

TOWN OF CALEDON PLANNING RECEIVED July 31, 2020 The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363 5230 SOUTH SERVICE ROAD, UNIT 107 BURLINGTON, ONTARIO, L7L 5K2 www.odandetech.com

EPA 1 BOUNDARY REFINEMENT/FUTURE INDUSTRIAL DEVELOPMENT 8281 Healey Road BOLTON, ONTARIO

FUNCTIONAL SERVICING REPORT AND STORM WATER MANAGEMENT DESIGN BRIEF

Prepared For:

8281 HEALEY ROAD GP LIMITED c/o ONE Properties

City File No: RZ 2020-0007

ORIGINAL: JULY 2020

TABLE OF CONTENTS

DESCRIPTION

page

1.	BACKGROUND	4
2.	SCOPE OF WORK	4
3.	SANITARY WASTE WATER DISPOSAL	5
4.	WATER DISTRIBUTION	8
5.	STORMWATER MANAGEMENT	.11
6.	FLOOD PLAIN ANALYSIS	.17
7.	SOILS REPORT	.30
8.	EROSION AND SEDIMENT CONTROL	.30
9.	CONCLUSIONS	.31
10.	REFERENCES:	.32

Note: This report should be read in conjunction with the complete Site Servicing & Grading Plans prepared by The Odan/Detech Group Inc.

APPENDIX A

Aerial Photo of Site

APPENDIX B

Concept Sanitary Sewer (Fig. SAN)

APPENDIX C

Concept Storm Sewer (Fig. STM) Pre & Post Development Flood Plain Mapping (Fig. FPM) Scenario 1, Pre-Development, HEC-RAS Model output Table Scenario 2, Post-Development, HEC-RAS Model output Table

APPENDIX D

Cole Engineering HEC-RAS Flood Plain Mapping Program - Sheet No. 172 HEC-RAS Cross Sections (Fig. XSEC)

APPENDIX E

Concept Grading (Fig. SG) Topographic Survey

EXECUTIVE SUMMARY

It is proposed to develop the existing lands located at 8281 Healey Road in Bolton, Ontario. The site is located on the south side of Healey Road, west of the intersection of Healey Road and Coleraine Drive. The proposed development currently zoned for industrial use. This report together with the EIS will establish the development limits and will address the requirements for storm water drainage to the existing Stormwater Management Pond (SWMP) located on AIMCo lands (Amazon Site) to the south. Preliminary review with AM Candaras confirmed that there is capacity available within the existing downstream pond and that adjustment to the pond inlet and outlet will be required to accommodate the flows from this development. This report will also evaluate the flood plain and determine impacts as a result of the proposed development on the existing water course as required by the TRCA. Further to the Stormwater Management requirements a brief summary of water and sanitary services will be provided to aid in review of the stormwater management requirements for the development.

8281 Healey Road GP Limited are proposing to develop the subject lands within the context of the permitted uses under the MP-580 and MS-579 zones under the Town of Caledon Zoning By-law 2006-50, as amended. However, prior to finalizing the details of development, adjustments to the EPA1 Zone Boundary that extends through the subject lands are proposed, refer to Figure 3 within the Planning Justification Report, provided within Appendix A of this report for reference. The proposed zone boundary refinement is based upon additional environmental analysis of the Clarkway Tributary Corridor. The proposed boundary refinement will continue to maintain the ecological integrity of the Clarkway Tributary Corridor, while making efficient use of the surrounding lands by creating a more developable footprint. Site design matters are to be finalized following the refinement of the zoning boundaries proposed by the Zoning By-law Amendment application.

The proposed waste water flow from this site is 15.42 L/sec total including an allowance for infiltration, the total sanitary flow will be adjusted based on the accepted development limits however the full area has been considered at this time in determining flows and capacity. The proposed service pipe for the Site will be a Force Main adequately sized at the detailed design stage to convey flows to the proposed 250mm gravity sewer extension from Coleraine Drive on Healey Road. There is a creek and culvert crossing located on Healey Road which limits the ability to provide a gravity feed directly to the proposed development. The location and details of the proposed sanitary service within the Town right-of-way will require approval from the Town and Region. The preferred location for the Force Main is within the south shoulder of Healey Road to avoid the need for expropriation and or Private Easements. The Region of Peel has indicated that there is an existing 600mm sanitary sewer on Coleraine Drive to accommodate the site. This will be confirmed during the review process with the Region of Peel.

