149	1.64	87.28	163.75	0.31
Reach 1	3585	100 CC Mid	85.50	254.78	259.53	257.50	259.61	0.000834	1.22	69.97	137.21	0.25
Reach 1	3585	100 CC End	105.70	254.78	259.75	257.75	259.85	0.000961	1.38	76.70	157.18	0.28

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	3576	2 yr	10.00	254.36	257.74		257.74	0.000067	0.28	35.16	20.20	0.07
Reach 1	3576	5 yr	21.50	254.36	258.23		258.24	0.000155	0.46	50.65	61.67	0.11
Reach 1	3576	10 yr	30.70	254.36	258.53		258.55	0.000178	0.54	76.96	119.12	0.12
Reach 1	3576	20 yr	40.40	254.36	258.79		258.80	0.000176	0.58	110.82	143.64	0.12
Reach 1	3576	50 yr	54.10	254.36	259.08		259.10	0.000172	0.62	155.47	158.34	0.12
Reach 1	3576	100 yr	65.00	254.36	259.27		259.28	0.000172	0.65	185.62	163.50	0.12
Reach 1	3576	200 yr	76.40	254.36	259.44		259.45	0.000173	0.68	213.93	169.27	0.12
Reach 1	3576	500 yr	92.00	254.36	259.64		259.66	0.000176	0.71	248.40	171.70	0.12
Reach 1	3576	1000 yr	104.20	254.36	259.77		259.79	0.000181	0.74	271.46	172.48	0.13
Reach 1	3576	Timmins	142.20	254.36	260.14		260.16	0.000193	0.82	335.74	175.42	0.13
Reach 1	3576	100 CC Mid	85.50	254.36	259.56		259.58	0.000175	0.70	234.81	171.13	0.12
Reach 1	3576	100 CC End	105.70	254.36	259.79		259.81	0.000182	0.74	274.15	172.57	0.13
Reach 1	3523	2 yr	10.00	255.26	257.73		257.74	0.000112	0.34	29.74	19.44	0.09
Reach 1	3523	5 yr	21.50	255.26	258.22		258.23	0.000223	0.54	39.68	23.37	0.13
Reach 1	3523	10 yr	30.70	255.26	258.51		258.53	0.000278	0.67	47.34	30.13	0.14
Reach 1	3523	20 yr	40.40	255.26	258.76		258.79	0.000328	0.78	57.46	56.30	0.16
Reach 1	3523	50 yr	54.10	255.26	259.04		259.08	0.000375	0.90	77.18	78.83	0.17
Reach 1	3523	100 yr	65.00	255.26	259.22		259.27	0.000407	0.98	92.44	98.12	0.18
Reach 1	3523	200 yr	76.40	255.26	259.39		259.44	0.000433	1.05	109.13	102.69	0.19
Reach 1	3523	500 yr	92.00	255.26	259.58		259.64	0.000457	1.12	129.52	104.10	0.20
Reach 1	3523	1000 yr	104.20	255.26	259.72		259.77	0.000480	1.18	143.14	105.27	0.20
Reach 1	3523	Timmins	142.20	255.26	260.08		260.14	0.000531	1.33	181.72	108.48	0.22
Reach 1	3523	100 CC Mid	85.50	255.26	259.51		259.56	0.000446	1.09	121.49	103.50	0.20
Reach 1	3523	100 CC End	105.70	255.26	259.73		259.79	0.000482	1.18	144.73	105.42	0.21
Reach 1	3420	2 yr	10.00	255.31	257.72		257.73	0.000132	0.37	27.04	17.42	0.09
Reach 1	3420	5 yr	21.50	255.31	258.19		258.21	0.000278	0.60	36.70	41.71	0.14
Reach 1	3420	10 yr	30.70	255.31	258.48		258.50	0.000331	0.71	55.32	92.51	0.16
Reach 1	3420	20 yr	40.40	255.31	258.73		258.75	0.000348	0.76	81.98	116.20	0.16
Reach 1	3420	50 yr	54.10	255.31	259.01		259.04	0.000333	0.79	117.10	126.51	0.16
Reach 1	3420	100 yr	65.00	255.31	259.20		259.22	0.000327	0.82	140.77	131.86	0.16
Reach 1	3420	200 yr	76.40	255.31	259.37		259.39	0.000322	0.85	162.96	132.89	0.16
Reach 1	3420	500 yr	92.00	255.31	259.56		259.59	0.000324	0.89	189.49	135.02	0.17
Reach 1	3420	1000 yr	104.20	255.31	259.69		259.72	0.000333	0.93	207.27	136.99	0.17
Reach 1	3420	Timmins	142.20	255.31	260.06		260.09	0.000351	1.03	257.40	140.17	0.18
Reach 1	3420	100 CC Mid	85.50	255.31	259.49		259.51	0.000321	0.87	179.08	133.81	0.16
Reach 1	3420	100 CC End	105.70	255.31	259.71		259.74	0.000334	0.94	209.34	137.12	0.17
Reach 1	3283	2 yr	10.00	254.65	257.71		257.71	0.000074	0.31	32.27	17.44	0.07
Reach 1	3283	5 yr	21.50	254.65	258.16		258.18	0.000180	0.53	40.72	23.31	0.12
Reach 1	3283	10 yr	30.70	254.65	258.44		258.46	0.000238	0.66	51.36	57.18	0.14
Reach 1	3283	20 yr	40.40	254.65	258.68		258.71	0.000280	0.77	66.06	64.27	0.15
Reach 1	3283	50 yr	54.10	254.65	258.96		258.99	0.000325	0.88	84.19	67.54	0.16
Reach 1	3283	100 yr	65.00	254.65	259.13		259.18	0.000360	0.96	96.20	68.94	0.17
Reach 1	3283	200 yr	76.40	254.65	259.29		259.34	0.000394	1.04	107.29	69.78	0.18
Reach 1	3283	500 yr	92.00	254.65	259.48		259.54	0.000441	1.14	120.52	70.67	0.20
Reach 1	3283	1000 yr	104.20	254.65	259.60		259.67	0.000482	1.22	129.15	71.23	0.21
Reach 1	3283	Timmins	142.20	254.65	259.94		260.02	0.000596	1.44	153.54	74.17	0.23
Reach 1	3283	100 CC Mid	85.50	254.65	259.41		259.46	0.000421	1.10	115.36	70.33	0.19
Reach 1	3283	100 CC End	105.70	254.65	259.62		259.68	0.000487	1.23	130.15	71.36	0.21
Reach 1	3157	2 yr	10.00	255.19	257.70	255.90	257.70	0.000106	0.34	29.71	18.69	0.09
Reach 1	3157	5 yr	21.50	255.19	258.13	256.31	258.15	0.000234	0.56	38.42	26.76	0.13
Reach 1	3157	10 yr	30.70	255.19	258.40	256.53	258.43	0.000303	0.70	47.38	44.02	0.15
Reach 1	3157	20 yr	40.40	255.19	258.64	256.71	258.67	0.000350	0.80	61.08	64.66	0.17
Reach 1	3157	50 yr	54.10	255.19	258.91	256.94	258.95	0.000396	0.92	79.24	69.62	0.18
Reach 1	3157	100 yr	65.00	255.19	259.08	257.09	259.12	0.000434	1.00	91.45	73.44	0.19
Reach 1	3157	200 yr	76.40	255.19	259.23	257.23	259.29	0.000472	1.08	103.11	76.52	0.20
Reach 1	3157	500 yr	92.00	255.19	259.42	257.42	259.48	0.000520	1.18	117.27	79.03	0.21
Reach 1	3157	1000 yr	104.20	255.19	259.53	257.56	259.60	0.000565	1.26	126.55	85.18	0.22
Reach 1	3157	Timmins	142.20	255.19	259.85	257.94	259.94	0.000695	1.49	153.27	106.02	0.25
Reach 1	3157	100 CC Mid	85.50	255.19	259.35	257.35	259.40	0.000498	1.14	111.74	78.00	0.21
Reach 1	3157	100 CC End	105.70	255.19	259.55	257.58	259.61	0.000570	1.27	127.62	85.65	0.22
Reach 1	3037	2 yr	10.00	256.09	257.68	256.66	257.69	0.000188	0.37	27.23	24.12	0.11
Reach 1	3037	5 yr	21.50	256.09	258.10	256.87	258.12	0.000331	0.57	37.92	26.65	0.15
Reach 1	3037	10 yr	30.70	256.09	258.36	257.01	258.39	0.000408	0.68	45.25	32.80	0.17
Reach 1	3037	20 yr	40.40	256.09	258.59	257.14	258.62	0.000448	0.77	58.44	73.04	0.18
Reach 1	3037	50 yr	54.10	256.09	258.86	257.31	258.90	0.000469	0.85	82.41	104.21	0.19
Reach 1	3037	100 yr	65.00	256.09	259.03	257.43	259.07	0.000474	0.90	100.80	110.98	0.19
Reach 1	3037	200 yr	76.40	256.09	259.19	257.55	259.23	0.000477	0.95	118.21	113.20	0.20
Reach 1	3037	500 yr	92.00	256.09	259.37	257.69	259.41	0.000495	1.02	139.45	135.52	0.20
Reach 1	3037	1000 yr	104.20	256.09	259.48	257.79	259.53	0.000518	1.07	154.80	153.49	0.21
Reach 1	3037	Timmins	142.20	256.09	259.80	258.10	259.86	0.000572	1.21	202.30	185.90	0.22
Reach 1	3037	100 CC Mid	85.50	256.09	259.30	257.63	259.34	0.000482	0.98	131.04	117.24	0.20
Reach 1	3037	100 CC End	105.70	256.09	259.49	257.81	259.54	0.000521	1.08	156.62	154.74	0.21

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	2941	2 yr	10.00	254.86	257.64		257.66	0.000499	0.54	18.36	17.29	0.17
Reach 1	2941	5 yr	21.50	254.86	258.03		258.06	0.000901	0.84	25.47	19.44	0.24
Reach 1	2941	10 yr	30.70	254.86	258.27		258.32	0.001114	1.01	30.37	22.49	0.27
Reach 1	2941	20 yr	40.40	254.86	258.49		258.55	0.001229	1.15	36.55	38.04	0.29
Reach 1	2941	50 yr	54.10	254.86	258.74		258.82	0.001240	1.28	55.39	104.24	0.29
Reach 1	2941	100 yr	65.00	254.86	258.92		259.00	0.001152	1.30	77.24	136.64	0.29
Reach 1	2941	200 yr	76.40	254.86	259.09		259.16	0.001044	1.31	101.08	154.01	0.28
Reach 1	2941	500 yr	92.00	254.86	259.28		259.34	0.000954	1.32	132.10	166.17	0.27
Reach 1	2941	1000 yr	104.20	254.86	259.40		259.46	0.000904	1.33	152.38	166.71	0.26
Reach 1	2941	Timmins	142.20	254.86	259.73		259.79	0.000804	1.36	208.25	168.96	0.25
Reach 1	2941	100 CC Mid	85.50	254.86	259.20		259.27	0.000995	1.32	119.76	163.67	0.27
Reach 1	2941	100 CC End	105.70	254.86	259.41		259.48	0.000900	1.33	154.67	166.77	0.26
Reach 1	2774	2 yr	10.00	256.05	257.58		257.59	0.000311	0.45	22.22	20.89	0.14
Reach 1	2774	5 yr	21.50	256.05	257.92		257.94	0.000579	0.73	29.49	22.44	0.20
Reach 1	2774	10 yr	30.70	256.05	258.13		258.17	0.000730	0.91	34.71	27.47	0.23
Reach 1	2774	20 yr	40.40	256.05	258.32		258.38	0.000849	1.05	41.99	52.83	0.25
Reach 1	2774	50 yr	54.10	256.05	258.57		258.64	0.000923	1.20	57.13	76.99	0.27
Reach 1	2774	100 yr	65.00	256.05	258.75		258.82	0.000915	1.26	71.75	82.78	0.27
