Appendix D

Hydraulic Analysis

Memo

To: Bradley Dufour

From: Aaron Farrell/Brian Bishop

Date: November 23, 2018

File: SWW187089

Re: **Hawthorne and McHugh Pedestrian Bridges, City of Windsor – Professional Opinion Regarding Anticipated Hydraulic Impacts**

The City of Windsor has proposed to construct two (2) pedestrian crossings of the Little River, as part of an overall trail system in the area. The General Arrangement Drawings for the structures (ref. the Hawthorne Pedestrian Bridge, and the McHugh Pedestrian Bridge) are attached for reference, which include key plans depicting the locations of each crossing. The subject reach of the Little River has been identified as a Municipal Drain, and as such is regulated under the Drainage Act; in addition, the subject reach is regulated by the Essex Region Conservation Authority, hence the proposed bridges would each require a permit from the ERCA for construction. Based upon discussions with City staff during the conference call of September 19, 2018, it is understood that no currently approved hydraulic models are available for the Little River, for use in completing detailed hydraulic analyses of the proposed pedestrian bridges. As such, the following has been prepared to provide our professional opinion regarding the anticipated hydraulic impacts of the pedestrian bridges, based upon a desktop review of available information.

As discussed with City staff during the conference call of September 19, 2018, the pedestrian bridges have been designed to span the bankfull limits of the Little River. Based upon our review of the General Arrangement Drawings for the pedestrian bridges, as well as the floodline mapping for the subject reach of the Little River (ref. attached), we concur that the pedestrian bridges have been designed such that the abutments would be situated at the bankfull limits of the Little River. We further note that the 100 year floodplain represents the Regulatory Floodplain for the Little River, and that the floodline mapping indicates that the 100 year floodplain would be contained to within the bankfull limits of the subject reach of the Little River. As such, it is anticipated that implementing the proposed pedestrian bridges, constructed per the designs advanced in the General Arrangement Drawings, would span the 100 year floodplain, and would not result in any adverse hydraulic impacts (i.e. change in water surface elevations either at, upstream, or

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

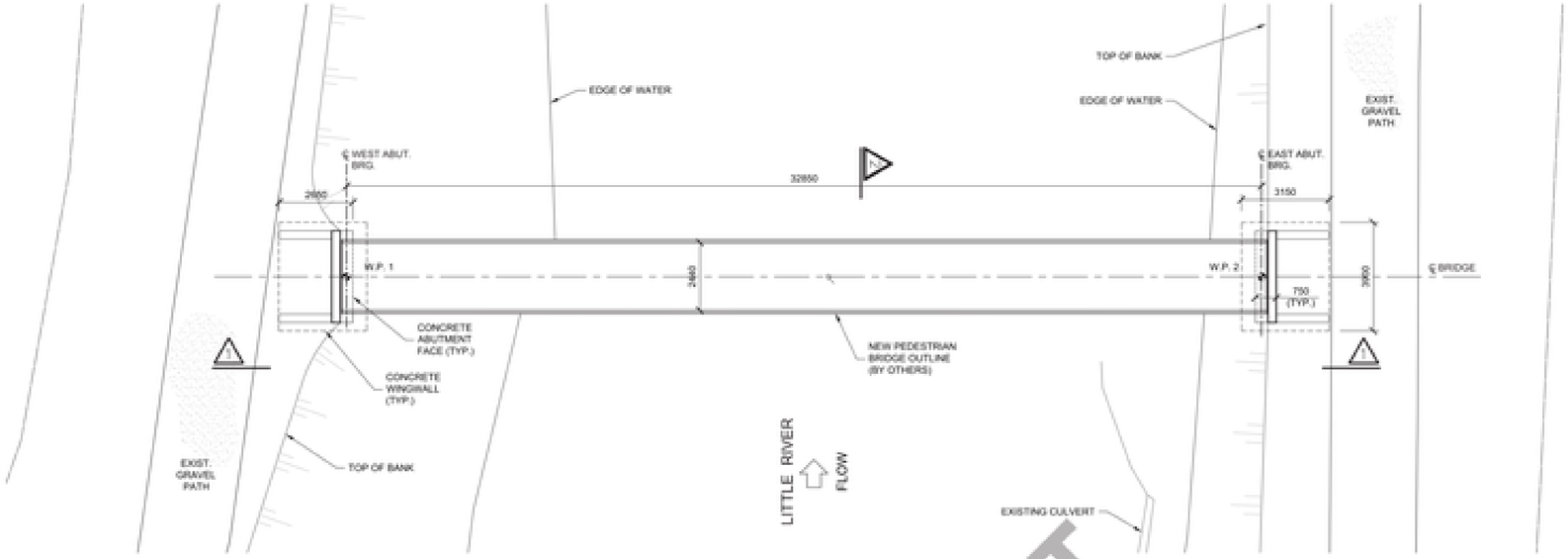
Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

