development engineering (London) Limited

CONSULTING CIVIL ENGINEERS

February 21, 2025 Project: DEL22-025

Kettle Creek Conservation Authority
44015 Ferguson Line
St. Thomas, ON, N5P 3T3

Attn: Maisa Fumagalli, Manager of Planning & Development

Re: Flood Impact Assessment
Kettle Creek Golf and Country Club
320 Carlow Road, Port Stanley, Central Elgin, Ontario

Introduction

Development Engineering (London) Limited (DevEng), on behalf of G-Lover Holdings Inc., is providing this letter to address the flood impact on the proposed residential development at 320 Carlow Road, Port Stanley.

The following reference documents and figures are enclosed with this letter:

- Kettle Creek Conservation Authority Regulation Limit Figure
- Email Correspondence with Kettle Creek Conservation Authority Re: Flooding Hazards
- Kettle Creek Floodplain Mapping Update at Port Stanley by True Consulting (March 2022)
- Kettle Creek Subdivision Grading Plan – Marr Drain, by SBM Ltd.
- Kettle Creek Subdivision - Floodplain Volume Plan, by SBM Ltd.
- Topographical Plan of Survey by Callon Dietz Inc. (November 2022)
- Existing and Proposed Flood Limits - Aerial, by DevEng
- Pre-development Floodplain Storage - by DevEng
- Post-development Floodplain Storage – by DevEng
- Proposed Draft Plan – 320 Carlow Road - MBPC

The subject development is located adjacent to another proposed development at 37719 Lake Line, Port Stanley (*Kettle Creek Subdivision*). Both developments are located within the Kettle Creek Conservation Authority (KCCA) Regulation Limits, as shown on the KCCA regulation limit figure.

The Kettle Creek Floodplain Mapping Update by TRUE Consulting presents the inundation limits of the regional storm in Figure 6 of the report. In addition, through communications with KCCA in October 2024, it is understood that the "updated regulatory flood elevation for the area of the subject lands is 178.90 m (CVGD2013)".

The following information will address any concerns regarding the flood limit/elevation with respect to the subject development (320 Carlow Road).

Flood Assessment

As shown on Figure 6 by TRUE Consulting, a portion of the subject development is located within the inundation limits. Within these limits is an open municipal drain known as the Marr Drain. Currently the Marr Drain conveys the subject site's stormwater runoff and is proposed to undergo maintenance as part of the *Kettle Creek Subdivision's* work. Updated drain grading will be included in the maintenance, which results in updated floodplain limits, as shown on the grading plan for Marr Drain by SBM Ltd.

A comparison of the existing and proposed floodplain limits are identified on the aerial figure (Existing & Proposed Floodplain Limits). Although the updated floodplain limit is proposed to be reduced and located within the existing floodplain limits, an analysis to ensure floodplain storage compensation has been completed and Table 1 below summarizes the storage comparison.
(Ref. pre-development and post-development storage figures)

Table 1 – Floodplain Storage Compensation Summary (m^3)

Floodplain Storage (m^3)	Existing Conditions[1]	Proposed Conditions[2]	Total Net Storage
360 Carlow Road	41,471	43,927	+2,456
37719 Lake Line	1,378	8	-1,370
Totals	42,849	43,935	+1,086

[1] Existing Conditions topographical information by Callon Dietz Inc. was utilized for the storage compensation analysis.
[2] Proposed Conditions grading design was completed by SBM Ltd.

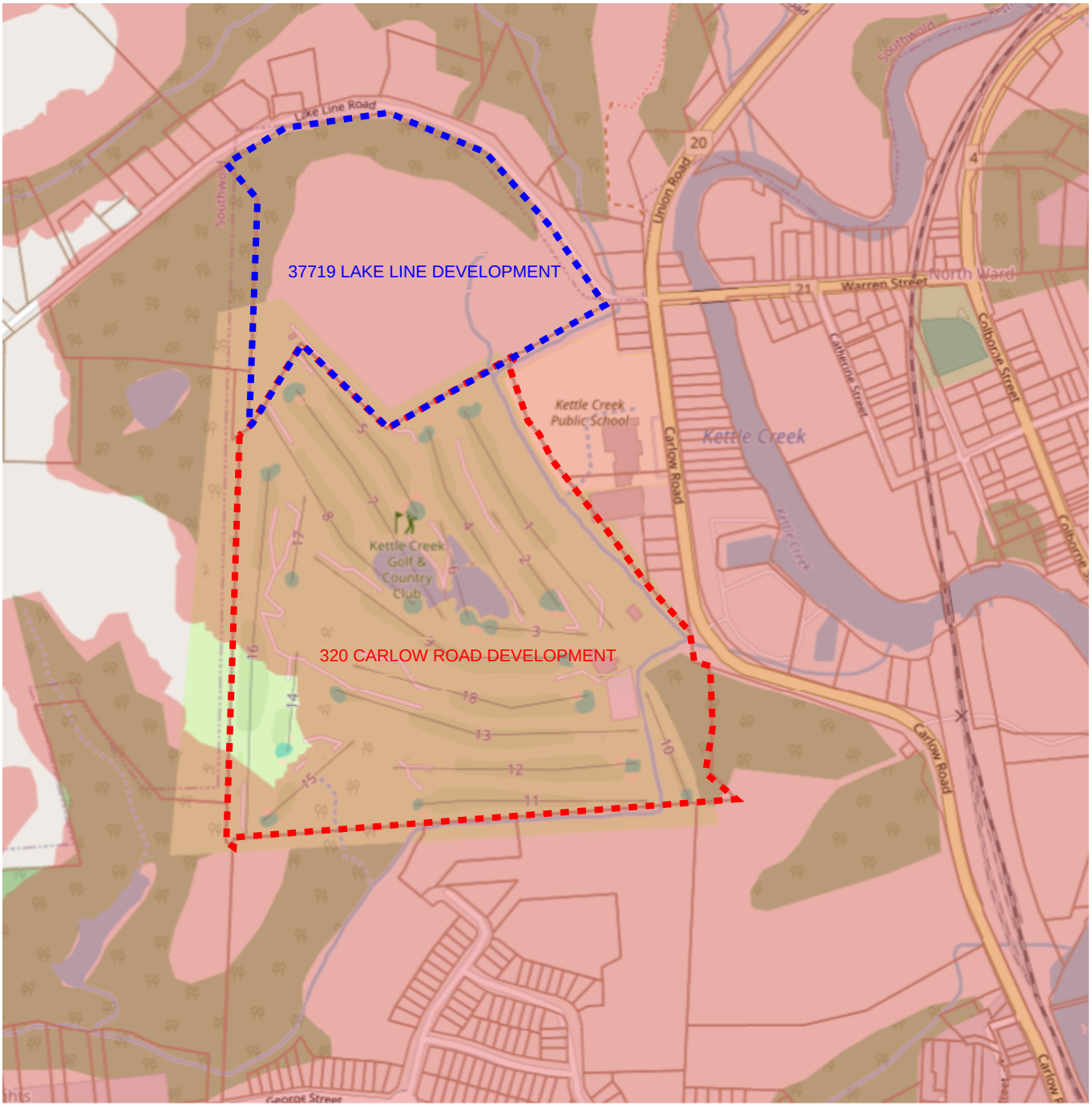
In addition, the subject development is proposed to be outside of the updated floodplain delineation (Proposed Draft Plan). The additional conditions for development within the flood fringe as outlined in the KCCA email correspondence are not applicable. Although, it is notable that a portion of Carlow Road, including the existing entrance to the subject site, is within the floodplain limits. Safe access for vehicles and pedestrians entering and exiting the development during times of flooding may be required (KCCA email correspondence - item b.). A proposed entrance at Lake Line and a proposed municipal right-of-way (ROW; Street A) are part of the Kettle Creek Subdivision development and will be outside of the updated floodplain limits. This future ROW is proposed to connect to the subject development (Ref. to Proposed Draft plan); therefore, satisfying the safe access requirement for vehicles and pedestrians during times of flooding.

We trust this assessment memo adequately outlines the flood impact strategy proposed to support Detailed Engineering Approval. If any clarification or additional information is required, please contact the undersigned.

DEVELOPMENT ENGINEERING (LONDON) LIMITED

Troy Winger, E.I.T.
Designer

Jon Bakker, P.Eng.
Senior Project Engineer



Legend:

- KCCA Regulation Limit
- 37719 LAKE LINE DEVELOPMENT
- 320 CARLOW ROAD DEVELOPMENT

CRS: NAD83 / UTM zone 17N (EPSG:26917)
Contact: jessica@kettlecreekconservation.on.ca

Imagery: Open Street Maps

Date: January 21, 2025

Ontario Regulation 41/24

Mapping is currently under review. Contact KCCA for information.

Kettle Creek Conservation Authority

Outlook

RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

From Joe Gordon <joe@kettlecreekconservation.on.ca>

Date Thu 10/3/2024 7:07 PM

To Jason Ross <jross@deveng.net>; Kevin Moniz <kevin@sbmltd.ca>; Alex Piggott <APiggott@centralelgin.org>; Mat Vaughan <mvaughan@elgin.ca>

Cc james glover <jamesgluv@gmail.com>; Jason Fleury <JFleury@deveng.net>; Geoff Brooks <GBrooks@centralelgin.org>; Elizabeth VanHooren <elizabeth@kettlecreekconservation.on.ca>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>

Hi Jason

Thank you for providing the servicing drawings for the revised Strathroy Turf Farm development.

I do not see anywhere in the drawings provided how the existing flooding hazards associated with the property are being addressed and mitigated by the new design.

For background, I can confirm that the most recent floodplain mapping for Port Stanley is the “Kettle Creek Floodplain Mapping Update at Port Stanley, ON” (TRUE, 2021). The hydraulic report and findings can be found on KCCA website: https://www.kettlecreekconservation.on.ca/wp-content/uploads/2022/04/1_Kettle-Creek-Floodplain-Mapping-Update-at-Port-Stanley.pdf

I can confirm that the updated regulatory flood elevation for the area of the subject lands is 178.9m (CVGD2013).

The results of this floodplain mapping update show a spills hazard area upon the original development site and on the abutting golf course lands from the municipal drain that traverses the property before outletting into Kettle Creek.

Within the community of Port Stanley, a two-zone floodplain management policy is applied. Therefore, development may be permitted within the flood fringe portion of the floodplain where the effects and risk to public safety are minor, could be mitigated in accordance with provincial standards, and where all of the following are demonstrated and achieved:

a. development and site alteration is carried out in accordance with floodproofing standards, protection works standards, and access standards;
b. vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies;
c. new hazards are not created and existing hazards are not aggravated; and
d. no adverse environmental impacts will result.

KCCA has previously required that the stormwater management pond must be located outside of the floodplain and required cut and fill calculations to demonstrate no net loss of floodplain storage and to ensure no negative impacts upon neighbouring or upstream/downstream

properties. Prior versions of the SWM for the initial development had addressed these issues to KCCA satisfaction.

As a result of the new proposed regional SWM pond and additional proposed draft plan of subdivision upon the abutting golf course lands, KCCA will need to see the same requirements met as in the prior SWM proposal.

Thank you for the opportunity to comment. Please do not hesitate to contact me if you have any questions or require further clarification.

Thank you,

Joe Gordon
Manager of Planning and Development
Kettle Creek Conservation Authority

From: Jason Ross <jross@deveng.net>
Sent: September 30, 2024 9:12 AM
To: Joe Gordon <joe@kettlecreekconservation.on.ca>; Kevin Moniz <kevin@sbmltd.ca>; Alex Piggott <APiggott@centralelgin.org>; Mat Vaughan <mvaughan@elgin.ca>
Cc: james glover <jamesgluv@gmail.com>; Jason Fleury <JFleury@deveng.net>; Geoff Brooks <GBrooks@centralelgin.org>; Elizabeth VanHooren <elizabeth@kettlecreekconservation.on.ca>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hi Joe

DevEng has been engaged to undertake design of the external works including trunk sanitary sewers, storm sewers and the stormwater management facility to support the Kettle Creek Subdivision (37719 Lake Line) and future development of the Kettle Creek Golf Course lands (320 Carlow Rd.).

Please follow the link in the attached email to download the first engineering submission of the trunk sewers and stormwater management facility.

Let me know if you have any questions regarding the information provided.

Regards,

Jason Ross, C.E.T. | Director, Project Manager

Cell: 519-872-7678

Development Engineering (London) Limited

From: Joe Gordon <joe@kettlecreekconservation.on.ca>
Sent: September 29, 2024 12:19 PM
To: Kevin Moniz <kevin@sbmltd.ca>; Alex Piggott <APiggott@centralelgin.org>; Mat Vaughan <mvaughan@elgin.ca>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>;

Geoff Brooks <GBrooks@centralelgin.org>; Elizabeth VanHooren <elizabeth@kettlecreekconservation.on.ca>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hi Kevin

Throughout the planning process for this development there was varying drafts for the proposed stormwater management pond location in consideration of the flooding hazard areas on the adjacent golf course property. It is also my understanding that there may have been some subsequent discussions with the municipality on another alternate stormwater pond location as a regional feature to provide stormwater control for the whole development area, including the future phases on the abutting golf course?

To assist in KCCA review of the most recent engineering submission for this development, can you also please provide clarification, and a copy of the most recent proposed stormwater manage pond details and location that is to be considered for this proposed draft plan?

Thank you,

Joe Gordon
Manager of Planning and Development
Kettle Creek Conservation Authority

From: Kevin Moniz <kevin@sbmltd.ca>
Sent: September 27, 2024 8:26 AM
To: Alex Piggott <APiggott@centralelgin.org>; Mat Vaughan <mvaughan@elgin.ca>; Joe Gordon <joe@kettlecreekconservation.on.ca>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>; Geoff Brooks <GBrooks@centralelgin.org>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hi Mat and Joe,

Please use the link below to our first detailed engineering submission for subdivision agreement for the proposed Strathroy Turf Farms Subdivision in Port Stanley (34T-CE-2101).
SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Engineering Submission #1

Please review and let us know if you require anything further for draft plan redline approval (Mat) or review comments prior to subdivision agreement (Joe).

Alex, please let me know if there are any additional approval authorities I should be circulating to.

Thanks and looking forward to receiving your acceptance or review comments,
Kevin

Kevin Moniz, P.Eng.
Principal
P: 519-471-6667 x123
E: kevin@sbmltd.ca

From: Kevin Moniz <kevin@sbmltd.ca>
Sent: Thursday, September 26, 2024 11:46 AM
To: Alex Piggott <APiggott@centralelgin.org>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>; Geoff Brooks <GBrooks@centralelgin.org>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Mat Vaughan <mvaughan@elgin.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hi Alex,

Thanks for your reply. SBM have not submitted directly to the County as we anticipated they would be circulated by the municipality as part of our July 26th submission, along with the KCCA and any other approval authority having jurisdiction. If that is not the case, please advise and we will submit directly to the County, KCCA, and any other approval authorities having jurisdiction. Please advise.

Thanks,
Kevin

Kevin Moniz, P.Eng.
Principal
P: 519-471-6667 x123
E: kevin@sbmltd.ca

From: Alex Piggott <APiggott@centralelgin.org>
Sent: Thursday, September 26, 2024 7:43 AM
To: Kevin Moniz <kevin@sbmltd.ca>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>; Geoff Brooks <GBrooks@centralelgin.org>; Carey Herd <cherd@centralelgin.org>; Kurtis Caron <kcaron@sbmltd.ca>; Mat Vaughan <mvaughan@elgin.ca>; Jeremy Siddall <jsiddall@centralelgin.org>; KEVIN McCLURE (kmcclure@stthomas.ca) <kmcclure@stthomas.ca>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hi Kevin:

We are going through your design submission for this subdivision, but the first question that may have a impact on the design of this subdivision is, have you received approval from the County of Elgin for your redline revision of your draft plan?

Alex Piggott, C.E.T. CRS-S
Manager of Development and Compliance

From: Geoff Brooks <GBrooks@centralelgin.org>
Sent: Friday, September 13, 2024 10:31 AM
To: 'Kevin Moniz' <kevin@sbmltd.ca>; Kurtis Caron <kcaron@sbmltd.ca>; Carey Herd <cherd@centralelgin.org>; Alex Piggott <APiggott@centralelgin.org>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Good morning Kevin,

We have the drawings but are a little behind on the review. Staff expect to have comments back to you two weeks from today.

For future reference, please address all development matters to Alex Piggott, Manager of Development and Compliance and you can cc me as well.

We'll be in touch if we have any questions.

Geoff Brooks
Director of Infrastructure & Community Services

The Municipality of Central Elgin
450 Sunset Drive, 1st Floor
St. Thomas, ON, N5R 5V1
P: 519-631-4860 ext. 7247
gbrooks@centralelgin.org

From: Kevin Moniz <kevin@sbmltd.ca>
Sent: Thursday, September 12, 2024 9:36 AM
To: Kurtis Caron <kcaron@sbmltd.ca>; Geoff Brooks <GBrooks@centralelgin.org>; Carey Herd <cherd@centralelgin.org>
Cc: james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>; Jason Fleury <JFleury@deveng.net>
Subject: RE: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Good morning Geoff and Robin,

Just following up on our first submission of the detailed engineering for subdivision agreement for the subject lands. Please let us know if you have had a chance to review, and if there are review comments to discuss, when we can meet to do so.

Thanks,
Kevin

Kevin Moniz, P.Eng.
Principal
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E: kevin@sbmltd.ca

STRIK BALDINELLI MONIZ
PLANNING · CIVIL · STRUCTURAL · MECHANICAL · ELECTRICAL

20 Years SINCE 2004

From: Kurtis Caron <kcaron@sbmltd.ca>
Sent: Friday, July 26, 2024 3:09 PM
To: gbrooks@centralelgin.org; rgreenall@centralelgin.org
Cc: Kevin Moniz <kevin@sbmltd.ca>; james glover <jamesgluv@gmail.com>; Jason Ross <jross@deveng.net>
Subject: SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Detailed Engineering Submission #1 (34T-CE-2101)

Hello Geoff and Robin,

Please find the first detailed engineering submission for the proposed Strathroy Turf Farms Subdivision in Port Stanley (34T-CE-2101) at the link below (due to file size).
SBM-18-0530 Strathroy Turf Farms Ltd.- Kettle Creek Subdivision - Engineering Submission #1

Please note that Development Engineering will be submitting separate reports and engineering drawings next week for the adjacent subdivision which will form a part of the total engineering package for 34T-CE-2101. That portion of the package is to be reviewed in conjunction with the documents provided today.

If you have any questions, please let us know, and we look forward to your review.

Regards,
Kurtis

Kurtis Caron, P. Eng
Civil Project Coordinator, Eng I
P: 519-471-6667 x226
C: 905-988-0057
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STRIK BALDINELLI MONIZ
PLANNING · CIVIL · STRUCTURAL · MECHANICAL · ELECTRICAL

20 Years SINCE 2004

March 3, 2022 Our File: 2389-021

Kettle Creek Conservation Authority
44015 Ferguson Line
St. Thomas, ON N5P 3T3

Attn Jennifer Dow:

Dear Ms. Dow:

RE: *FINAL 2021 Kettle Creek Floodplain Mapping Update at Port Stanley, ON*

Introduction

Thank you for the opportunity to provide engineering services on this project. The main intent of the project is to update existing Kettle Creek Floodplain Mapping in Port Stanley. The study limits include the Kettle Creek and floodplain from Roberts Line to the Port Stanley Harbour (see Figure 1).

Current floodplain mapping originates from the late 1980's which has been updated and revised several times between 2005 and 2010 (Riggs, 2010). The availability of Light Detection And Ranging (LiDAR) data provides much more accurate topographic data of the river and floodplain system compared to topographic data that would have been available in the late 1980's (which the current mapping is based on). Given the age of the existing floodplain mapping, the availability of large-scale LiDAR data, together with the advancement in the area of hydraulic modeling provide ample justification for updating existing floodplain mapping in Port Stanley.

In the text that follows a summary is provided that details the work undertaken for the 2021 Port Stanley Floodplain Mapping Update project, including:

- background data review,
- field visit and topographic and bathymetric data collection,
- characterization of flows (including climate change),
- digital terrain modeling,
- hydraulic modeling (including ice jams),
- summary of study findings (inundation, access/egress and ice jams), and
- floodplain mapping.

Background Data Review

Kettle Creek Conservation Authority (KCCA) staff have provided key relevant background documents for use in this work. These documents include the Kettle Creek Hydraulic Study (Riggs, 2010), Dalewood Dam Hazard Potential Classification (GHD, 2020), and the Hydraulic Report for the Replacement of Meeks Bridge (CIMA+, 2020). Topographic and bathymetric survey from the work of CIMA+ (2020) was also provided. Further, digital drawings of bathymetric soundings of the Port Stanley Harbour from the lift bridge to the south end of the existing breakwaters, documented in Riggs (2019), were also provided, as were drawings of the soundings at the lift bridge (Riggs, 2020).