Reach 1	2774	200 yr	76.40	256.05	258.92		258.99	0.000916	1.32	87.19	103.44	0.27
Reach 1	2774	500 yr	92.00	256.05	259.10		259.18	0.000942	1.41	107.16	116.67	0.28
Reach 1	2774	1000 yr	104.20	256.05	259.21		259.30	0.000967	1.47	121.22	124.32	0.29
Reach 1	2774	Timmins	142.20	256.05	259.55		259.64	0.000969	1.59	164.71	136.20	0.29
Reach 1	2774	100 CC Mid	85.50	256.05	259.03		259.11	0.000923	1.37	99.31	108.37	0.28
Reach 1	2774	100 CC End	105.70	256.05	259.23		259.32	0.000969	1.48	122.87	124.48	0.29
Reach 1	2769	2 yr	10.00	256.49	257.55		257.59	0.001753	0.77	12.96	20.21	0.31
Reach 1	2769	5 yr	21.50	256.49	257.87		257.93	0.002231	1.09	19.81	23.82	0.37
Reach 1	2769	10 yr	30.70	256.49	258.08		258.16	0.002274	1.25	25.79	33.14	0.38
Reach 1	2769	20 yr	40.40	256.49	258.28		258.37	0.002211	1.37	33.46	49.35	0.39
Reach 1	2769	50 yr	54.10	256.49	258.54		258.63	0.001909	1.44	51.48	83.43	0.37
Reach 1	2769	100 yr	65.00	256.49	258.73		258.82	0.001620	1.43	68.41	93.58	0.35
Reach 1	2769	200 yr	76.40	256.49	258.90		258.99	0.001430	1.43	85.55	103.13	0.33
Reach 1	2769	500 yr	92.00	256.49	259.09		259.18	0.001314	1.46	107.42	121.27	0.32
Reach 1	2769	1000 yr	104.20	256.49	259.21		259.30	0.001302	1.51	122.11	129.48	0.32
Reach 1	2769	Timmins	142.20	256.49	259.55		259.63	0.001155	1.56	167.01	140.93	0.31
Reach 1	2769	100 CC Mid	85.50	256.49	259.02		259.10	0.001359	1.45	98.60	117.18	0.33
Reach 1	2769	100 CC End	105.70	256.49	259.22		259.31	0.001297	1.52	123.87	129.72	0.32
Reach 1	2764	2 yr	10.00	256.67	257.50		257.57	0.006027	1.13	8.88	19.87	0.54
Reach 1	2764	5 yr	21.50	256.67	257.81		257.91	0.005045	1.41	15.28	21.35	0.53
Reach 1	2764	10 yr	30.70	256.67	258.02		258.14	0.004563	1.54	20.71	33.42	0.52
Reach 1	2764	20 yr	40.40	256.67	258.23		258.35	0.003622	1.57	30.84	56.90	0.48
Reach 1	2764	50 yr	54.10	256.67	258.51		258.62	0.002520	1.53	50.32	81.83	0.42
Reach 1	2764	100 yr	65.00	256.67	258.72		258.81	0.001954	1.48	67.81	90.34	0.38
Reach 1	2764	200 yr	76.40	256.67	258.89		258.98	0.001674	1.47	84.98	101.43	0.35
Reach 1	2764	500 yr	92.00	256.67	259.09		259.17	0.001503	1.49	106.64	122.44	0.34
Reach 1	2764	1000 yr	104.20	256.67	259.20		259.29	0.001465	1.53	121.45	127.89	0.34
Reach 1	2764	Timmins	142.20	256.67	259.54		259.62	0.001267	1.58	166.93	144.33	0.32
Reach 1	2764	100 CC Mid	85.50	256.67	259.01		259.10	0.001575	1.49	97.81	114.51	0.35
Reach 1	2764	100 CC End	105.70	256.67	259.22		259.30	0.001456	1.53	123.21	128.41	0.34
Reach 1	2752	2 yr	10.00	256.55	257.44		257.50	0.004590	1.09	9.13	17.39	0.48
Reach 1	2752	5 yr	21.50	256.55	257.75		257.85	0.004955	1.43	15.06	20.32	0.53
Reach 1	2752	10 yr	30.70	256.55	257.96		258.09	0.004562	1.57	20.31	32.76	0.52
Reach 1	2752	20 yr	40.40	256.55	258.18		258.31	0.003691	1.61	29.05	48.18	0.49
Reach 1	2752	50 yr	54.10	256.55	258.47		258.59	0.002602	1.58	46.39	67.32	0.43
Reach 1	2752	100 yr	65.00	256.55	258.67		258.78	0.002168	1.57	61.26	82.85	0.40
Reach 1	2752	200 yr	76.40	256.55	258.86		258.96	0.001788	1.54	77.03	89.95	0.37
Reach 1	2752	500 yr	92.00	256.55	259.05		259.15	0.001712	1.61	95.67	106.90	0.37
Reach 1	2752	1000 yr	104.20	256.55	259.17		259.27	0.001629	1.63	108.84	109.83	0.36
Reach 1	2752	Timmins	142.20	256.55	259.50		259.61	0.001496	1.73	147.75	123.86	0.35
Reach 1	2752	100 CC Mid	85.50	256.55	258.98		259.08	0.001713	1.57	88.44	101.08	0.36
Reach 1	2752	100 CC End	105.70	256.55	259.18		259.28	0.001624	1.64	110.32	110.39	0.36
Reach 1	2741	2 yr	10.00	256.59	257.39		257.46	0.004419	1.14	8.79	14.85	0.47
Reach 1	2741	5 yr	21.50	256.59	257.64		257.79	0.006669	1.69	12.72	16.09	0.61
Reach 1	2741	10 yr	30.70	256.59	257.82		258.02	0.007263	1.96	15.70	16.98	0.65
Reach 1	2741	20 yr	40.40	256.59	258.02		258.25	0.006948	2.12	19.09	18.08	0.65
Reach 1	2741	50 yr	54.10	256.59	258.26		258.53	0.006568	2.30	23.71	19.60	0.65
Reach 1	2741	100 yr	65.00	256.59	258.42	258.06	258.72	0.006401	2.45	27.26	28.95	0.66
Reach 1	2741	200 yr	76.40	256.59	258.57	258.19	258.90	0.006223	2.58	33.15	55.63	0.66
Reach 1	2741	500 yr	92.00	256.59	258.78	258.37	259.10	0.005335	2.60	48.61	89.69	0.62
Reach 1	2741	1000 yr	104.20	256.59	258.94	258.68	259.22	0.004408	2.51	65.61	105.05	0.57
Reach 1	2741	Timmins	142.20	256.59	259.39		259.58	0.002685	2.25	118.06	140.83	0.46
Reach 1	2741	100 CC Mid	85.50	256.59	258.69	258.29	259.02	0.005807	2.62	41.19	76.30	0.64
Reach 1	2741	100 CC End	105.70	256.59	258.97	258.68	259.24	0.004272	2.49	67.94	105.47	0.57
Reach 1	2728	2 yr	10.00	256.22	257.40		257.42	0.000858	0.64	15.66	18.83	0.22

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	2728	5 yr	21.50	256.22	257.67		257.72	0.001618	1.03	20.94	20.51	0.32
Reach 1	2728	10 yr	30.70	256.22	257.86		257.94	0.001953	1.24	25.02	22.02	0.36
Reach 1	2728	20 yr	40.40	256.22	258.06		258.16	0.002083	1.39	29.80	27.81	0.38
Reach 1	2728	50 yr	54.10	256.22	258.33		258.44	0.002025	1.54	38.82	37.55	0.38
Reach 1	2728	100 yr	65.00	256.22	258.50		258.63	0.002029	1.65	46.18	50.46	0.39
Reach 1	2728	200 yr	76.40	256.22	258.66		258.80	0.002017	1.74	55.81	66.01	0.40
Reach 1	2728	500 yr	92.00	256.22	258.86		259.01	0.001927	1.81	69.71	79.35	0.39
Reach 1	2728	1000 yr	104.20	256.22	259.00		259.15	0.001888	1.87	81.87	94.29	0.39
Reach 1	2728	Timmins	142.20	256.22	259.39		259.54	0.001625	1.93	126.61	134.27	0.37
Reach 1	2728	100 CC Mid	85.50	256.22	258.78		258.93	0.001965	1.78	63.81	68.08	0.39
Reach 1	2728	100 CC End	105.70	256.22	259.01		259.17	0.001872	1.87	83.58	94.69	0.39
Reach 1	2692	2 yr	10.00	255.62	257.40		257.41	0.000148	0.37	27.27	20.33	0.10
Reach 1	2692	5 yr	21.50	255.62	257.67		257.69	0.000386	0.66	32.84	21.20	0.17
Reach 1	2692	10 yr	30.70	255.62	257.86		257.89	0.000547	0.84	36.94	22.48	0.20
Reach 1	2692	20 yr	40.40	255.62	258.06		258.11	0.000658	0.99	42.40	32.04	0.22
Reach 1	2692	50 yr	54.10	255.62	258.32		258.39	0.000758	1.15	52.29	45.61	0.25
Reach 1	2692	100 yr	65.00	255.62	258.49		258.57	0.000836	1.27	61.01	59.98	0.26
Reach 1	2692	200 yr	76.40	255.62	258.65		258.74	0.000895	1.37	72.80	84.29	0.27
Reach 1	2692	500 yr	92.00	255.62	258.85		258.95	0.000922	1.46	90.59	94.61	0.28
Reach 1	2692	1000 yr	104.20	255.62	258.99		259.09	0.000934	1.52	104.48	105.89	0.29
Reach 1	2692	Timmins	142.20	255.62	259.37		259.48	0.000943	1.66	154.84	149.36	0.29
Reach 1	2692	100 CC Mid	85.50	255.62	258.77		258.86	0.000915	1.43	83.18	91.15	0.28
Reach 1	2692	100 CC End	105.70	255.62	259.00		259.11	0.000932	1.53	106.37	106.81	0.29
Reach 1	2587	2 yr	10.00	254.02	257.40		257.40	0.000030	0.22	46.28	22.21	0.05
Reach 1	2587	5 yr	21.50	254.02	257.66		257.67	0.000098	0.41	52.24	23.32	0.09
Reach 1	2587	10 yr	30.70	254.02	257.84		257.86	0.000159	0.55	56.65	24.35	0.11
Reach 1	2587	20 yr	40.40	254.02	258.04		258.06	0.000218	0.66	61.56	25.50	0.13
Reach 1	2587	50 yr	54.10	254.02	258.30		258.33	0.000287	0.81	69.61	36.82	0.15
Reach 1	2587	100 yr	65.00	254.02	258.46		258.50	0.000337	0.91	76.64	52.35	0.17
Reach 1	2587	200 yr	76.40	254.02	258.62		258.67	0.000385	1.00	86.68	74.87	0.18
Reach 1	2587	500 yr	92.00	254.02	258.81		258.87	0.000438	1.11	101.65	80.89	0.20
Reach 1	2587	1000 yr	104.20	254.02	258.94		259.01	0.000475	1.19	112.60	83.56	0.21
Reach 1	2587	Timmins	142.20	254.02	259.31		259.40	0.000561	1.39	144.73	89.47	0.23
Reach 1	2587	100 CC Mid	85.50	254.02	258.73		258.79	0.000418	1.07	95.48	78.95	0.19
Reach 1	2587	100 CC End	105.70	254.02	258.96		259.03	0.000478	1.20	114.03	83.81	0.21
Reach 1	2461	2 yr	10.00	254.58	257.39		257.39	0.000072	0.30	32.98	17.84	0.07
Reach 1	2461	5 yr	21.50	254.58	257.63		257.65	0.000228	0.58	37.46	19.20	0.13
Reach 1	2461	10 yr	30.70	254.58	257.80		257.83	0.000367	0.76	41.01	23.92	0.16
Reach 1	2461	20 yr	40.40	254.58	257.98		258.02	0.000497	0.92	46.24	38.88	0.19
