



**51, 53, 55 & 75 Bradford Street &
20 Checkley Street
City of Barrie**

**Preliminary Bunker's Creek
Regulatory Floodplain Analysis**

December 2019

Submitted by:

**SCS Consulting Group Ltd
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8
Phone 905 475 1900
Fax 905 475 8335**

Project Number: 2196

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1 st	December 2019	Official Plan Amendment and Zoning By-Law Amendment	City of Barrie, Barrie Lakeshore Developments

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Barrie Lakeshore Developments to prepare this Preliminary Bunker's Creek Regulatory Floodline Analysis report in support of the submission for Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBLA) from the City of Barrie for the proposed development of the property located at 51, 53, 55 and 75 Bradford Street and 20 Checkley Street in the City of Barrie.

1.1 Study Area

The subject site is generally bound by Bradford Street to the west, existing commercial development, residential development and Simcoe Street to the north, Lakeshore Drive to the east and Bunker's Creek to the south (refer to **Figure 1.1**).

The subject development is approximately 3.5 ha in size and is proposed to consist of high-rise mixed-use buildings providing opportunities for street related commercial uses, residential uses, hotel and amenity uses. The Site Plan is included in **Appendix A**. The study area drains to Bunker's Creek, which outlets to Lake Simcoe immediately downstream (east) of Lakeshore Drive.

1.2 Purpose and Objectives of the Preliminary Floodplain Analysis

This preliminary floodplain analysis has been prepared in support of the OPA and ZBLA approval process. The preliminary floodplain limit will inform the delineation of the proposed development limits.

1.3 Previous Documentation

The Lake Simcoe and Region Conservation Authority (LSRCA) have previously prepared draft hydraulic (HEC-RAS) modelling for Bunker's Creek (2005) and this modelling is considered their Regulatory modelling. A copy of the 2005 HEC-RAS model was obtained from LSRCA and used as the basis of the preliminary floodplain analysis, as directed by LSRCA.

The Regulatory storm event for Bunker's Creek is the 100 year storm event.

It is noted that this model utilizes a starting water elevation at Lake Simcoe of 219.5 m, which represents the high-water level of Lake Simcoe. It is also noted that this LSRCA model does not account for the significant reconstruction of Lakeshore Drive and the crossings of Bunker's Creek that were completed between the years 2014 and 2016 (based on IBI 2013 design).

2.0 PRELIMINARY FLOODPLAIN ANALYSIS

2.1 HEC-RAS Model Updates

Detailed topographic mapping for the site was completed by Schaeffer Dzaldov Bennett surveyors in Fall 2019 and was utilized as the base for the preliminary floodplain analysis and mapping (refer to **Appendix B**).

For this initial preliminary floodplain analysis, the LSRCA's HEC-RAS model (plan name "BunkEx_GR_2195") was updated to:

- ➔ Update the geometry of cross-sections 66, 116, 166, 216, and 264 to reflect the recent detailed topographic survey for the portions of the cross-sections that are within the site; and
- ➔ Shift cross-section 264 downstream by 7 m to reflect the toe of the Bradford Street embankment.

The new HEC-RAS plan name that incorporates the above revisions is called "OldLDNewTopo". A copy of the HEC-RAS model and output is included in **Appendix C**.

2.2 Pre Lakeshore Drive Reconstruction Regulatory Floodline

The resulting preliminary Regulatory (100 year) floodplain limits that would have reflected the Regulatory floodplain prior to the Lakeshore Drive reconstruction are illustrated on **Figure 1.1**.

3.0 FUTURE FLOODPLAIN MODEL UPDATES

Further updates to the preliminary Bunker's Creek Regulatory floodplain modelling are underway to further refine the model to 1) reflect the current configuration of Lakeshore Drive and the Bunker's Creek and Kidd's Creek crossings, 2) balance the Regulatory floodlines of Bunker's and Kidd's Creeks at Lakeshore Drive, and 3) reflect the proposed Bunker's Creek Bradford Street culvert replacement and watercourse capacity improvements between Bradford Street and Lakeshore Drive.

3.1 Lakeshore Drive Reconstruction

Based on discussions and meetings with LSRCA and the City of Barrie, both the LSRCA's regulatory Bunker's Creek and Kidd's Creek HEC-RAS models need to be updated to reflect the Lakeshore Drive reconstruction, as these LSRCA models were not used in the modelling that was completed to support the Lakeshore Drive reconstruction works (i.e. other HEC-RAS models were completed, but not adopted by LSRCA as the Regulatory models).

SCS is currently in the process of updating the coding of the geometry for Lakeshore Drive and the crossings of Kidd's and Bunker's Creeks, based on a recently completed topographic survey by Schaeffer Dzaldov Bennett Surveyors.

3.2 Balancing of Bunker's and Kidd's Creek Regulatory Floodlines

As previously noted, the Regulatory storm event for Bunker's Creek is the 100 year event. The Regulatory storm event for Kidd's Creek is the Regional Storm (Hurricane Hazel) event.

Once the coding for Lakeshore Drive and the associated crossings has been updated, the Regulatory water surface elevations at Lakeshore Drive between the Kidd's Creek and Bunker's Creek HEC-RAS models need to be balanced. This will be completed by iterating the boundary of the starting and ending limit of the Lakeshore Drive cross-section coding between the two models such that the end (south limit) of the cross-section for the Kidd's Creek model is the starting chainage (north limit) for the coding of the cross-section for the Bunker's Creek model and the resulting Regulatory flood elevations at/overtopping Lakeshore Drive (using the Regional storm for Kidd's Creek and 100 year storm for Bunker's Creek) is the same in each model (i.e. balanced).

3.3 Bunker's Creek Culvert Replacement and Watercourse Improvements

The City of Barrie's Bunker's Creek Master Drainage Plan Update (Giffels, June 2004) and subsequent Drainage Master Plan (Tatham Engineering, March 2019) identified proposed improvements to the Bunker's Creek watercourse crossing at Bradford Street to increase the conveyance capacity of the road crossing and reduce the frequency of flooding and depth and velocity of overtopping during the Regulatory event such that safe access/egress will be provided across Bradford Street.

The proposed culvert improvement proposed requires watercourse improvements up and downstream of Bradford Street to accommodate the wider span structure of the crossing. Downstream of Bradford Street, the low flow channel has limited capacity (less than the 2 year

storm event). The low flow channel is proposed to be widened to approximately 15.3 m and redesigned using natural channel design principles. The proposed widening works will improve the hydraulics of the drainage system and reduce the extent and frequency of flooding.