Data from the background documents were used in the present project, when deemed appropriate. For example, dense river soundings collected by CIMA+ around the Meeks Bridge (near the upstream study limit) were used, along with Port Stanley Inner Harbour soundings from Riggs (2019 and 2020). Flow characterization and quantification available in Riggs (2010) and GHD (2020) reports were used in the present floodplain mapping update project.

Available soundings from CIMA+(2020) were provided in digital form, and were directly used to characterize the riverbed in the area of Meeks Bridge. The sounding surveys from Riggs (2019) were provided as scanned drawings, which were geo-referenced and manually digitized in order to extract soundings from the lift bridge to the existing breakwaters. The digitized soundings were then used in the development of the digital elevation models (described in subsequent sections).

Field Visit and Topographic and Bathymetric Data Collection

A field visit by the undersigned was completed on September 8th, 2021, and was accompanied by staff from the KCCA. The site visit included a visual assessment at key locations in the study area, along with the collection of relevant topographic and bathymetric data at bridge and other river crossings. As the Meeks Bridge was under construction at the time of the field visit, topographic and bathymetric data could not be collected. However, data at this location from the CIMA+ (2020) work was used in the study.

Remaining bridges included those at: i) Warren Street, ii) Railway Bridge, and iii) Lift Bridge. TRUE Consulting and KCCA staff visited each location and collected the following:

1. Photograph of bridge opening,
2. Top of deck elevation,
3. Underside of beam elevations and measurements,
4. Elevations at water's edge, (left bank) toe of slope (left bank), several below water soundings, toe of slope (right bank), and water's edge (right bank),
5. Dimensions of opening,
6. Location and number of piers (if present), and
7. Other data that deemed relevant (i.e., embankment details, slopes, etc.).

Further, TRUE/KCCA staff have surveyed the river bathymetry at a number of accessible locations within the reach between Sparta Line and Warren Street. Kettle Creek in the noted reach is outside the backwater influence of Lake Erie, and could be accessed without use of a boat. The surveying took place during low flow conditions when individuals could safely wade across the river. All topographic and bathymetric soundings collected by the TRUE/KCCA team was carried

out using a Real Time Kinematic (RTK) Global Navigation Satellite System (GNSS) receiver connected to a set of virtual base stations sending corrections in real time via a data-priority cellular network.

For the reach of Kettle Creek influenced by Lake Erie backwater conditions, bathymetric soundings were collected by Callon Dietz on October 18, 2021. The data collection was accomplished using an eco-sounder mounted on a small boat. A total of 38 river cross sections were collected upstream of the lift bridge (spaced approximately 100 m apart). Using such a large number of surveyed river cross sections ensured that geometry of the riverbed is appropriately represented for use in hydraulic modeling and floodplain mapping work.

All survey related work in this assignment used a first order vertical benchmark at the pier in Port Stanley (Natural Resources of Canada Benchmark Id. 973006) to ensure consistency and accuracy of the field survey campaigns. Vertical datum used in the surveying work was Canadian Geodetic Vertical Datum 2013, abbreviated as CGVD2013. All elevations reported in this project are to this vertical datum.

The topographic and bathymetric survey data from all sources (collected previously by others and collected as part of this assignment) was assembled and used for the development of the hydraulic model ready digital elevation model.

Characterization of Flows (Including Climate Change)

The Kettle Creek watershed drains mostly agricultural lands between London and Port Stanley. The drainage area of the watershed is 434 km^2, with creeks flowing generally in the southwestern direction towards Lake Erie. In the south portion of the watershed soils are generally well-drained, while soils in the northern portion are poorly-drained (GHD, 2020). The creek has deeply incised into the surrounding land mass over geologic time (in the order of 30 m).

Most recent flow characterization of the available streamflow gauges in the watershed is documented in the Dalewood Dam Hazard Potential Classification Report (GHD, 2020). In that work, single station frequency analyses were carried out, along with statistical trend and homogeneity tests (prerequisite for frequency analyses).

For this work, the single station frequency analysis of the Water Survey of Canada streamflow gauge of Kettle Creek at St. Thomas (id. 02GC002) was used. GHD (2020) report provides the flow values for various return period ranging from 2-yr to 500-yr at the 02GC002 gauge (shown in Table 1). As there is an increase in drainage area from St. Thomas to Port Stanley, the flows therefore require adjustment to take the increase into consideration. The technique of flow scaling was used in this work (also used in Riggs, 2010 and GHD, 2020). The scaling was completed by determining flow at the outlet (with the larger drainage area) using the scaling relationship recommended in the Ministry of Transportation of Ontario Drainage Management Manual (MTO, 1997). The results of the flow scaling are provided in Table 1.

To further verify the flows used at the outlet of Kettle Creek, regional analysis using the Unified Ontario Flow Method (UOFM), summarized in MTO (2016) was used to check the flow scaling results provided in Table 1 (note that not all return periods are available from the UOFM method).

Interpretation of the results indicates that the flow scaling technique used is appropriate, and thus shall be used in this work.

TABLE 1 – SINGLE STATION FREQUENCY ANALYSIS AT KETTLE CREEK

Return Period [yrs]	Q [m^3/s] @ 02GC002 [DA = 331 km^2]	Q [m^3/s] @ Outlet of Kettle Creek scaled [DA = 434 km^2]	Q [m^3/s] @ Outlet of Kettle Creek, UOFM [DA = 434 km^2]
500	268.0	328.4	
200	249.1	305.2	
100	233.8	286.5	287.5
50	217.6	266.6	256.8
25	200.0	245.1	
10	174.2	213.4	186.2
5	151.6	185.8	
2	113.4	139.0	105.2

Estimates of Regional flow using hydrologic modeling are summarized in the Kettle Creek Hydraulic Study (Riggs, 2010), and are used in this work. The reported flow value for Regional flow conditions at Port Stanley is 957 m^3/s.

Provincial Policy Statement 2020 notes that Ontario should prepare for impacts resulting from climate change that may increase the risk associated with natural hazards. Impacts of future climate change on magnitude and frequency of flood flows within the Kettle Creek watershed has not been assessed in detail. Climate change assessment is a more involved exercise that requires generating appropriate hydrometeorological inputs and running hydrologic process models to obtain flow characteristics under future conditions. Given that such a detailed study is not presently available, this work applies a factor of 15% to peak flows to represent possible influence of climate change within the time horizon representing mid century (2050's). Change factors ranging from 10-20% are commonly used in British Columbia (EGBC, 2018) even when large scale hydrologic modeling has been completed and are available.

Floodplain mapping in this work is completed using flows with and without consideration of climate change. Note that floodlines estimated using the 15% factor should be considered for information purposes only until such time as more detailed climate change studies become available.

Digital Terrain Modeling

Large scale LiDAR digital terrain model is required for hydraulic modeling as it efficiently captures geometry of the terrain for large areas of land. However, LiDAR sensors are not able to penetrate the water's surface, thus resulting in inaccurate elevations below the water line. Geometry of the terrain under the water's surface is thus not captured using LiDAR, but is required for accurate assessments of river hydraulics. Combining LiDAR topography with topographic and bathymetric survey data are required to construct a hydraulic model ready Digital Elevation Model (DEM). The end product thus includes a digital surface accurate for both above and below water portions of the river and are used in all subsequent hydraulic modeling in this work.

The publicly available MNRF 2016-18 Lake Erie LiDAR data set was used in this assignment (MNRF, 2021). LiDAR data includes a Digital Elevation Model (DEM) having a horizontal resolution of 0.5 m x 0.5 m. The vertical datum of the MNRF LiDAR product was CGVD2013, and is consistent with the bathymetric and topographic data gathered during the data collection campaigns.

The topographic survey within the study area was used to compare elevations between data collected using survey grade instrumentation and the LiDAR DEM product. In areas where the two sources of data overlapped, comparisons showed that on the ground measurements of elevations are consistent with the LiDAR DEM product, thus providing confidence in use of the LiDAR DEM elevations.

For the Kettle Creek the bathymetric soundings collected during both field campaigns were used to create a Triangulated Irregular Network (TIN) model, and then convert it to a 0.5 m in-stream DEM. A customized procedure, similar to one provided by Merwade et. al. (2005), was used to transform the river alignment and the bathymetric survey from a Cartesian to a curvilinear orthogonal system. The reason for the coordinate transformation is that construction of a TIN surface using cross section based river bathymetry is much simpler in the curvilinear orthogonal system than in the Cartesian system. After construction of the TIN surface in the curvilinear orthogonal system was completed, the surface was converted back to the Cartesian system, and used to construct an in-stream only 0.5 m DEM. The in-stream only DEM uses only the surveyed bathymetry data.

The combination of topographic survey points and LiDAR geometry were used to construct a TIN surface at each bridge location within the study area (Warren Street, Railway Bridge, and the Lift Bridge). The TIN model at each bridge crossing used topographic/bathymetric survey points to capture the portion of the topography that is not available in the LiDAR data (i.e., under bridge decks). Each individual TIN model (at a bridge crossing) was then converted to a 0.5 m DEM, for final processing. Manual adjustments in some parts of Kettle Creek (i.e., under heavy vegetation) was required to ensure consistency in the overall digital surface.

The 0.5 m DEMs representing i) in-stream bathymetry, ii) banks underneath bridge decks, and iii) manual adjustments from heavy vegetation were “burned into” (or merged with) the large scale 0.5 m LiDAR DEM ultimately producing a hydraulic model ready product that accurately captures all above and below water terrain of the river and banks (required for accurate floodplain modeling). The merged digital surface (consisting of LiDAR derived ground surface, surveyed topography and bathymetry, as well as manual adjustments) include the best available geometric data for the study area.

Hydraulic Modeling (including ice jams)

The hydraulic analysis carried out in this assessment uses the Hydrologic Modeling Center’s River Analysis Systems (HEC-RAS), developed and maintained by the US Army Corps of Engineers. The HEC-RAS model is currently the standard hydraulic model widely used in North America and the world. HEC-RAS allows its users to carry out 1D and 2D river hydraulic analyses, using steady or unsteady techniques. Depending on the type of analysis required different variants of the

models were used. Version 6.1 of the HEC-RAS model is used in this work, as it is latest at the time of this writing.

Implicit in 1D hydraulic models are approximations that allow river flow to travel unidirectionally from one cross section to the next, which may not always be accurate in cases of wide and shallow floodplains where overland flow patterns govern flow hydraulics. In such cases use of 2D hydraulic modeling is better suited to better capture the physics of the flow.

In this work 1D and 2D variants of the HEC-RAS hydraulic model are used to quantify detailed behavior of the hydraulics within the study area. 1D model is used for comparisons to previous (historic) mapping, and for computation of water surface profiles for lower return period flows (from 2- to 50-yr flows), and for ice jam analyses. For higher return period flows (100-yr and Regional), a 2D variant of the model is used. Note that the 2D model is considered more accurate in capturing physics of the flow, but is also more computationally demanding. Flow statistics reported in Table 1 (at outlet of Kettle Creek) are used as upstream flow.

Hydraulic roughness in terms of Manning's coefficient was derived using 2020 SWOOP aerial photography within the study area. Values used in the modeling were based on typical roughness values correlated with the surface treatment. Table 2 shows the roughness values used in this work, and are consistent with standard practice for similar land use classes.

Table 2 – Hydraulic Roughness Values

Land use type	Manning's n value
Forest	0.100
Residential	0.025
Fields	0.030
Channel	0.035

The downstream boundary conditions in Lake Erie were set as the 20-yr return period using the monthly average lake level statistic (estimated as 174.56 m CGVD2013). Hourly Lake Erie water level observations from the Port Stanley gauge (1961-2021) were downloaded and subsequently analyzed. Hourly data was converted to monthly data, and used to extract annual maximum monthly water level. The annual extremes were fit to several statistical distributions to estimate corresponding return period values. Statistical fits using method of moments and L-moments have yielded similar results. For the purposes of this work, Generalized Extreme Value distribution with parameters estimated using L-moments, was selected and used to establish downstream boundary condition for the modeling work. The Kettle Creek Hydraulic Study (Riggs, 2010) used a long term average of the Lake Erie water levels, which was lower than the values used in this assignment. Since the flood levels in Port Stanley (upstream of the Lift Bridge) are influenced more by the hydraulic gradient of the river than the backwater conditions of the lake, the starting value of the downstream boundary condition does not significantly impact flood levels and flood lines. For the area downstream of the Lift Bridge lake levels are the governing mechanism of flooding, that are summarized in the Port Stanley Coastal Risk Assessment (Zuzek, 2021) report.

For the HEC-RAS 1D model cross sections were extracted from the hydraulic model ready DEM (see above). A schematic of the 1D model is shown in Figure 2. The extent of the cross sections

was chosen to fully encompass flood lines from Regional flow conditions. The bridges were added to the model by entering their surveyed geometry (deck, soffit, piers, etc.). Ineffective flow areas, obstruction areas and levee nodes (dyke features at Union Road and the Railway embankment) were included in the modeling. The flows summarized in Table 1 were added to the upstream model boundary and were used in steady state HEC-RAS simulations. Water surface profiles and flood lines associated with each profile were extracted from the model for further processing/mapping.

For the HEC-RAS 2D model, a large number (in the tens or tens or hundreds of thousand) of discrete elements are typically used to represent the geometry (river and floodplain) of the study area. Using a large number of elements allows for capturing geometry of the physical system with high degree of accuracy, especially when the goal of the assignment is to evaluate flow paths, depths, velocities and spill characteristics of flow areas resulting from passage of large flood events. The advantage of 2D modeling is that a range of flood flows (from small to extreme) can be assessed in time and space, while making a minimum number of assumptions (no assumptions on ineffective flow areas for example).

Required data for 2D modeling includes: i) terrain surface that captures key geometric features within the river and floodplain (i.e., hydraulic model ready DEM), ii) a model grid or mesh that discretizes the study area into a large number of computational elements, iii) hydraulic structures (bridges, culverts, weirs, dykes, etc.), iv) initial and boundary conditions (flows and levels), and v) Manning's roughness coefficients for the main channel and the overbank areas.

Model grid for the study area was constructed using unstructured elements of varying geometric proportions. Fine resolution mesh was used in areas that were deemed to control flow characteristics, like main channels, bridges approaches, crests of roadways, top and bottom of slopes, etc. Coarser resolution mesh was used elsewhere in the model domain in areas that are not anticipated to actively convey flow but could still be inundated. Care was taken to include appropriate grid resolution in the model to capture relevant features, and still keep computation times to a minimum. Figure 3 shows the model schematic of the HEC-RAS 2D model in this work.

Bridge structures were coded into the HEC-RAS 2D model in the same fashion as in the 1D model. Version 6.1 of the HEC-RAS 2D model allows bridge information to be included in similar manner as the 1D model variant. Care was taken to develop internal upstream and downstream breaklines according to best modeling practice to properly represent the geometry at bridges in 2D (which ultimately control water levels upstream).

Design flows (summarized in Table 1) were gradually added at the upstream model boundary in the 2D model to simulate peak flow conditions while ensuring the model achieves numerical stability. As the present analyses involves riverine floodplain mapping, flows were gradually ramped to reach design flow conditions. Once flows reached design conditions, they were applied sufficiently long to achieve steady state conditions in the system and thus obtain maximum water levels during the desired event. The resulting flood inundation extents were processed to ultimately develop the floodplain maps.

Ice Jams

Ice jams in Port Stanley result from the constriction imposed by the lift bridge. Previous ice jam analyses were completed as part of the Kettle Creek Hydraulic Study (Riggs, 2010).

For the assessment of ice jams within Port Stanley in this work, a limited scope ice jam modeling was carried out. Ice jams result from a combination of factors including i) ice conditions, ii) river flows, iii) lake levels, and iv) river geometry. A set of parameters were defined using a reasonable combination of ice jam factors, and 1D steady state HEC-RAS ice jam analyses were carried out using the model documented above. A conversation with KCCA staff revealed that ice thickness is monitored on a weekly basis during the winter months. Based on the past measurements, ice thickness of 0.3 m is possible up to Warren Street, and sometimes all the way to Sparta Line (the upstream extent of the study area).

For the hydraulic modeling in this work, ice jam thickness of 0.3 m was assumed to occur between the harbour and the Warren Street Bridge. The HEC-RAS 1D steady state model was used to determine water surface profiles within the study area resulting from 2, 5, 10, and 25-yr storm in combination with a 0.3 m thick ice sheet from the harbour to Warren Street. The lake level in the simulations of ice jams was set at 174.56 m CGVD2013, same as in the clear water (non-ice) conditions.

It is not customary to carry out ice jam assessments using combination of scenarios, as it is unlikely that all flood mechanisms would occur at the same time. For example, combinations of 100-yr lake level with 100-yr flood with an ice jam would be extremely rare. As a reasonable scenario this work considers 20-yr lake level in combination with an ice jam, with floods ranging from 2-yr to 25-yr.

Summary of Study Findings

100-yr and Regional Inundation Limits

The natural floodplain of the Kettle Creek in the upstream portion of the study area has been historically infilled by construction of embankments that support the Port Stanley Terminal Railway on the east, and Union Road on the west. The said embankments act to restrict the limits of flood inundation, as long as floods do not cause them to overtop. Figure 4 shows inundation extents for the 100-yr and Regional Storm conditions. The 100-yr floodplain is generally bound by the noted embankments north of Port Stanley, and stays generally close to its existing river alignment in the southern reach. The 100-yr flood does not spill the existing harbour walls. This statement is true for existing and future (climate change factored) flows (as shown in Figure 5) and depends on lake levels during flooding conditions. In this work flooding was evaluated assuming a 20-yr monthly lake level occurs during the course of the flood. Impact of overtopping the harbour walls from coastal flooding is covered in Zuzek (2021).

The Regional flood line has been found to inundate wider areas than the 100-yr flood (as expected). The inundation in this case extends beyond the Union Road and Port Stanley Terminal Railway embankments, with the flood either causing overtopping (at Union Road on the western floodplain) or causing backwater that extends upstream (at Sunset Drive on the eastern floodplain). The Regional flow has been found to overtop Warren Street east of the bridge, and

thus cause inundation of the area running parallel to the river between Warren Street and Kettle Creek. This area was previously not identified as floodplain in the Kettle Creek Hydraulic Study (Riggs, 2010). The more refined analyses carried out in this work using 2D flow modeling indicates that overbank flow upstream causes Warren Street east of the bridge to overtop, and act like a weir. 1D hydraulic modeling (including one carried out in this work) did not capture dynamics of overbank flow, and thus did not identify this mechanism of flooding.

Figure 6 shows inundation extents from the Regional flow conditions with and without climate change. As expected, higher flows under climate change conditions incrementally flood wider areas.

Assessment of Access/Egress

For the purposes of evaluating access and egress (to and from Port Stanley) during times of flooding the 2D hydraulic model was used to estimate depths and velocities along traveled road surfaces. Access/egress is evaluated using Regional flow conditions. Traveled road surfaces are defined as access roads used during times of flood hazards. Vehicles traveling on access roads can include cars, trucks, and emergency vehicles (firetrucks, and ambulances). Hydraulic modeling carried out produced spatially varied depths and velocities that are used to evaluate whether the traveled surfaces meet existing Provincial access/egress standards.

The Provincial standard for access/egress is evaluated based on depths, velocities, and a product of depth and velocity. MNR (2002) states that reasonably low risk conditions for pedestrian access during times of flooding are reached when depth does not exceed 0.8 m, velocity does not exceed 1.7 m/s and a product of depth and velocity does not exceed 0.4 m^2/s (MNR 2002, Appendix p.27). Thus, if any one of three quoted criteria are exceeded, the Provincial standard is considered not met.

Access/egress road profiles evaluated are those surface that are anticipated to be inundated during Regional storm conditions. Table 3 lists the locations of the road profiles considered, while Figure 7 shows their locations on a plan area map (along with direction arrows for each profile). Figures 8 to 13 shows profile plots for ground surface vs water level (top), velocity (middle), and depth (bottom). By having the profile data in Figures 8 to 13 the Provincial access/egress standard was evaluated. Summary of depths, velocities and their product is shown in Table 4, where it is identified that most access/egress roads within the study area do not meet the required Provincial standard under Regional flow conditions.

Table 3 – Access/Egress Profiles

Profile I.D..	Description
1	Roberts Line downstream of Meeks Bridge
2	Colborne Street north of Warren Street
3	Warren Street east of bridge
4	Colborne Street north of Bridge Street
5	Carlow Road near the marina
6	Union Road north of Warren Street

Table 4 – Access/Egress Summary

Profile I.D.	Depth [m]	Velocity [m/s]	Depth x Velocity [m^2/s]	Is Provincial Standard Met [Yes or No]
1	2.0	0.5	1.0	No
2	0.55	0.1	0.06	Yes
3	0.35	1.6	0.56	No
4	1.3	1.7	2.21	No
5	1.0	0.05	0.05	No
6	2.5	0.21	0.52	No

Assessment of Ice Jams

Simulations of ice jams are extremely sensitive to the thickness and extent of ice in the inner harbour and upstream river reach. For this assignment an ice thickness of 0.3 m is selected in the area between the harbour and Warren Street. The water level in Lake Erie was set as in the clear water flood conditions (documented above). Simulations of water surface profiles were carried out using the HEC-RAS 1D hydraulic model developed in this work, with the ice jam option turned on. Flood events ranging from 2-yr to 25-yr were considered in the simulations.