Reach 1	2461	50 yr	54.10	254.58	258.22		258.28	0.000616	1.09	57.59	54.72	0.22
Reach 1	2461	100 yr	65.00	254.58	258.37		258.44	0.000696	1.21	66.28	57.27	0.24
Reach 1	2461	200 yr	76.40	254.58	258.52		258.60	0.000774	1.32	75.14	63.28	0.25
Reach 1	2461	500 yr	92.00	254.58	258.69		258.79	0.000854	1.44	86.59	64.30	0.27
Reach 1	2461	1000 yr	104.20	254.58	258.82		258.93	0.000912	1.53	94.64	64.75	0.28
Reach 1	2461	Timmins	142.20	254.58	259.17		259.30	0.001051	1.76	117.50	66.22	0.30
Reach 1	2461	100 CC Mid	85.50	254.58	258.62		258.71	0.000823	1.39	81.94	64.03	0.26
Reach 1	2461	100 CC End	105.70	254.58	258.84		258.94	0.000917	1.54	95.70	64.80	0.28
Reach 1	2350	2 yr	10.00	255.39	257.38		257.38	0.000100	0.32	31.19	21.14	0.08
Reach 1	2350	5 yr	21.50	255.39	257.60		257.62	0.000287	0.60	38.48	44.67	0.15
Reach 1	2350	10 yr	30.70	255.39	257.75		257.78	0.000426	0.77	46.15	55.55	0.18
Reach 1	2350	20 yr	40.40	255.39	257.92		257.96	0.000520	0.90	57.83	82.13	0.20
Reach 1	2350	50 yr	54.10	255.39	258.16		258.21	0.000576	1.02	78.62	95.89	0.22
Reach 1	2350	100 yr	65.00	255.39	258.31		258.36	0.000607	1.09	94.02	103.43	0.22
Reach 1	2350	200 yr	76.40	255.39	258.46		258.51	0.000624	1.15	109.09	105.06	0.23
Reach 1	2350	500 yr	92.00	255.39	258.64		258.70	0.000649	1.23	128.71	112.90	0.24
Reach 1	2350	1000 yr	104.20	255.39	258.76		258.83	0.000660	1.28	143.18	115.69	0.24
Reach 1	2350	Timmins	142.20	255.39	259.12		259.19	0.000670	1.39	185.79	122.18	0.25
Reach 1	2350	100 CC Mid	85.50	255.39	258.56		258.62	0.000640	1.20	120.55	110.50	0.23
Reach 1	2350	100 CC End	105.70	255.39	258.78		258.84	0.000659	1.28	145.14	116.06	0.24
Reach 1	2206	2 yr	10.00	254.84	257.37		257.37	0.000078	0.30	33.54	25.49	0.07
Reach 1	2206	5 yr	21.50	254.84	257.56		257.58	0.000249	0.58	39.96	45.62	0.13
Reach 1	2206	10 yr	30.70	254.84	257.70		257.72	0.000393	0.76	46.83	57.32	0.17
Reach 1	2206	20 yr	40.40	254.84	257.85		257.89	0.000508	0.91	57.43	83.67	0.20
Reach 1	2206	50 yr	54.10	254.84	258.07		258.12	0.000582	1.04	80.04	124.62	0.21
Reach 1	2206	100 yr	65.00	254.84	258.23		258.28	0.000604	1.10	100.53	141.41	0.22
Reach 1	2206	200 yr	76.40	254.84	258.37		258.42	0.000602	1.14	121.42	145.58	0.22
Reach 1	2206	500 yr	92.00	254.84	258.55		258.61	0.000599	1.19	148.40	154.31	0.22
Reach 1	2206	1000 yr	104.20	254.84	258.68		258.73	0.000602	1.23	168.59	164.29	0.23
Reach 1	2206	Timmins	142.20	254.84	259.05		259.10	0.000558	1.27	233.12	182.27	0.22
Reach 1	2206	100 CC Mid	85.50	254.84	258.48		258.53	0.000599	1.17	137.30	149.14	0.22
Reach 1	2206	100 CC End	105.70	254.84	258.70		258.75	0.000599	1.23	171.46	165.48	0.23
Reach 1	2117	2 yr	10.00	254.72	257.36		257.36	0.000060	0.26	46.20	80.12	0.07
Reach 1	2117	5 yr	21.50	254.72	257.55		257.56	0.000175	0.48	63.14	103.00	0.11

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	2117	10 yr	30.70	254.72	257.68		257.69	0.000263	0.61	77.37	120.41	0.14
Reach 1	2117	20 yr	40.40	254.72	257.83		257.85	0.000308	0.70	96.40	130.18	0.15
Reach 1	2117	50 yr	54.10	254.72	258.05		258.08	0.000321	0.76	126.90	138.28	0.16
Reach 1	2117	100 yr	65.00	254.72	258.21		258.23	0.000326	0.80	148.09	139.16	0.16
Reach 1	2117	200 yr	76.40	254.72	258.35		258.38	0.000330	0.84	168.31	140.02	0.17
Reach 1	2117	500 yr	92.00	254.72	258.53		258.56	0.000336	0.88	193.71	141.28	0.17
Reach 1	2117	1000 yr	104.20	254.72	258.66		258.69	0.000342	0.92	211.57	142.29	0.17
Reach 1	2117	Timmins	142.20	254.72	259.02		259.05	0.000350	1.01	263.69	144.36	0.18
Reach 1	2117	100 CC Mid	85.50	254.72	258.46		258.48	0.000334	0.87	183.42	140.75	0.17
Reach 1	2117	100 CC End	105.70	254.72	258.68		258.70	0.000341	0.92	214.05	142.38	0.17
Reach 1	1981	2 yr	10.00	254.12	257.36		257.36	0.000030	0.22	46.24	36.88	0.05
Reach 1	1981	5 yr	21.50	254.12	257.53		257.54	0.000104	0.44	53.20	42.51	0.09
Reach 1	1981	10 yr	30.70	254.12	257.65		257.66	0.000179	0.60	58.87	56.72	0.12
Reach 1	1981	20 yr	40.40	254.12	257.79		257.81	0.000251	0.73	67.26	63.35	0.14
Reach 1	1981	50 yr	54.10	254.12	257.99		258.03	0.000328	0.88	82.35	77.01	0.17
Reach 1	1981	100 yr	65.00	254.12	258.14		258.18	0.000379	0.98	93.36	77.85	0.18
Reach 1	1981	200 yr	76.40	254.12	258.27		258.32	0.000426	1.07	103.93	78.76	0.19
Reach 1	1981	500 yr	92.00	254.12	258.44		258.50	0.000483	1.17	117.34	80.20	0.21
Reach 1	1981	1000 yr	104.20	254.12	258.56		258.62	0.000526	1.25	126.80	81.28	0.22
Reach 1	1981	Timmins	142.20	254.12	258.90		258.98	0.000623	1.45	155.02	83.44	0.24
Reach 1	1981	100 CC Mid	85.50	254.12	258.37		258.43	0.000460	1.13	111.90	79.57	0.20
Reach 1	1981	100 CC End	105.70	254.12	258.57		258.64	0.000529	1.26	128.16	81.41	0.22
Reach 1	1747	2 yr	10.00	254.18	257.35	255.06	257.35	0.000043	0.23	49.24	56.64	0.06
Reach 1	1747	5 yr	21.50	254.18	257.50	255.44	257.51	0.000142	0.45	59.33	70.40	0.10
Reach 1	1747	10 yr	30.70	254.18	257.60	255.64	257.62	0.000237	0.60	66.22	75.86	0.13
Reach 1	1747	20 yr	40.40	254.18	257.72	255.83	257.74	0.000319	0.72	75.72	80.21	0.16
Reach 1	1747	50 yr	54.10	254.18	257.91	256.06	257.95	0.000390	0.84	92.00	87.21	0.18
Reach 1	1747	100 yr	65.00	254.18	258.05	256.22	258.08	0.000439	0.93	103.93	92.09	0.19
Reach 1	1747	200 yr	76.40	254.18	258.17	256.36	258.21	0.000482	1.00	115.60	93.69	0.20
Reach 1	1747	500 yr	92.00	254.18	258.33	256.55	258.38	0.000532	1.10	130.63	96.47	0.21
Reach 1	1747	1000 yr	104.20	254.18	258.44	256.68	258.49	0.000569	1.16	141.23	98.03	0.22
Reach 1	1747	Timmins	142.20	254.18	258.76	257.23	258.83	0.000645	1.33	174.30	104.65	0.24
Reach 1	1747	100 CC Mid	85.50	254.18	258.27	256.47	258.31	0.000512	1.06	124.49	95.60	0.21
Reach 1	1747	100 CC End	105.70	254.18	258.45	256.70	258.51	0.000570	1.17	142.85	98.17	0.22
Reach 1	1709		Inl Struct									
Reach 1	1703	2 yr	10.00	255.74	256.80	256.76	256.98	0.018164	1.87	5.35	12.42	0.91
Reach 1	1703	5 yr	21.50	255.74	257.07	257.07	257.35	0.020307	2.33	9.28	17.29	1.00
Reach 1	1703	10 yr	30.70	255.74	257.25	257.25	257.56	0.018926	2.47	12.60	21.00	0.99
Reach 1	1703	20 yr	40.40	255.74	257.39	257.39	257.73	0.018798	2.61	15.79	24.83	1.01
Reach 1	1703	50 yr	54.10	255.74	257.57	257.57	257.94	0.014927	2.70	21.74	37.59	0.93
Reach 1	1703	100 yr	65.00	255.74	257.68	257.68	258.08	0.014176	2.84	25.79	40.17	0.93
Reach 1	1703	200 yr	76.40	255.74	257.78	257.78	258.21	0.013592	2.97	29.86	41.67	0.92
Reach 1	1703	500 yr	92.00	255.74	257.91	257.91	258.37	0.012619	3.10	35.55	43.23	0.91
Reach 1	1703	1000 yr	104.20	255.74	258.00	258.00	258.48	0.012550	3.23	39.18	44.05	0.91
Reach 1	1703	Timmins	142.20	255.74	258.23	258.23	258.82	0.012580	3.61	49.76	48.26	0.94
Reach 1	1703	100 CC Mid	85.50	255.74	257.86	257.86	258.30	0.012960	3.04	33.25	42.71	0.91
Reach 1	1703	100 CC End	105.70	255.74	258.00	258.00	258.50	0.012597	3.25	39.55	44.12	0.92
Reach 1	1683	2 yr	10.00	255.79	256.61	256.47	256.69	0.008634	1.27	7.86	19.28	0.64
Reach 1	1683	5 yr	21.50	255.79	256.85	256.71	256.99	0.009081	1.66	13.04	23.34	0.69
Reach 1	1683	10 yr	30.70	255.79	256.98	256.84	257.17	0.009234	1.92	16.31	25.29	0.72
Reach 1	1683	20 yr	40.40	255.79	257.11	256.97	257.34	0.009403	2.15	19.48	26.91	0.75
Reach 1	1683	50 yr	54.10	255.79	257.25	257.12	257.55	0.009663	2.43	23.54	28.06	0.78
Reach 1	1683	100 yr	65.00	255.79	257.35	257.23	257.70	0.010250	2.65	26.27	30.31	0.82
Reach 1	1683	200 yr	76.40	255.79	257.45	257.34	257.84	0.010302	2.83	29.49	33.08	0.83
Reach 1	1683	500 yr	92.00	255.79	257.54	257.47	258.03	0.011570	3.15	32.71	37.93	0.89
Reach 1	1683	1000 yr	104.20	255.79	257.61	257.61	258.16	0.012139	3.34	35.54	39.31	0.92
Reach 1	1683	Timmins	142.20	255.79	257.91	257.91	258.52	0.010677	3.59	48.26	44.87	0.89
Reach 1	1683	100 CC Mid	85.50	255.79	257.50	257.43	257.95	0.010955	3.01	31.44	36.50	0.86
Reach 1	1683	100 CC End	105.70	255.79	257.63	257.62	258.17	0.011990	3.35	36.13	39.47	0.92