downstream of the crossings) along the Little River for all events up to and including the 100 year storm.

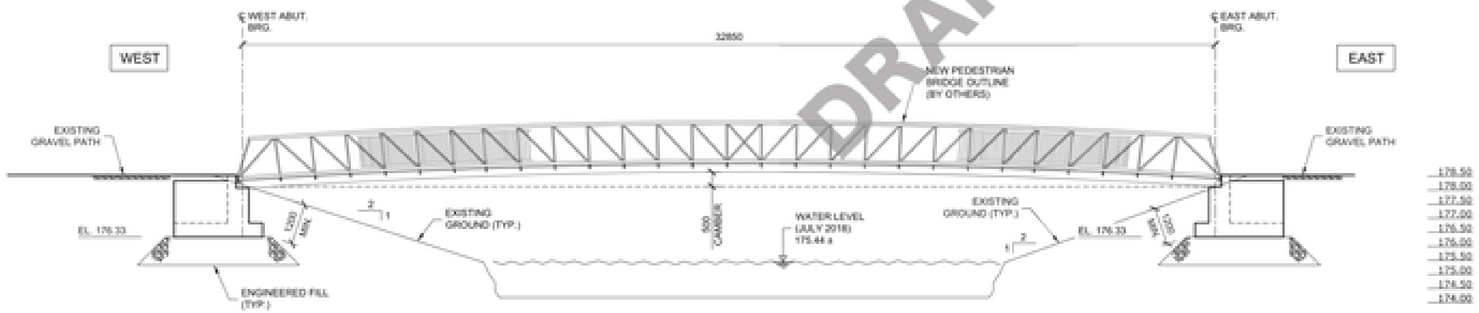
Consideration has also been given toward the potential for blockage at the structure, either by debris or ice jam, and associated flood risk. Recognizing that the abutments would be situated at the bankfull limit of the watercourse and outside of the 100 year floodplain, the potential for such occurrences is anticipated to be low. Furthermore, based upon the discussions with City staff, it is understood that hydraulic structures at nearby roadway crossings have been designed per the same criteria as is being used for the pedestrian bridges, and that blockages have not been reported at the roadway crossings. The pedestrian bridges would be arced above the water level more than would typically be incorporated into the design of a roadway bridge, hence offering a greater level of protection against blockage from debris than would be anticipated at a roadway crossing. Consequently, it is likewise anticipated that the proposed pedestrian bridges would not be susceptible to blockage from debris or ice jams.

We trust that the foregoing opinion satisfies your current requirements in this regard.