Results of the ice jam analyses are shown in Figures 14 (for 2-yr and 5-yr floods) and Figure 15 (for 10-yr and 25-yr floods). By inspecting the output it is readily observed that ice jams significantly increase the upstream water surface elevations compared to clear water flood conditions. In comparing the 25-yr flow under clear water conditions (no ice) with the 25-yr flow under ice jam conditions, the water levels around Warren Street could rise as much as 1 m. This means that area around Warren Street could experience flooding with a 0.3 m thick ice jam with a 25-yr flow that is comparable to flood profiles that are somewhere between the 100-yr and Regional (clear water flow) conditions (see Figure 16).

Even though limited in scope, ice jam analyses performed have revealed extreme effects of harbour ice as the mechanism that could significantly exacerbate riverine flooding in Port Stanley (a known consequence). The thickness and extent of the ice will determine the severity of the flooding that could ensue. A more comprehensive assessment is required before any more conclusions could be drawn. In the meantime, it is recommended to keep monitoring ice thickness and its upstream extent on regular basis, as it can have significant impact on riverine flooding in Port Stanley.

Floodplain Mapping

The floodplain mapping shown is shown as report style figures in this document. The hydraulic models (1D and 2D versions), along with inundation extends (in vector and raster formats) were provided to KCCA for further use and processing in their Geographic Information System, as per the agreed upon scope. Metadata associated with the digital products was included, to ease integration of the mapping products in the existing systems.

Should you have additional questions or require additional clarifications, please do not hesitate to contact the undersigned.

Yours truly,

TRUE CONSULTING

Pat Prodanovic, Ph.D., P. Eng.
Water Resources and Coastal Engineer

PP/mm

Enclosures

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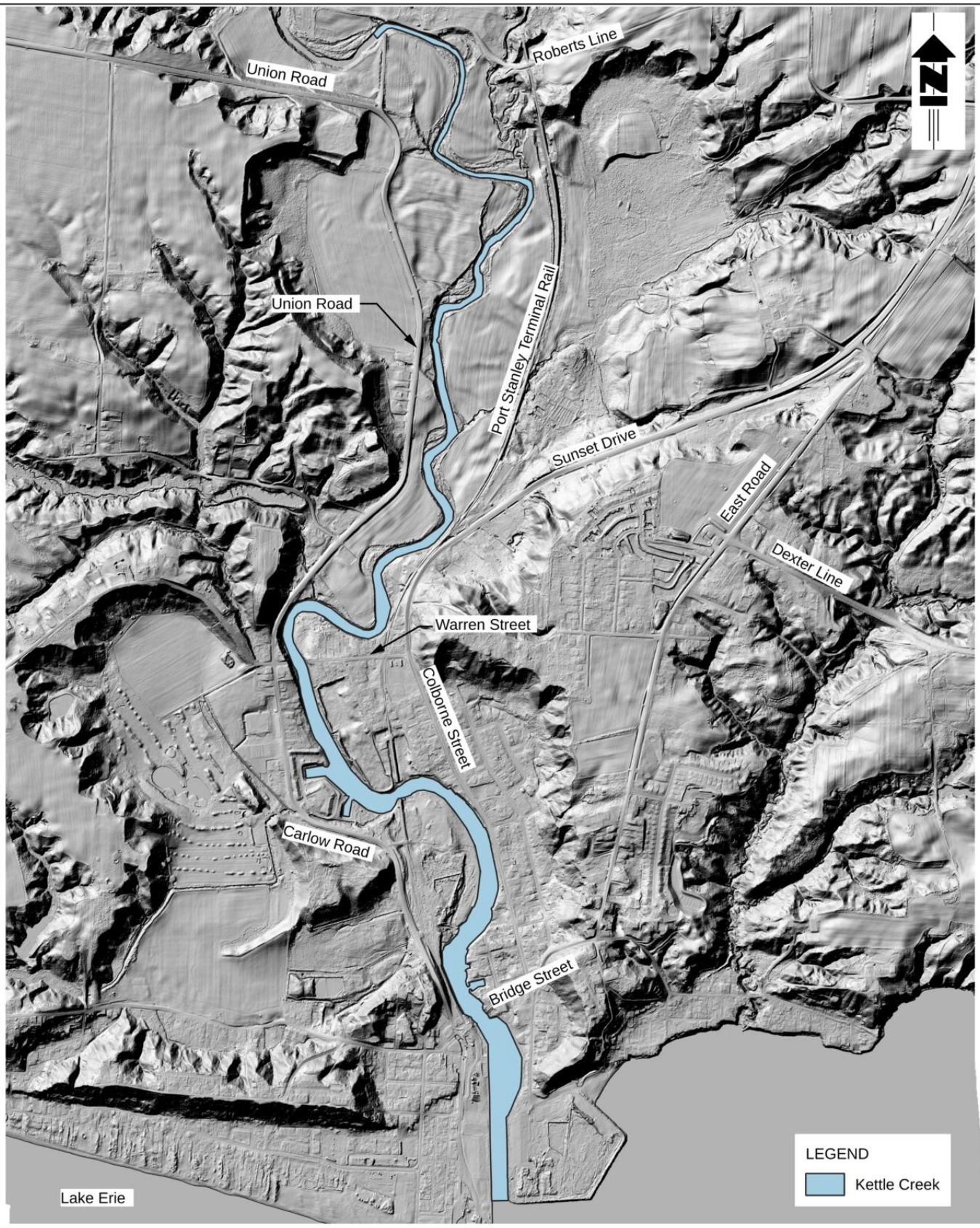

SITE PLAN

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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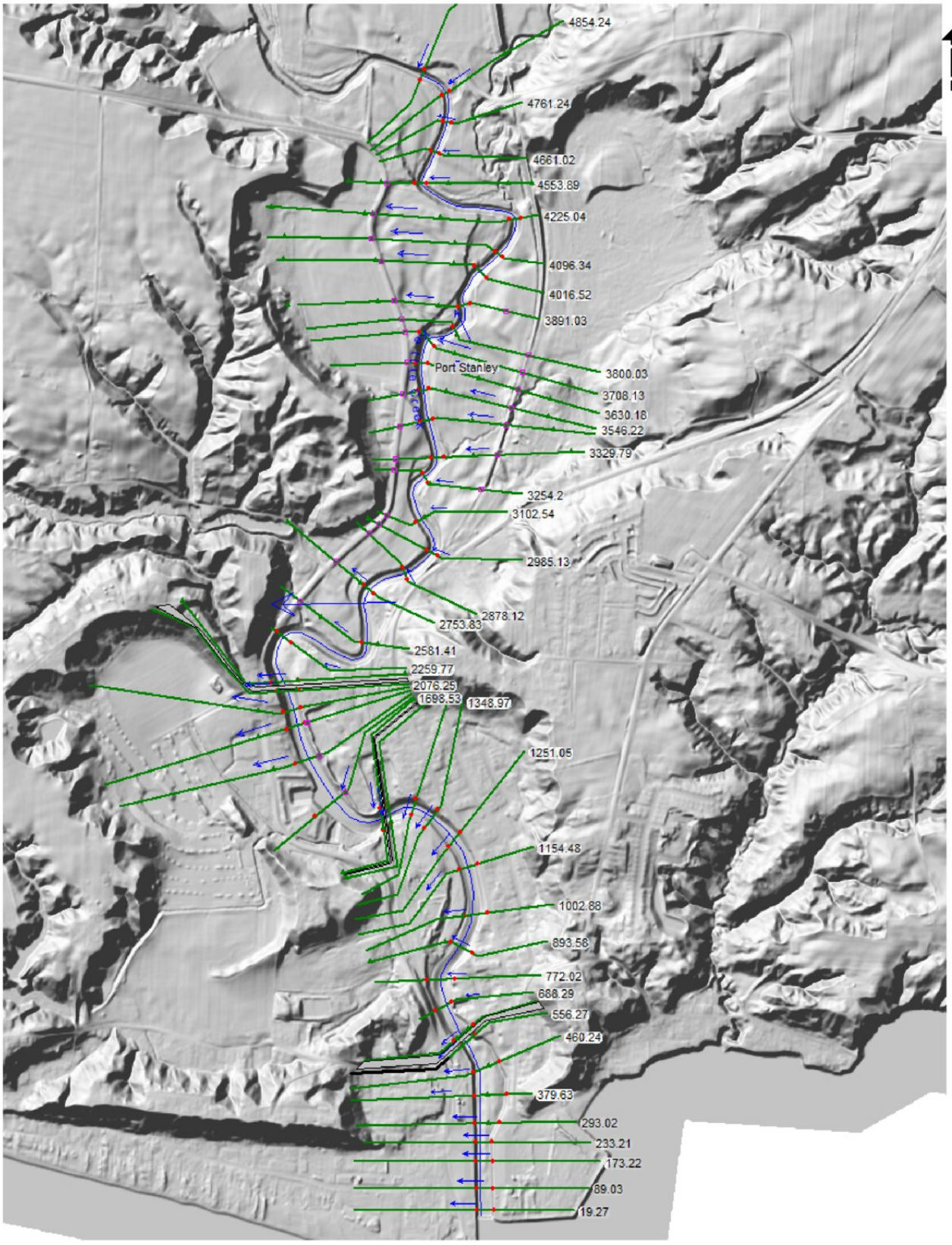
SCALE: 1:17,000	
FIG. NO: 1	REV.: 0
PROJECT NO: 2389-021	
DATE: November 2021	



HEC-RAS 1D CROSS SECTIONS

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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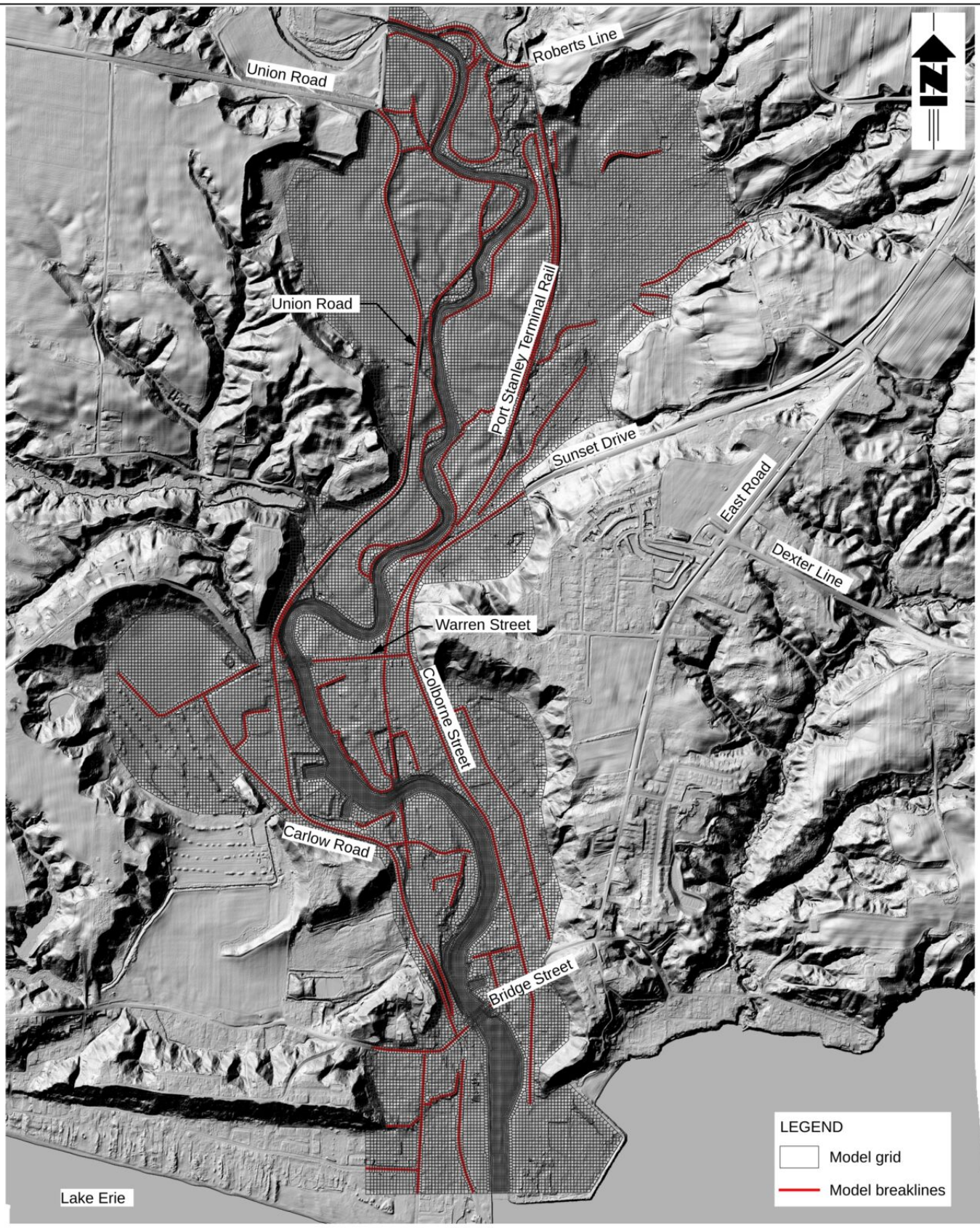

HEC-RAS 2D MODEL GRID

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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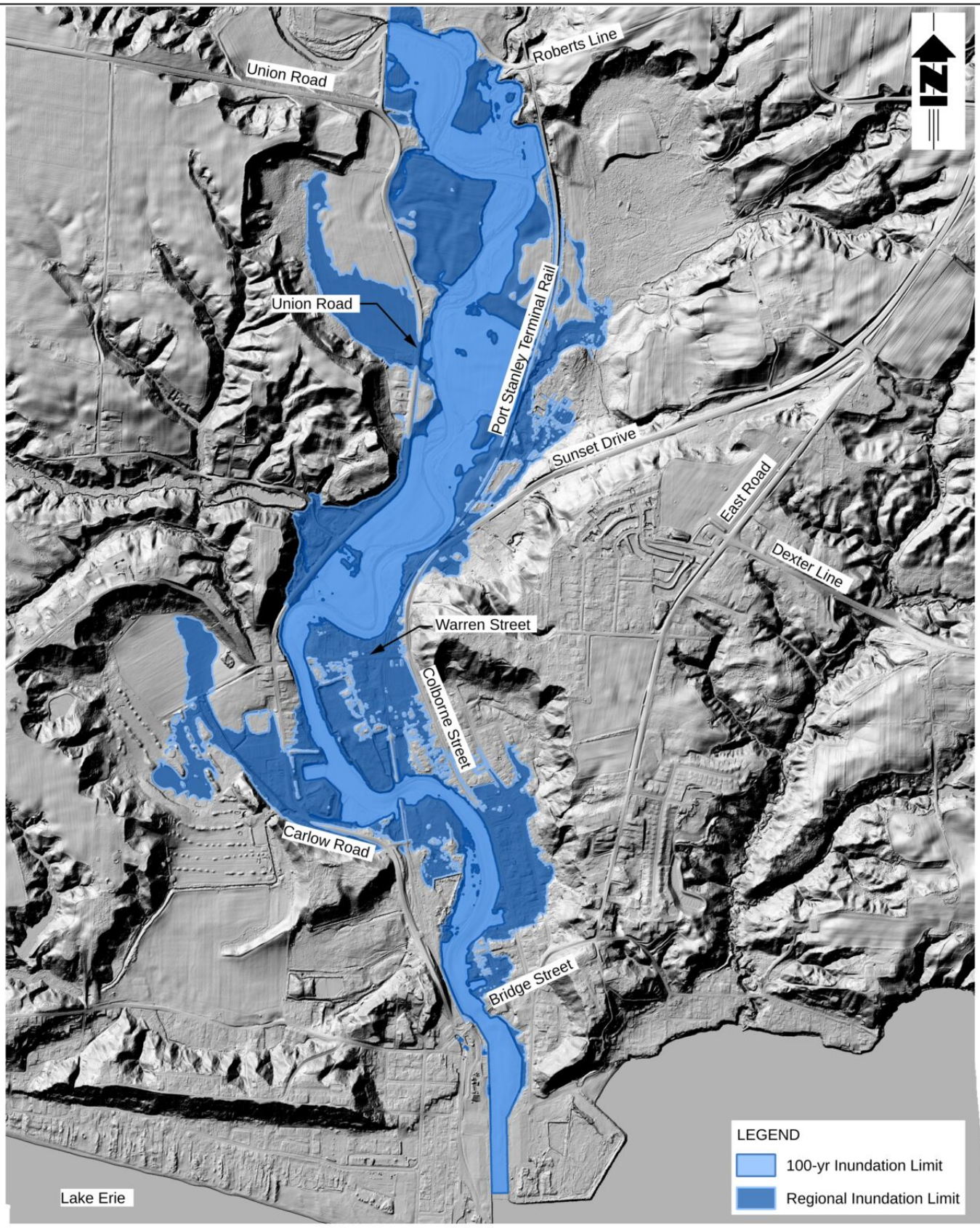

INUNDATION LIMITS

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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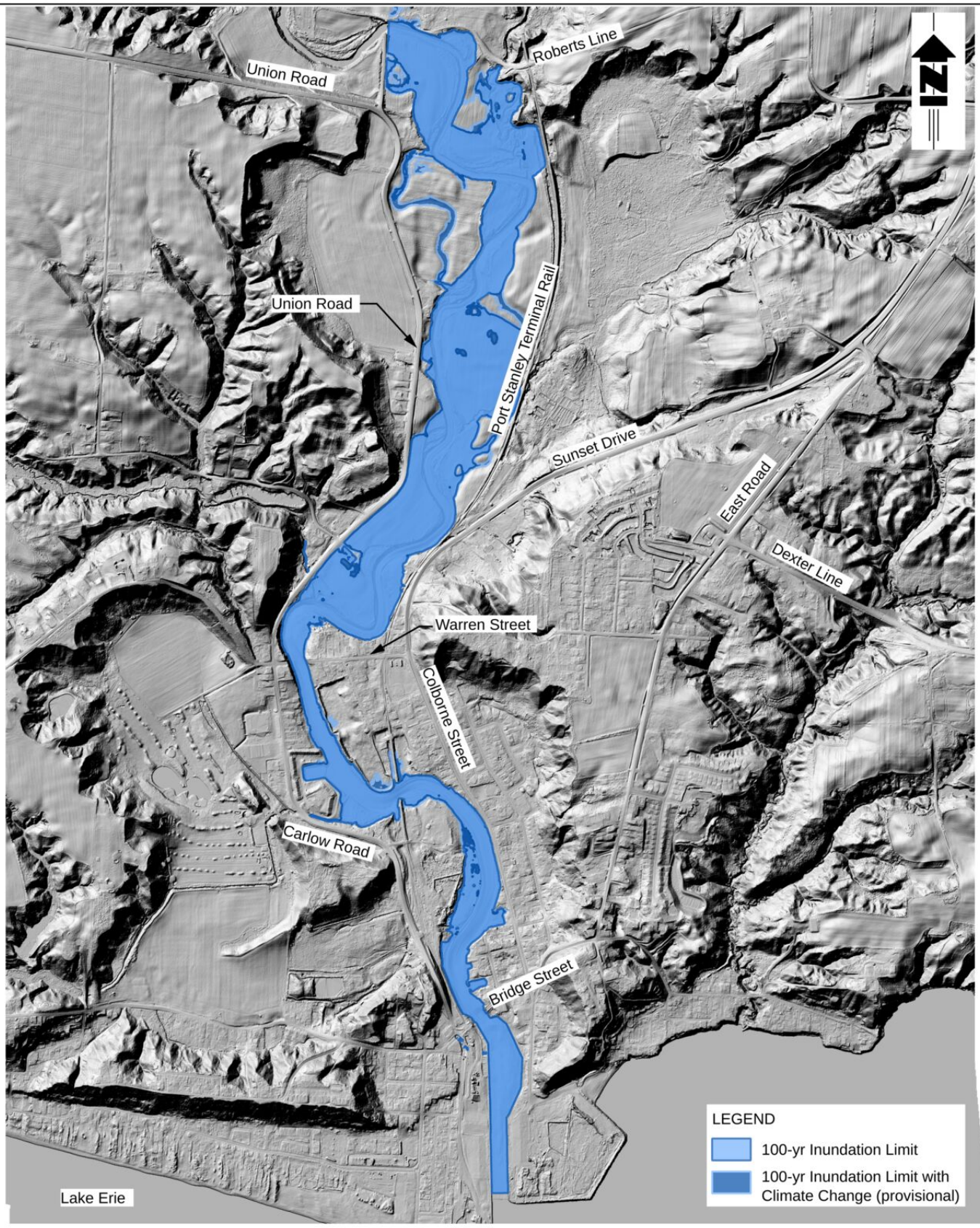
DATE: November 2021	