The City of Barrie has recently retained a consultant to undertake the design of the Bunker's Creek culvert and watercourse improvements. The detailed design of the culvert and watercourse improvements will be incorporated into the HEC-RAS model.

3.4 Final Regulatory Floodlines

Upon completion of the above modelling, the final Regulatory floodlines for Bunker's Creek and Kidd's Creek will be plotted to delineate the floodlines on the subject site.

Respectfully Submitted:

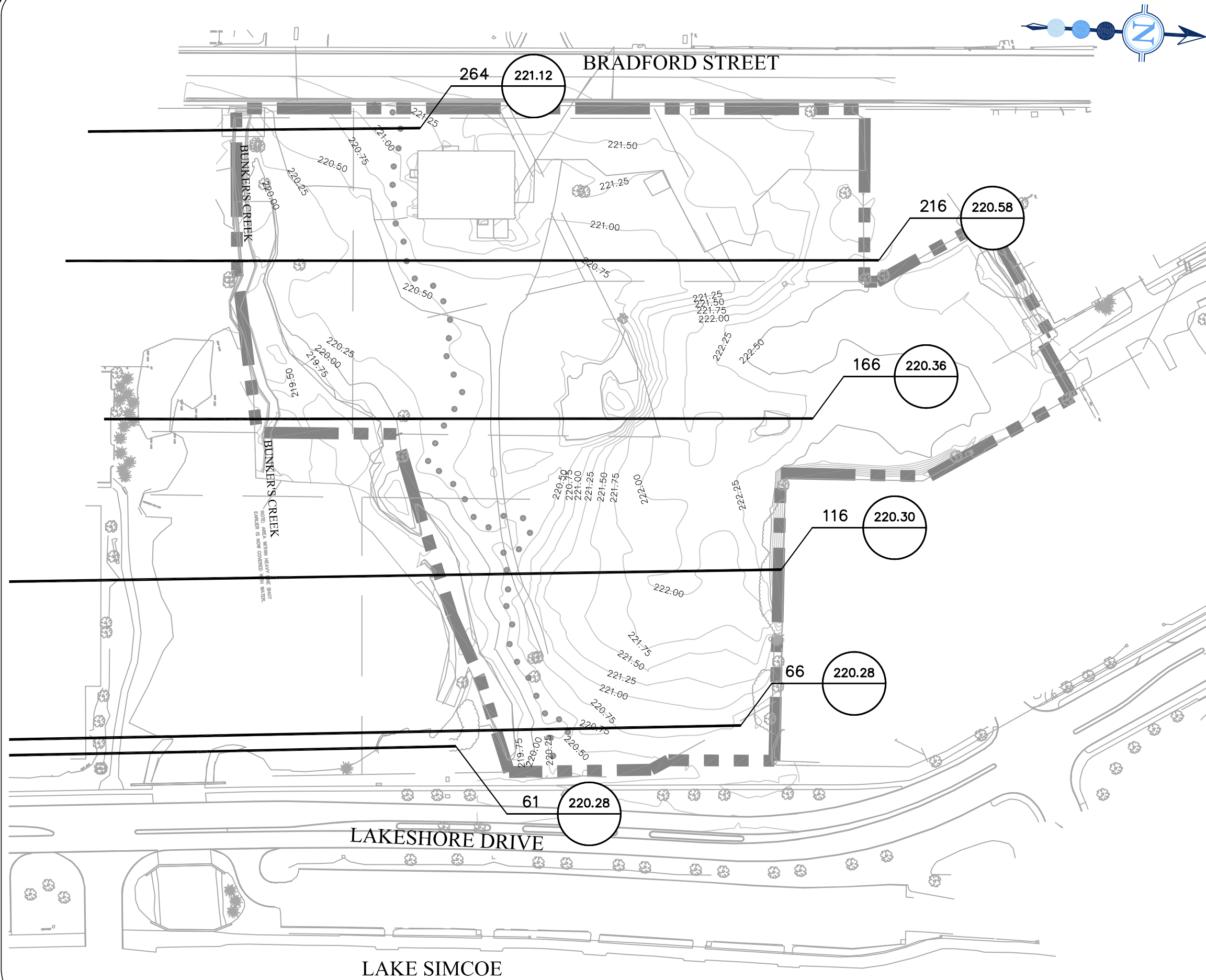
SCS Consulting Group Ltd.



Ben O'Neill, EIT
boneill@scsconsultinggroup.com



Sarah Kurtz, P. Eng.
skurtz@scsconsultinggroup.com



LEGEND:

- PROPERTY BOUNDARY
- EXISTING CONTOUR AND ELEVATION
- EXISTING REGULATORY FLOODLINE
- EXISTING REGULATORY FLOOD ELEVATION
- HEC-RAS SECTION ID
- HEC-RAS SECTION LEADER
- HEC - RAS CROSS-SECTION



30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

BARRIE LAKRSHORE DEVELOPMENTS

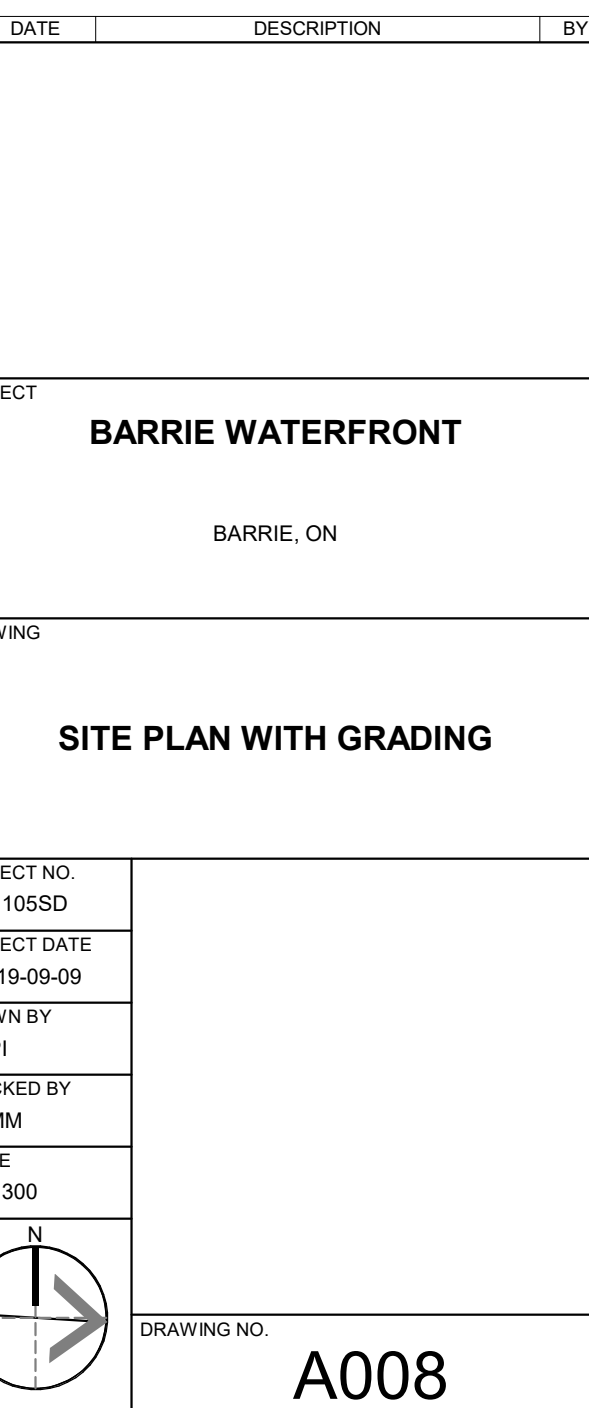
51, 53, 55 & 75 BRADFORD STREET
AND 20 CHECKLEY STREET- BARRIE