Reach 1	1657	2 yr	10.00	255.60	256.17	256.17	256.34	0.023992	1.80	5.54	17.08	1.01
Reach 1	1657	5 yr	21.50	255.60	256.40	256.40	256.64	0.020987	2.18	9.86	20.81	1.01
Reach 1	1657	10 yr	30.70	255.60	256.53	256.53	256.83	0.019213	2.42	12.78	22.90	1.00
Reach 1	1657	20 yr	40.40	255.60	256.66	256.66	257.00	0.017597	2.62	15.69	24.23	0.99
Reach 1	1657	50 yr	54.10	255.60	256.82	256.82	257.22	0.015692	2.84	20.01	28.66	0.97
Reach 1	1657	100 yr	65.00	255.60	256.94	256.94	257.38	0.014275	2.96	23.72	31.08	0.94
Reach 1	1657	200 yr	76.40	255.60	257.04	257.04	257.53	0.014088	3.13	26.87	32.21	0.95
Reach 1	1657	500 yr	92.00	255.60	257.21	257.16	257.72	0.012317	3.22	32.64	37.03	0.91
Reach 1	1657	1000 yr	104.20	255.60	257.36	257.31	257.85	0.010626	3.21	38.11	38.80	0.86
Reach 1	1657	Timmins	142.20	255.60	257.73	257.57	258.24	0.008209	3.30	53.54	43.48	0.79
Reach 1	1657	100 CC Mid	85.50	255.60	257.14	257.13	257.64	0.013042	3.19	30.11	34.07	0.93
Reach 1	1657	100 CC End	105.70	255.60	257.37	257.32	257.87	0.010483	3.22	38.74	39.00	0.86
Reach 1	1648	2 yr	10.00	254.85	256.06		256.10	0.003028	0.93	10.75	18.59	0.39

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	1648	5 yr	21.50	254.85	256.34		256.42	0.004142	1.29	16.89	24.35	0.48
Reach 1	1648	10 yr	30.70	254.85	256.51		256.62	0.004226	1.48	21.31	26.37	0.50
Reach 1	1648	20 yr	40.40	254.85	256.67		256.81	0.004159	1.64	25.66	27.18	0.51
Reach 1	1648	50 yr	54.10	254.85	256.88		257.04	0.004101	1.83	31.26	28.18	0.52
Reach 1	1648	100 yr	65.00	254.85	257.02		257.21	0.004071	1.96	35.41	28.97	0.53
Reach 1	1648	200 yr	76.40	254.85	257.16		257.38	0.004067	2.09	39.52	30.06	0.54
Reach 1	1648	500 yr	92.00	254.85	257.33		257.58	0.004156	2.26	44.66	32.12	0.55
Reach 1	1648	1000 yr	104.20	254.85	257.45		257.73	0.004197	2.38	48.70	33.83	0.56
Reach 1	1648	Timmins	142.20	254.85	257.78		258.14	0.004343	2.71	60.70	39.32	0.59
Reach 1	1648	100 CC Mid	85.50	254.85	257.26		257.50	0.004129	2.19	42.50	31.12	0.55
Reach 1	1648	100 CC End	105.70	254.85	257.46		257.74	0.004203	2.39	49.18	33.96	0.56
Reach 1	1637	2 yr	10.00	255.10	255.86	255.86	256.02	0.023969	1.76	5.67	18.01	1.00
Reach 1	1637	5 yr	21.50	255.10	256.08	256.08	256.32	0.020525	2.21	9.75	19.67	1.00
Reach 1	1637	10 yr	30.70	255.10	256.21	256.21	256.52	0.019075	2.46	12.49	20.52	1.00
Reach 1	1637	20 yr	40.40	255.10	256.33	256.33	256.71	0.018193	2.70	15.03	21.44	1.01
Reach 1	1637	50 yr	54.10	255.10	256.50	256.50	256.94	0.016396	2.94	18.75	23.29	0.99
Reach 1	1637	100 yr	65.00	255.10	256.62	256.62	257.11	0.015500	3.10	21.66	25.00	0.98
Reach 1	1637	200 yr	76.40	255.10	256.74	256.74	257.27	0.014712	3.25	24.69	26.89	0.97
Reach 1	1637	500 yr	92.00	255.10	256.91	256.91	257.47	0.013219	3.38	29.49	29.46	0.94
Reach 1	1637	1000 yr	104.20	255.10	257.01	257.01	257.62	0.012978	3.52	32.53	30.12	0.95
Reach 1	1637	Timmins	142.20	255.10	257.41	257.31	258.04	0.009947	3.64	45.18	33.87	0.86
Reach 1	1637	100 CC Mid	85.50	255.10	256.85	256.85	257.39	0.013462	3.30	27.75	28.98	0.94
Reach 1	1637	100 CC End	105.70	255.10	257.02	257.02	257.64	0.012900	3.53	32.95	30.20	0.94
Reach 1	1622	2 yr	10.00	254.36	255.38		255.52	0.015271	1.68	5.96	14.56	0.84
Reach 1	1622	5 yr	21.50	254.36	255.77		255.93	0.008135	1.75	12.47	18.84	0.67
Reach 1	1622	10 yr	30.70	254.36	256.01		256.18	0.006925	1.82	17.31	22.37	0.64
Reach 1	1622	20 yr	40.40	254.36	256.22		256.40	0.005647	1.91	22.34	25.69	0.60
Reach 1	1622	50 yr	54.10	254.36	256.47		256.67	0.004722	2.02	29.16	27.43	0.57
Reach 1	1622	100 yr	65.00	254.36	256.64		256.86	0.004462	2.12	33.74	27.90	0.56
Reach 1	1622	200 yr	76.40	254.36	256.80		257.04	0.004279	2.23	38.27	28.66	0.56
Reach 1	1622	500 yr	92.00	254.36	256.98		257.26	0.004275	2.39	43.83	31.14	0.57
Reach 1	1622	1000 yr	104.20	254.36	257.12		257.42	0.004203	2.50	48.31	32.52	0.57
Reach 1	1622	Timmins	142.20	254.36	257.50		257.87	0.004146	2.79	61.89	38.71	0.58
Reach 1	1622	100 CC Mid	85.50	254.36	256.91		257.17	0.004284	2.33	41.52	30.24	0.57
Reach 1	1622	100 CC End	105.70	254.36	257.14		257.44	0.004196	2.51	48.85	32.71	0.57
Reach 1	1594	2 yr	10.00	253.70	255.35		255.39	0.001576	0.85	11.83	14.50	0.29
Reach 1	1594	5 yr	21.50	253.70	255.72		255.80	0.002314	1.25	17.63	17.01	0.37
Reach 1	1594	10 yr	30.70	253.70	255.94		256.05	0.002761	1.48	21.62	19.43	0.42
Reach 1	1594	20 yr	40.40	253.70	256.14		256.28	0.002993	1.67	25.76	22.05	0.44
Reach 1	1594	50 yr	54.10	253.70	256.39		256.56	0.003069	1.88	31.58	24.64	0.46
Reach 1	1594	100 yr	65.00	253.70	256.54		256.75	0.003237	2.05	35.65	26.96	0.48
Reach 1	1594	200 yr	76.40	253.70	256.70		256.93	0.003372	2.21	40.00	30.10	0.50
Reach 1	1594	500 yr	92.00	253.70	256.87		257.15	0.003598	2.41	45.69	33.99	0.52
Reach 1	1594	1000 yr	104.20	253.70	257.01		257.31	0.003656	2.53	50.52	36.10	0.53
Reach 1	1594	Timmins	142.20	253.70	257.40		257.76	0.003732	2.83	65.53	42.00	0.55
Reach 1	1594	100 CC Mid	85.50	253.70	256.80		257.06	0.003527	2.33	43.27	32.98	0.51
Reach 1	1594	100 CC End	105.70	253.70	257.03		257.33	0.003659	2.54	51.13	36.34	0.53
Reach 1	1586	2 yr	10.00	254.41	255.12	255.12	255.34	0.021449	2.09	4.77	10.83	1.01
Reach 1	1586	5 yr	21.50	254.41	255.43	255.43	255.74	0.018394	2.45	8.93	15.57	0.99
Reach 1	1586	10 yr	30.70	254.41	255.60	255.60	255.97	0.016667	2.73	11.68	16.65	0.98
Reach 1	1586	20 yr	40.40	254.41	255.75	255.75	256.20	0.015699	2.98	14.33	17.84	0.98
Reach 1	1586	50 yr	54.10	254.41	255.98	255.98	256.48	0.013373	3.18	18.88	22.94	0.94
Reach 1	1586	100 yr	65.00	254.41	256.14	256.14	256.67	0.012231	3.31	22.66	25.18	0.92
Reach 1	1586	200 yr	76.40	254.41	256.26	256.26	256.85	0.012428	3.52	25.65	26.67	0.94
Reach 1	1586	500 yr	92.00	254.41	256.46	256.46	257.07	0.010951	3.61	31.48	29.56	0.90
Reach 1	1586	1000 yr	104.20	254.41	256.55	256.55	257.23	0.011428	3.82	34.22	30.44	0.93
Reach 1	1586	Timmins	142.20	254.41	256.89	256.89	257.67	0.010830	4.19	45.39	36.13	0.93
Reach 1	1586	100 CC Mid	85.50	254.41	256.39	256.39	256.98	0.011190	3.55	29.41	28.90	0.90
Reach 1	1586	100 CC End	105.70	254.41	256.56	256.56	257.25	0.011482	3.85	34.55	30.56	0.93
Reach 1	1572	2 yr	10.00	253.69	254.58	254.58	254.75	0.022148	1.80	5.75	18.43	0.98
Reach 1	1572	5 yr	21.50	253.69	254.80	254.80	255.06	0.019644	2.27	10.08	20.95	1.00
Reach 1	1572	10 yr	30.70	253.69	254.95	254.95	255.25	0.018137	2.50	13.28	22.81	0.99
Reach 1	1572	20 yr	40.40	253.69	255.07	255.07	255.43	0.017700	2.72	16.24	24.41	1.00
Reach 1	1572	50 yr	54.10	253.69	255.24	255.24	255.66	0.015920	2.95	20.46	26.36	0.98
Reach 1	1572	100 yr	65.00	253.69	255.36	255.36	255.82	0.015167	3.12	23.61	28.34	0.98
Reach 1	1572	200 yr	76.40	253.69	255.47	255.47	255.97	0.014369	3.26	27.19	34.66	0.97
Reach 1	1572	500 yr	92.00	253.69	255.64	255.64	256.16	0.012740	3.36	33.19	37.47	0.93
Reach 1	1572	1000 yr	104.20	253.69	255.75	255.75	256.29	0.012083	3.45	37.41	38.62	0.92
Reach 1	1572	Timmins	142.20	253.69	256.00	256.00	256.66	0.012123	3.86	47.84	44.67	0.95
Reach 1	1572	100 CC Mid	85.50	253.69	255.57	255.57	256.08	0.013205	3.31	30.83	36.58	0.94
Reach 1	1572	100 CC End	105.70	253.69	255.76	255.76	256.31	0.012066	3.47	37.85	38.72	0.92
Reach 1	1561	2 yr	10.00	253.07	254.14	254.14	254.31	0.023298	1.84	5.44	15.93	1.00
Reach 1	1561	5 yr	21.50	253.07	254.38	254.38	254.62	0.021071	2.14	10.11	23.35	1.01

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	1561	10 yr	30.70	253.07	254.52	254.52	254.79	0.018641	2.30	13.85	29.69	0.98
Reach 1	1561	20 yr	40.40	253.07	254.64	254.64	254.94	0.016523	2.47	17.57	31.83	0.95
Reach 1	1561	50 yr	54.10	253.07	254.77	254.77	255.14	0.015862	2.72	21.82	32.43	0.96
Reach 1	1561	100 yr	65.00	253.07	254.87	254.87	255.27	0.015409	2.89	24.99	32.95	0.97
Reach 1	1561	200 yr	76.40	253.07	254.95	254.95	255.41	0.015550	3.08	27.82	34.09	0.98