CLIMATE CHANGE INUNDATION LIMITS

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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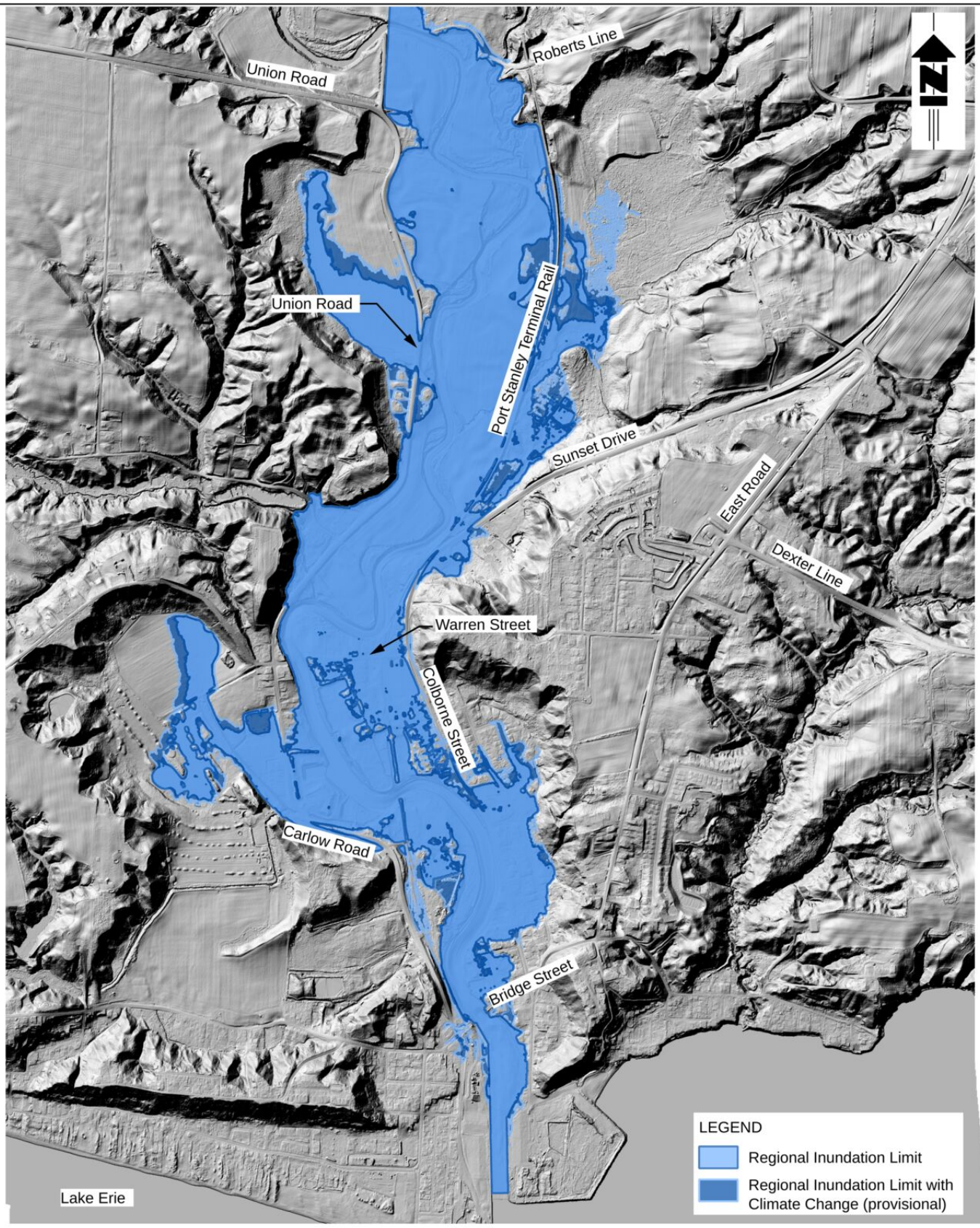

CLIMATE CHANGE INUNDATION LIMITS

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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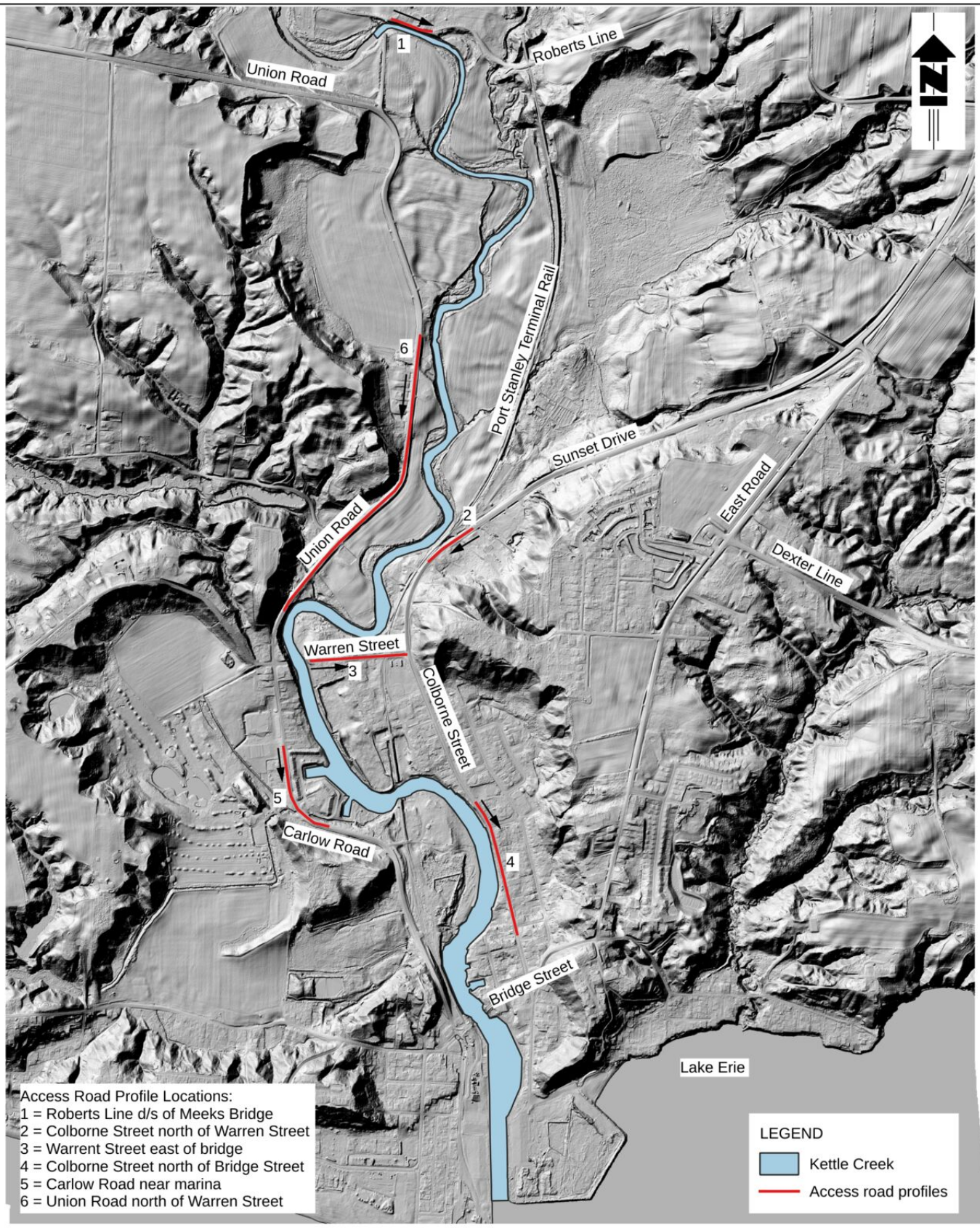

ACCESS ROAD OVERTOPPING LOCATIONS

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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FIG. NO: 7	REV.: 0
PROJECT NO: 2389-021	
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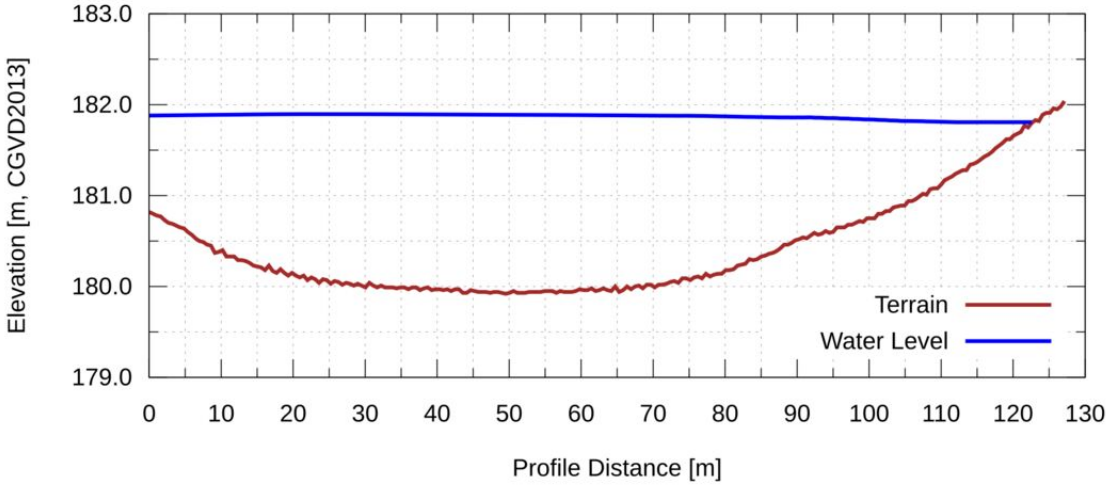

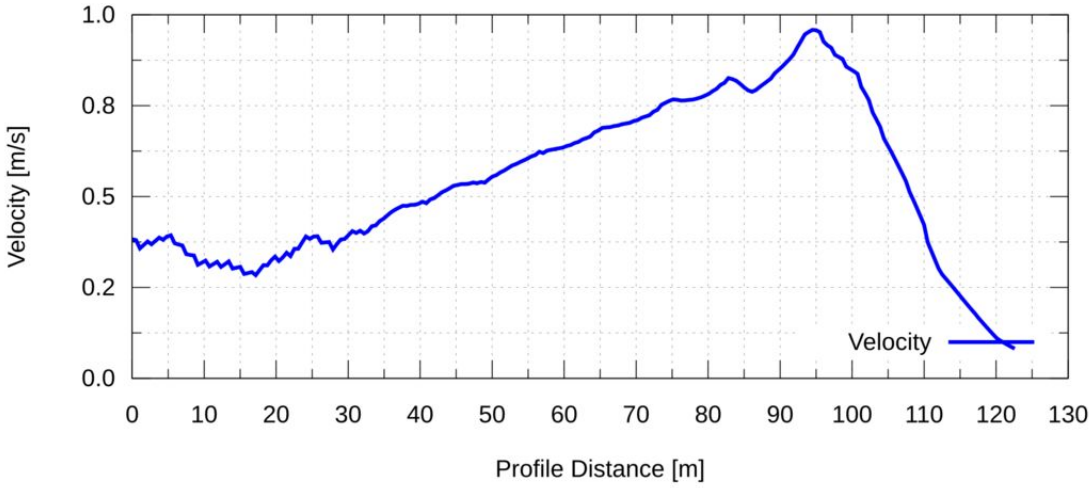

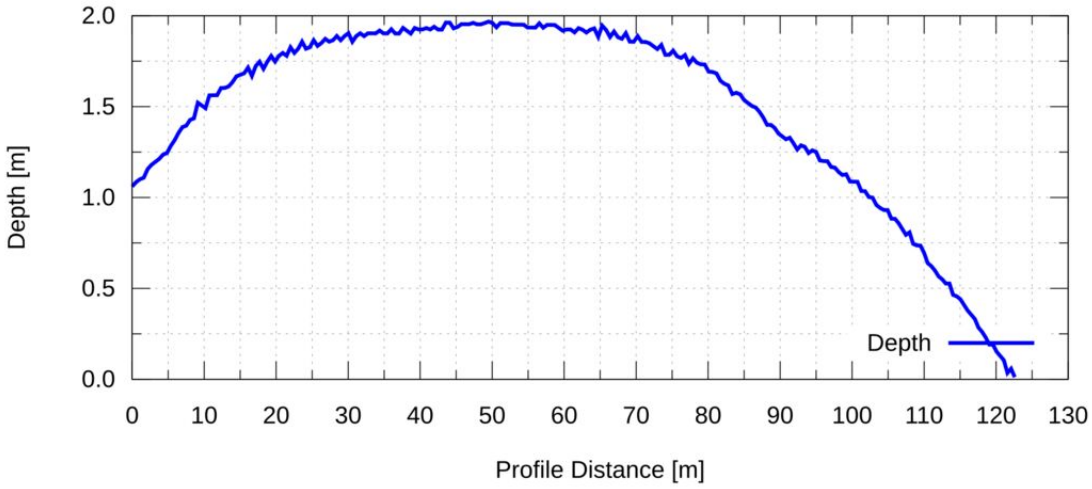

LOC 1: ROBERTS LN D/S OF MEEKS BRIDGE

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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PROJECT NO: 2389-021

DATE: November 2021

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SCALE: AS NOTED

FIG. NO: 8

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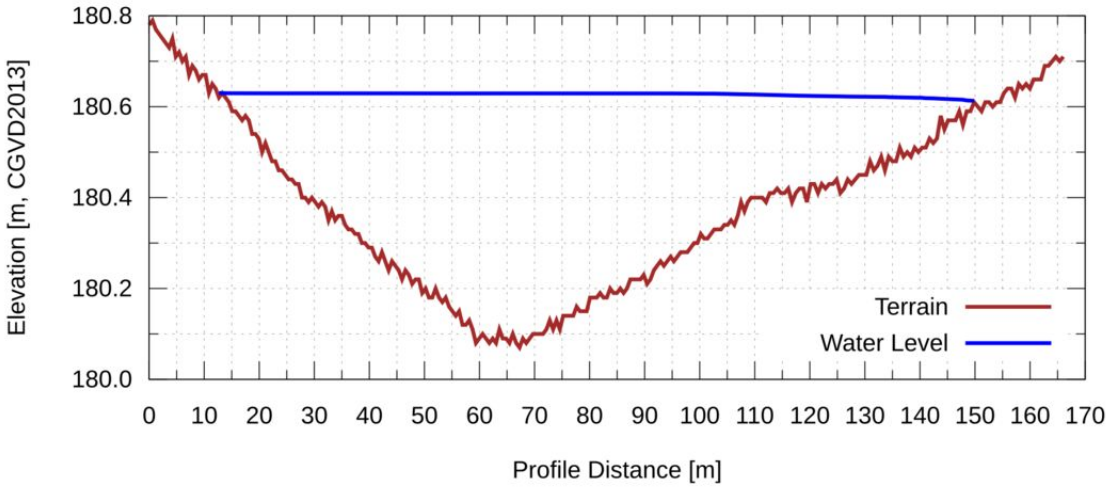

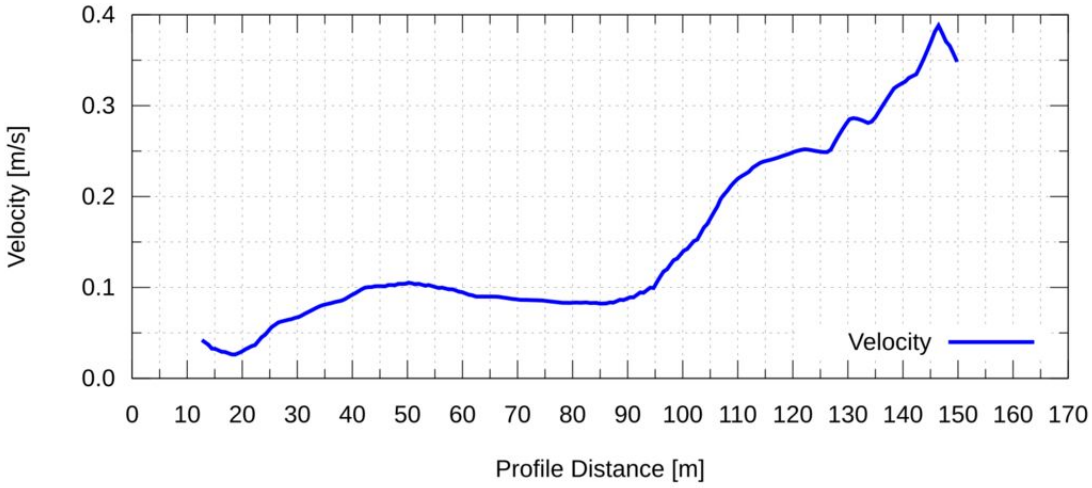

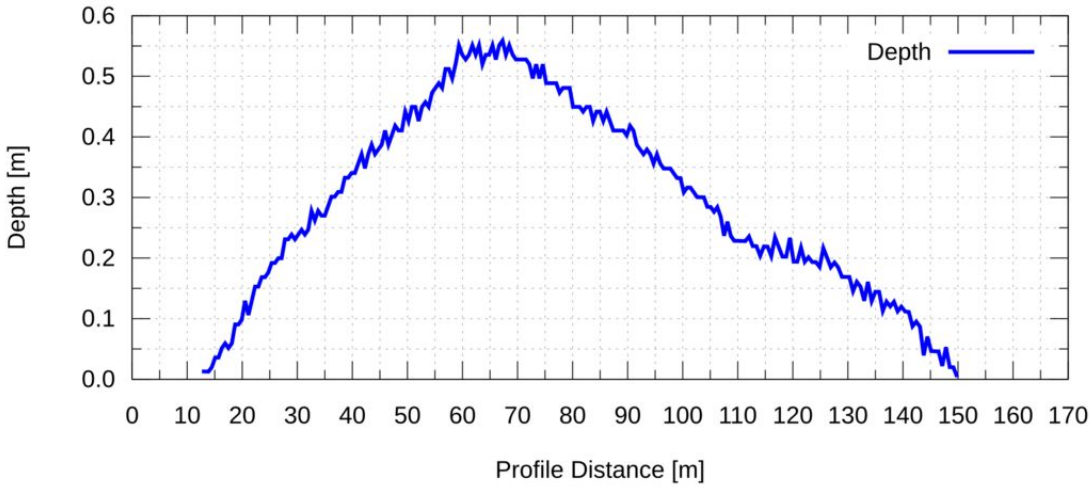

LOC 2: COLBORNE ST NORTH OF WARREN ST

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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FIG. NO: 9	REV.: 0
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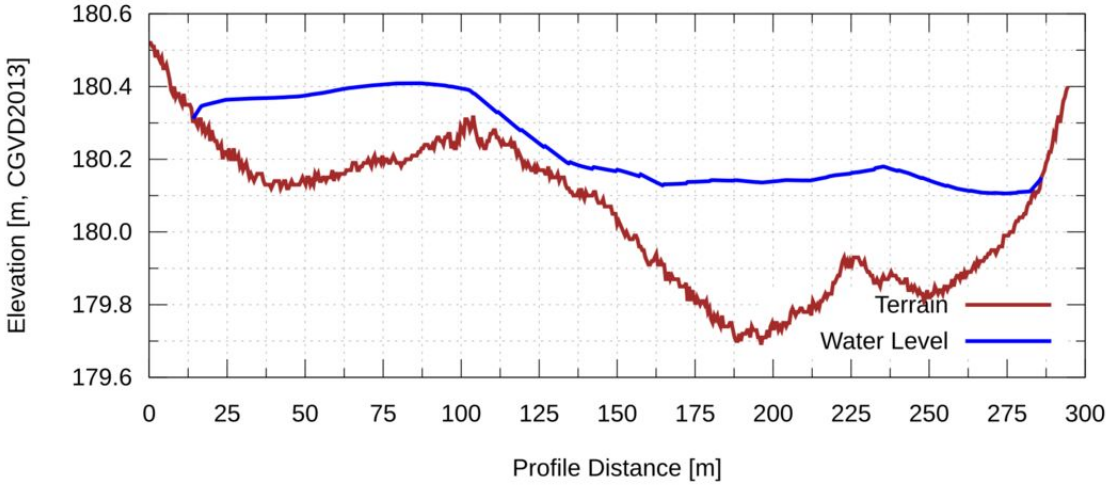