AF/BB/af

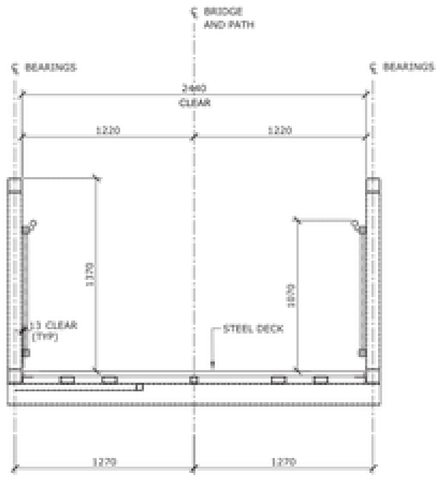


PLAN
SCALE: 1:100



ELEVATION ⚠1
SCALE: 1:100

WORKING POINT DATA		
	NORTHING	EASTING
WP.1	4679036.228	326677.136
WP.2	4693583.676	326130.393



SECTION ⚠2
SCALE: 1:20

NOTE:
- DENOTES DIMENSIONS TO BE REVIEWED WITH PRE-ENGINEERED BRIDGE SHOP DRAWING

1. CONCRETE

- ALL CONCRETE CONSTRUCTION TO BE CARRIED OUT IN ACCORDANCE WITH CSA STANDARD A23.1-14/ A23.2-14.
- MINIMUM CONCRETE STRENGTH TO BE 35MPa (AT 28 DAYS) CLASS C-1, UNLESS OTHERWISE NOTED.
- CLEAR COVER TO CONCRETE:
  CONCRETE CAST AGAINST EARTH
  AND PERMANENTLY EXPOSED TO EARTH.....100mm ± 25
  REMAINDER, UNLESS OTHERWISE NOTED..... 70mm ± 20
- ALL EXPOSED CONCRETE EDGES TO BE CHAMFERED 20mm UNLESS OTHERWISE NOTED.

2. REINFORCING STEEL

- REINFORCING STEEL SHALL BE GRADE 400W UNLESS OTHERWISE NOTED.
- TENSION LAP SPLICES SHALL BE CLASS 'B' UNLESS OTHERWISE NOTED.
- BAR HOOKS SHALL BE STANDARD LENGTH UNLESS OTHERWISE NOTED.
- BARS MARKED WITH PREFIX 'S' DENOTE STAINLESS STEEL BARS.

3. STRUCTURAL STEEL

- STRUCTURAL STEEL FOR TRUSS MEMBERS SHALL CONFORM TO CAN/CSA G40.20/G40.21 GRADE 350 AT. THE CHARPY IMPACT ENERGY REQUIREMENTS SHALL BE 27 JOULES AND THE TEST TEMPERATURE SHALL BE -30°C
- ALL OTHER STRUCTURAL STEEL SHALL CONFORM TO CAN/CSA G40.20/G40.21 GRADE 350 A.
- BOLTS ON WEATHERING STEEL SHALL BE ASTM A325M, TYPE 3. BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE.
- BOLTS SHALL BE INSTALLED BY THE TURN OF NUT METHOD.
- WELDING SHALL CONFORM TO CSA CAN3-W59-13 AND AWS D.1.5.
- UNLESS OTHERWISE NOTED, THE MINIMUM FILLET WELD SHALL BE AS FOLLOWS:

MATERIAL THICKNESS OF THICKER PART JOINED (mm)	MINIMUM SIZE OF SINGLE PASS FILLET WELD (mm)
TO 12mm INCLUSIVE	5
OVER 12 TO 20	6
OVER 20 TO 40	7
OVER 40 TO 60	10
OVER 60 TO 120	12

- ALL ELEMENTS OF THE BEARING TO BE DESIGNED BY EAGLE BRIDGE OR THE PRE-ENGINEERED BRIDGE SUPPLIER.
- BRIDGE SUPERSTRUCTURE SHALL BE CAMBERED TO THE VALUE SHOWN ON THE DEVELOPED ELEVATION ON THE CONTRACT DRAWINGS AND SHALL INCLUDE AN ALLOWANCE FOR SUPERSTRUCTURE SELF-WEIGHT AND SUPERIMPOSED DEAD LOADS.

4. GEOTECHNICAL:

LOAD BEARING CAPACITY:

ULS = 240 KPa
SLS = 160 KPa

- ABUTMENT FOOTINGS ARE TO BE CONSTRUCTED ON 1m ENGINEERED FILL AS SHOWN ON THE CONTRACT DRAWINGS.
- GEOTECHNICAL REPORT #SWW187089 DATED AUGUST 16TH, 2018 COMPLETED BY WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS.