Reach 1	1561	500 yr	92.00	253.07	255.12	255.12	255.59	0.013192	3.14	34.26	45.80	0.93
Reach 1	1561	1000 yr	104.20	253.07	255.22	255.22	255.71	0.012381	3.22	39.03	49.03	0.91
Reach 1	1561	Timmins	142.20	253.07	255.45	255.45	256.03	0.012060	3.55	51.00	53.61	0.93
Reach 1	1561	100 CC Mid	85.50	253.07	255.03	255.03	255.52	0.014960	3.18	30.63	37.34	0.98
Reach 1	1561	100 CC End	105.70	253.07	255.24	255.24	255.72	0.012089	3.21	39.90	49.35	0.90
Reach 1	1551	2 yr	10.00	252.80	253.34	253.34	253.48	0.025396	1.64	6.10	22.96	1.01
Reach 1	1551	5 yr	21.50	252.80	253.53	253.53	253.72	0.022268	1.97	11.05	29.81	1.01
Reach 1	1551	10 yr	30.70	252.80	253.64	253.64	253.88	0.019751	2.17	14.47	31.38	0.99
Reach 1	1551	20 yr	40.40	252.80	253.74	253.73	254.02	0.018897	2.37	17.58	32.58	0.99
Reach 1	1551	50 yr	54.10	252.80	253.86	253.86	254.20	0.017613	2.58	21.83	33.90	0.99
Reach 1	1551	100 yr	65.00	252.80	253.96	253.96	254.32	0.016640	2.71	25.13	34.79	0.98
Reach 1	1551	200 yr	76.40	252.80	254.03	254.03	254.45	0.017558	2.92	27.50	35.93	1.02
Reach 1	1551	500 yr	92.00	252.80	254.19	254.19	254.61	0.013992	2.91	34.57	45.60	0.93
Reach 1	1551	1000 yr	104.20	252.80	254.35	254.27	254.73	0.010698	2.81	41.75	48.60	0.84
Reach 1	1551	Timmins	142.20	252.80	254.73		255.08	0.006976	2.74	61.94	55.82	0.71
Reach 1	1551	100 CC Mid	85.50	252.80	254.10	254.04	254.55	0.017084	3.02	30.39	42.51	1.02
Reach 1	1551	100 CC End	105.70	252.80	254.37	254.27	254.75	0.010395	2.80	42.67	49.84	0.83
Reach 1	1539	2 yr	10.00	252.01	252.95	252.78	253.08	0.009099	1.58	6.35	11.44	0.68
Reach 1	1539	5 yr	21.50	252.01	253.18	253.18	253.44	0.019841	2.26	9.50	18.01	0.99
Reach 1	1539	10 yr	30.70	252.01	253.35	253.35	253.63	0.019769	2.32	13.20	24.09	1.00
Reach 1	1539	20 yr	40.40	252.01	253.48	253.48	253.79	0.019268	2.44	16.57	27.66	1.01
Reach 1	1539	50 yr	54.10	252.01	253.62	253.62	253.97	0.019092	2.61	20.75	31.35	1.02
Reach 1	1539	100 yr	65.00	252.01	253.73	253.73	254.10	0.017478	2.71	24.08	33.33	1.00
Reach 1	1539	200 yr	76.40	252.01	253.91	253.81	254.24	0.011777	2.56	30.31	35.73	0.85
Reach 1	1539	500 yr	92.00	252.01	254.16		254.45	0.007626	2.41	39.91	41.52	0.71
Reach 1	1539	1000 yr	104.20	252.01	254.32		254.60	0.006130	2.36	47.15	43.74	0.65
Reach 1	1539	Timmins	142.20	252.01	254.69		255.00	0.004883	2.48	64.23	50.01	0.60
Reach 1	1539	100 CC Mid	85.50	252.01	254.06		254.36	0.008863	2.45	35.96	39.75	0.75
Reach 1	1539	100 CC End	105.70	252.01	254.34		254.62	0.005994	2.36	48.01	43.93	0.64
Reach 1	1493	2 yr	10.00	251.88	252.29	252.29	252.41	0.025827	1.58	6.33	25.54	1.01
Reach 1	1493	5 yr	21.50	251.88	252.82		252.86	0.002388	0.91	23.66	36.54	0.36
Reach 1	1493	10 yr	30.70	251.88	253.11		253.15	0.001510	0.88	34.77	39.71	0.30
Reach 1	1493	20 yr	40.40	251.88	253.36		253.40	0.001156	0.91	44.76	41.38	0.27
Reach 1	1493	50 yr	54.10	251.88	253.63		253.68	0.001000	0.97	56.37	43.98	0.26
Reach 1	1493	100 yr	65.00	251.88	253.82		253.87	0.000940	1.02	64.93	47.66	0.26
Reach 1	1493	200 yr	76.40	251.88	254.00		254.06	0.000899	1.08	74.36	57.34	0.26
Reach 1	1493	500 yr	92.00	251.88	254.23		254.29	0.000839	1.13	87.97	59.81	0.26
Reach 1	1493	1000 yr	104.20	251.88	254.39		254.46	0.000811	1.17	97.86	61.28	0.26
Reach 1	1493	Timmins	142.20	251.88	254.77		254.85	0.000844	1.33	121.56	64.94	0.27
Reach 1	1493	100 CC Mid	85.50	251.88	254.14		254.20	0.000858	1.11	82.49	58.83	0.26
Reach 1	1493	100 CC End	105.70	251.88	254.41		254.48	0.000808	1.18	99.03	61.48	0.26
Reach 1	1471	2 yr	10.00	251.00	252.32		252.33	0.000194	0.36	27.99	26.29	0.11
Reach 1	1471	5 yr	21.50	251.00	252.83		252.84	0.000274	0.51	42.04	29.77	0.14
Reach 1	1471	10 yr	30.70	251.00	253.11		253.13	0.000325	0.60	50.85	31.88	0.15
Reach 1	1471	20 yr	40.40	251.00	253.36		253.38	0.000355	0.69	58.85	33.70	0.16
Reach 1	1471	50 yr	54.10	251.00	253.63		253.66	0.000398	0.80	68.44	36.84	0.18
Reach 1	1471	100 yr	65.00	251.00	253.81		253.85	0.000430	0.88	76.19	47.75	0.19
Reach 1	1471	200 yr	76.40	251.00	253.99		254.04	0.000456	0.95	84.91	50.30	0.19
Reach 1	1471	500 yr	92.00	251.00	254.22		254.28	0.000480	1.04	96.68	51.67	0.20
Reach 1	1471	1000 yr	104.20	251.00	254.38		254.44	0.000499	1.10	105.17	54.39	0.21
Reach 1	1471	Timmins	142.20	251.00	254.75		254.84	0.000598	1.31	127.28	67.87	0.23
Reach 1	1471	100 CC Mid	85.50	251.00	254.13		254.18	0.000470	1.00	91.97	51.20	0.20
Reach 1	1471	100 CC End	105.70	251.00	254.40		254.46	0.000501	1.11	106.21	54.89	0.21
Reach 1	1400	2 yr	10.00	251.00	252.30		252.31	0.000313	0.43	23.09	23.56	0.14
Reach 1	1400	5 yr	21.50	251.00	252.80		252.82	0.000388	0.60	38.04	36.65	0.16
Reach 1	1400	10 yr	30.70	251.00	253.08		253.10	0.000406	0.70	49.03	43.48	0.17
Reach 1	1400	20 yr	40.40	251.00	253.32		253.35	0.000426	0.78	61.25	55.16	0.18
Reach 1	1400	50 yr	54.10	251.00	253.59		253.63	0.000455	0.88	77.52	62.61	0.19
Reach 1	1400	100 yr	65.00	251.00	253.78		253.82	0.000474	0.95	89.49	65.86	0.20
Reach 1	1400	200 yr	76.40	251.00	253.96		254.00	0.000490	1.01	101.56	69.46	0.20
Reach 1	1400	500 yr	92.00	251.00	254.19		254.24	0.000500	1.09	118.32	75.22	0.21
Reach 1	1400	1000 yr	104.20	251.00	254.35		254.41	0.000507	1.14	130.77	77.99	0.21
Reach 1	1400	Timmins	142.20	251.00	254.72		254.79	0.000572	1.31	160.62	82.89	0.23
Reach 1	1400	100 CC Mid	85.50	251.00	254.10		254.15	0.000495	1.06	111.51	73.01	0.21
Reach 1	1400	100 CC End	105.70	251.00	254.37		254.43	0.000507	1.14	132.26	78.26	0.21
Reach 1	1112	2 yr	10.00	251.10	252.15	251.57	252.17	0.000817	0.64	15.75	18.36	0.22
Reach 1	1112	5 yr	21.50	251.10	252.60	251.80	252.64	0.001009	0.88	24.64	21.26	0.26
Reach 1	1112	10 yr	30.70	251.10	252.87	251.94	252.92	0.001072	1.03	30.56	23.70	0.27

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	1112	20 yr	40.40	251.10	253.09	252.08	253.16	0.001142	1.17	37.35	39.03	0.29
Reach 1	1112	50 yr	54.10	251.10	253.34	252.26	253.42	0.001227	1.33	49.05	53.79	0.30
Reach 1	1112	100 yr	65.00	251.10	253.51	252.40	253.61	0.001254	1.42	58.94	61.57	0.31
Reach 1	1112	200 yr	76.40	251.10	253.68	252.53	253.79	0.001245	1.49	70.24	73.34	0.32
Reach 1	1112	500 yr	92.00	251.10	253.92	252.69	254.03	0.001158	1.54	87.22	86.55	0.31
Reach 1	1112	1000 yr	104.20	251.10	254.09	252.81	254.19	0.001113	1.57	99.73	110.96	0.31
Reach 1	1112	Timmins	142.20	251.10	254.43	253.26	254.56	0.001193	1.76	126.91	131.37	0.32
Reach 1	1112	100 CC Mid	85.50	251.10	253.83	252.63	253.93	0.001184	1.52	80.44	81.56	0.31
Reach 1	1112	100 CC End	105.70	251.10	254.11	252.82	254.21	0.001108	1.58	101.24	112.45	0.31
Reach 1	1082	2 yr	10.00	251.11	252.10	251.71	252.13	0.002222	0.79	12.72	23.90	0.34
Reach 1	1082	5 yr	21.50	251.11	252.57	251.95	252.61	0.001348	0.90	24.68	27.93	0.29
Reach 1	1082	10 yr	30.70	251.11	252.84	252.12	252.89	0.001193	1.00	34.04	44.26	0.28
Reach 1	1082	20 yr	40.40	251.11	253.06	252.24	253.12	0.001104	1.07	45.14	52.62	0.28
Reach 1	1082	50 yr	54.10	251.11	253.32	252.38	253.38	0.001075	1.17	59.24	58.22	0.28
Reach 1	1082	100 yr	65.00	251.11	253.49	252.49	253.56	0.001043	1.23	69.73	61.84	0.28
Reach 1	1082	200 yr	76.40	251.11	253.67	252.58	253.74	0.001009	1.29	80.20	76.04	0.28
Reach 1	1082	500 yr	92.00	251.11	253.91	252.76	253.99	0.000943	1.34	94.79	105.26	0.28
Reach 1	1082	1000 yr	104.20	251.11	254.08	252.89	254.15	0.000917	1.38	105.08	113.92	0.28
Reach 1	1082	Timmins	142.20	251.11	254.41	253.19	254.52	0.001030	1.59	126.44	128.49	0.30
Reach 1	1082	100 CC Mid	85.50	251.11	253.82	252.68	253.89	0.000961	1.31	89.05	102.66	0.28
Reach 1	1082	100 CC End	105.70	251.11	254.10	252.89	254.17	0.000914	1.39	106.30	117.01	0.28
Reach 1	1013	2 yr	10.00	250.87	252.05	251.30	252.07	0.000492	0.54	18.53	18.69	0.17
Reach 1	1013	5 yr	21.50	250.87	252.51	251.52	252.54	0.000696	0.78	28.35	29.85	0.21
Reach 1	1013	10 yr	30.70	250.87	252.78	251.67	252.82	0.000780	0.91	39.83	77.40	0.23