The required water demand for Site is 9.9 L/sec peak hour, 6.6 L/sec peak day and 339.6 L/sec fire flow demand. It is expected that adequate flows will be available as the Region recently constructed a new water tower located north of the Healey Road, just north of this development and recently undertook upsizing of the water main on Coleraine Drive south of Healey Road.

Fire flow tests on Coleraine Drive from a recent development to the south provided for an available flow of 500L/s (7925 USgpm) at 20 psi. prior to completing the water main replacement and upsizing on Coleraine Drive.

Storm water management can be accomplished as follows:

- 1. Roof top storage and control flow roof drains. Maximum roof ponding of 150 mm. Emergency overflow scuppers around the roof perimeter.
- 2. Parking area surface storage including piping and oversized manholes (if required).
- 3. Downstream storm water management pond providing water quantity and quality as per MOE Design Guidelines. Pond is existing and both quantity and quality will be confirmed by AM Candaras at the detailed design stage. The pond was sized to accept allowable flows from an area of 21.87ha. for a 100 year release rate of 180 L/sec/ha.
- 4. The pond will provide for Erosion Control detention to a 25mm storm for 48 hours.

The Site is serviceable with water, waste water and storm water quantity and quality controls. In addition the site has no deleterious effect on the down-stream and up-stream flood plain.

1. BACKGROUND

The property under study is an 13.58 ha (33.54 acres) site. The developable areas will be determined through this report together with the EIS. The site is located at 8281 Healey Road Coleraine Drive in Bolton, Ontario. The site is located on the south side of Healey Road, west of the intersection of Healey Road and Coleraine Drive. The proposed development is zoned Industrial and the extent of development limits will be determined within this report and the EIS. There are existing residences located to the northwest of the site, north side of Healey Road. The site is primarily an agricultural field (see aerial view). There is an existing drainage feature adjacent to the east within the site boundaries and a portion of this is located within the adjacent lands to the east.

8281 Healey Road GP Limited are proposing to develop the subject lands within the context of the permitted uses under the MP-580 and MS-579 zones under the Town of Caledon Zoning By-law 2006-50, as amended. However, prior to finalizing the details of development, adjustments to the EPA1 Zone Boundary that extends through the subject lands are proposed, refer to Figure 3 within the Planning Justification Report, provided within Appendix A of this report for reference. The proposed zone boundary refinement is based upon additional environmental analysis of the Clarkway Tributary Corridor. The proposed boundary refinement will continue to maintain the ecological integrity of the Clarkway Tributary Corridor, while making efficient use of the surrounding lands by creating a more developable footprint. Site design matters are to be finalized following the refinement of the zoning boundaries proposed by the Zoning By-law Amendment application.

The property generally slopes from north to south.

Refer to topographic survey completed by Speight Van Nostrand & Gibson OLS within Appendix E.

2. SCOPE OF WORK

THE ODAN/DETECH GROUP INC. was retained by 8281 Healey Road GP Limited to review the site, collect data, evaluate the site for the proposed industrial use and present the findings in a this Functional Servicing Report in support of a Zoning By-Law Amendment ("ZBA"). The purpose of this Functional Servicing Report is to present findings related to the conveyance of Storm Water from the development to the existing Stormwater Management Pond located on the AIMco (Amazon Site) Lands to the south. In addition this report will determine the development limits based on the floodplain analysis and findings within the EIS determining the natural heritage features as discussed with the TRCA. The scope of work in brief involves the following:

- a) Collecting existing servicing drawings from the Town of Caledon and Region of Peel in order to establish availability and feasibility of site servicing;
- b) Meetings/conversations with Town Planners & Engineers, Region of Peel and TRCA.
- c) Evaluation of the data and presentation of the findings in a Functional Servicing Report for Stormwater Management and Floodplain Mapping in support of a Site Plan Application.

d) Collecting information for Floodplain Modelling from the TRCA.