1. PONY TRUSS BRIDGE SUPERSTRUCTURE DESIGN IS PROVIDED SCHEMATICALLY ONLY. THE CONTRACTOR SHALL DESIGN, SUPPLY AND INSTALL THE PONY TRUSS BRIDGE SUPERSTRUCTURE. STAMPED SHOP DRAWINGS SHALL BE SUBMITTED TO THE CONTRACT ADMINISTRATOR FOR REVIEW PRIOR TO FABRICATION.
2. PONY TRUSS BRIDE SHALL BE DESIGNED IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE CAN/CSA S6-14.
3. THE ABUTMENT ARRANGEMENT AND DESIGN ARE BASED ON A PRE-ENGINEERED SUPERSTRUCTURE DESIGN BY EAGLE BRIDGE. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS FOR THE CONSULTANT TO REDESIGN THE ABUTMENTS AND AMEND THE CONTRACT DOCUMENTS SHOULD ANOTHER PRE-ENGINEERED BRIDGE SUPPLIER BE UTILIZED.
4. ALL WORK SHALL CONFORM TO CHBDC AND ALL STANDARDS REFERENCED WITHIN LOCAL REGULATIONS AND BYLAWS AND THE OCCUPATIONAL HEALTH AND SAFETY ACT FOR CONSTRUCTION PROJECTS. THE LATEST VERSIONS OF THE STANDARDS SHALL APPLY.
5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, DETAILS, ELEVATIONS AND UTILITIES SHOWN ON STRUCTURAL DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING WITH THE WORK.
6. THE CONTRACTOR SHALL ENSURE THE STABILITY OF ALL COMPONENTS DURING HANDLING, TRANSPORTATION AND ERECTION.
7. THE ABUTMENT FOOTING BEARING SURFACE MUST BE INSPECTED BY A COMPETENT GEOTECHNICAL ENGINEER OR THEIR REPRESENTATIVE TO CONFIRM THE BEARING SURFACE. THE FOOTING SHALL BEAR ON THE ENGINEERED FILL AS SHOWN ON THE CONTRACT DRAWINGS.
8. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF THE UTILITIES, SERVICES, STRUCTURES, ROADWAYS, ETC. DURING CONSTRUCTION OPERATIONS AT NO COST TO THE CITY. THE CONTRACTOR'S METHOD OF PROTECTION ARE TO BE SUBMITTED TO THE CONTRACT ADMINISTRATOR FOR REVIEW.
9. THE CONTRACTOR SHALL PROVIDE A THOROUGHLY PLANNED DEBRIS CONTAINMENT SYSTEM TO BE INSTALLED PRIOR TO START OF WORK, TO PREVENT DEBRIS FROM FALLING INTO THE WATERCOURSE. THE DEBRIS CONTAINMENT SYSTEM SHALL BE INSTALLED TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.
10. GRADES SHOWN ARE APPROXIMATE. FINISHED GRADE IS TO BE APPROVED IN THE FIELD BY THE ENGINEER.
11. WHERE EXISTING CONDITIONS ARE SHOWN AND THEY ARE NOT NECESSARILY ACCURATE OR COMPLETE, THE CONTRACTOR SHALL CONFIRM ALL EXISTING DIMENSIONS AND LOCATIONS.

REV. #	DESCRIPTION	DATE	APP.BY

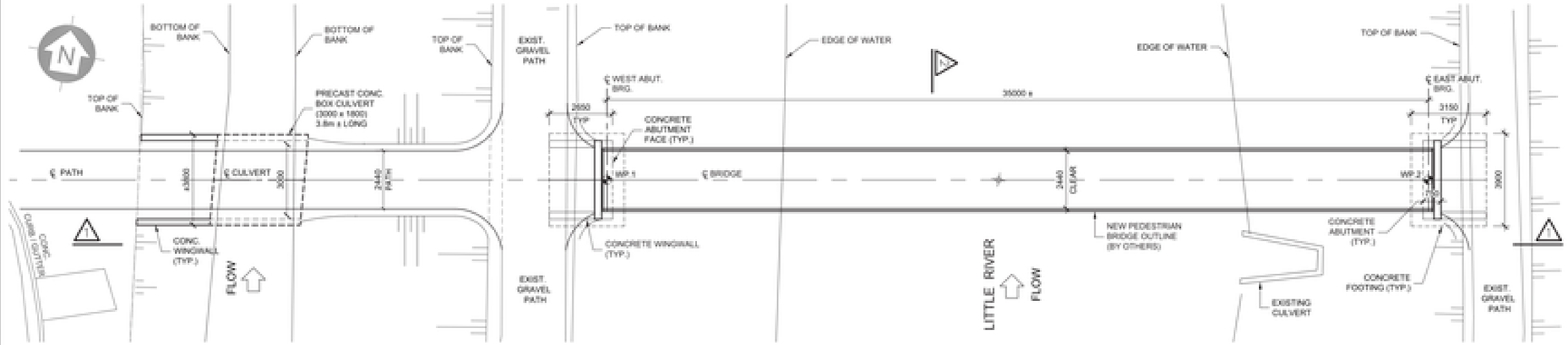
wood.
50 Troop Avenue, Unit 300
Dartmouth, N.S., B3B 1Z1
(T) 902-468-2940 (F) 902-468-7314