REGULATORY FLOODLINE
PRE LAKESHORE DRIVE RECONSTRUCTION

DESIGNED BY: B.O.	CHECKED BY: S.E.K.
SCALE: 1:1250	DATE: DECEMBER 2019
PROJECT No: 2196	FIGURE No: 1.1

APPENDIX A

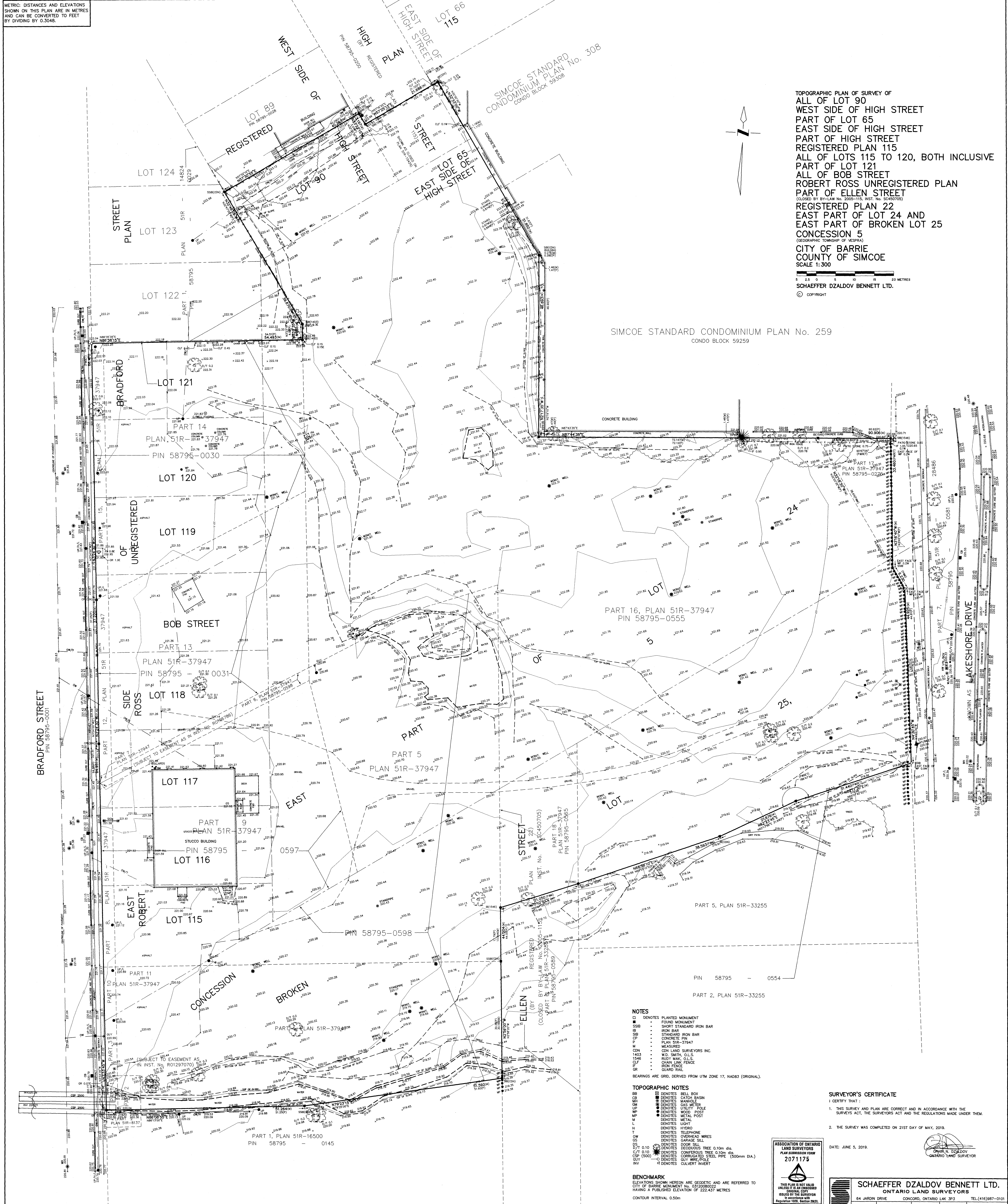
SITE PLAN



APPENDIX B

TOPOGRAPHIC SURVEY

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



TOPOGRAPHIC PLAN OF SURVEY OF
ALL OF LOT 90
WEST SIDE OF HIGH STREET
PART OF LOT 65
EAST SIDE OF HIGH STREET
PART OF HIGH STREET
REGISTERED PLAN 115
ALL OF LOTS 115 TO 120, BOTH INCLUSIVE
PART OF LOT 121
ALL OF BOB STREET
ROBERT ROSS UNREGISTERED PLAN
PART OF ELLEN STREET
(CLOSED BY BY-LAW No. 2385-115, WET. No. 23445705)
REGISTERED PLAN 22
EAST PART OF LOT 24 AND
EAST PART OF BROKEN LOT 25
CONCESSION 5
(GEOGRAPHIC TOWNSHIP OF VESPRE)
CITY OF BARRIE
COUNTY OF SIMCOE
SCALE 1:300



0 2.5 5 10 15 20 METRES

SCHAEFFER DZALDOV BENNETT LTD.