3. SANITARY WASTE WATER DISPOSAL

The proposed development will consist of an Industrial Development. The area of Building area will be determined at a later date upon determine the development limits. As such the sanitary flows will based on the full development area at this stage and adjusted upon determining the exact development limits.

The proposed service pipe for the Site will be a Force Main adequately sized at the detailed design stage to convey flows to the proposed 250mm gravity sewer extension from Coleraine Drive on Healey Road. There is a creek and culvert crossing located on Healey Road which limits the ability to provide a gravity feed directly to the proposed development. The location and details of the proposed sanitary service within the Town right-of-way will require approval from the Town and Region. The preferred location for the Force Main is within the south shoulder of Healey Road to avoid the need for expropriation and or Private Easements. The Region of Peel has indicated that there is an existing 600mm sanitary sewer on Coleraine Drive to accommodate the site. This will be confirmed during the review process with the Region of Peel. The site is zoned for he intended use and therefore is considered serviceable.

The Table below shows the summary of the sanitary flow calculations. The development will utilize the existing sanitary sewer on Coleraine Drive. Extension of this sewer will be required on Healey Road to service the development. The proposed conceptual sewer and existing sewers are shown on the proposed sanitary figure in Appendix B.

There are currently no existing sanitary sewer connections to the Site.

This is the only land use proposed for the Site.

The proposed flows are based on the full site area, not the final development area. As such this is the worst case scenario for the development and flows are expected to significantly reduce once the developable limits are established.

Since the tenant(s) for the site are yet to be determined, the actual employee count for the site is unknown. Therefore the calculated sanitary flows were based on the Region of Peel Sanitary Design Guidelines which estimates 70 persons per hectare for the proposed Light Industrial land use. See the following spread sheet below for more details of the calculations.

SANITARY FLOW CALCULATIONS

SCENARIO:

8281 Healey Road Single Warehouse (Assumed)

This program calculates the sanitary discharge from various land use As per the Region of Peel Guideline

FILL IN COLOURED CELLS AS REQUIRED

INDUSTRIAL SITE AREA (ha) =	13.58	
RESIDENTIAL SITE AREA (ha) =	0.00	

TOTAL SITE AREA for infiltration 13.58

(na) =							
LAND USE	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW I/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, I/sec
RESIDENTIAL Density 1, using 86 person/site area			0	0	0.00	4.50	0.00
RESIDENTIAL Density 2, using 170 persons/site area			0	0	0.00	4.50	0.00
RESIDENTIAL Density 3, using 270 persons/site area			0	0	0.00	4.50	0.00
RESIDENTIAL Density 3, using 2.7 persons/unit			0	0	0.00	4.50	0.00
RESIDENTIAL Density 4, using 400person/site area			0	0	0.00	4.50	0.00
RESIDENTIAL Density 4, using 2.7 persons/unit			0	0	0.00	4.50	0.00
INDUSTRIAL, Using estimated population for Site (Light Industrial 70 persons/ba)	40.50		054	007040	2.22	0.04	40.74
COMMERCIAL Using 1.1	13.58		951	287842	3.33	3.81	12.71
persons/100 m2			0	0	0.00	4.50	0.00
OFFICES, Using 3.3 persons/100 m2			0	0	0.00	4.50	0.00
INDUSTRIAL, Using 2 persons/100 m2			0	0	0.00	4.50	0.00

951

TOTAL		V1=	287842	Q1=	0.00
				Q2=	12.71
Q = (MqP/86400) + A * I (L/sec)				Qinfil	2.72
				Qtot	15.42
Q1= total flow from Residential Land Use (L/sec)	where :	P is population	า		
Q2= total flow from Industrial Land Use (L/sec)		q = 302.8 L/pe	rson/day for re	esidential an	ld
Qinfil = total flow from infiltration (L/sec)		q = 302.8 L/pe	rson/day for I	NDUSTRIAL	
Qtot = total flow (Land use + infiltration)		A = gross site	area for infiltra	ation	
		i = 0.20 L/sec/	ha (infiltration	rate)	
V1= Total Volume from Land Use in liters		Peaking Facto	r M = 1 + [14 / (4 + (P/	1000,1/2))]

Note, not all of the Site area will contribute to infiltration as a portion of the site is located within TRCA regulated area.