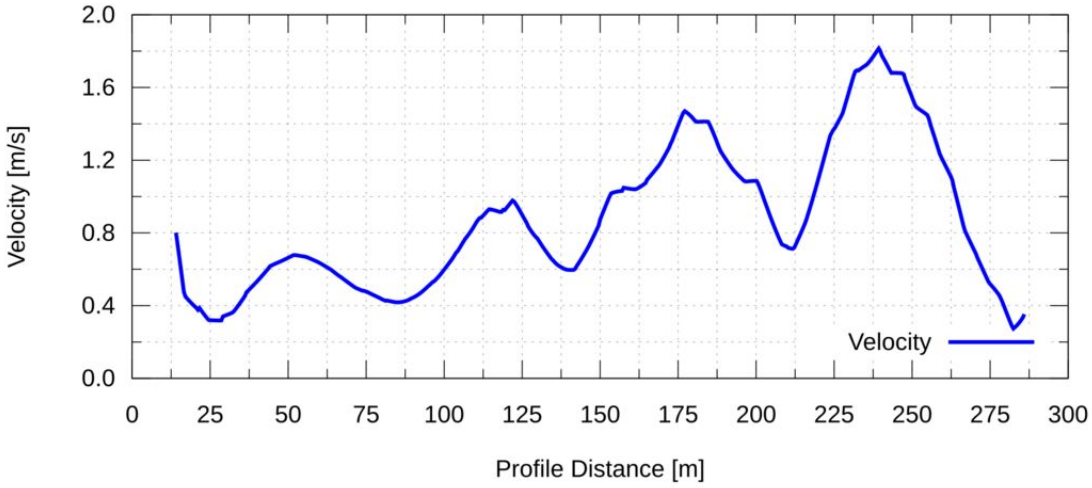

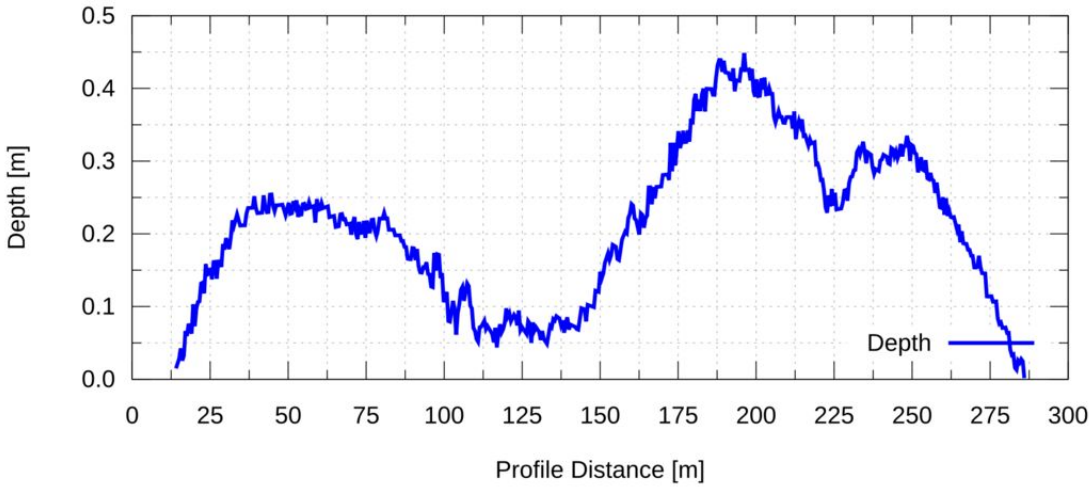

LOC 3: WARREN ST EAST OF BRIDGE

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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FIG. NO: 10	REV.: 0
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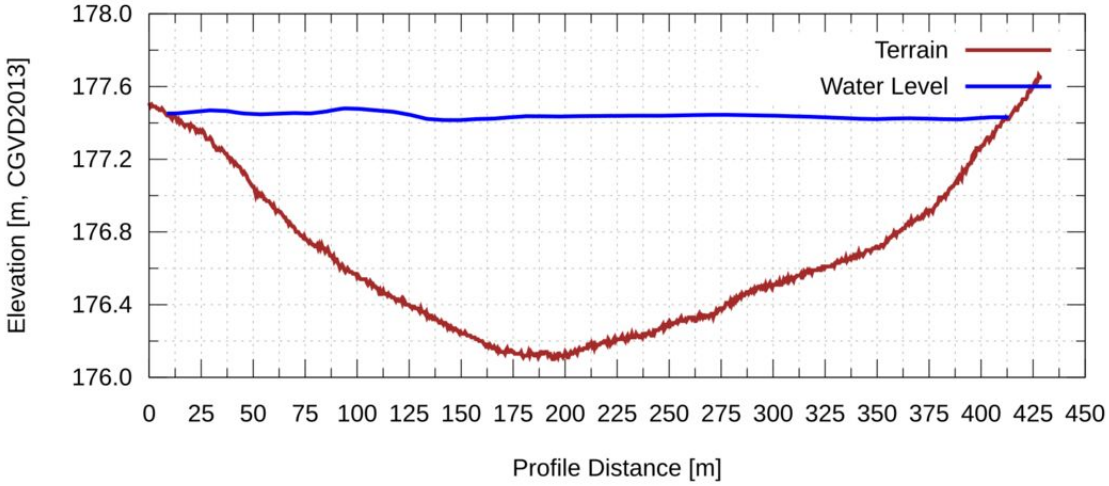

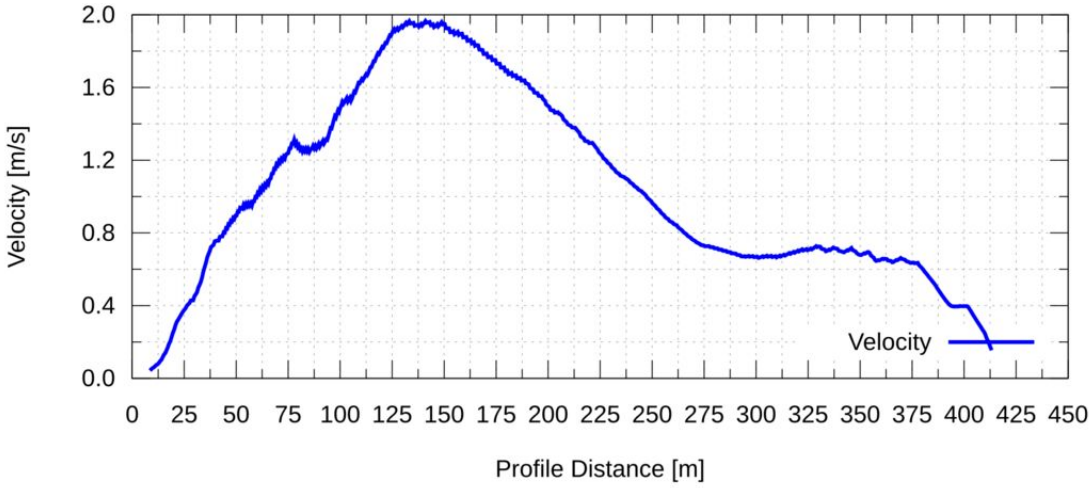

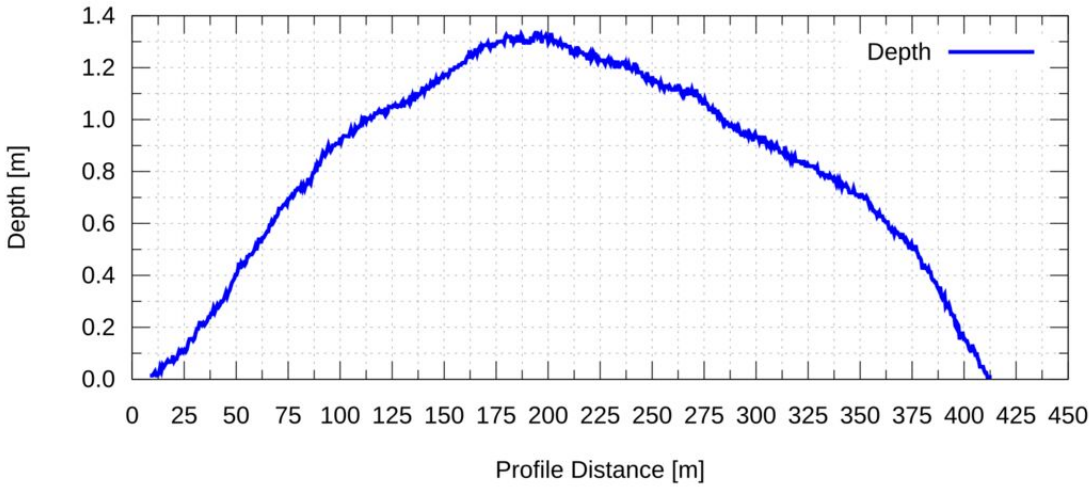

LOC 4: COLBORNE ST NORTH OF BRIDGE ST

2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

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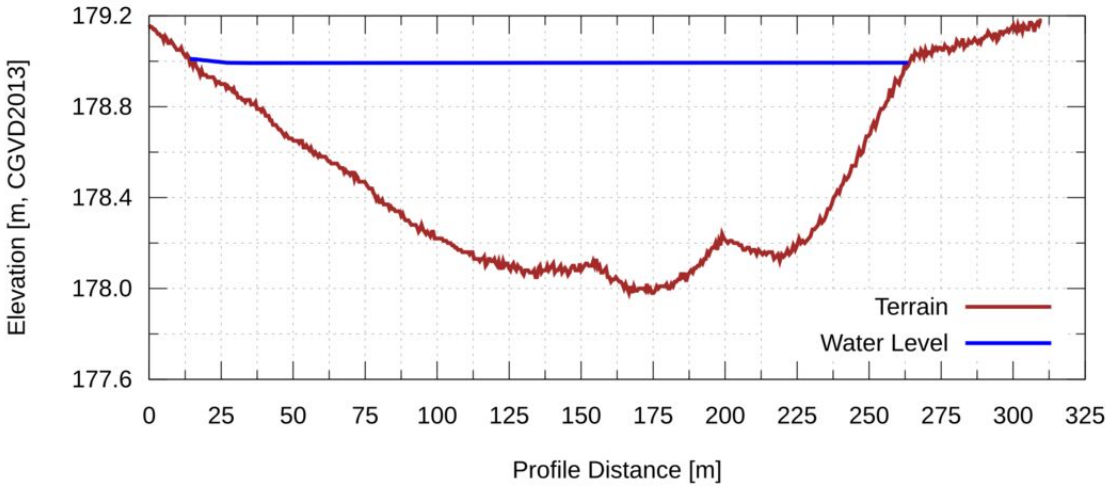
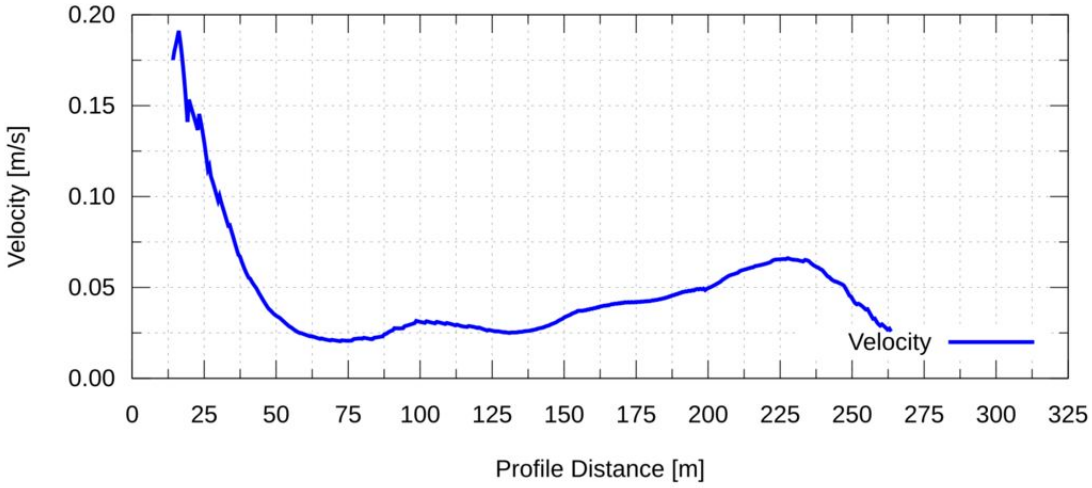
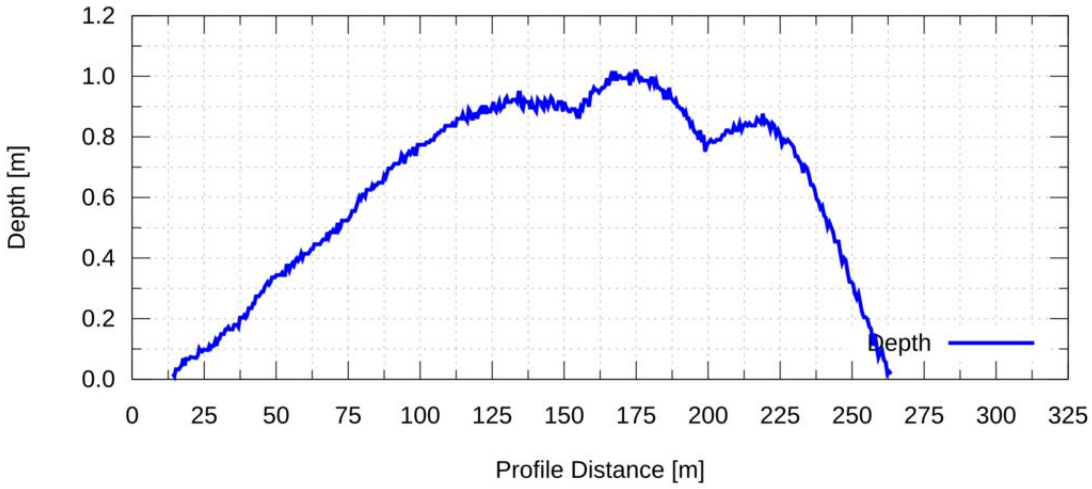
FIG. NO: 11	REV.: 0
PROJECT NO: 2389-021	
DATE: November 2021	





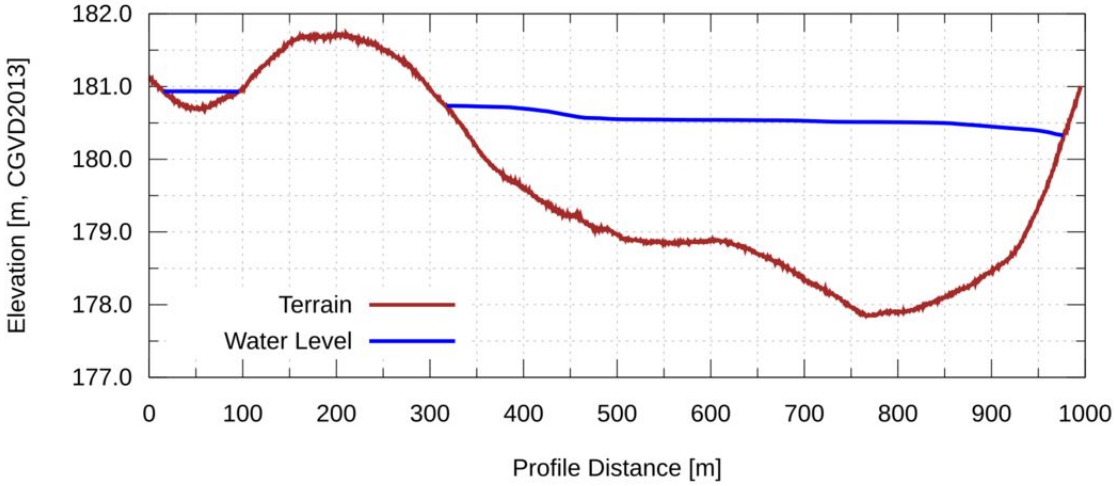


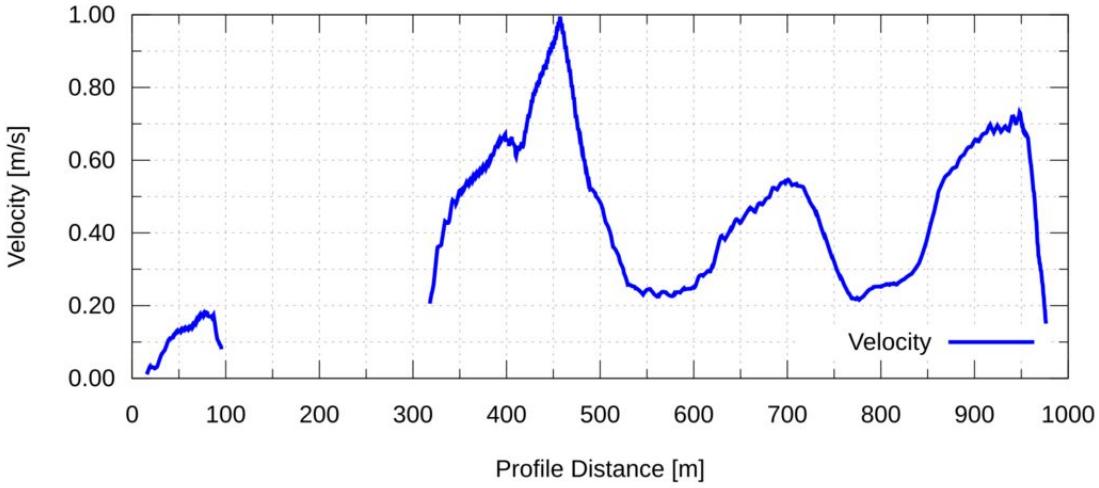
LOC 5: CARLOW RD NEAR MARINA

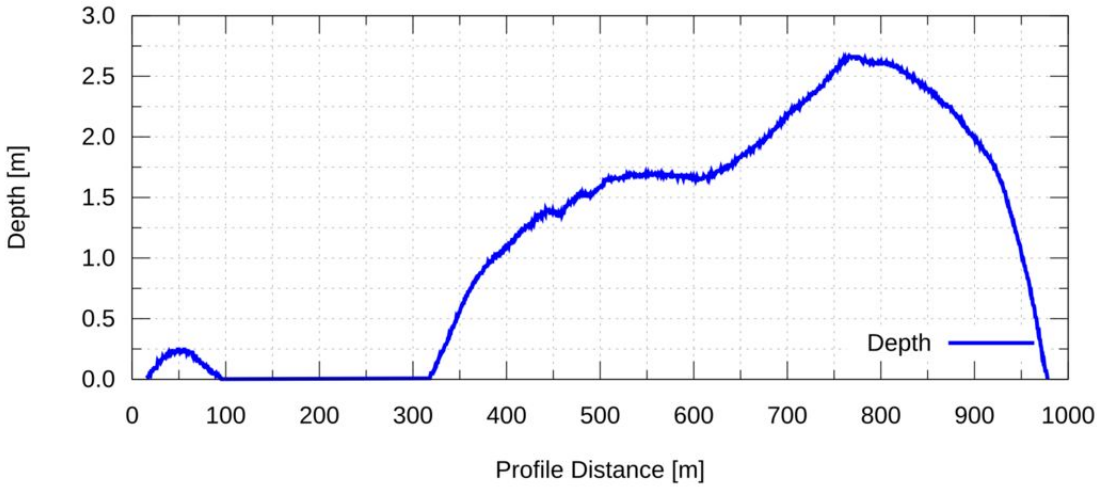
2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