CLIENT: CITY OF WINDSOR

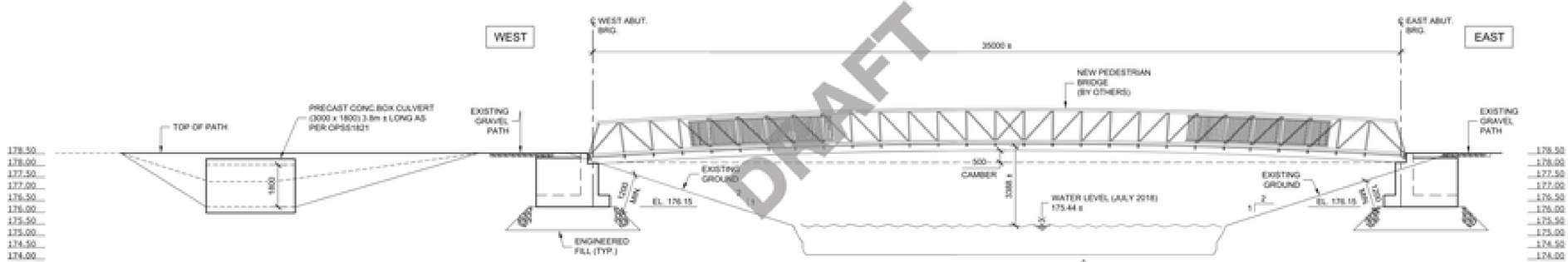
PROJECT: HAWTHORNE PEDESTRIAN BRIDGE
CITY OF WINDSOR, ONTARIO

TITLE: GENERAL ARRANGEMENT & NOTES

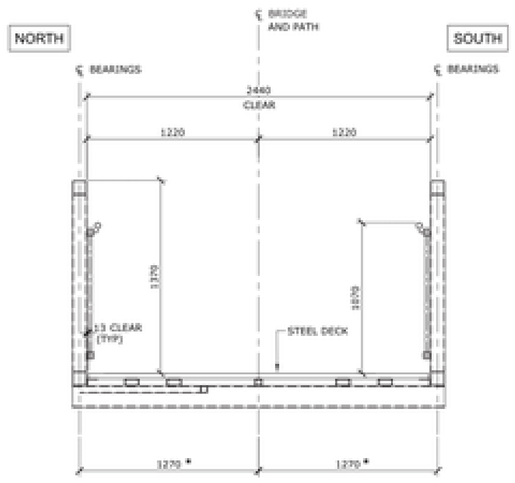
DRAWN BY: TO	PROJECTION: UTM Zone 17	DATE: 10/11/2018	
CHECKED BY: SH	DATUM: NAD83	PROJECT NO: TBR187177-02 - 01 Hawthorne	
REV. NO: N/A	SCALE: As Noted	FIGURE No: 01	



PLAN
SCALE: 1:100



ELEVATION 1
SCALE: 1:100



SECTION 2
SCALE: 1:20

NOTE:
- DENOTES DIMENSIONS TO BE REVIEWED WITH PRE-ENGINEERED BRIDGE SHOP DRAWING

GENERAL NOTES:

1. CONCRETE
- ALL CONCRETE CONSTRUCTION TO BE CARRIED OUT IN ACCORDANCE WITH CSA STANDARD A23.1-14/ A23.2-14.
- MINIMUM CONCRETE STRENGTH TO BE 35MPa (AT 28 DAYS) CLASS C-1, UNLESS OTHERWISE NOTED.
- CLEAR COVER TO CONCRETE:
  CONCRETE CAST AGAINST EARTH
  AND PERMANENTLY EXPOSED TO EARTH.....100mm ± 25
  REMAINDER, UNLESS OTHERWISE NOTED..... 70mm ± 20
- ALL EXPOSED CONCRETE EDGES TO BE CHAMFERED 20mm UNLESS OTHERWISE NOTED.