Based on the above Table the maximum sanitary flow the proposed development will be as follows:

Total = 15.42 L/sec including infiltration.

It is proposed to provide a Force Main to service the development to a new gravity sewer on Healey Road. The Region minimum sewer size is 250 mm. The 250 mm sewer will be at a slope of approximately 0.7% to maximize cover and distance for a gravity feed to the development. A pipe with these properties has a full flow capacity of 50.0 L/sec (n=0.013).

This pipe will have sufficient capacity for the proposed development at 8281 Healey Road as well as available capacity for any developments east of 8281 Healey fronting the south side of Healey Road.

The location of the lateral services including the Force Main required for 8281 Healey Road will be determined at the detailed design stage with the Town of Caledon.

Refer to the Site Servicing drawings for the sanitary sewer system to the site and through the site.

4. WATER DISTRIBUTION

Domestic & Fire Water Requirements:

There is an existing 200mm water main located on Healey Road looped from Coleraine Drive to Humber Station Road and 750mm dia. water main on Coleraine Drive. It is proposed to utilize the existing 200mm water main for both domestic and firefighting services to the proposed Industrial lands. As the site is located within an existing Industrial Corridor with large Regional Feeder mains it is expected that the availability of water supply will be sufficient to service the development. The Region of Peel constructed a water Tower near the intersection of Holland Road and Coleraine Drive to the north located north of the existing CTC Warehouse site.

Fire Flow – based on FUS. All calculations to be verified by Fire Consultant at time of sprinkler design.

Refer to the Fire Underwriters' calculation on the following page for the fire flow demand. In calculating the fire flow demand for the industrial building, the following assumptions were made as the final size of the building is unknown at this time. The calculation assume maximizing the building footprint within the proposed development limits:

- The building is of fire resistive (steel) construction.
- The building will be sprinklered and the sprinkler system will be fully supervised.
- The building contents will be of combustible classification.

A hydrant flow test has been conducted on the existing 300mm water main located in front of the Site on Coleraine Drive. The flow test will provide the available flows and pressures in order to determine if the water supply has sufficient capacity for the proposed development.

According to the MOE criteria, the allowable pressures are as follows:

Condition	Allowable Pressures (kPa			
	Min.	Max.	•	
1) Minimum Hour	275	700		
2) Peak Hour	275	700		
3) Peak Day + Fire Flow	140	700		

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the Region Design Manual Standards.

The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the Ontario Building Code 2006. The minimal residual pressure under fire conditions is 140 kPa (20.3 psi).

The required firefighting flows are calculated below based on the assumption of maximizing the development area and building area within the development. The final required fire flows will be determined at the detailed design stage.