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SIMCOE STANDARD CONDOMINIUM PLAN No. 259
CONDO BLOCK 59259

PART 16, PLAN 51R-37947
PIN 58795-0555

PART 5, PLAN 51R-33255

PART 2, PLAN 51R-33255

NOTES

□	DENOTES	PLANTED MONUMENT
■	"	FOUND MONUMENT
SSIB	"	SHORT STANDARD IRON BAR
IB	"	IRON BAR
SIB	"	STANDARD IRON BAR
CP	"	CONCRETE PIN
P	"	PLAN 51R-37947
M	"	MEASURED
CDN	"	CDN LAND SURVEYORS INC.
1403	"	W.D. SMITH, O.L.S.
1546	"	RUDY MAK, O.L.S.
CLF	"	CHAIN LINK FENCE
IF	"	IRON FENCE
GR	"	GUARD RAIL

REMARKS ARE GRID DERIVED FROM UTM ZONE 17 NAD83 (ORIGINAL)

TOPOGRAPHIC NOTES

BB	☼	DENOTES	BELL BOX
CB	☼	DENOTES	CATCH BASIN
MB	☼	DENOTES	MANHOLE
GP	☼	DENOTES	GAS METER
UP	☼	DENOTES	UTILITY POLE
WM	●	DENOTES	WOOD POST
MP	●	DENOTES	METAL POST
M	☼	DENOTES	METAL
DN	☼	DENOTES	LIGHT
H	☼	DENOTES	HYDRO
T	☼	DENOTES	TELEPHONE
OW	☼	DENOTES	OVERHEAD WIRES
GS	☼	DENOTES	GARAGE SILL
DO	☼	DENOTES	DOOR SILL
D/T 0.10	☼	DENOTES	DECIDUOUS TREE 0.10m dia.
C/T 0.10	☼	DENOTES	CONIFEROUS TREE 0.10m dia.
GUY 500	☼	DENOTES	STEEL RATED STEEL PIPE (500mm DIA)
WY	☼	DENOTES	GUY WIRE/POLE
INV	☼	DENOTES	CULVERT INVERT

BENCHMARK
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO
CITY OF BARRIE MONUMENT No. 03120080022
HAVING A PUBLISHED ELEVATION OF 222.437 METRES
CONTOUR INTERVAL 0.50m

SURVEYOR'S CERTIFICATE

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 21ST DAY OF MAY, 2019

DATE: JUNE 5, 2019.