Reach 1	1013	20 yr	40.40	250.87	253.01	251.81	253.05	0.000769	0.98	56.61	113.71	0.24
Reach 1	1013	50 yr	54.10	250.87	253.27	252.00	253.32	0.000719	1.04	80.13	134.22	0.23
Reach 1	1013	100 yr	65.00	250.87	253.45	252.14	253.50	0.000679	1.07	99.13	147.41	0.23
Reach 1	1013	200 yr	76.40	250.87	253.63	252.27	253.68	0.000630	1.09	119.40	163.63	0.22
Reach 1	1013	500 yr	92.00	250.87	253.88	252.44	253.93	0.000549	1.08	151.14	186.34	0.21
Reach 1	1013	1000 yr	104.20	250.87	254.06	252.62	254.10	0.000508	1.09	174.89	196.70	0.21
Reach 1	1013	Timmins	142.20	250.87	254.40	253.10	254.45	0.000523	1.19	225.92	212.70	0.21
Reach 1	1013	100 CC Mid	85.50	250.87	253.79	252.37	253.83	0.000575	1.08	138.21	179.19	0.22
Reach 1	1013	100 CC End	105.70	250.87	254.08	252.62	254.12	0.000503	1.09	177.76	197.80	0.21
Reach 1	895	2 yr	10.00	250.80	251.96		251.99	0.000944	0.70	14.36	16.01	0.23
Reach 1	895	5 yr	21.50	250.80	252.38		252.43	0.001298	1.02	21.24	17.79	0.29
Reach 1	895	10 yr	30.70	250.80	252.62		252.69	0.001467	1.21	25.70	19.67	0.32
Reach 1	895	20 yr	40.40	250.80	252.83		252.92	0.001531	1.36	36.56	73.82	0.33
Reach 1	895	50 yr	54.10	250.80	253.11		253.20	0.001347	1.41	59.69	91.34	0.32
Reach 1	895	100 yr	65.00	250.80	253.31		253.39	0.001174	1.40	78.84	97.63	0.30
Reach 1	895	200 yr	76.40	250.80	253.51		253.58	0.001024	1.39	99.26	110.25	0.29
Reach 1	895	500 yr	92.00	250.80	253.78		253.84	0.000868	1.37	132.69	134.51	0.27
Reach 1	895	1000 yr	104.20	250.80	253.96		254.02	0.000750	1.33	158.45	140.36	0.25
Reach 1	895	Timmins	142.20	250.80	254.32		254.38	0.000701	1.39	208.69	142.61	0.25
Reach 1	895	100 CC Mid	85.50	250.80	253.67		253.74	0.000945	1.39	118.42	130.71	0.28
Reach 1	895	100 CC End	105.70	250.80	253.99		254.04	0.000737	1.33	161.55	140.50	0.25
Reach 1	834	2 yr	10.00	250.62	251.79	251.51	251.87	0.004658	1.24	8.10	12.75	0.49
Reach 1	834	5 yr	21.50	250.62	252.12	251.82	252.27	0.005773	1.71	12.54	14.28	0.58
Reach 1	834	10 yr	30.70	250.62	252.30	252.01	252.51	0.006319	2.03	15.25	15.31	0.63
Reach 1	834	20 yr	40.40	250.62	252.46	252.17	252.73	0.006997	2.33	17.62	15.90	0.67
Reach 1	834	50 yr	54.10	250.62	252.62	252.39	253.00	0.008271	2.76	20.24	17.37	0.75
Reach 1	834	100 yr	65.00	250.62	252.72	252.54	253.20	0.009219	3.06	22.21	18.78	0.80
Reach 1	834	200 yr	76.40	250.62	252.79	252.70	253.38	0.010954	3.43	23.48	19.35	0.88
Reach 1	834	500 yr	92.00	250.62	252.88	252.88	253.64	0.012953	3.88	25.33	20.16	0.96
Reach 1	834	1000 yr	104.20	250.62	253.04	253.04	253.83	0.012213	4.00	28.56	22.29	0.95
Reach 1	834	Timmins	142.20	250.62	253.74	253.74	254.24	0.005710	3.40	69.40	87.53	0.69
Reach 1	834	100 CC Mid	85.50	250.62	252.82	252.81	253.53	0.012892	3.77	24.03	19.60	0.96
Reach 1	834	100 CC End	105.70	250.62	253.05	253.05	253.85	0.012147	4.01	28.95	22.50	0.95
Reach 1	769	2 yr	10.00	250.65	251.40		251.50	0.007032	1.43	7.96	21.08	0.60
Reach 1	769	5 yr	21.50	250.65	251.71		251.85	0.007302	1.75	15.07	25.01	0.64
Reach 1	769	10 yr	30.70	250.65	251.92		252.07	0.006811	1.86	20.68	29.09	0.63
Reach 1	769	20 yr	40.40	250.65	252.11		252.27	0.006169	1.96	26.68	33.71	0.62
Reach 1	769	50 yr	54.10	250.65	252.34		252.52	0.005214	2.06	35.29	42.20	0.59
Reach 1	769	100 yr	65.00	250.65	252.50		252.69	0.004788	2.14	43.76	61.25	0.57
Reach 1	769	200 yr	76.40	250.65	252.67		252.85	0.004132	2.14	55.75	81.79	0.54
Reach 1	769	500 yr	92.00	250.65	252.88		253.04	0.003384	2.10	75.07	99.26	0.50
Reach 1	769	1000 yr	104.20	250.65	253.03		253.17	0.002946	2.07	90.45	106.42	0.47
Reach 1	769	Timmins	142.20	250.65	253.44		253.57	0.002126	2.00	138.70	127.90	0.42
Reach 1	769	100 CC Mid	85.50	250.65	252.79		252.96	0.003691	2.13	66.77	94.75	0.52
Reach 1	769	100 CC End	105.70	250.65	253.05		253.19	0.002892	2.07	92.45	107.03	0.47
Reach 1	587	2 yr	10.00	249.58	251.42		251.42	0.000085	0.30	38.11	40.70	0.08
Reach 1	587	5 yr	21.50	249.58	251.68		251.70	0.000211	0.52	49.30	42.78	0.12
Reach 1	587	10 yr	30.70	249.58	251.86		251.88	0.000301	0.66	56.94	44.19	0.15
Reach 1	587	20 yr	40.40	249.58	252.02		252.05	0.000383	0.79	64.29	45.70	0.17

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	587	50 yr	54.10	249.58	252.23		252.27	0.000481	0.94	73.91	47.68	0.20
Reach 1	587	100 yr	65.00	249.58	252.38		252.42	0.000549	1.05	81.06	49.16	0.21
Reach 1	587	200 yr	76.40	249.58	252.52		252.58	0.000610	1.15	88.27	50.77	0.23
Reach 1	587	500 yr	92.00	249.58	252.71		252.77	0.000680	1.27	97.82	52.67	0.24
Reach 1	587	1000 yr	104.20	249.58	252.84		252.92	0.000727	1.35	104.98	53.97	0.25
Reach 1	587	Timmins	142.20	249.58	253.22		253.33	0.000854	1.59	127.25	66.53	0.28
Reach 1	587	100 CC Mid	85.50	249.58	252.63		252.69	0.000652	1.22	93.88	51.91	0.24
Reach 1	587	100 CC End	105.70	249.58	252.86		252.94	0.000731	1.36	105.92	54.13	0.25
Reach 1	514	2 yr	10.00	248.77	251.41		251.42	0.000033	0.23	45.91	28.59	0.05
Reach 1	514	5 yr	21.50	248.77	251.68		251.68	0.000100	0.43	53.61	29.95	0.09
Reach 1	514	10 yr	30.70	248.77	251.85		251.86	0.000160	0.57	58.78	30.57	0.11
Reach 1	514	20 yr	40.40	248.77	252.00		252.03	0.000224	0.70	63.67	31.38	0.14
Reach 1	514	50 yr	54.10	248.77	252.20		252.24	0.000313	0.87	70.16	33.75	0.16
Reach 1	514	100 yr	65.00	248.77	252.34		252.39	0.000380	0.99	74.99	34.49	0.18
Reach 1	514	200 yr	76.40	248.77	252.48		252.54	0.000448	1.10	79.77	35.20	0.20
Reach 1	514	500 yr	92.00	248.77	252.66		252.73	0.000536	1.25	85.99	36.46	0.22
Reach 1	514	1000 yr	104.20	248.77	252.78		252.87	0.000601	1.35	90.62	37.21	0.23
Reach 1	514	Timmins	142.20	248.77	253.14		253.27	0.000784	1.65	104.58	42.20	0.27
Reach 1	514	100 CC Mid	85.50	248.77	252.58		252.65	0.000500	1.19	83.43	35.90	0.21
Reach 1	514	100 CC End	105.70	248.77	252.80		252.89	0.000608	1.37	91.23	37.31	0.23
Reach 1	505	2 yr	10.00	248.83	251.41	249.49	251.42	0.000032	0.22	48.33	27.60	0.05
Reach 1	505	5 yr	21.50	248.83	251.68	249.72	251.68	0.000096	0.41	55.71	28.70	0.09
Reach 1	505	10 yr	30.70	248.83	251.85	249.86	251.86	0.000152	0.54	60.70	29.52	0.11
Reach 1	505	20 yr	40.40	248.83	252.00	249.98	252.03	0.000212	0.66	65.40	30.07	0.13
Reach 1	505	50 yr	54.10	248.83	252.20	250.15	252.24	0.000295	0.82	71.59	31.69	0.16
Reach 1	505	100 yr	65.00	248.83	252.34	250.27	252.39	0.000358	0.93	76.11	32.18	0.17
Reach 1	505	200 yr	76.40	248.83	252.48	250.39	252.53	0.000421	1.04	80.55	32.59	0.19
Reach 1	505	500 yr	92.00	248.83	252.65	250.56	252.72	0.000502	1.18	86.26	33.20	0.21
Reach 1	505	1000 yr	104.20	248.83	252.78	250.69	252.86	0.000563	1.28	90.46	33.66	0.22
Reach 1	505	Timmins	142.20	248.83	253.14	251.01	253.26	0.000732	1.57	102.70	34.91	0.26
Reach 1	505	100 CC Mid	85.50	248.83	252.58	250.49	252.65	0.000469	1.12	83.93	32.93	0.20
Reach 1	505	100 CC End	105.70	248.83	252.80	250.70	252.88	0.000569	1.29	91.01	33.72	0.23
Reach 1	500		Inl Struct									
Reach 1	492	2 yr	10.00	249.45	250.16		250.23	0.009297	1.19	8.38	23.96	0.64
Reach 1	492	5 yr	21.50	249.45	250.39		250.50	0.008456	1.52	14.10	25.95	0.66
Reach 1	492	10 yr	30.70	249.45	250.54		250.69	0.007527	1.68	18.29	27.34	0.65
Reach 1	492	20 yr	40.40	249.45	250.71		250.87	0.006493	1.77	23.02	29.21	0.62
Reach 1	492	50 yr	54.10	249.45	250.93		251.10	0.005335	1.87	29.80	33.01	0.58
Reach 1	492	100 yr	65.00	249.45	251.08		251.27	0.004748	1.94	35.11	33.94	0.56
Reach 1	492	200 yr	76.40	249.45	251.23		251.43	0.004433	2.02	40.06	34.52	0.56
Reach 1	492	500 yr	92.00	249.45	251.41		251.64	0.004143	2.13	46.42	35.18	0.55
Reach 1	492	1000 yr	104.20	249.45	251.53		251.77	0.004136	2.23	50.51	35.83	0.55
Reach 1	492	Timmins	142.20	249.45	251.82		252.14	0.004363	2.56	61.53	38.88	0.59
Reach 1	492	100 CC Mid	85.50	249.45	251.34		251.56	0.004183	2.07	44.05	34.90	0.55
Reach 1	492	100 CC End	105.70	249.45	251.54		251.79	0.004139	2.24	50.98	35.91	0.56