FUTURE INDUSTRIAL DEVELOPMENT, 8281 HEALEY ROAD, BOLTON, ON FSR & STORM WATER MANAGEMENT BRIEF

					1		1			
WATER SUPPLY FOR PUBLIC FIRE PROTEC	CTION , FIRE	E UNDERW	RITERS S	URVEY						
GUIDE FOR DETERMINATION OF REQUIR	ED FIRE FLO	ows	r							
$F = 220 \times C \times \sqrt{A}$										
Where:										
F = required fire flow in liters per minute										
C= Coefficient related to the type of const	truction			1						
A = the total floor area in square meters										
(excluding basements) in the building										
considered										
LOCATION:	8	8281 Heal	ey Road			Building:	Industrial V	Varehouse		r
OBC OCCUPANCY:	In	dustrial W	arehouse	5		PROJECT No:	19233			
BUILDING FOOT PRINT (m2)	48810					-			Contents	Charge
				1						
# OF STOREYS	1								Non-Combustible	-25%
									Limited Combustible	-15%
									Combustible	0%
		Non come	l	1					Free Burning	150/
CONSTRUCTION CLASS:			T	T					Free Burning	15%
						`			Rapid Buring	25%
AUTOMATED SPRINKLER PROTECTION		Credit	Total						-	
NFPA 13 sprinkler standard	yes	30%	F.00/	<u> </u>					Construe	ction Class
Standard Water Supply	yes	10%	50%	├					1.5	Wood Frame
Fully Supervised System	yes	10%							1	Urdinary
		50%							0.8	Fire Resistive
CONTENTS FACTOR:		L CON	ı nbustihle	1	1	CHARGE	0%		0.0	THE RESISTIVE
						CHANGE.	070		Separation	Charge
EXPOSURE 1 (south)	Distan	nce to Expo	sure Bui	lding (m)		>45			0-3 m	25%
		pv	Length	- Height			0%		3.1 -10 m	20%
EXPOSURE 2 (east)	Distan	nce to Expo	osure Bui	Iding (m)		>45	0.71		10.1 - 20 m	15%
			Length	- Height			0%		20.1 - 30 m	10%
EXPOSURE 3 (west)	Distan	nce to Expo	osure Bui	lding (m)		>45	0.0/		30.1 - 45	5%
			Length	- Height			0%		> 45 m	0%
EXPOSURE 4 (north)	Distan	nce to Expo	osure Bui	lding (m)		>45	0%			
			Length	- Height			0%			
						Total [.]	0%	no more		
								than 75%		
	No									
ARE BUILDINGS CONTIGUOUS.	NU									
FIRE RESISTANT BUILDING	Are vertical o	openings and	l exterior ve	ertical comr	nunicatio	ns protected with a min	nimum		Yes	
	one (1) hr rat	ting?								
CALCULATIONS	C =	0.8		non con	nbustibl	e				
	A =	48810	m2	(2 larges	st floors	+ 50% of 8 floors a	above)		STOREY AREAS m2	
	F –	38801	1/min	1						
Bound to Nearest 1000 L /	р' – с –	30004	L/min	musthe	> 2000	l /min			49010	
Kound to Nearest 1000 L/min	r =	39000	L/min	inust be	> 2000				48810	1
CORRECTION FACTORS:				1						
OCCUPANCY	,	0	L/min	1						
FIRE FLOW ADJUSTED FOR OCCUPANCY	,	39000	L/min	1						
REDUCTION FOR SPRINKLER		-19500	L/min							
EXPOSURE CHARGE		0	L/min							
		1	-,	1						
REQUIRED FIRE FLOW	F=	19500	L/min							
Pound to Nearest 1000 L (min	- -	20000	L/min	5283	ucam					
Kound to Nearest 1000 L/MIN	F =	20000		5265	usgiii					
	F =	333	L/sec							
				<u> </u>						
	1	1	L	1		1				1

Other Design Considerations

The water mains within the proposed site shall be installed in accordance with the current Region specifications and requirements.

If there is a crossing of the water main and a sewer, the water main shall cross above the sewer with sufficient vertical separation to allow for proper bedding and structural support of the water main (0.5m minimum).

In cases where there is a conflict with the elevation of the sewer and the water main such that the water main cannot cross above the sewer, the water main has been designed to cross below the sewer subject to the following conditions.

- a) There shall be a minimum vertical separation of 0.5m between the bottom of the sewer pipe and the top of the water main,
- b) The water main shall be lowered below the sewer using vertical thrust blocks and restraining joints,
- c) The length of the water main pipe shall be centered at the point of crossing so that the joints are equidistant and as far as possible from the sewer, and
- d) The sewer shall be adequately supported to prevent joint deflection and settling.

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the Region of Peel criteria.

The Water demands were calculated as follows:

Note that the Region water per capita is 300 while the Sanitary is 300 for Industrial.

a)	Average Day domestic demand -		3.3 L/sec			
	Refer to the Sanitary calculations	(951 persons)				
b)	Peak day demand -	2.0 x daily demand	6.6 L/sec			
c)	Peak hour demand -	3.0 daily demand	9.9 L/sec			
d)	Fire Flow Demand -	Based on FUS	*333 L/sec			
	* - based on anticipated building size to be verified upon determining development limits.					

Total Development Water Demand

339.6 L/s (5383 USgpm)

5. STORMWATER MANAGEMENT

INTRODUCTION

The site is primarily an agricultural field (see aerial view). There is an existing drainage feature adjacent to the east property bound and a portion of this is located within the site boundary. This drainage feature has a flood plain present. The Natural Heritage Features and related limits will be evaluated under a separate EIS Memorandum. This report will evaluate the proposed site stormwater management and flood plain in relation to the proposed development limits.