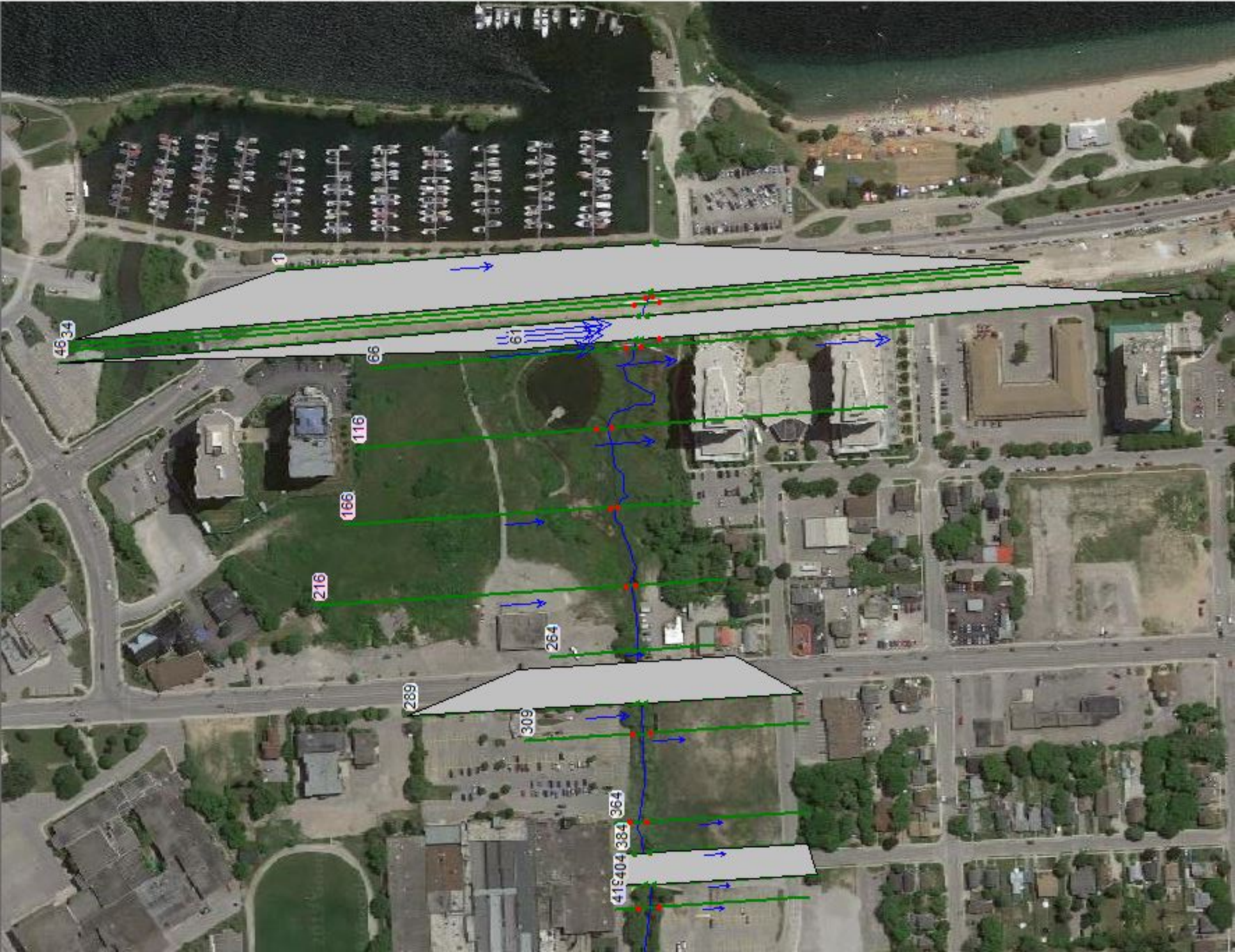
ONTARIO LAND SURVEYOR

SCHAEFFER DZALDOV BENNETT LTD.
ONTARIO LAND SURVEYORS

64 JARDIN DRIVE CONCORD, ONTARIO L4K 3P3 TEL. (416) 887-0101

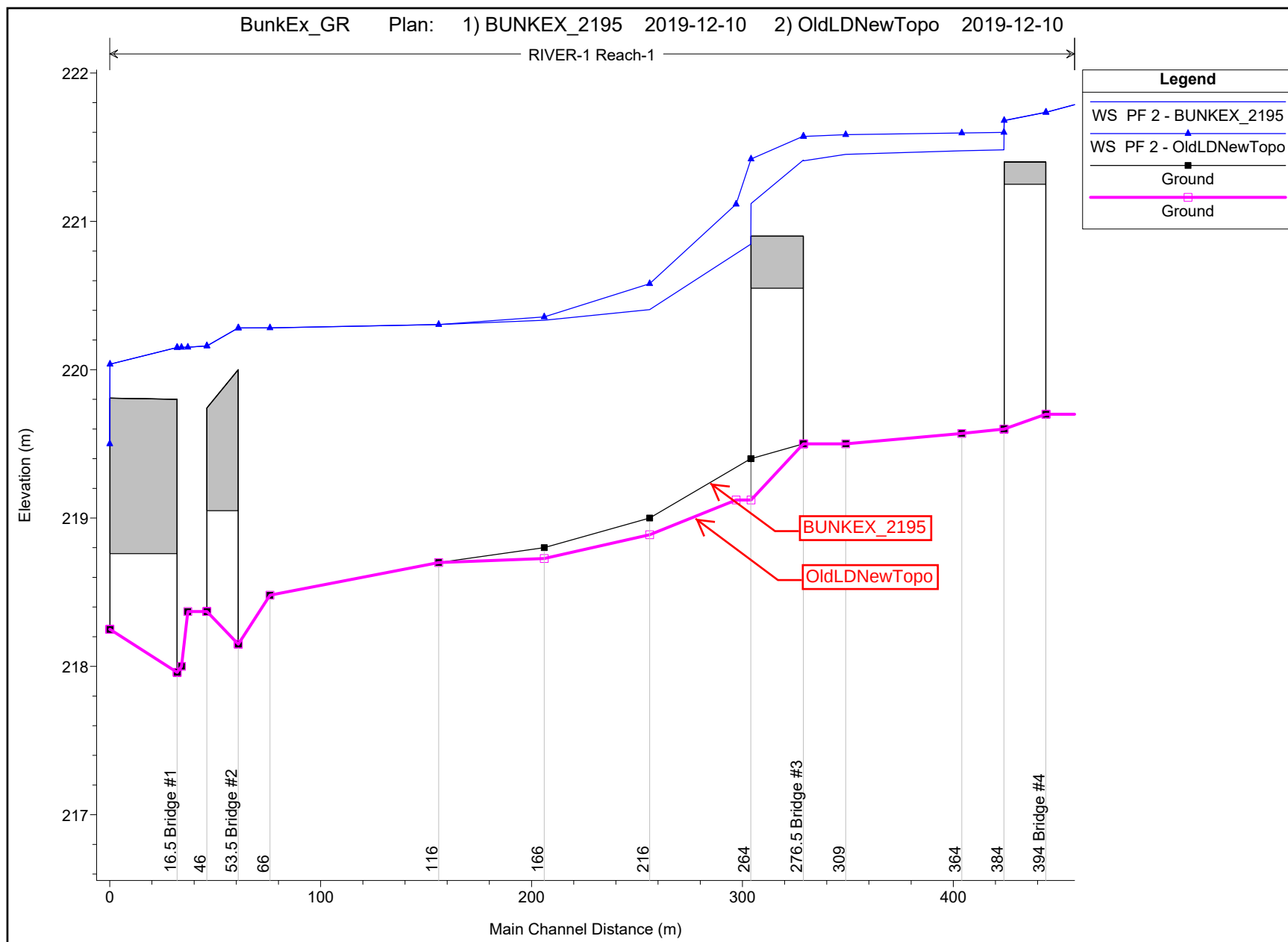