2. REINFORCING STEEL
- REINFORCING STEEL SHALL BE GRADE 400W UNLESS OTHERWISE NOTED.
- TENSION LAP SPLICES SHALL BE CLASS 'B' UNLESS OTHERWISE NOTED.
- BAR HOOKS SHALL BE STANDARD LENGTH UNLESS OTHERWISE NOTED.
- BARS MARKED WITH PREFIX 'S' DENOTE STAINLESS STEEL BARS.

3. STRUCTURAL STEEL
- STRUCTURAL STEEL FOR TRUSS MEMBERS SHALL CONFORM TO CAN/CSA G40.20/G40.21 GRADE 350 AT. THE CHARPY IMPACT ENERGY REQUIREMENTS SHALL BE 27 JOULES AND THE TEST TEMPERATURE SHALL BE -30°C
- ALL OTHER STRUCTURAL STEEL SHALL CONFORM TO CAN/CSA G40.20/G40.21 GRADE 350 A.
- BOLTS ON WEATHERING STEEL SHALL BE ASTM A325M, TYPE 3. BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE.
- BOLTS SHALL BE INSTALLED BY THE TURN OF NUT METHOD.
- WELDING SHALL CONFORM TO CSA CAN3-W59-13 AND AWS D.1.5.
- UNLESS OTHERWISE NOTED, THE MINIMUM FILLET WELD SHALL BE AS FOLLOWS:

MATERIAL THICKNESS OF THICKER PART JOINED (mm)	MINIMUM SIZE OF SINGLE PASS FILLET WELD (mm)
TO 12mm INCLUSIVE	5
OVER 12 TO 20	6
OVER 20 TO 40	7
OVER 40 TO 60	10
OVER 60 TO 120	12

- ALL ELEMENTS OF THE BEARING TO BE DESIGNED BY EAGLE BRIDGE OR THE PRE-ENGINEERED BRIDGE SUPPLIER.
- BRIDGE SUPERSTRUCTURE SHALL BE CAMBERED TO THE VALUE SHOWN ON THE DEVELOPED ELEVATION ON THE CONTRACT DRAWINGS AND SHALL INCLUDE AN ALLOWANCE FOR SUPERSTRUCTURE SELF-WEIGHT AND SUPERIMPOSED DEAD LOADS.

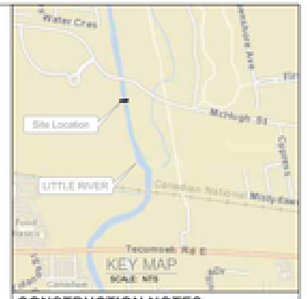
4. GEOTECHNICAL:

LOAD BEARING CAPACITY:

ULS = 240 kPa
SLS = 160 kPa

- ABUTMENT FOOTINGS ARE TO BE CONSTRUCTED ON 1m ENGINEERED FILL AS SHOWN ON THE CONTRACT DRAWINGS.
- GEOTECHNICAL REPORT #SWW187089 DATED AUGUST 16TH, 2018 COMPLETED BY WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS.

WORKING POINT DATA		
	NORTHING	EASTING
WP.1	4694083.848	323393.992
WP.2	4700023.499	357408.469



CONSTRUCTION NOTES:

1. PONY TRUSS BRIDGE SUPERSTRUCTURE DESIGN IS PROVIDED SCHEMATICALLY ONLY. THE CONTRACTOR SHALL DESIGN, SUPPLY AND INSTALL THE PONY TRUSS BRIDGE SUPERSTRUCTURE. STAMPED SHOP DRAWINGS SHALL BE SUBMITTED TO THE CONTRACT ADMINISTRATOR FOR REVIEW PRIOR TO FABRICATION.
2. PONY TRUSS BRIDE SHALL BE DESIGNED IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE CAN/CSA S6-14.
3. THE ABUTMENT ARRANGEMENT AND DESIGN ARE BASED ON A PRE-ENGINEERED SUPERSTRUCTURE DESIGN BY EAGLE BRIDGE. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS FOR THE CONSULTANT TO REDESIGN THE ABUTMENTS AND AMEND THE CONTRACT DOCUMENTS SHOULD ANOTHER PRE-ENGINEERED BRIDGE SUPPLIER BE UTILIZED.
4. ALL WORK SHALL CONFORM TO CHBDC AND ALL STANDARDS REFERENCED WITHIN LOCAL REGULATIONS AND BYLAWS AND THE OCCUPATIONAL HEALTH AND SAFETY ACT FOR CONSTRUCTION PROJECTS. THE LATEST VERSIONS OF THE STANDARDS SHALL APPLY.
5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, DETAILS, ELEVATIONS AND UTILITIES SHOWN ON STRUCTURAL DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING WITH THE WORK.
6. THE CONTRACTOR SHALL ENSURE THE STABILITY OF ALL COMPONENTS DURING HANDLING, TRANSPORTATION AND ERECTION.
7. THE ABUTMENT FOOTING BEARING SURFACE MUST BE INSPECTED BY A COMPETENT GEOTECHNICAL ENGINEER OR THEIR REPRESENTATIVE TO CONFIRM THE BEARING SURFACE. THE FOOTING SHALL BEAR ON THE ENGINEERED FILL AS SHOWN ON THE CONTRACT DRAWINGS.
8. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF THE UTILITIES, SERVICES, STRUCTURES, ROADWAYS, ETC. DURING CONSTRUCTION OPERATIONS AT NO COST TO THE CITY. THE CONTRACTOR'S METHOD OF PROTECTION ARE TO BE SUBMITTED TO THE CONTRACT ADMINISTRATOR FOR REVIEW.
9. THE CONTRACTOR SHALL PROVIDE A THOROUGHLY PLANNED DEBRIS CONTAINMENT SYSTEM TO BE INSTALLED PRIOR TO START OF WORK, TO PREVENT DEBRIS FROM FALLING INTO THE WATERCOURSE. THE DEBRIS CONTAINMENT SYSTEM SHALL BE INSTALLED TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.
10. GRADES SHOWN ARE APPROXIMATE. FINISHED GRADE IS TO BE APPROVED IN THE FIELD BY THE ENGINEER.
11. WHERE EXISTING CONDITIONS ARE SHOWN AND THEY ARE NOT NECESSARILY ACCURATE OR COMPLETE, THE CONTRACTOR SHALL CONFIRM ALL EXISTING DIMENSIONS AND LOCATIONS.

REV. #	DESCRIPTION	DATE	APP.BY

Environment & Infrastructure Solutions
wood.

CLIENT: CITY OF WINDSOR

PROJECT: McHUGH PEDESTRIAN BRIDGE
CITY OF WINDSOR, ONTARIO

TITLE: GENERAL ARRANGEMENT & NOTES

DRAWN BY: TC	PROJECTION: UTM Zone 17	DATE: 10/11/2018	
CHECKED BY: EU	DATUM: NAD83	PROJECT NO: SWW187089-01 - Working	
REV. NO: N/A	SCALE: As Noted	FIGURE No: 1	

ESSEX REGION
CONSERVATION AUTHORITY

FLOOD RISK MAP
LITTLE RIVER
CARTE DE RISQUE D'INONDATION

LEGEND LÉGENDE

SHEET INDEX TABLEAU D'ASSEMBLAGE

GENERAL INFORMATION

RENSEIGNEMENTS GÉNÉRAUX

COMPILATION NOTE

PHOTOGRAMMÉTRIE

Environment Canada — Inland Waters Directorate
Environnement Canada — Direction Générale des Eaux intérieures

Ontario — Ministry of Natural Resources
Ministère des richesses naturelles

Sheet

05 17 3400 46850

SCALE 1:5000 ECHELLE

METRES (m) 0 200 400 600 METRES
FEET 500 0 500 1000 1500 2000 PIEDS

CONTOUR INTERVAL 1 METRE NORTH AMERICAN DATUM 1927
ÉQUIDISTANCE DES COURBES DE NIVEAU 1 MÈTRE SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NORD-AMÉRICAIN 1927

MacLaren ENGINEERS INC.

W. L. C. ENGLISH — CIVIL — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

REGULATION No _____ No DU RÈGLEMENT
SCHEDULE No _____ CÉDULE No

PRODUCED BY KENTING EARTH SCIENCES LIMITED

R. W. STEMP — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

MAP NO. ERI - 6

42141-A1