The SWM for this site will follow the guidelines of the Bolton Community Plan, Employment Lands and North Hill Supermarket Site, Comprehensive Environmental Impact Study and Management Plan, Phase 3 report, Aquafor Beech Limited, June 21, 2012 (Technical Memo and Implementation).

It is our understanding that the above mentioned Aquafor Beech Report has been adopted by the Town of Caledon and Toronto Region Conservation Authority and is to be followed for design requirements.

In addition to the above noted report the SWM Facility located on the AIMCo. Property (Amazon Site) to the south will be utilized for conveyance and storage of this development. This pond was designed and approved under separate Site Plan Application. Preliminary evaluation and discussions with AM Candaras, design Engineer for the downstream receiving pond, indicated that the pond has available capacity to accept flows from this proposed development. Alterations to the pond outlet structure and appurtenances may be required, however, the pond was constructed to accept a larger site area initially based on an allowable flow rate of 180 l/sec/ha. The SWM Pond tributary area was reduced during the original design with the construction of a separate pond to service a private development to the north east, therefore, reducing the tributary area to the AIMCo. Site pond. The pond was however constructed based on the original tributary area and the volume within the pond remained unchanged.

The following targets will be evaluated by AM Canadaras for the downstream pond as the pond will ultimately control the flows to the Clark Tributary from the proposed development.

CRITERIA (Targets)

- 1. Level 1 ("enhanced") water quality control.
- 2. Capture and release of 25mm over 48 hours for erosion control.
- 3. Flood (quantity control)
 - 100 Year Release Rate of 180 L/s/ha (to downstream SWM Pond).
 - Regional Storm

DISCUSSION:

- A conceptual Site Plan is will be finalized upon determining the development limits based on this report and the EIS.
- The site soil is a Clayey Silt Till and or clay till and is based on Geotechnical information available within this and surrounding areas. The soils are not conducive to large scale infiltration, thus Infiltration was ruled out as a major means of Storm Water Management for quantity controls.
- Rooftop storage will be utilized to attenuate flow prior to entering into the storm water management facility. The maximum storage depth is to be limited to 150 mm as per OBC. The roof areas will have emergency scuppers in case of blockage. The detained flow will discharge to the storm sewer on site and be further detained within the Storm Water Management Pond downstream of the proposed development. Flow to the downstream pond will be conveyed via a proposed series of inline pipes crossing through TRCA lands and under the existing drainage feature.
- The Regional Storm event will be used for determine rooftop storage and required hoppers and weirs to aid in the reduction of downstream pipe sizing. Any downsizing of storm pipes will be reviewed at the detailed design stage. This report will provide pipe sizing based on the allowable flows to the downstream Stormwater Management Pond as provided by AM Candaras.
- The allowable conveyance from this development will be based on the larger of the 100 Year and Regional Storm Events. The governing allowable flows for this development were established previously by AM Candaras. The allowable flows to the downstream SWM Pond have been determined to be 3.39 m3/s for the Regional Storm Event and 3.94 m3/s for the 100 year storm event. As such the allowable flows from the upstream area will be 180 l/s/ha. with a maximum tributary area of 21.87 ha. The proposed development is comprised of only 13.58 ha. The conveyance system will be reviewed for the full upstream area and modifications will be made during the detailed design stage based on the actual conveyance of flows.

STORM WATER CONVEYANCE:

As per meetings and discussions with the TRCA the flows from the proposed development will be conveyed through TRCA lands, through the floodplain and below the drainage feature. In order to minimize impacts the conveyance system will be sloped and sized to achieve a minimum 1.0m separation from the bottom of the channel.

As required by the TRCA a Geomorphologist is required to assess the impact of the sewer depth in comparison to the bottom of the channel. A Geomorphologist is currently assessing the proposed system together with Odan Detech. These findings will be presented in a separate memo and in support of this application. It is expected that the findings will support the above noted separation, however, adjustments may be required to achieve the required separation from the channel bottom to the top of pipe. As noted previously the pipe sizing will be adjusted based on the actual flow conveyance. Under this report the full conveyance of flow will be considered.