APPENDIX C

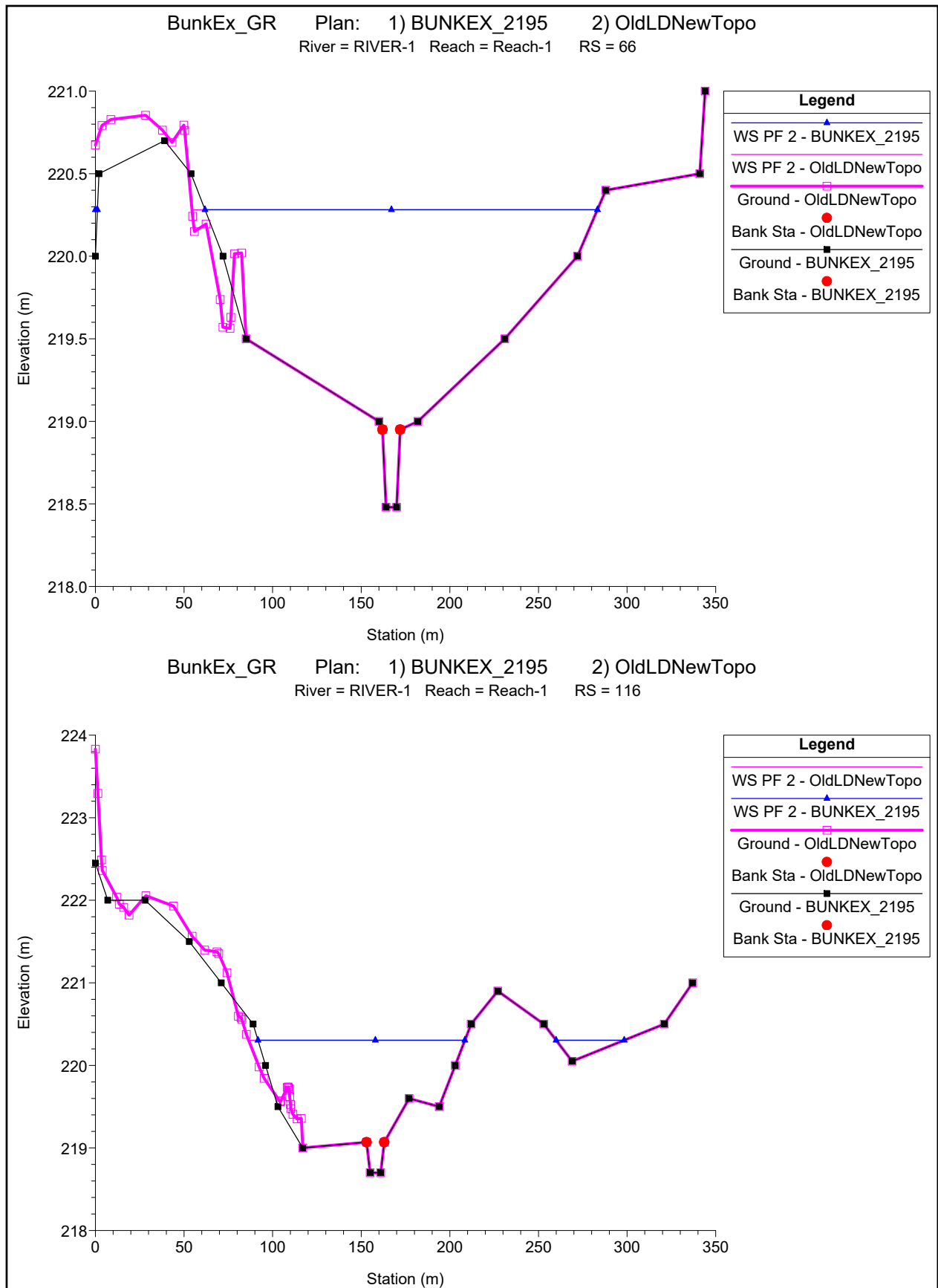
HEC-RAS MODEL



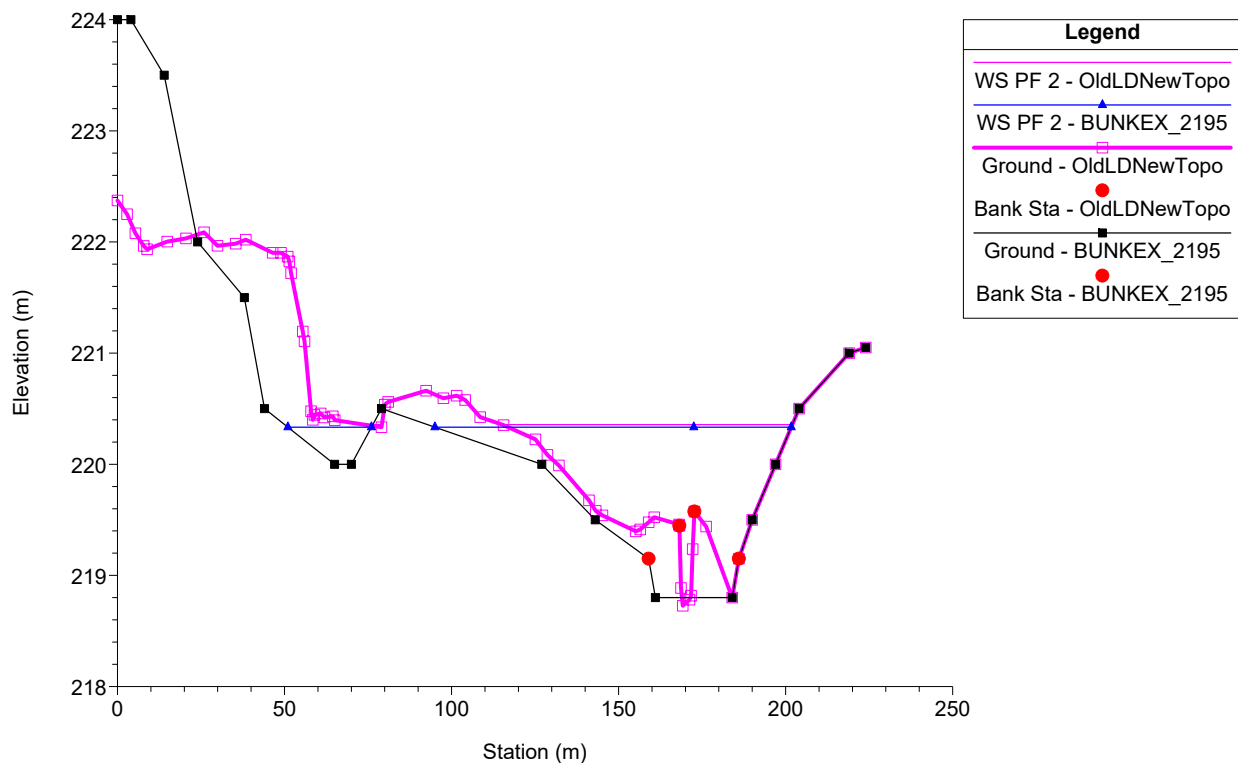
HEC-RAS Plan: OldLDNewTopo River: RIVER-1 Reach: Reach-1 Profile: PF 2