TRUE

DRAWN BY: PP	
SCALE: AS NOTED	
FIG. NO: 12	REV.: 0
PROJECT NO: 2389-021	
DATE: November 2021	





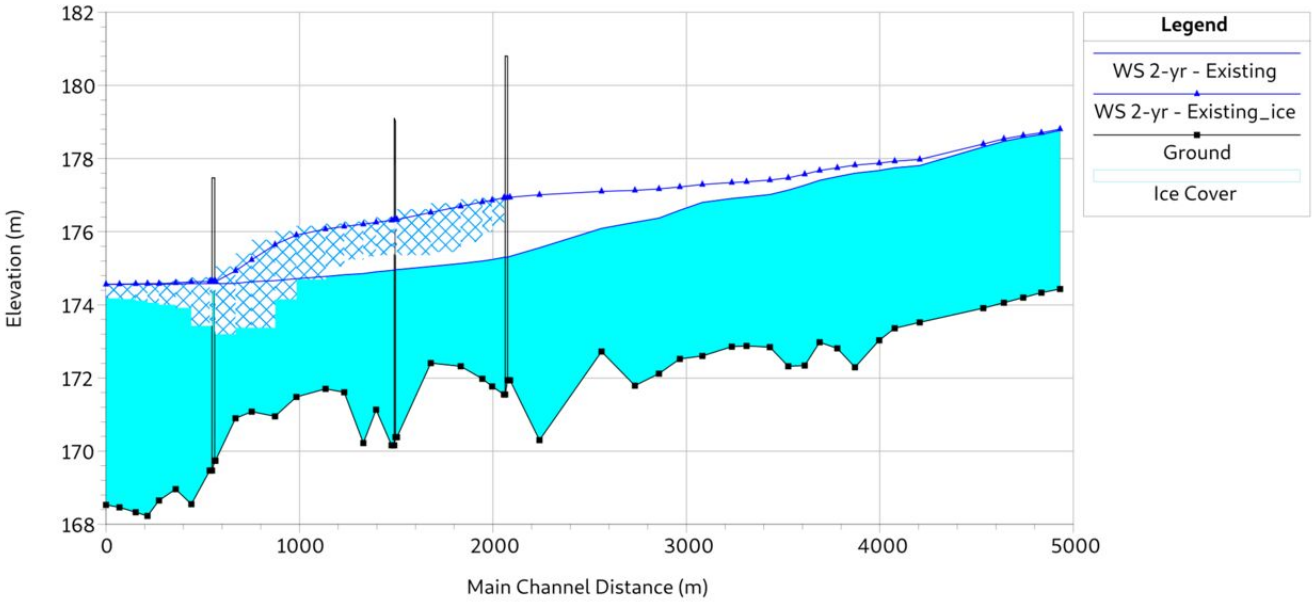


LOC 6: UNION RD NORTH OF WARREN ST

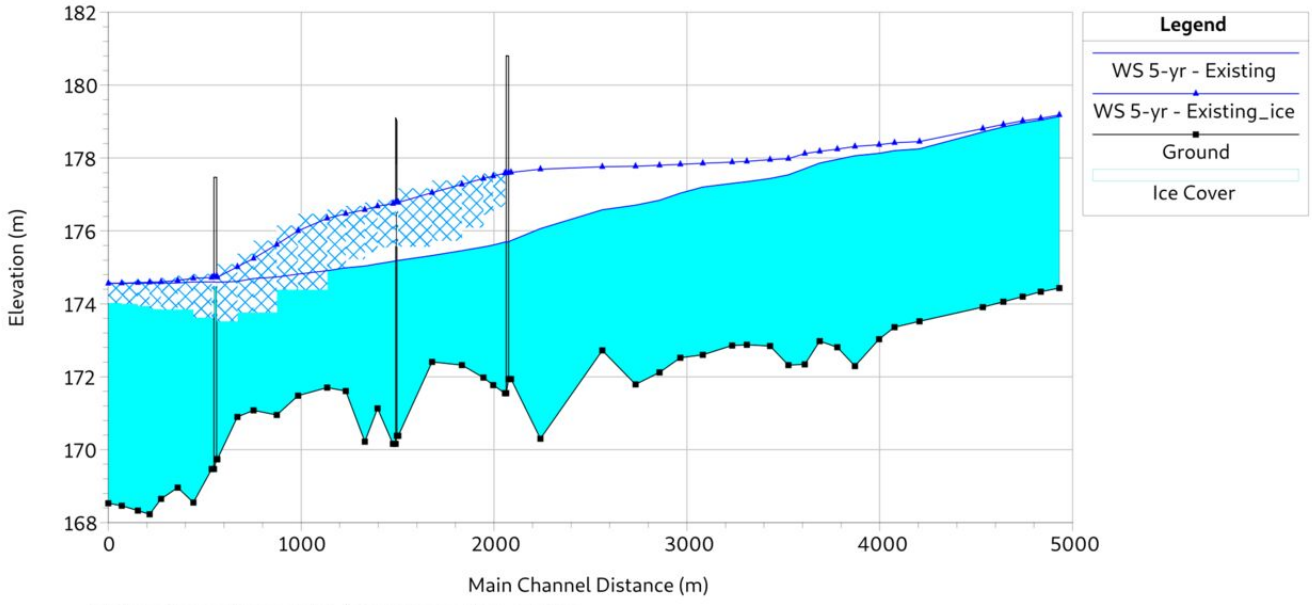
2021 KETTLE CREEK FLOODPLAIN MAPPING
PORT STANLEY, ONTARIO

TRUE

DRAWN BY: PP	
SCALE: AS NOTED	
FIG. NO: 13	REV.: 0
PROJECT NO: 2389-021	
DATE: November 2021	



a) 2-yr clear water and ice jam water surface profiles



b) 5-yr clear water and ice jam water surface profiles

ICE JAM PROFILES, 2- AND 5-YR FLOWS

2021 KETTLE CREEK FLOODPLAIN MAPPING PORT STANLEY, ONTARIO

TRUE

PROJECT NO: 2389-021

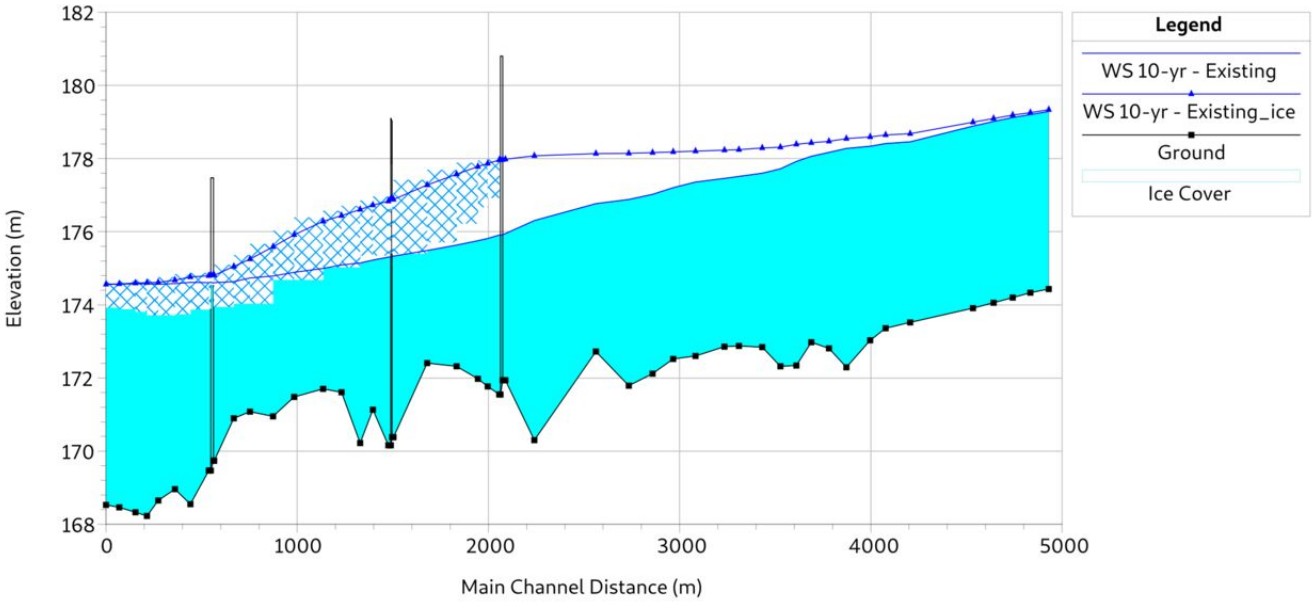
DATE: November 2021

DRAWN BY: PP

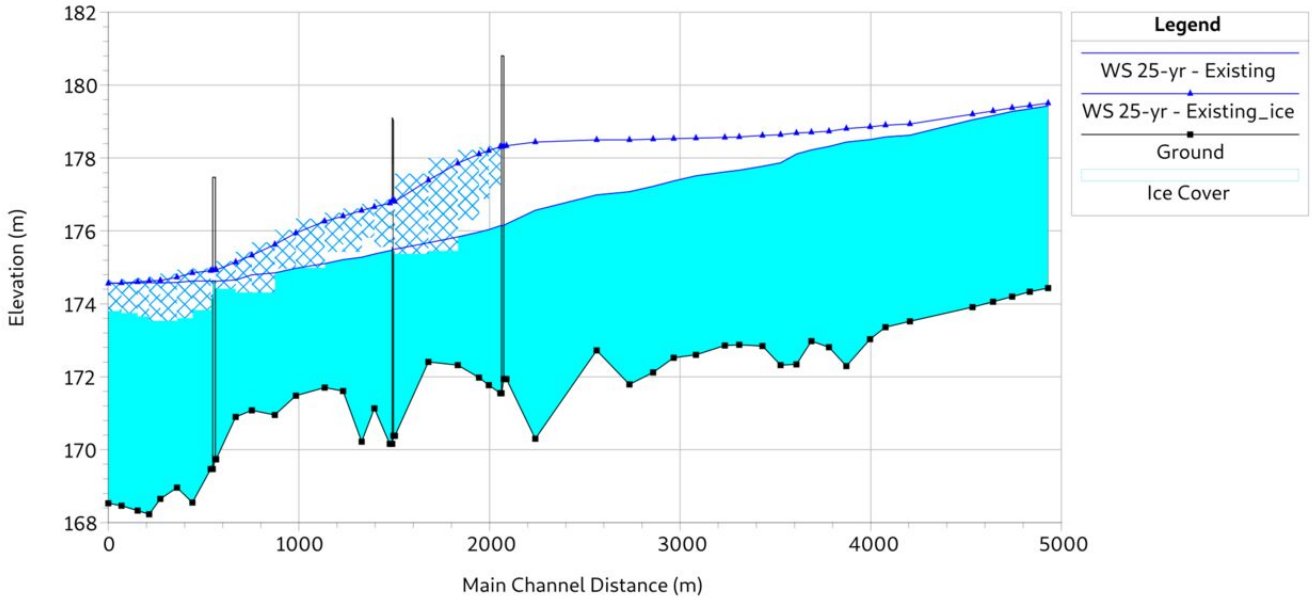
SCALE: AS NOTED

FIG. NO: 14

REV.: 0



a) 10-yr clear water and ice jam water surface profiles



b) 25-yr clear water and ice jam water surface profiles

ICE JAM PROFILES, 10- AND 25-YR FLOWS

2021 KETTLE CREEK FLOODPLAIN MAPPING PORT STANLEY, ONTARIO

TRUE

PROJECT NO: 2389-021

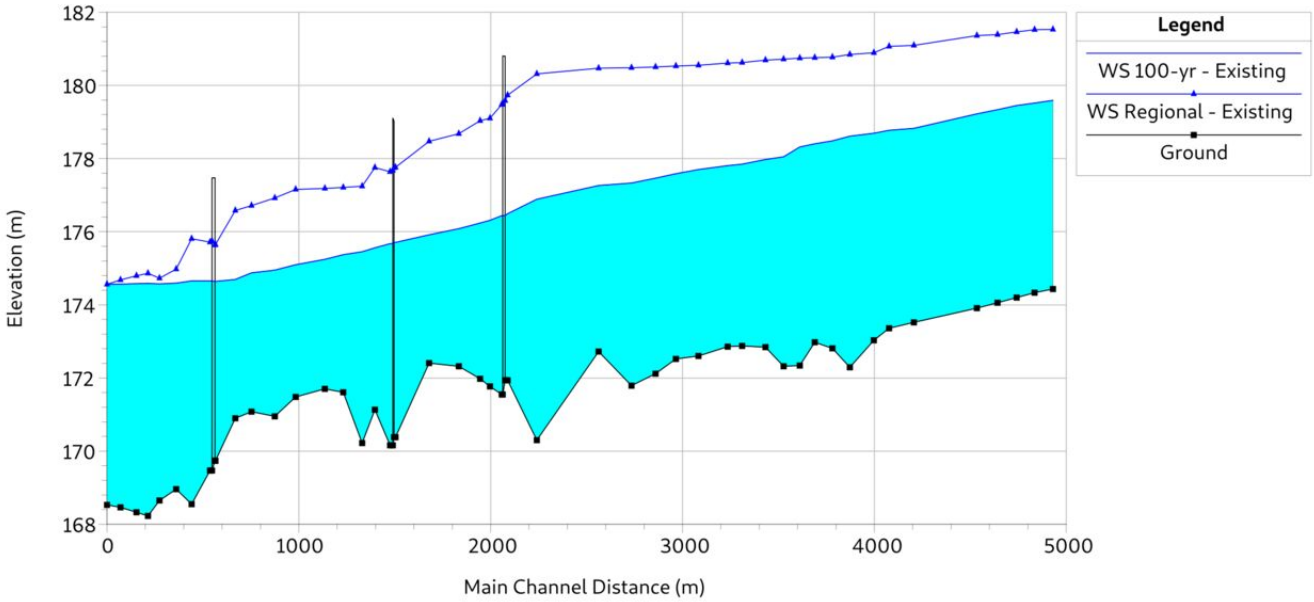
DATE: November 2021

DRAWN BY: PP

SCALE: AS NOTED

FIG. NO: 15

REV.: 0



a) 100-yr and Regional clear water water surface profiles (for comparison only)

CLEAR WATER PROFILES, 100-YR AND REG.

2021 KETTLE CREEK FLOODPLAIN MAPPING PORT STANLEY, ONTARIO

TRUE

PROJECT NO: 2389-021

DATE: November 2021

DRAWN BY: PP

SCALE: AS NOTED

FIG. NO: 16

REV.: 0

GRADING CERTIFICATE:

I HEREBY CERTIFY THAT THE PROPOSED GRADING AND APPURTENANT DRAINAGE WORKS COMPLY WITH SOUND ENGINEERING DESIGN AND THAT THE PROPOSED GRADING IS COMPATIBLE WITH EXISTING DRAINAGE PATTERNS ON AND ACROSS THESE LANDS AND THE ADJOINING LANDS OR APPLICABLE CITY BY-LAWS.

ROAD OCCUPANCY PERMIT NOTE:
ROAD OCCUPANCY PERMIT FOR ALL EXTERNAL WORKS IS REQUIRED.

RESTORATION NOTE:
ALL WORK IN THE ROAD ALLOWANCE SHALL MEET THE MINIMUM SPECIFICATIONS OF THE MUNICIPALITY OF CENTRAL ELGIN PHYSICAL SERVICES DEPARTMENT. THE INFRASTRUCTURE DESIGN GUILDLINES AND CONSTRUCTION STANDARDS ARE TO BE APPLIED TO WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE UNLESS OTHERWISE APPROVED BY THE MUNICIPALITY.

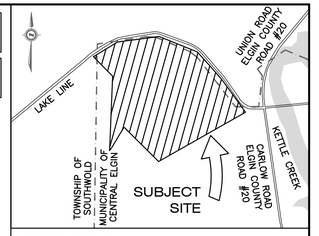
FOR GRADING ON ADJACENT LANDS, IF REQUIRED, DEVELOPER SHALL OBTAIN WRITTEN APPROVAL FROM ADJACENT LAND OWNER.

THE OWNER'S CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL MEASURES IN COMPLIANCE WITH THE ONTARIO TRAFFIC MANUAL BOOK 7 FOR ALL WORKS WITHIN THE MUNICIPALITY RIGHT-OF-WAY. THE OWNER'S OWNER'S CONTRACTOR SHALL SUBMIT TRAFFIC CONTROL PLANS TO THE MUNICIPALITY/ENGINEER FOR REVIEW PRIOR TO PROCEEDING WITH CONSTRUCTION.

ALL CLEARANCES TO ELECTRICAL CONDUCTORS AS SET OUT IN THE 2012 OBC DIV. B-3.1.19.1 'ELECTRICAL CONDUCTOR CLEARANCES TO BUILDINGS' SHALL BE MAINTAINED

BOULEVARD AREAS AND CONCRETE SIDEWALKS DISTURBED DURING INSTALLATION OF SERVICES SHALL BE RESTORED TO MATCH EX. CONDITION OR SURFACE WORKS NOTES ON SHEET C1, WHICHEVER IS GREATER, ALL AT NO COST TO THE MUNICIPALITY.

TACTILE PLATE NOTE:
CAST IRON TACTILE PLATES POWDER COATED RED ARE REQUIRED IN THE SIDEWALK RAMPS PER AODA LEGISLATION, OPSD 310.033, AND OPSD 310.039.



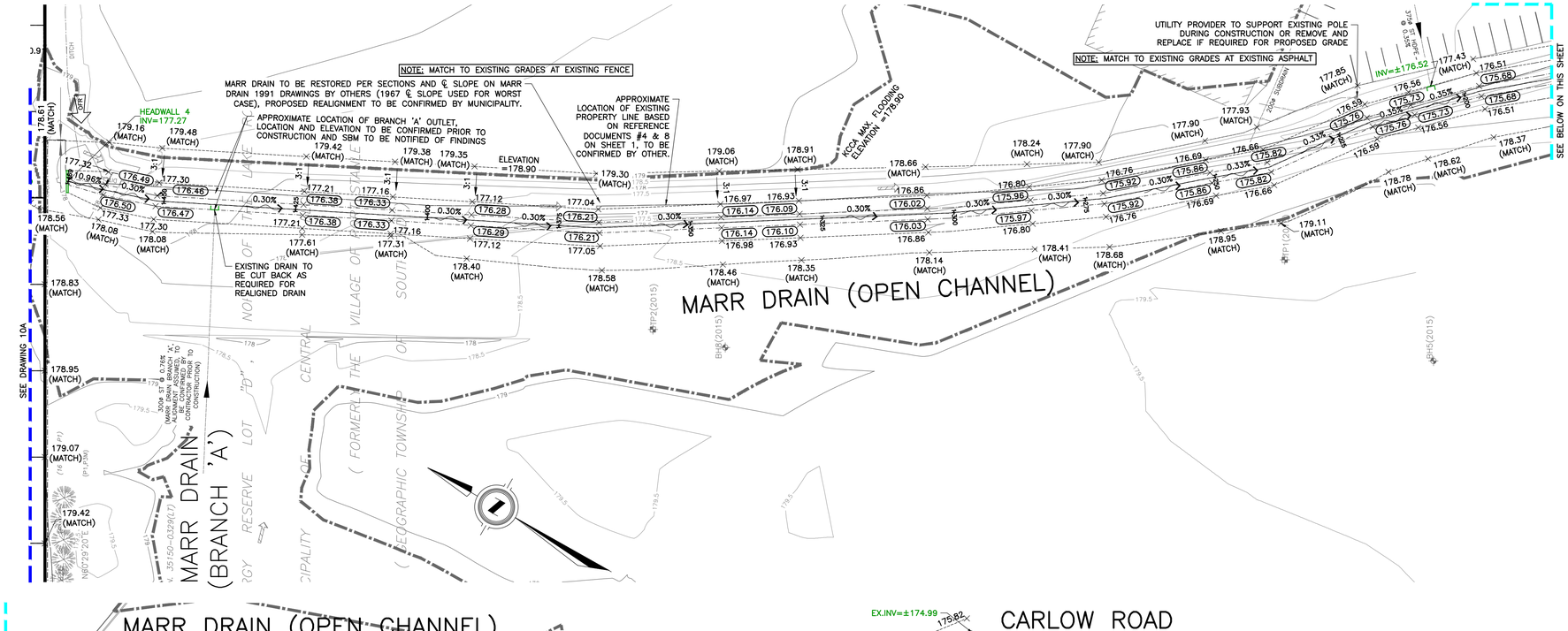
KEY PLAN
N.T.S.

LEGAL INFORMATION

PART OF
CLERGY RESERVE LOT "D"
NORTH OF THE LAKE ROAD
PART OF
JAMES BEGG LOTS 14 & 15
REGISTERED PLAN No. 20 (MIDD)
AND PART OF
ROAD ALLOWANCE BETWEEN LOTS 14 & 15
NORTH OF THE LAKE ROAD
AND ALL OF
LOT "T", REGISTERED PLAN No.39
IN THE
MUNICIPALITY OF CENTRAL ELGIN
COUNTY OF ELGIN

GRADING NOTES:

1. EXISTING GRADES AND DRAINAGE OF ABUTTING LANDS IS NOT TO BE DISTURBED.
2. REAR YARD SWALES SHALL BE LOCATED 2m FROM REAR PROPERTY LINE WITH REAR YARD CATCH BASINS 0.6m FROM SIDE YARD PROPERTY LINE.
3. DRIVEWAYS SHALL BE A MINIMUM OF 3% AND MAXIMUM OF 10% (ALL REASONABLE EFFORTS SHALL BE TAKEN FOR 8% MAX) TO BACK OF SIDEWALK OR BACK OF CURB WHERE THERE ARE NO SIDEWALKS.
4. GROUND ELEVATIONS AT BUILDINGS ABUTTING OVERLAND FLOW ROUTES ARE TO BE 225 ABOVE OVERLAND FLOW ROUTE ELEVATIONS.
5. GROUND ELEVATIONS AT BUILDING OPENING ABUTTING OVERLAND FLOW ROUTES ARE TO TO BE 450mm ABOVE OVERLAND FLOW ROUTE ELEVATIONS.
6. SUMP PUMP DISCHARGE MUST BE DIRECTED TO THE STORM SEWER VIA THE STORM PDC. NO SANITARY SEWER CONNECTIONS PERMITTED.
7. A MINIMUM OF 150mm (6") FROM THE TOP OF FOUNDATION TO THE FINISHED GRADE OUTSIDE THE BUILDING MUST BE PROVIDED, TYPICAL.
8. RETAINING WALLS, 1000mm OR GREATER, & GUARD RAILS ON TOP (IF REQUIRED) ARE TO BE DESIGNED BY AND CONSTRUCTED TO THE SPECIFICATIONS OF A REGISTERED PROFESSIONAL ENGINEER IN ACCORDANCE WITH THE ONTARIO BUILDING CODE.
9. THE MIN. TOP OF FOUNDATION ELEVATION, UNDERSIDE OF FOOTING ELEVATION, BASEMENT WINDOW SILL ELEVATION, ETC. ARE TO BE CONFIRMED BY THE CONTRACTOR IN CONSULTATION WITH THE BUILDING DESIGNER, BASED ON THE FINISHED FLOOR ELEVATION PROVIDED. CONTACT STRIK, BALDINELLI, MONIZ LTD. (SBM) FOR CLARIFICATION, IF REQUIRED.
10. TOP OF FOUNDATION WALL (TFW), GARAGE CUT (GC), AND UNDERSIDE OF FOOTING (USF) ARE SHOWN FOR REFERENCE ONLY. USF IS CALCULATED BASED ON A 1.22m FROST COVER BASED ON LOWEST BUILDING ELEVATION ON THE FRONTAGE FOR THE PURPOSE OF PDC CONFLICT REVIEW. HOMEBUILDER TO REVIEW HYDROGEOLOGICAL STUDY PRIOR TO SUBMISSION TO ENSURE SUFFICIENT CLEARANCE FROM GROUNDWATER TABLE.