In order to provide a gravity sewer and maintain a separation of 1.0m the conveyance system will consist of multiple pipes sized adequately to convey the allowable flows to the downstream sewers and SWM pond.

The allowable flows from the proposed development have been established at 180 L/sec/ha. As the current development limits have not been established at this time the actual flows from development cannot be determined at this time.

As such the conveyance pipes will be determined based on the allowable flows and allowable tributary areas as provided by AM Candaras. The following total flow will be conveyed to the downstream sewers from the upstream tributary areas.

Total Area = 21.87 ha. Allowable Release Rate 100 Year Storm = 180 L/sec/ha.

Total Conveyance Required = 3,937 l/sec

Based on the above is proposed to provide three (3) 975mm storm sewers at a slope of 0.35% to convey flows.

Each pipe will provide for a conveyance of 1,326 l/sec for a total conveyance of 3,978 l/sec under full flow conditions. Thus meeting the allowable conveyance.

As previously indicated the flows from the site will be further reduced at the detailed design stage through the use of rooftop controls. Adjustments to pipe sizes will be addressed at that time. In addition the proposed development will utilize rooftop storage to further reduce the conveyance pipe size.

Adjustments to the downstream pond release rates will be made to meet the allowable flows from addition of 8281 Healey Road to this SWM pond. The addition of the proposed development upstream area to the existing storm water management pond will increase the allowable flows as per the following table.

8182 Healey Road

This program calculates the total flow from the unit flow equations

AREA =	21.87	ha	A - AREA IN ha
--------	-------	----	----------------

1		
UNIT EQUATION	UNIT FLOW (L/sec/ha)	TOTAL FLOW (L/sec)
Q = 55 L/sec/ha	55	1203
Q = 29.912 - 2.316 ln (A)	23	498
Q = 26.566 - 2.082 ln (A)	20	441
Q = 22.639 - 1.741 ln (A)	17	378
Q = 17.957 - 1.373 ln (A)	14	300
Q = 14.652 - 1.136 ln (A)	11	244
Q = 9.506 - 0.719 ln (A)	7	159
	UNIT EQUATION Q = 55 L/sec/ha Q = 29.912 - 2.316 ln (A) Q = 26.566 - 2.082 ln (A) Q = 22.639 - 1.741 ln (A) Q = 17.957 - 1.373 ln (A) Q = 14.652 - 1.136 ln (A) Q = 9.506 - 0.719 ln (A)	UNIT EQUATIONUNIT FLOW (L/sec/ha) $Q = 55$ L/sec/ha55 $Q = 29.912 - 2.316$ ln (A)23 $Q = 26.566 - 2.082$ ln (A)20 $Q = 22.639 - 1.741$ ln (A)17 $Q = 17.957 - 1.373$ ln (A)14 $Q = 14.652 - 1.136$ ln (A)11 $Q = 9.506 - 0.719$ ln (A)7

The above flows and adjustments to the downstream facility will be reviewed and completed by AM Candaras at the detailed design stage.

QUALITY CONTROL:

Since the developed portion of the Site is > 0.25 ha water quality needs to be addressed. Quality control will follow MOE 2003 guidelines Level 1. The SWM pond for this site will be located on the AIMCo. (Amazon) Property to the south, the low point of the development. Flow will be conveyed via a conveyance storm sewer as identified previously within this report through the TRCA regulated lands.

Water Quality will be addressed within the existing SWM Pond. It is proposed to retrofit the pond to address the required water quality for this development.

The following Tables identify the requirements to obtain necessary volumes, velocities and flows to achieve the required Water Quality under MOE 2003 Guidelines. To aid in retrofitting the downstream storm water management facility to achieve the required water quality the following preliminary assessment has been completed. AM Candaras will provide an additional assessment with regards to the existing SWM Facility and required alteration at the detailed design stage.