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Reach-1	1220	PF 2	44.38	224.20	226.44	226.44	226.97	0.022605	4.28	16.68	14.43	0.92
Reach-1	1110	PF 2	44.38	222.60	224.91		225.00	0.003392	2.11	36.85	23.37	0.45
Reach-1	1072	PF 2	44.38	222.50	224.83		224.89	0.002235	1.81	45.14	28.57	0.38
Reach-1	1014	PF 2	44.38	222.35	224.25		224.61	0.012140	3.89	21.11	17.04	0.90
Reach-1	964	PF 2	44.38	221.85	224.06	223.57	224.17	0.004829	2.33	36.34	30.39	0.50
Reach-1	930	PF 2	44.38	221.82	223.41	223.41	223.82	0.024590	4.21	18.99	21.05	1.07
Reach-1	860	PF 2	44.38	221.70	223.50		223.51	0.000464	0.77	111.64	93.44	0.19
Reach-1	815	PF 2	44.38	221.50	223.33		223.45	0.004713	2.35	38.49	40.60	0.58
Reach-1	758	PF 2	56.23	221.30	223.21		223.30	0.002133	1.74	59.51	50.34	0.41
Reach-1	725	PF 2	56.23	221.30	223.25		223.26	0.000121	0.43	139.73	79.01	0.10
Reach-1	676	PF 2	56.23	221.30	222.67	222.67	223.19	0.012201	3.37	21.24	24.17	0.93
Reach-1	675	PF 2	56.23	220.30	222.69		222.94	0.003253	2.27	29.86	24.42	0.50
Reach-1	585	PF 2	56.23	220.00	222.71		222.76	0.000709	1.22	81.27	72.48	0.24
Reach-1	542	PF 2	56.23	219.90	222.66	222.34	222.72	0.000836	1.30	58.57	107.81	0.28
Reach-1	533		Culvert									
Reach-1	524	PF 2	58.49	219.85	222.43	222.11	222.49	0.000957	1.29	55.37	102.35	0.29
Reach-1	504	PF 2	58.49	219.82	222.04	222.04	222.33	0.004601	2.60	27.44	50.44	0.64
Reach-1	419	PF 2	58.49	219.70	221.79		221.84	0.000681	1.02	63.87	94.91	0.25
Reach-1	404	PF 2	58.49	219.70	221.73	221.54	221.81	0.001404	1.41	50.55	95.62	0.32
Reach-1	394		Bridge									
Reach-1	384	PF 2	58.49	219.60	221.60	221.25	221.62	0.000252	0.62	90.00	108.78	0.15
Reach-1	364	PF 2	58.49	219.57	221.60		221.61	0.000195	0.55	98.18	110.87	0.13
Reach-1	309	PF 2	58.49	219.50	221.58		221.60	0.000248	0.70	104.91	165.88	0.16
Reach-1	289	PF 2	58.49	219.50	221.57	221.13	221.59	0.000806	1.15	149.31	250.00	0.26
Reach-1	276.5		Bridge									
Reach-1	264	PF 2	60.76	219.12	221.12	221.12	221.32	0.007789	2.88	49.80	98.69	0.68
Reach-1	216	PF 2	60.76	218.89	220.58		220.68	0.005298	2.21	60.94	107.76	0.57
Reach-1	166	PF 2	60.76	218.73	220.36		220.43	0.004443	1.97	61.81	91.96	0.53
Reach-1	116	PF 2	60.76	218.70	220.30		220.33	0.000944	1.02	115.90	160.40	0.26
Reach-1	66	PF 2	61.96	218.48	220.28		220.29	0.000378	0.69	194.85	228.73	0.17
Reach-1	61	PF 2	61.96	218.15	220.28	220.00	220.28	0.000144	0.42	326.09	421.85	0.10
Reach-1	53.5		Bridge									
Reach-1	46	PF 2	61.96	218.37	220.16	219.92	220.16	0.000544	0.65	264.50	606.00	0.15
Reach-1	37	PF 2	61.96	218.37	220.15		220.16	0.000406	0.65	269.96	606.00	0.17
Reach-1	34	PF 2	61.96	218.00	220.15		220.16	0.000553	0.69	260.54	606.00	0.15
Reach-1	32	PF 2	61.96	217.96	220.15	219.83	220.15	0.000529	0.37	274.12	606.00	0.08
Reach-1	16.5		Bridge									
Reach-1	1	PF 2	61.96	218.25	219.50	218.90	219.50	0.000115	0.31	300.01	242.03	0.09