BENCHMARKS:

MONUMENT NAME: 973006 (GEODETIC BENCHMARK)

LOCATION: PORT STANLEY GEODETIC BRASS TABLET SET IN TOP OF AT SOUTH END OF WHARF AT WEST SIDE OF HARBOUR IN PORT STANLEY, 38.8m SOUTH OF SOUTH EAST CORNER OF WATER GAUGE HOUSE, 8.3m SOUTHEAST OF CYL SUPPORT FOR GREEN BEACON LIGHT AND 2.27m EAST OF BOLLARD IN CENTER OF SEMI-CIRCULAR END OF THE WARF.

ELEVATION: 175.902m (CGVD28:78)

ELEVATION: 175.460m (CGVD2013)

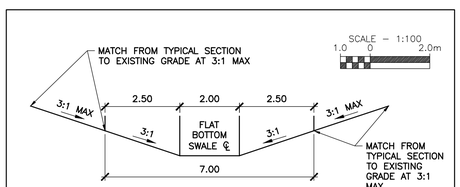
MONUMENT NAME: V010915404

LOCATION: BRASS CAP ON THE SOUTH OF LAKE ROAD, IN THE COUNTY OF ELGIN, IN THE GEOGRAPHIC TOWNSHIP OF SOUTHWOLD, APPROXIMATELY 8.0m SOUTH OF THE CENTRELINE OF LAKE ROAD AND 11.8m EAST OF THE PRODUCTION OF CENTRELINE OF SCOTCH ROAD.

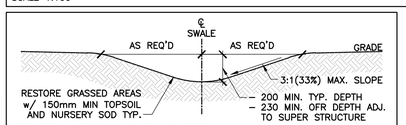
ELEVATION: 214.432m (CGVD28:78)

(CONTRACTOR TO CONFIRM BENCHMARK INFORMATION PRIOR TO CONSTRUCTION)

VERTICAL DATUM NOTE:
INFORMATION FROM CGVD28:78 HAS BEEN VERTICALLY ADJUSTED BY -0.442m BASED ON BENCHMARK DATUM VALUES OF 175.902 TO 175.460 TO CONVERT TO CGVD2013 PER NATURAL RESOURCES CANANDA DOCUMENT NRCAN 973006 PORT STANLEY PIER BM

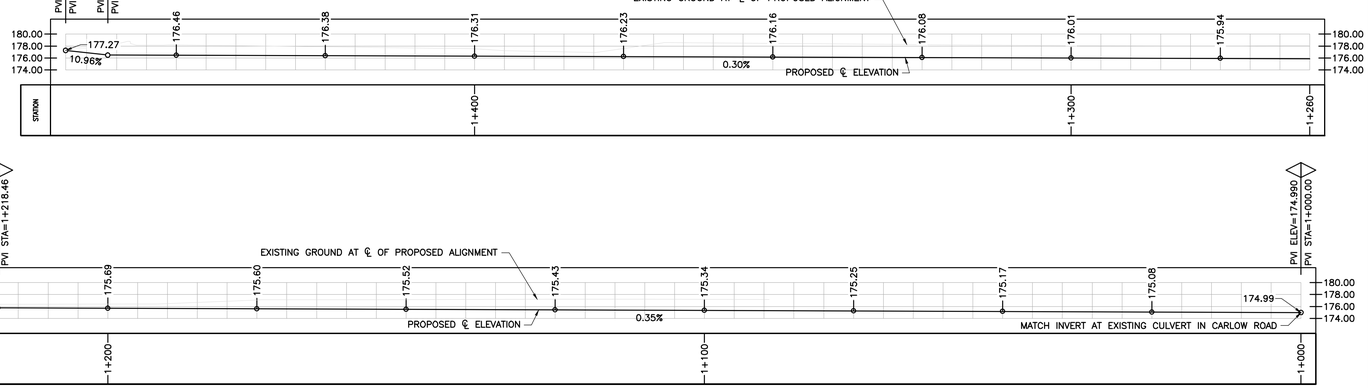


MARR DRAIN TYPICAL SECTION
SCALE 1:100



TYP. SWALE DETAIL
N.T.S.

MARR DRAIN ℄ PROFILE



REFER TO NOTES, LEGEND, AND DETAILS ON SHEET 1, 16, 17 & 18

AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	JSF/KJC
DRAWN	JSF
CHECKED	KAM
APPROVED	KAM
DATE	03/01/2024
CAD	SBM-18-0530

No.	REVISIONS	D/M/Y	BY
1	ISSUED FOR ENGINEERING SUBMISSION	17/02/21	JSF
2	CONCEPTUAL ZONING DATA CHART ADDED	08/03/21	JSF
3	FOR PRE-SUBMISSION CONSULTATION MEETING	05/04/21	JSF
4	ISSUED FOR DRAFT PLAN APPLICATION	16/07/21	JSF
5	REISSUED FOR DRAFT PLAN APPLICATION	02/08/22	JSF
6	REISSUED FOR DRAFT PLAN APPLICATION	15/12/22	JSF
7	REISSUED FOR DRAFT PLAN APPLICATION	20/01/23	JSF
8	ISSUED FOR ENGINEERING REVIEW	26/07/24	JSF

CONSULTANT
STRIK BALDINELLI MONIZ
PLANNING - CIVIL - STRUCTURAL - MECHANICAL - ELECTRICAL
1599 Adelaide St. N, Unit 301, London, Ontario, N5X 4E8
Tel: (519) 471-6667 Fax: (519) 471-0034
Email: sbm@sbmltd.ca

ENGINEER'S STAMP
LICENSED PROFESSIONAL ENGINEER
K. A. MONIZ
100124664
July 26, 2024
PROVINCE OF ONTARIO

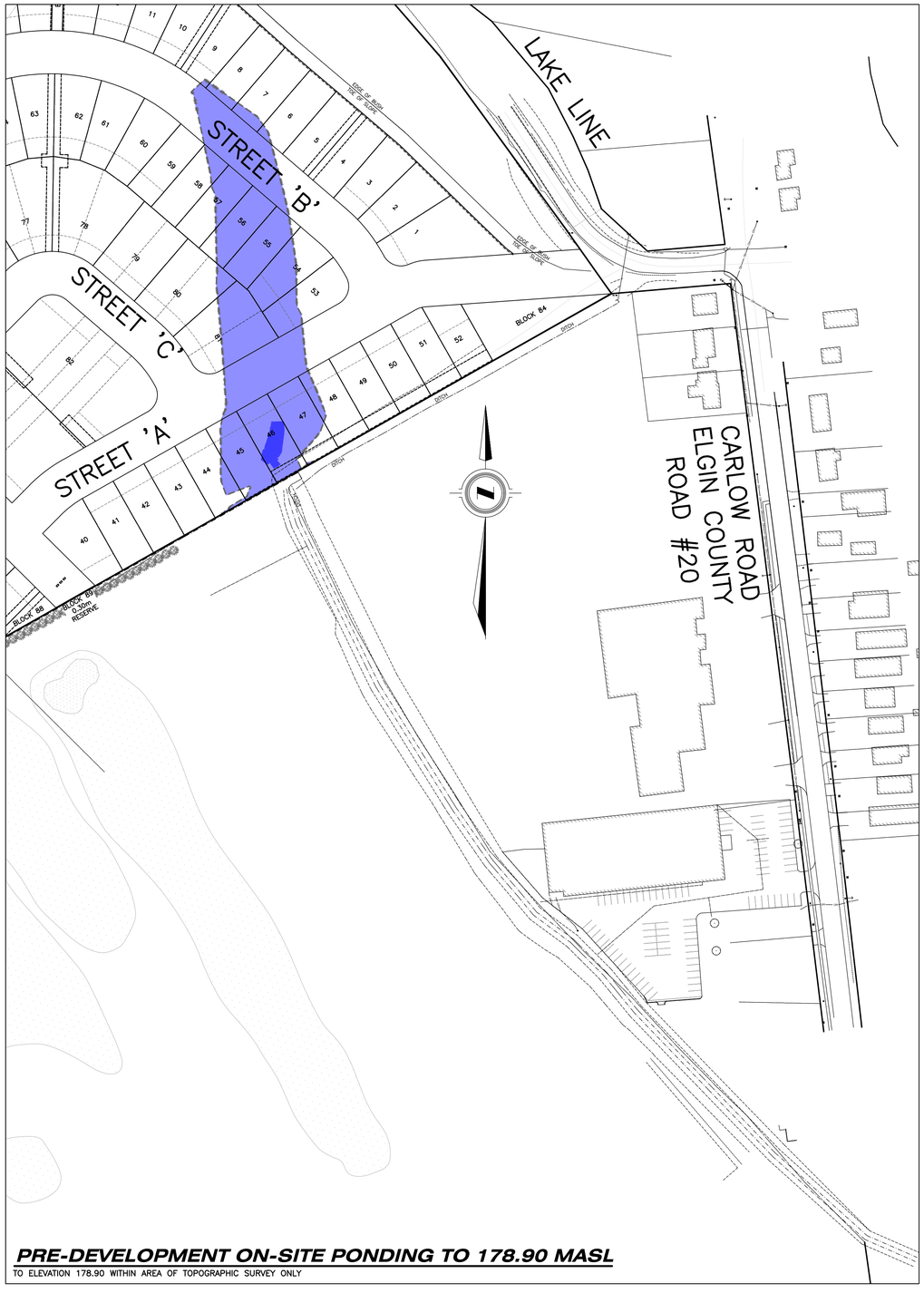
C.TECH'S STAMP
CERTIFIED TECHNICIAN
OACETT
ONTARIO
JORDAN SAMUEL FAUBERT
Nº 910283
2024

THE CORPORATION OF THE MUNICIPALITY OF
CENTRAL ELGIN

SCALE
SCALE - 1:500
5.0 0 10.0m

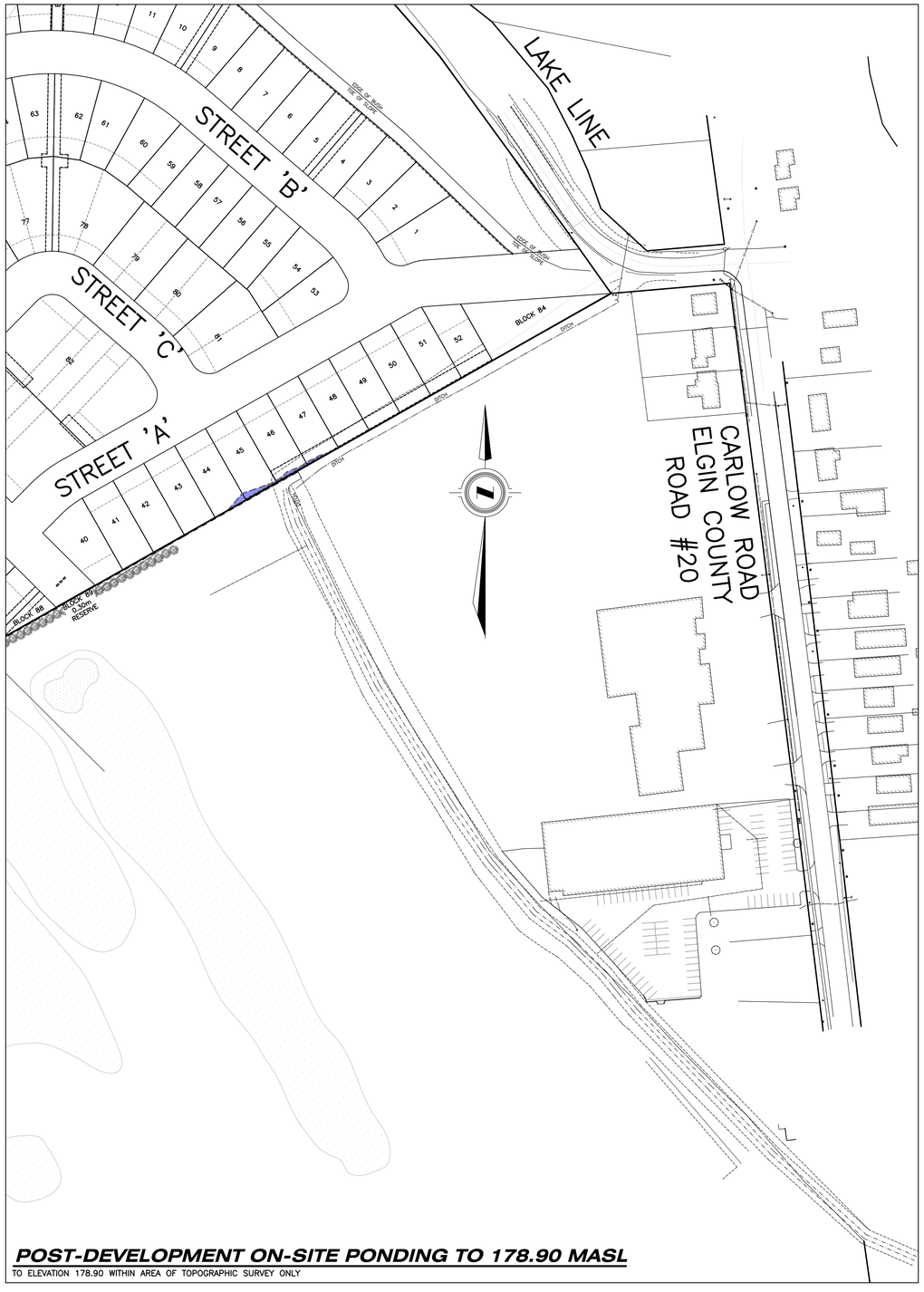
TITLE
SUBDIVISION GRADING PLAN - MARR DRAIN REALIGNMENT
KETTLE CREEK SUBDIVISION
37719 LAKE LINE
PORT STANLEY, ONTARIO

PROJECT No. SBM-18-0530
SHEET No. 10D
PLAN FILE No. -



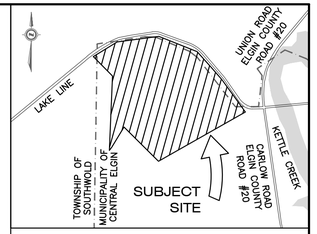
PRE-DEVELOPMENT ON-SITE PONDING TO 178.90 MASL

TO ELEVATION 178.90 WITHIN AREA OF TOPOGRAPHIC SURVEY ONLY



POST-DEVELOPMENT ON-SITE PONDING TO 178.90 MASL

TO ELEVATION 178.90 WITHIN AREA OF TOPOGRAPHIC SURVEY ONLY



KEY PLAN

N.T.S.

LEGAL INFORMATION

PART OF
CLERGY RESERVE LOT "D"
NORTH OF THE LAKE ROAD
PART OF
JAMES BEGG LOTS 14 & 15
REGISTERED PLAN No. 20 (MIDD)
AND PART OF
ROAD ALLOWANCE BETWEEN
LOTS 14 & 15 NORTH OF THE LAKE ROAD
AND ALL OF
LOT "I", REGISTERED PLAN No.39
IN THE
MUNICIPALITY OF CENTRAL ELGIN
COUNTY OF ELGIN

BENCHMARKS:

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ELEVATION: 175.902m (CGVD28:78)

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LEGEND:

- UP TO 0.5m DEPTH
- 0.5m TO 1.0m DEPTH
- 1.0m TO 1.5m DEPTH
- 1.5m TO 2.0m DEPTH
- 2.0m TO 2.5m DEPTH
- 2.5m TO 3.5m DEPTH
- 2.5m TO 3.5m DEPTH

VOLUME SUMMARY	
PRE (Cu.M.)	POST (Cu.M.)
1,378	8

SEE DRAWINGS OF FUTURE SUBDIVISION BY OTHERS FOR FULL FLOODING VOLUME CHANGES. CURRENT TABLE ONLY REPRESENTS CHANGES WITHIN SITE BOUNDARIES AND NOT FLOODING CHANGES OF INTERCONNECTED DEVELOPMENT TOGETHER

REFER TO NOTES, LEGEND, AND DETAILS ON SHEET 1, 17, 18 & 19

AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	JSF/KJC
DRAWN	JSF
CHECKED	KAM
APPROVED	NGU/KAM
DATE	19/01/2023
CAD	SBM-18-0530

No.	REVISIONS	D/M/Y	BY
1	REISSUED FOR DRAFT PLAN APPLICATION	20/01/23	JSF
2	COORDINATED TO MARR DRAIN REALIGNMENT	27/03/23	JSF
3	COORDINATED TO ENGINEERING SUBMISSION	16/12/24	JSF

CONSULTANT
STRIK BALDINELLI MONIZ
PLANNING • CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL
1599 Adelaide St. N, Unit 301, London, Ontario, N5X 4E8
Tel: (519) 471-6667 Fax: (519) 471-0034
Email: sbm@sbmltd.ca

ENGINEER'S STAMP

PRELIMINARY NOT FOR CONSTRUCTION

C.TECH'S STAMP

THE CORPORATION OF THE MUNICIPALITY OF CENTRAL ELGIN

SCALE
SCALE - 1:1250
12.5 0 25.0m

TITLE
FLOOD PLAIN VOLUME PLAN

KETTLE CREEK SUBDIVISION
37719 LAKE LINE
PORT STANLEY, ONTARIO

PROJECT No. SBM-18-0530
SHEET No. SK1
PLAN FILE No. -

S:\2018 Jobs\SBM-18-0530 Gryphon Turf Farms Ltd. - Kettle Creek Subdivision\3 Design\1 Civil\Drawings\SBM-18-0530 Preliminary Drawings\SBM-18-0530 Gryphon Turf Farms Ltd. - Kettle Creek Subdivision - Flood Plain.dwg

TOPOGRAPHICAL PLAN OF SURVEY

OF ALL OF

LOT 15

OF PART OF

LOT 16

AND PART OF

CLERGY RESERVE LOT "D"
RANGE 1 NORTH OF LAKE ROAD

(GEOGRAPHIC TOWNSHIP OF SOUTHWOLD)

IN THE

MUNICIPALITY OF CENTRAL ELGIN

COUNTY OF ELGIN

SCALE 1:1000 (METRIC)

15 7.5 0 15 30 45 60 75

(SCALE IN METRES)

THE INTENDED PLOT SIZE OF THIS PLAN IS 1210mm IN WIDTH BY 910mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:1000

JAKE SURGENOR
ONTARIO LAND SURVEYOR

DITCH CENTRELINE CO-ORDINATES MTM ZONE 10, NAD83(CSRS)(CBN+6-2010.0		
Pt	NORTHING	EASTING
200	4726562.40	409542.50
201	4726579.50	409525.90
202	4726591.50	409514.50
203	4726601.20	409505.00
204	4726607.00	409500.20
205	4726609.90	409495.90
206	4726613.40	409493.40
207	4726616.30	409489.30
208	4726620.10	409486.50
209	4726624.30	409483.00
210	4726628.50	409479.50
211	4726630.70	409476.20
212	4726633.90	409473.30
213	4726638.40	409469.20
214	4726642.70	409465.90
215	4726645.80	409461.40
216	4726648.00	409458.80
217	4726651.00	409458.10
218	4726652.80	409456.50
219	4726653.80	409453.60
220	4726658.70	409451.80
221	4726662.10	409449.10
222	4726667.40	409443.50
223	4726672.00	409441.10
224	4726673.80	409439.70
225	4726676.80	409436.80
226	4726678.80	409434.80
227	4726681.60	409434.20
228	4726684.10	409432.70
229	4726687.30	409432.40
230	4726688.60	409431.40
231	4726694.40	409426.30
232	4726698.70	409424.50
233	4726704.60	409419.80
234	4726708.90	409418.60
235	4726711.30	409416.10
236	4726713.70	409415.50
237	4726717.20	409413.10
238	4726725.60	409408.20
239	4726731.00	409404.40
240	4726734.00	409404.10
241	4726737.90	409400.60
242	4726739.70	409399.20
243	4726744.50	409396.30
244	4726752.80	409390.70
245	4726758.70	409386.80
246	4726760.80	409385.20
247	4726762.60	409384.20
248	4726764.20	409384.40
249	4726765.50	409383.10
250	4726767.20	409382.50
251	4726769.00	409382.00
252	4726770.70	409381.00
253	4726773.20	409381.20
254	4726775.20	409379.40
255	4726777.10	409378.20
256	4726779.70	409378.00
257	4726781.10	409376.60
258	4726782.50	409375.10
259	4726783.40	409373.50
260	4726784.20	409371.90
261	4726785.60	409371.80
262	4726786.90	409371.70
263	4726789.60	409370.90
264	4726792.30	409370.20
265	4726795.00	409368.50
266	4726797.60	409366.90
267	4726801.60	409364.20
268	4726805.10	409363.90
269	4726808.50	409363.60
270	4726810.10	409362.60
271	4726811.30	409362.30
272	4726812.70	409362.20
273	4726817.00	409360.50
274	4726821.30	409358.80
275	4726825.60	409356.30
276	4726829.70	409357.80

LEGEND

□	DENOTES SURVEY MONUMENT SET
■	DENOTES SURVEY MONUMENT FOUND
CC	DENOTES CUT CROSS
CUTT	DENOTES CUT "T"
IB	DENOTES IRON BAR
RIB	DENOTES 16mm DIAMETER ROUND IRON BAR
SCP	DENOTES SPECIFIED CONTROL POINT
SIB	DENOTES STANDARD IRON BAR
WIT	DENOTES WITNESS
741	DENOTES D.I. HOUGHTON, O.L.S.
1017	DENOTES CALLON DIETZ, O.L.S.'s
1355	DENOTES BRIAN VAUGHAN, O.L.S.
1130	DENOTES J.G. RUPPT, O.L.S.
P.I.N.	DENOTES PROPERTY IDENTIFIER NUMBER
R.P.	DENOTES REGISTERED PLAN
M	DENOTES MEASURED
S	DENOTES SET
P1	DENOTES PLAN 11R-7427
P2	DENOTES PLAN 11R-10614
P3	DENOTES PLAN 11M-259
P4	DENOTES PLAN 11M-247
CB	DENOTES CATCH BASIN
HP	DENOTES HYDRO POLE
SL	DENOTES STREET LIGHT
FH	DENOTES FIRE HYDRANT
MH	DENOTES MAN HOLE
WV	DENOTES WATER VALVE
	DENOTES CONIFEROUS TREE
	DENOTES DECIDUOUS TREE
	DENOTES SHRUB
	DENOTES ELECTRICAL METER
	DENOTES GATE
	DENOTES GAS METER
	DENOTES MISCELLANEOUS TRAFFIC SIGN
	DENOTES POLE ANCHOR

INTEGRATION DATA

BEARINGS ARE MTM GRID DERIVED FROM SPECIFIED CONTROL POINTS 00119973006 AND 00819730801, MTM-10 NAD-1983:CSRS:CBN+6-2010.0.