Reach 1	474	2 yr	10.00	249.34	250.06		250.11	0.004314	0.99	10.15	21.66	0.46
Reach 1	474	5 yr	21.50	249.34	250.27		250.38	0.006013	1.46	14.88	23.74	0.57
Reach 1	474	10 yr	30.70	249.34	250.43		250.57	0.006000	1.67	18.76	24.53	0.59
Reach 1	474	20 yr	40.40	249.34	250.60		250.76	0.005538	1.81	23.03	25.34	0.59
Reach 1	474	50 yr	54.10	249.34	250.81		251.01	0.005183	1.97	28.53	26.33	0.58
Reach 1	474	100 yr	65.00	249.34	250.96		251.18	0.004959	2.09	32.73	30.86	0.58
Reach 1	474	200 yr	76.40	249.34	251.10		251.34	0.004875	2.22	37.34	35.61	0.59
Reach 1	474	500 yr	92.00	249.34	251.26		251.54	0.004863	2.38	43.61	39.07	0.60
Reach 1	474	1000 yr	104.20	249.34	251.38		251.68	0.004873	2.49	48.07	40.10	0.60
Reach 1	474	Timmins	142.20	249.34	251.65		252.04	0.005316	2.86	59.56	44.42	0.65
Reach 1	474	100 CC Mid	85.50	249.34	251.20		251.46	0.004889	2.32	41.05	38.28	0.59
Reach 1	474	100 CC End	105.70	249.34	251.39		251.69	0.004891	2.50	48.55	40.34	0.61
Reach 1	372	2 yr	10.00	248.70	249.29	249.23	249.39	0.013274	1.43	6.97	19.57	0.77
Reach 1	372	5 yr	21.50	248.70	249.66	249.43	249.78	0.005765	1.48	14.52	20.40	0.56
Reach 1	372	10 yr	30.70	248.70	249.92	249.56	250.04	0.004411	1.55	19.83	21.13	0.51
Reach 1	372	20 yr	40.40	248.70	250.13	249.69	250.27	0.004131	1.66	24.33	22.08	0.51
Reach 1	372	50 yr	54.10	248.70	250.36	249.85	250.53	0.004000	1.83	29.65	23.32	0.51
Reach 1	372	100 yr	65.00	248.70	250.52	249.97	250.72	0.004013	1.95	33.83	29.45	0.52
Reach 1	372	200 yr	76.40	248.70	250.66	250.09	250.88	0.004043	2.08	38.31	34.01	0.53
Reach 1	372	500 yr	92.00	248.70	250.84	250.24	251.08	0.003993	2.22	47.39	76.07	0.54
Reach 1	372	1000 yr	104.20	248.70	250.97	250.35	251.22	0.003799	2.28	58.35	108.51	0.53
Reach 1	372	Timmins	142.20	248.70	251.39	250.70	251.60	0.002740	2.21	98.47	133.07	0.46
Reach 1	372	100 CC Mid	85.50	248.70	250.76	250.18	251.00	0.004040	2.17	42.93	55.83	0.54
Reach 1	372	100 CC End	105.70	248.70	250.99	250.37	251.24	0.003752	2.28	59.91	109.85	0.53
Reach 1	270	2 yr	10.00	248.28	249.04	248.64	249.06	0.001268	0.65	15.32	24.19	0.26
Reach 1	270	5 yr	21.50	248.28	249.53	248.83	249.56	0.000927	0.77	28.68	47.68	0.24
Reach 1	270	10 yr	30.70	248.28	249.82	248.95	249.86	0.000801	0.84	40.93	63.30	0.23

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	270	20 yr	40.40	248.28	250.05	249.06	250.09	0.000773	0.91	53.06	90.55	0.24
Reach 1	270	50 yr	54.10	248.28	250.30	249.21	250.35	0.000775	1.01	74.79	161.33	0.24
Reach 1	270	100 yr	65.00	248.28	250.48	249.32	250.53	0.000741	1.05	95.71	197.29	0.24
Reach 1	270	200 yr	76.40	248.28	250.64	249.44	250.69	0.000672	1.06	118.40	217.24	0.23
Reach 1	270	500 yr	92.00	248.28	250.85	249.59	250.89	0.000605	1.07	146.60	220.82	0.22
Reach 1	270	1000 yr	104.20	248.28	251.00	249.71	251.04	0.000566	1.08	166.95	221.89	0.22
Reach 1	270	Timmins	142.20	248.28	251.41	249.98	251.45	0.000490	1.11	223.55	225.77	0.21
Reach 1	270	100 CC Mid	85.50	248.28	250.77	249.52	250.81	0.000630	1.07	135.20	220.26	0.23
Reach 1	270	100 CC End	105.70	248.28	251.02	249.72	251.06	0.000562	1.08	169.37	222.06	0.22
Reach 1	212	2 yr	10.00	247.95	248.95	248.48	248.98	0.001628	0.79	12.66	17.98	0.30
Reach 1	212	5 yr	21.50	247.95	249.45	248.74	249.49	0.001474	0.94	22.99	32.33	0.30
Reach 1	212	10 yr	30.70	247.95	249.74	248.91	249.79	0.001411	1.01	30.41	36.72	0.30
Reach 1	212	20 yr	40.40	247.95	249.96	249.05	250.03	0.001400	1.11	36.57	39.13	0.31
Reach 1	212	50 yr	54.10	247.95	250.20	249.25	250.28	0.001426	1.25	43.69	41.28	0.32
Reach 1	212	100 yr	65.00	247.95	250.37	249.38	250.46	0.001461	1.35	48.81	42.69	0.33
Reach 1	212	200 yr	76.40	247.95	250.52	249.50	250.63	0.001519	1.46	53.62	44.02	0.34
Reach 1	212	500 yr	92.00	247.95	250.70	249.66	250.83	0.001602	1.60	59.68	45.66	0.36
Reach 1	212	1000 yr	104.20	247.95	250.83	249.76	250.98	0.001663	1.69	64.24	48.07	0.37
Reach 1	212	Timmins	142.20	247.95	251.20	250.05	251.39	0.001812	1.96	79.14	59.48	0.39
Reach 1	212	100 CC Mid	85.50	247.95	250.63	249.59	250.75	0.001567	1.54	57.22	44.97	0.35
Reach 1	212	100 CC End	105.70	247.95	250.85	249.77	251.00	0.001669	1.71	64.81	48.39	0.37
Reach 1	157	2 yr	10.00	247.89	248.87	248.42	248.90	0.001422	0.69	14.59	23.09	0.28
Reach 1	157	5 yr	21.50	247.89	249.39	248.66	249.42	0.000943	0.79	27.18	25.31	0.24
Reach 1	157	10 yr	30.70	247.89	249.69	248.80	249.73	0.000895	0.88	34.92	26.58	0.24
Reach 1	157	20 yr	40.40	247.89	249.91	248.92	249.96	0.000945	0.99	40.86	27.52	0.26
Reach 1	157	50 yr	54.10	247.89	250.15	249.07	250.21	0.001053	1.14	49.45	42.17	0.28
Reach 1	157	100 yr	65.00	247.89	250.31	249.18	250.39	0.001114	1.23	56.72	46.31	0.29
Reach 1	157	200 yr	76.40	247.89	250.46	249.29	250.55	0.001179	1.33	63.73	50.89	0.30
Reach 1	157	500 yr	92.00	247.89	250.64	249.43	250.75	0.001269	1.45	72.97	82.84	0.32
Reach 1	157	1000 yr	104.20	247.89	250.78	249.53	250.89	0.001328	1.53	81.65	115.37	0.33
Reach 1	157	Timmins	142.20	247.89	251.16	249.81	251.29	0.001292	1.66	115.14	150.48	0.33
Reach 1	157	100 CC Mid	85.50	247.89	250.57	249.37	250.67	0.001229	1.40	69.09	67.26	0.31
Reach 1	157	100 CC End	105.70	247.89	250.79	249.53	250.91	0.001339	1.54	82.80	122.74	0.33
Reach 1	116	2 yr	10.00	247.27	248.84	247.98	248.86	0.000496	0.57	17.43	16.14	0.18
Reach 1	116	5 yr	21.50	247.27	249.36	248.28	249.39	0.000685	0.83	26.04	17.50	0.22
Reach 1	116	10 yr	30.70	247.27	249.64	248.45	249.69	0.000833	0.98	31.23	18.70	0.24
Reach 1	116	20 yr	40.40	247.27	249.85	248.61	249.92	0.001067	1.15	35.84	29.32	0.28
Reach 1	116	50 yr	54.10	247.27	250.07	248.81	250.16	0.001262	1.35	42.50	30.90	0.31
Reach 1	116	100 yr	65.00	247.27	250.22	248.95	250.33	0.001396	1.49	47.33	33.08	0.33
Reach 1	116	200 yr	76.40	247.27	250.36	249.10	250.49	0.001543	1.63	51.93	35.01	0.35
Reach 1	116	500 yr	92.00	247.27	250.52	249.28	250.68	0.001744	1.82	58.13	41.14	0.37
Reach 1	116	1000 yr	104.20	247.27	250.63	249.41	250.82	0.001884	1.95	63.17	48.22	0.39
Reach 1	116	Timmins	142.20	247.27	250.97	249.86	251.21	0.002144	2.26	78.98	120.74	0.43
Reach 1	116	100 CC Mid	85.50	247.27	250.45	249.20	250.60	0.001668	1.75	55.49	40.06	0.36
Reach 1	116	100 CC End	105.70	247.27	250.65	249.42	250.84	0.001899	1.97	63.79	56.36	0.39
Reach 1	106	2 yr	10.00	247.68	248.81	248.28	248.85	0.001630	0.91	11.01	12.42	0.31
Reach 1	106	5 yr	21.50	247.68	249.30	248.58	249.38	0.001838	1.25	17.33	17.08	0.35
Reach 1	106	10 yr	30.70	247.68	249.56	248.77	249.67	0.002112	1.49	21.10	40.34	0.38
Reach 1	106	20 yr	40.40	247.68	249.74	248.95	249.89	0.002596	1.75	24.84	63.08	0.43
Reach 1	106	50 yr	54.10	247.68	249.92	249.18	250.13	0.003270	2.07	30.16	82.04	0.48
Reach 1	106	100 yr	65.00	247.68	250.05	249.34	250.30	0.003701	2.28	34.07	87.29	0.52
Reach 1	106	200 yr	76.40	247.68	250.15	249.50	250.45	0.004198	2.49	37.30	88.35	0.56
Reach 1	106	500 yr	92.00	247.68	250.27	249.85	250.63	0.004891	2.79	41.05	93.14	0.61
Reach 1	106	1000 yr	104.20	247.68	250.34	250.04	250.77	0.005486	3.02	43.64	96.55	0.64
Reach 1	106	Timmins	142.20	247.68	250.47	250.39	251.13	0.008134	3.82	48.57	101.20	0.79
Reach 1	106	100 CC Mid	85.50	247.68	250.22	249.67	250.56	0.004596	2.67	39.54	91.09	0.58
Reach 1	106	100 CC End	105.70	247.68	250.35	250.05	250.78	0.005546	3.05	44.00	96.93	0.65
Reach 1	100		Inl Struct									
Reach 1	88	2 yr	10.00	247.47	248.06	247.94	248.16	0.008733	1.40	7.15	15.28	0.65
Reach 1	88	5 yr	21.50	247.47	248.35	248.19	248.52	0.008822	1.82	11.83	17.11	0.70
Reach 1	88	10 yr	30.70	247.47	248.53	248.35	248.75	0.008847	2.04	15.03	18.24	0.72
Reach 1	88	20 yr	40.40	247.47	248.70	248.50	248.95	0.008728	2.22	18.22	19.30	0.73
Reach 1	88	50 yr	54.10	247.47	248.94	248.69	249.22	0.008077	2.36	22.89	20.77	0.72
Reach 1	88	100 yr	65.00	247.47	249.13	248.82	249.43	0.007253	2.41	27.02	21.97	0.69
Reach 1	88	200 yr	76.40	247.47	249.33	248.95	249.63	0.006501	2.43	31.46	23.21	0.67