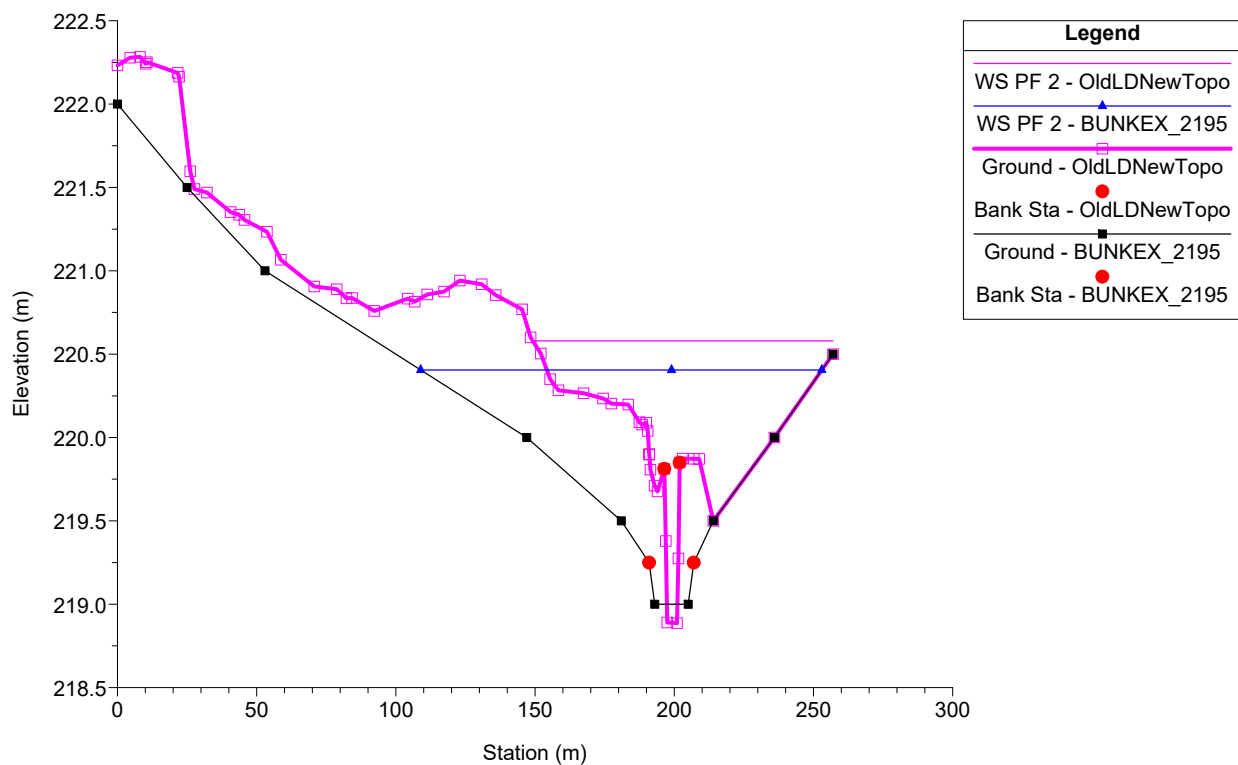




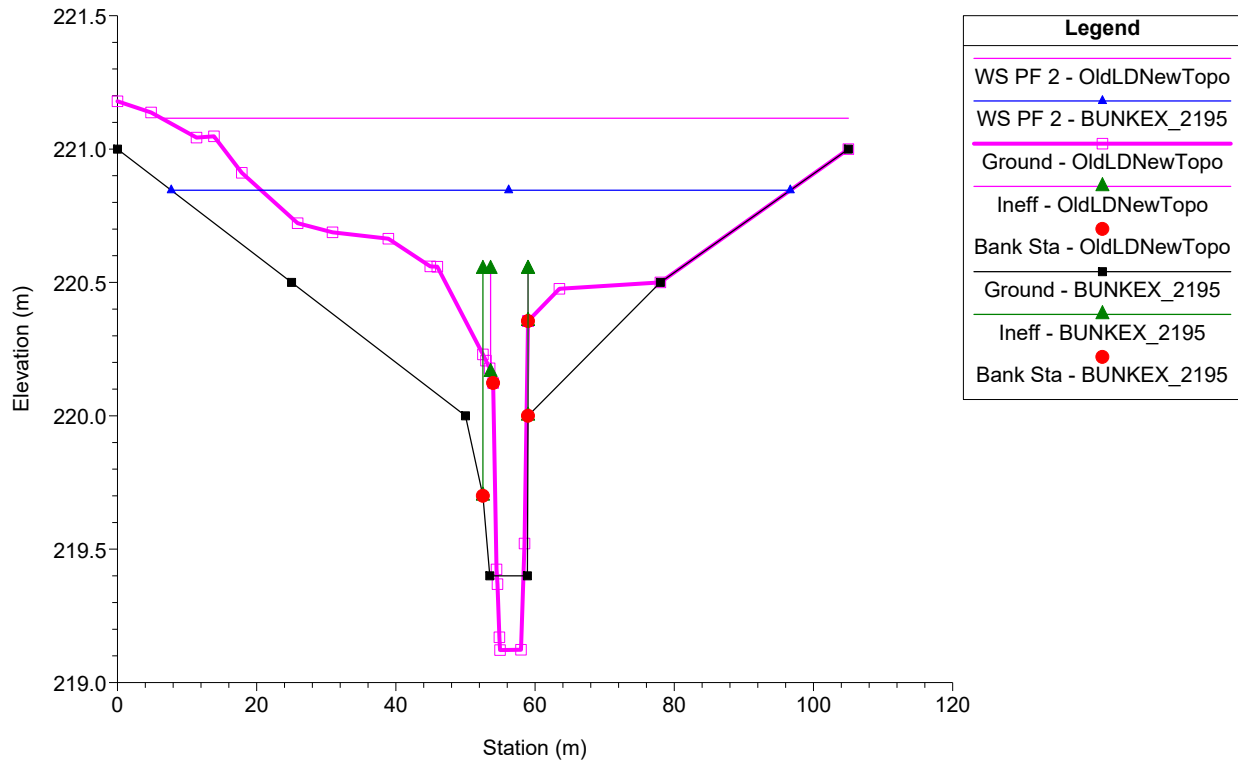
BunkEx_GR Plan: 1) BUNKEX_2195 2) OldLDNewTopo
 River = RIVER-1 Reach = Reach-1 RS = 166



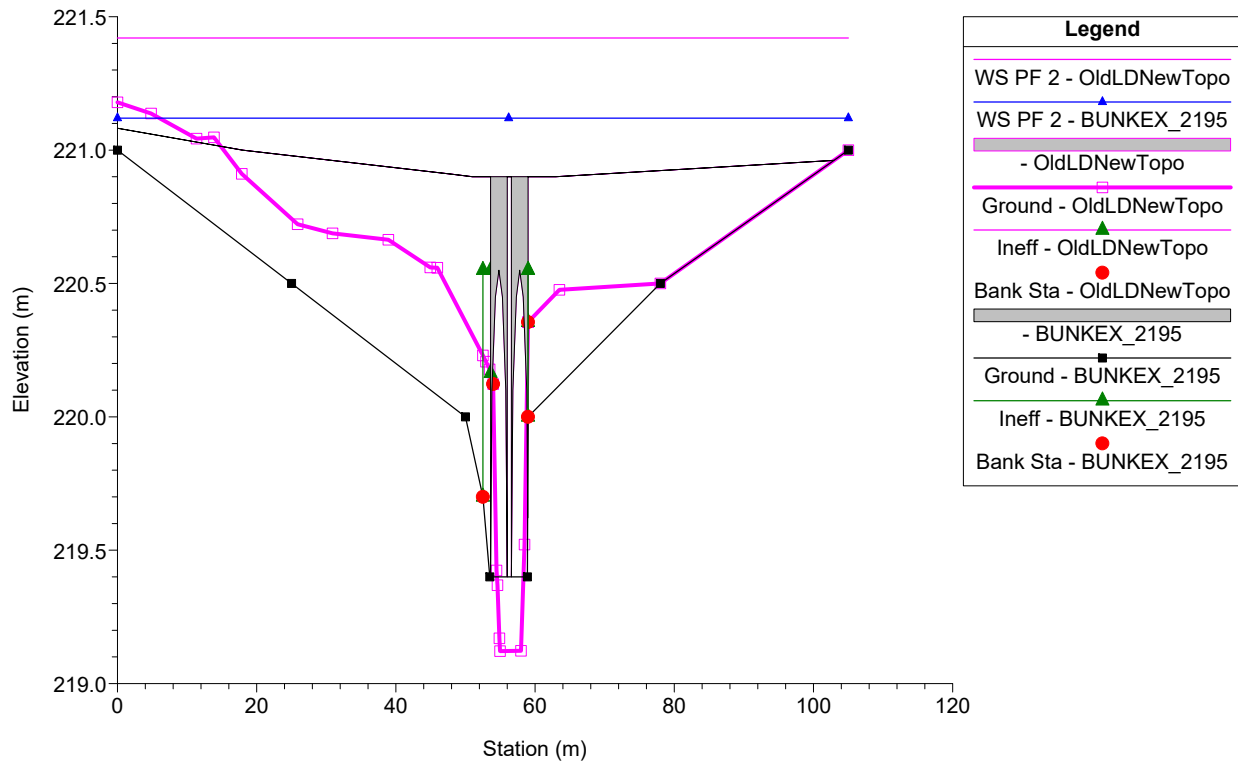
BunkEx_GR Plan: 1) BUNKEX_2195 2) OldLDNewTopo
 River = RIVER-1 Reach = Reach-1 RS = 216



BunkEx_GR Plan: 1) BUNKEX_2195 2) OldLDNewTopo
 River = RIVER-1 Reach = Reach-1 RS = 264



BunkEx_GR Plan: 1) BUNKEX_2195 2) OldLDNewTopo
 River = RIVER-1 Reach = Reach-1 RS = 276.5 BR Bridge #3



SCS Consulting Group Ltd
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8
Phone 905 475 1900
Fax 905 475 8335