SPECIFIED CONTROL POINTS (SCP's): MTM-10, NAD83:CSRS:CBN+6-2010.0 COORDINATES TO URBAN ACCURACY PER SEC. 14 (2) OF O.REG. 216/10		
POINT ID	NORTHING	EASTING
00119973006	4725126.633	410276.070
00819730801	4726693.792	410482.672
PLAN COORDINATES, MTM ZONE 10, NAD83:CSRS:CBN+6-2010.0		
1	4726213.002	409024.619
2	4726836.545	409359.540
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN		

VERTICAL CONTROL DATA

MONUMENT NUMBER: 00119260U1648
TYPE: BRASS TABLET
LOCATION: LONDON & PORT STANLEY RAILWAY, BRIDGE OVER KETTLE CREEK, 0.8KM NORTH OF STATION, TABLET IN EAST END OF BRIDGE SEAT OF SOUTH CONCRETE ABUTMENT, 30CM FROM NORTH EDGE.
DATUM: CGVD28:78
ORDER: FIRST ORDER
GEODETIC ELEVATION: 178.167m

SITE BENCHMARKS

NUMBER: 1
TYPE: DOOR SILL
LOCATION: MAIN ENTRANCE OF KETTLE CREEK GOLF & COUNTRY CLUB CLUBHOUSE AS SHOWN ON FACE OF PLAN.
GEODETIC ELEVATION: 181.43m

NUMBER: 2
TYPE: ROUND IRON BAR
LOCATION: 261m± NORTH AND 47m± EAST OF SOUTHWEST CORNER OF SUBJECT PROPERTY AS SHOWN ON FACE OF PLAN.
GEODETIC ELEVATION: 211.883m

NUMBER: 3
TYPE: ROUND IRON BAR
LOCATION: NORTHWEST CORNER OF SUBJECT PROPERTY AS SHOWN ON FACE OF PLAN.
GEODETIC ELEVATION: 183.285m

NOTES

FOR BEARING COMPARISONS, A ROTATION OF 0°58'35" COUNTER-CLOCKWISE, WAS APPLIED TO THE BEARINGS FROM P1.

FOR BEARING COMPARISONS, A ROTATION OF 1°06'10" COUNTER-CLOCKWISE, WAS APPLIED TO THE BEARINGS FROM P3 & P4.

ALL DIMENSIONS SHOWN ARE MEASURED, UNLESS OTHERWISE NOTED.

METRIC DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

(1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
(2) THE SURVEY WAS COMPLETED ON THE 22nd DAY OF NOVEMBER, 2022.

28 NOV 2022
DATE

JAKE SURGENOR
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER 2200420.

H:\PROJECTS\2019\19-22517 Kettle Creek Sub Lake Line Rd\TopoBoundaryCorbie(E-1629).dwg November 28, 2022

Callon Dietz INCORPORATED
ONTARIO LAND SURVEYORS
CARLETON PLACE LONDON NORTH BAY ST. THOMAS
info@callondietz.com callondietz.com

SURVEY BY: YS	DRAWN BY: DT/IS	FILE No: 19-22517 C	PLAN No: E-1629

ISO 9001 REGISTERED

LEGEND

EXISTING REGIONAL FLOOD LIMIT

PROPOSED REGIONAL FLOOD LIMIT

London Office
41 Adelaide St. N., Unit 71
(519) 672-8310

Paris Office
31 Mechanic St., Unit 301
(519) 442-1441

development engineering (London) Limited
CONSULTING CIVIL ENGINEERS

SCALE

SCALE – 1:1000
10 0 20m

TITLE

320 CARLOW ROAD
PORT STANLEY, ONTARIO

EXISTING & PROPOSED FLOODPLAIN LIMITS

PROJECT No. DEL22–025

SHEET No. 1

PLAN FILE No.

joan Feb.10/25–1050am DEL22–025 – Flood Limits in MTM.dwg

LEGEND

-0.04 0.07 — DENOTES STORAGE DEPTH IN METERS (LESS THAN 0.1m) FROM SURFACE 1 TO SURFACE 2

0.21 — DENOTES STORAGE DEPTH IN METERS (GREATER THAN 0.1m) FROM SURFACE 1 TO SURFACE 2

1.48 — DENOTES STORAGE DEPTH IN METERS (GREATER THAN 1.2m) FROM SURFACE 1 TO SURFACE 2

SITE BOUNDARY

EXISTING REGIONAL FLOOD LIMIT

SURFACE 1: ORIGINAL GROUND SURFACE
SURFACE 2: REGIONAL FLOOD ELEVATION (178.90m)

PRE-DEVELOPMENT STORAGE
41,471m³

KETTLE CREEK SUBDIVISION
37719 LAKE LINE
DESIGN BY SBM LTD.

BLOCK 132
MEDIUM DENSITY

BLOCK 135
STORMWATER
MANAGEMENT

EXISTING
POND

BLOCK 131
MEDIUM
DENSITY

BLOCK 133
PARKLAND

BLOCK 139 NATURAL
ENVIRONMENT/FUTURE
DEVELOPMENT

STREET A

STREET B

STREET C

CARLOW RD

EX. EDGE OF ASPHALT

EX. PUBLIC SCHOOL
MUN. #350

EX. COMMUNITY
CENTRE AND
ARENA
MUN. #332

EX. CONDO SITE
MUN. #301

MUN. #378
MUN. #375
MUN. #373
MUN. #371
MUN. #369
MUN. #367
MUN. #365
MUN. #363
MUN. #361
MUN. #359
MUN. #357
MUN. #355
MUN. #353
MUN. #330
MUN. #328
MUN. #326
MUN. #322

SCALE – 1:2000
20 0 40m
ORIGINAL PLAN – 11"x17"

London Office
41 Adelaide St. N., Unit 71
(519) 672-8310

Paris Office
31 Mechanic St., Unit 301
(519) 442-1441

development engineering (London) Limited
CONSULTING CIVIL ENGINEERS

PROJECT N°: DEL22-025
DRAWN BY: TW
DATE: FEB. 2025

TITLE: 320 CARLOW ROAD

PRE-DEVELOPMENT FLOOD LIMITS/STORAGE

Plotted: Feb.19/25–10:33am Name: DEL22-025 – Flood Assessment.dwg

LEGEND

-0.04 0.07 — DENOTES STORAGE DEPTH IN METERS (LESS THAN 0.1m) FROM SURFACE 1 TO SURFACE 2

0.21 — DENOTES STORAGE DEPTH IN METERS (GREATER THAN 0.1m) FROM SURFACE 1 TO SURFACE 2

1.48 — DENOTES STORAGE DEPTH IN METERS (GREATER THAN 1.2m) FROM SURFACE 1 TO SURFACE 2

SITE BOUNDARY

PROPOSED REGIONAL FLOOD LIMIT

SURFACE 1: POST DEVELOPMENT GRADING
SURFACE 2: REGIONAL FLOOD ELEVATION (178.90m)

POST–DEVELOPMENT STORAGE
43,927m³
NET INCREASE 2,456m³

KETTLE CREEK SUBDIVISION
37719 LAKE LINE
DESIGN BY SBM LTD.

BLOCK 132
MEDIUM DENSITY

BLOCK 135
STORMWATER
MANAGEMENT

BLOCK 133
PARKLAND

BLOCK 131
MEDIUM
DENSITY

BLOCK 139 NATURAL
ENVIRONMENT/FUTURE
DEVELOPMENT

EXISTING
POND

STREET A

STREET B

STREET C

CARLOW RD

EX. EDGE OF ASPHALT

EX. PUBLIC SCHOOL
MUN. #350

EX. COMMUNITY
CENTRE AND
ARENA
MUN. #332

EX. CONDO SITE
MUN. #301

MUN. #378
MUN. #375
MUN. #373
MUN. #371
MUN. #369
MUN. #367
MUN. #365
MUN. #363
MUN. #361
MUN. #359
MUN. #357
MUN. #355
MUN. #353
MUN. #330
MUN. #328
MUN. #326
MUN. #322

SCALE – 1:2000
20 0 40m
ORIGINAL PLAN – 11"x17"

London Office
41 Adelaide St. N., Unit 71
(519) 672-8310

Paris Office
31 Mechanic St., Unit 301
(519) 442-1441

development engineering (London) Limited
CONSULTING CIVIL ENGINEERS

PROJECT N°: DEL22–025
DRAWN BY: TW
DATE: FEB. 2025

TITLE: 320 CARLOW ROAD

POST–DEVELOPMENT FLOOD LIMITS/STORAGE

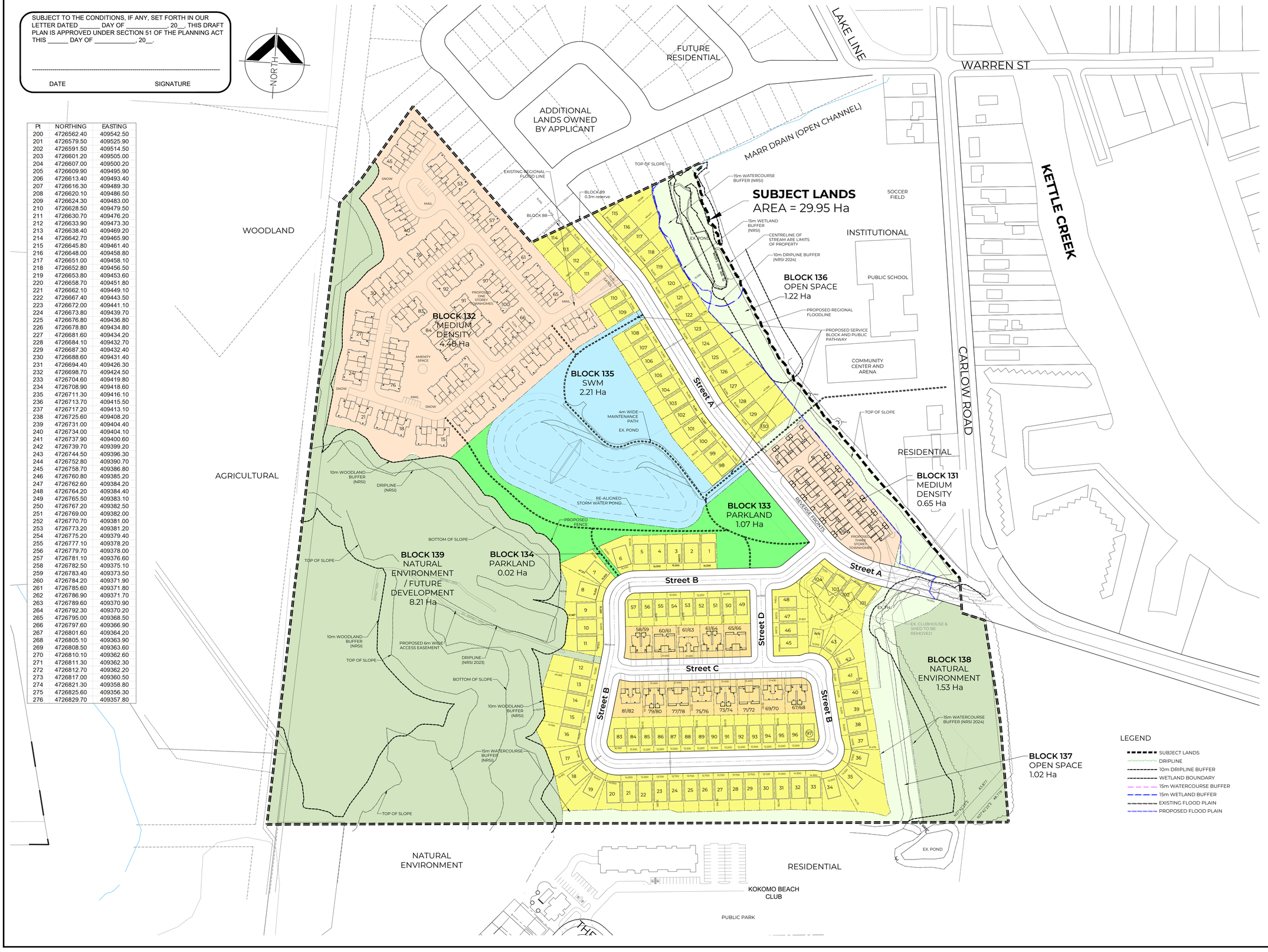
Plotted: Feb.19/25–10:29am Name: DEL22–025 – Flood Assessment.dwg

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____ DAY OF _____, 20__, THIS DRAFT PLAN IS APPROVED UNDER SECTION 51 OF THE PLANNING ACT THIS _____ DAY OF _____, 20__.

DATE SIGNATURE

NORTH

Pt	NORTHING	EASTING
200	4726562.40	409542.50
201	4726579.50	409525.90
202	4726591.50	409514.50
203	4726601.20	409505.00
204	4726607.00	409500.20
205	4726609.90	409495.90
206	4726613.40	409493.40
207	4726616.30	409489.30
208	4726620.10	409486.50
209	4726624.30	409483.00
210	4726628.50	409479.50
211	4726630.70	409476.20
212	4726633.90	409473.30
213	4726638.40	409469.20
214	4726642.70	409465.90
215	4726645.80	409461.40
216	4726648.00	409458.80
217	4726651.00	409458.10
218	4726652.80	409456.50
219	4726653.80	409453.60
220	4726658.70	409451.80
221	4726662.10	409449.10
222	4726667.40	409443.50
223	4726672.00	409441.10
224	4726673.80	409439.70
225	4726676.80	409436.80
226	4726678.80	409434.80
227	4726681.60	409434.20
228	4726684.10	409432.70
229	4726687.30	409432.40
230	4726688.60	409431.40
231	4726694.40	409426.30
232	4726698.70	409424.50
233	4726704.60	409419.80
234	4726708.90	409418.60
235	4726711.30	409416.10
236	4726713.70	409415.50
237	4726717.20	409413.10
238	4726725.60	409408.20
239	4726731.00	409404.40
240	4726734.00	409404.10
241	4726737.90	409400.60
242	4726739.70	409399.20
243	4726744.50	409396.30
244	4726752.80	409390.70
245	4726758.70	409386.80
246	4726760.80	409385.20
247	4726762.60	409384.20
248	4726764.20	409384.40
249	4726765.50	409383.10
250	4726767.20	409382.50
251	4726769.00	409382.00
252	4726770.70	409381.00
253	4726773.20	409381.20
254	4726775.20	409379.40
255	4726777.10	409378.20
256	4726779.70	409378.00
257	4726781.10	409376.60
258	4726782.50	409375.10
259	4726783.40	409373.50
260	4726784.20	409371.90
261	4726785.60	409371.80
262	4726786.90	409371.70
263	4726789.60	409370.90
264	4726792.30	409370.20
265	4726795.00	409368.50
266	4726797.60	409366.90
267	4726801.60	409364.20
268	4726805.10	409363.90
269	4726808.50	409363.60
270	4726810.10	409362.60
271	4726811.30	409362.30
272	4726812.70	409362.20
273	4726817.00	409360.50
274	4726821.30	409358.80
275	4726825.60	409356.30
276	4726829.70	409357.80



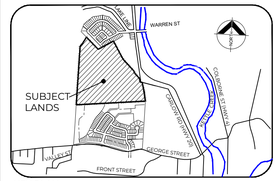
LEGEND

- SUBJECT LANDS
- DRIPLINE
- 10m DRIPLINE BUFFER
- WETLAND BOUNDARY
- 15m WATERCOURSE BUFFER
- 15m WETLAND BUFFER
- EXISTING FLOOD PLAIN
- PROPOSED FLOOD PLAIN

MONTEITH BROWN
PLANNING CONSULTANTS
219 OXFORD STREET WEST, UNIT 302
LONDON, ONTARIO. N6H 1S5 519.686.1300
WWW.MBPC.CA

DRAFT PLAN OF SUBDIVISION

LOT 15 & PART OF LOT 16 CLERGY, RESERVE LOT D. PART RD ALLOW
RP 11R-7427 PARTS 1 TO 10
(Geographic Township of Southwold)
MUNICIPALITY OF CENTRAL ELGIN,
COUNTY OF ELGIN



KEY PLAN
N.T.S.

OWNER'S CERTIFICATE

I, Jay McGuffin of Monteith Brown Planning Consultants, am authorized to submit this Draft Plan of Subdivision on behalf of the owners.

Jay McGuffin, MCIP, RPP
MBPC, Principal Planner — Date

SURVEYOR'S CERTIFICATE

I hereby certify that the boundary of the lands to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown.

J. Paul Crocker, OLS
Callon Dietz Incorporated — Date

REQUIREMENTS UNDER SECTION 51 (17) OF THE PLANNING ACT, 1990

a) as shown on plan
b) as shown on plan
c) as shown on key plan
d) as shown on land use schedule
e) as shown on plan
f) as shown on plan
g) as shown on plan
h) municipal water
i) silt, sand, sand and gravel, and silt till
j) as shown on plan
k) municipal sewers
l) as shown on plan

LAND USE SCHEDULE

LAND USE	AREA (Ha)	%
SINGLE DETACHED LOTS	5.87	29.0
SEMI DETACHED LOTS	0.90	4.5
MEDIUM DENSITY BLOCKS	5.13	25.4
PARKLAND	1.09	5.4
STORM WATER MANAGEMENT	2.21	10.9
OPEN SPACE	2.24	11.1
STREETS A TO D	2.77	13.7
DEVELOPABLE AREA	20.21	100.0
NATURAL ENVIRONMENT	9.74	
TOTAL SITE AREA	29.95	

No.	Revision	Date	Initial
2	SUBMIT FOR COMMENTS	DEC 2024	BS
1	PRE CONSULTATION	OCT 2024	BS

BAR SCALE
1: 1,500
0 15 30 45 60m

ADDRESS
320 CARLOW ROAD
KETTLE CREEK GOLF COURSE
PORT STANLEY

DRAWN BY:	CHECKED BY:	PROJECT No. :
BS	PM	22-1800
DESIGNED BY:	APPROVED BY:	DRAWING No.
BS	JMC	1
SCALE: on 24x36 1:1500	DATE: Feb 06, 2025	