Reach 1	88	500 yr	92.00	247.47	249.56	249.11	249.88	0.005887	2.47	37.64	37.14	0.64
Reach 1	88	1000 yr	104.20	247.47	249.76	249.23	250.07	0.005262	2.46	43.90	45.50	0.62
Reach 1	88	Timmins	142.20	247.47	250.32	249.58	250.60	0.003637	2.40	64.98	56.94	0.53
Reach 1	88	100 CC Mid	85.50	247.47	249.46	249.05	249.77	0.006222	2.47	34.72	30.89	0.66
Reach 1	88	100 CC End	105.70	247.47	249.78	249.25	250.09	0.005197	2.46	44.72	46.55	0.61
Reach 1	71	2 yr	10.00	246.67	248.03		248.08	0.001994	0.94	10.66	13.34	0.34
Reach 1	71	5 yr	21.50	246.67	248.28		248.40	0.004007	1.52	14.18	14.52	0.49

HEC-RAS Plan: Miskwaa Ziibi River 20240227   River: Miskwaa Ziibi   Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	71	10 yr	30.70	246.67	248.44		248.62	0.005256	1.86	16.52	15.25	0.57
Reach 1	71	20 yr	40.40	246.67	248.59		248.82	0.006244	2.14	18.85	15.94	0.63
Reach 1	71	50 yr	54.10	246.67	248.77		249.08	0.007410	2.48	21.79	16.78	0.70
Reach 1	71	100 yr	65.00	246.67	248.90		249.28	0.008076	2.70	24.07	17.40	0.73
Reach 1	71	200 yr	76.40	246.67	249.06		249.47	0.008175	2.84	26.88	18.14	0.75
Reach 1	71	500 yr	92.00	246.67	249.09	248.94	249.67	0.011161	3.35	27.47	18.29	0.87
Reach 1	71	1000 yr	104.20	246.67	249.19	249.08	249.84	0.011994	3.56	29.26	18.74	0.91
Reach 1	71	Timmins	142.20	246.67	249.90		250.44	0.007194	3.25	43.81	22.08	0.73
Reach 1	71	100 CC Mid	85.50	246.67	249.04	248.86	249.57	0.010693	3.23	26.47	18.03	0.85
Reach 1	71	100 CC End	105.70	246.67	249.20	249.10	249.86	0.012094	3.59	29.47	18.79	0.91
Reach 1	64	2 yr	10.00	247.42	247.98	247.83	248.05	0.006319	1.16	8.62	19.51	0.55
Reach 1	64	5 yr	21.50	247.42	248.24	248.04	248.36	0.006591	1.58	13.80	20.80	0.61
Reach 1	64	10 yr	30.70	247.42	248.41	248.17	248.57	0.006521	1.80	17.41	21.59	0.62
Reach 1	64	20 yr	40.40	247.42	248.57	248.31	248.77	0.006325	1.97	20.98	22.20	0.63
Reach 1	64	50 yr	54.10	247.42	248.77	248.47	249.02	0.006156	2.20	25.67	25.92	0.64
Reach 1	64	100 yr	65.00	247.42	248.92	248.59	249.20	0.005938	2.34	30.14	38.27	0.64
Reach 1	64	200 yr	76.40	247.42	249.11	248.69	249.39	0.005118	2.37	36.58	42.87	0.61
Reach 1	64	500 yr	92.00	247.42	249.19	248.82	249.54	0.006174	2.69	39.33	42.96	0.67
Reach 1	64	1000 yr	104.20	247.42	249.33	249.02	249.69	0.005811	2.75	44.29	43.19	0.66
Reach 1	64	Timmins	142.20	247.42	250.05	249.33	250.33	0.002971	2.48	70.90	46.99	0.50
Reach 1	64	100 CC Mid	85.50	247.42	249.11	248.81	249.45	0.006405	2.65	36.59	42.87	0.68
Reach 1	64	100 CC End	105.70	247.42	249.34	249.04	249.71	0.005773	2.76	44.88	43.23	0.66
Reach 1	55		Bridge									
Reach 1	53	2 yr	10.00	247.15	247.57	247.57	247.73	0.023217	1.80	5.55	16.86	1.00
Reach 1	53	5 yr	21.50	247.15	247.80	247.80	248.05	0.019916	2.24	9.69	19.33	0.99
Reach 1	53	10 yr	30.70	247.15	247.95	247.95	248.26	0.018625	2.46	12.71	21.36	0.99
Reach 1	53	20 yr	40.40	247.15	248.08	248.08	248.44	0.017751	2.65	15.69	22.98	0.99
Reach 1	53	50 yr	54.10	247.15	248.25	248.25	248.65	0.016878	2.83	19.82	25.40	0.99
Reach 1	53	100 yr	65.00	247.15	248.36	248.36	248.81	0.016100	3.00	22.60	25.74	0.99
Reach 1	53	200 yr	76.40	247.15	248.46	248.46	248.96	0.015695	3.17	25.25	26.09	0.99
Reach 1	53	500 yr	92.00	247.15	248.59	248.59	249.16	0.015189	3.38	28.74	26.64	0.99
Reach 1	53	1000 yr	104.20	247.15	248.69	248.69	249.31	0.014758	3.52	31.44	27.07	0.99
Reach 1	53	Timmins	142.20	247.15	248.99	248.99	249.73	0.013498	3.87	39.78	29.23	0.98
Reach 1	53	100 CC Mid	85.50	247.15	248.54	248.54	249.08	0.015315	3.29	27.35	26.43	0.99
Reach 1	53	100 CC End	105.70	247.15	248.71	248.71	249.33	0.014604	3.52	31.84	27.14	0.99
Reach 1	46	2 yr	10.00	246.10	247.17	247.17	247.37	0.023960	1.99	5.01	13.07	1.03
Reach 1	46	5 yr	21.50	246.10	247.46	247.46	247.74	0.020851	2.34	9.18	16.74	1.01
Reach 1	46	10 yr	30.70	246.10	247.63	247.63	247.95	0.019480	2.52	12.17	18.82	1.00
Reach 1	46	20 yr	40.40	246.10	247.77	247.77	248.14	0.019257	2.68	15.08	21.15	1.01
Reach 1	46	50 yr	54.10	246.10	247.97	247.97	248.35	0.018411	2.73	19.79	26.15	1.00
Reach 1	46	100 yr	65.00	246.10	248.08	248.08	248.50	0.018632	2.84	22.86	28.74	1.02
Reach 1	46	200 yr	76.40	246.10	248.18	248.18	248.63	0.018029	2.96	25.81	29.77	1.01
Reach 1	46	500 yr	92.00	246.10	248.32	248.32	248.80	0.017314	3.09	29.82	31.32	1.01
Reach 1	46	1000 yr	104.20	246.10	248.40	248.40	248.92	0.016833	3.20	32.55	31.64	1.01
Reach 1	46	Timmins	142.20	246.10	248.65	248.65	249.28	0.015753	3.51	40.48	32.46	1.00
Reach 1	46	100 CC Mid	85.50	246.10	248.27	248.27	248.73	0.017318	3.02	28.36	30.85	1.00
Reach 1	46	100 CC End	105.70	246.10	248.41	248.41	248.94	0.016787	3.22	32.87	31.67	1.01
Reach 1	30	2 yr	10.00	245.32	246.90		246.90	0.000146	0.32	31.55	28.73	0.10
Reach 1	30	5 yr	21.50	245.32	246.89		246.92	0.000682	0.68	31.42	28.67	0.21
Reach 1	30	10 yr	30.70	245.32	246.89		246.94	0.001412	0.98	31.24	28.59	0.30
Reach 1	30	20 yr	40.40	245.32	246.88		246.96	0.002501	1.31	30.96	28.43	0.40
Reach 1	30	50 yr	54.10	245.32	246.86		247.02	0.004715	1.78	30.34	28.08	0.55
Reach 1	30	100 yr	65.00	245.32	246.55	246.55	246.99	0.016872	2.92	22.24	25.56	1.00
Reach 1	30	200 yr	76.40	245.32	246.66	246.66	247.13	0.016391	3.06	24.98	26.21	1.00
Reach 1	30	500 yr	92.00	245.32	246.79	246.79	247.32	0.015874	3.22	28.61	27.18	1.00
Reach 1	30	1000 yr	104.20	245.32	246.90	246.90	247.45	0.015669	3.29	31.69	28.79	1.00
Reach 1	30	Timmins	142.20	245.32	247.20	247.20	247.81	0.015168	3.48	40.88	33.30	1.00
Reach 1	30	100 CC Mid	85.50	245.32	246.74	246.74	247.24	0.016139	3.16	27.05	26.71	1.00
Reach 1	30	100 CC End	105.70	245.32	246.92	246.92	247.47	0.015627	3.30	32.06	28.97	1.00
Reach 1	10	2 yr	10.00	245.32	246.90	245.52	246.90	0.000024	0.16	62.61	44.90	0.04
Reach 1	10	5 yr	21.50	245.32	246.90	245.65	246.91	0.000112	0.35	62.69	44.92	0.09
Reach 1	10	10 yr	30.70	245.32	246.90	245.74	246.92	0.000227	0.50	62.78	44.95	0.13
Reach 1	10	20 yr	40.40	245.32	246.91	245.82	246.93	0.000390	0.66	62.93	44.99	0.17
Reach 1	10	50 yr	54.10	245.32	246.91	245.92	246.95	0.000691	0.88	63.20	45.07	0.22
Reach 1	10	100 yr	65.00	245.32	246.39	246.00	246.52	0.003868	1.60	40.91	40.32	0.50
Reach 1	10	200 yr	76.40	245.32	246.44	246.08	246.61	0.004532	1.79	43.06	40.72	0.54
Reach 1	10	500 yr	92.00	245.32	246.56	246.17	246.75	0.004772	1.96	47.62	41.74	0.57
Reach 1	10	1000 yr	104.20	245.32	246.66	246.25	246.87	0.004593	2.03	52.23	43.05	0.56
Reach 1	10	Timmins	142.20	245.32	246.97	246.46	247.22	0.004261	2.24	65.63	45.96	0.56
Reach 1	10	100 CC Mid	85.50	245.32	246.50	246.13	246.69	0.004786	1.90	45.42	41.09	0.56
Reach 1	10	100 CC End	105.70	245.32	246.68	246.25	246.89	0.004575	2.04	52.79	43.15	0.56
Reach 1	-13	2 yr	10.00	245.32	246.90	245.54	246.90	0.000000	0.19	57.27	67.69	0.05

HEC-RAS Plan: Miskwaa Ziibi River 20240227 River: Miskwaa Ziibi Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	-13	5 yr	21.50	245.32	246.90	245.68	246.91	0.000000	0.40	57.27	67.69	0.10
Reach 1	-13	10 yr	30.70	245.32	246.90	245.78	246.92	0.000000	0.58	57.27	67.69	0.15
Reach 1	-13	20 yr	40.40	245.32	246.90	245.87	246.93	0.000000	0.76	57.27	67.69	0.20
Reach 1	-13	50 yr	54.10	245.32	246.90	245.98	246.95	0.000001	1.02	57.27	67.69	0.26
Reach 1	-13	100 yr	65.00	245.32	246.30	246.07	246.51	0.000005	2.04	31.83	33.33	0.67
Reach 1	-13	200 yr	76.40	245.32	246.30	246.15	246.59	0.000006	2.40	31.83	33.33	0.78
Reach 1	-13	500 yr	92.00	245.32	246.30	246.26	246.73	0.000009	2.89	31.83	33.33	0.94
Reach 1	-13	1000 yr	104.20	245.32	246.34	246.34	246.84	0.000010	3.14	33.17	33.40	1.01
Reach 1	-13	Timmins	142.20	245.32	246.58	246.58	247.19	0.000009	3.45	41.41	35.83	1.00
Reach 1	-13	100 CC Mid	85.50	245.32	246.30	246.22	246.67	0.000008	2.69	31.83	33.33	0.88
Reach 1	-13	100 CC End	105.70	245.32	246.35	246.35	246.86	0.000010	3.16	33.49	33.42	1.01