SUMMARY OF POND DESIGN MOE 2003, TOWN & TRCA							
DESIGN ELEMENT	REQUIRED						
DRAINAGE AREA (ha)	10 ha (preferred)						
PERMENANT STORAGE	1974 m ³						
FOREBAY DEPTH	1.0 m						
FOREBAY AREA	< 33% OF TOTAL PERMANENT POOL						
PERMANENT POOL DEPTH	MAX 3.0 m						
FREE BOARD FROM TOP OF POND TO 100 YR HGL POND TO REGION HGL	0.30 m N/A						
FOREBAY SETTLING LENGTH	TBD						
DRAWDOWN TIME	Minimum 12 hr						
	Preferred 24 to 48 hr						
CLEAN OUT FREQUENCY (years)	TBD						

The above adjustment to the downstream pond will be confirmed by AM Candaras at the detailed design stage. As the pond was designed for a larger tributary area it is expected that water quality can be addressed without significant alterations to the pond.

Should the treatment of water quality become a concern at the downstream pond the use of Oil/Grit separators on site at 8281 Healey Road will be reviewed.

It is expected that the site will consist mainly of rooftop with some asphalt parking and loading areas. The use of an Oil/Grit separator would satisfy the requirement for water quality on site treating any asphalt areas. Rooftop which is considered clean water and provides for an 80% TSS removal rate. As it is expected the majority of the site will consist of building rooftop the water quality for this area would achieve 80% TSS and bypass the Oil/Grit Separators.

Further review on options to address water quality will be reviewed at the detailed design stage.

EROSION CONTROL:

The criterion is to capture and release 25mm of rainfall over a 24-48 hour period. Erosion Control will be determined based on the downstream pond. The downstream pond was designed to the same requirements and it is expected that the requirement will be achieved based on available volume in the downstream pond.

IMPLEMENTATION OF SWM:

- The site is to utilize roof top storage to minimize impacts and flows to the downstream receiving sewers and conveyance system. This will also minimize the total flows to the storm water management pond and thus reduce alterations to existing sewers, forebays and extended detention requirements.
- Parking surface storage is not utilized due to design constraints, but will be reviewed further at the detailed design stage.
- All Storms will be conveyed to the downstream SWM facility including the 100 year and Regional Storm Events to the established allowable flows and tributary areas.
- LID (soak away pits) will be provided for water balance of the development, if required, and will be determined at the detailed design stage.
- The downstream SWM Pond will be utilized for water quality/quantity as detailed above. A Memo at this stage will be provided from AM Candaras confirming that the downstream pond can accept flows from the proposed development and will be capable of providing the necessary water quality treatment.

6. FLOOD PLAIN ANALYSIS

1. Background & Criteria

There is a regulated floodplain established by the TRCA which impacts the proposed development. As per discussions with the TRCA and based on the Natural Heritage features the watercourse has migrated to the east from it historical records. This was determined by the Ecologist during site visits. In order to improve the function of the water course this report together with the EIS will assess both the floodplain and Natural Heritage features.

The TRCA has provided a hydraulic analysis of the Clarkway Tributary floodplain using the computer modelling software *HEC-RAS*. The regulated flood limit as given by TRCA's HEC-RAS Model extends within the site, and adjacent lands.

The existing floodplain regulated area as given by TRCA is within the subject site. The existing regulated flood line is given by the hydraulic analysis prepared using the computer hydraulic modelling software *HEC-RAS* by Cole Engineering. The following page shows the HEC-RAS Flood Plain Mapping Program Sheet No. 172 for the Clarkway HEC-RAS sections located within 8281 Healey Road. These will be used to assess both the predevelopment and post development Flood plain conditions.

The HEC-RAS Model prepared by Cole Engineering was provided to The Odan/Detech Group and informs the following cut-fill-balance analysis and post-development flood conveyance HEC-RAS analysis herein.

The proposed development's grading and layout has been designed to satisfy TRCA's criteria for development within floodplain-regulated areas and cause no greater flood risk than existing to the adjacent properties.

The TRCA's criteria for floodplain Cut-Fill balance was considered herein – it is shown as follows that the proposed development satisfies TRCA's criteria for *Active Floodplain Storage* within the subject site.



A full size copy of the above drawings can be located within Appendix D.

The Regional Storm and 100-Year flood elevations that were established at each HEC-RAS section within the model.

The following HEC-RAS models will be used to analyze the impacts of the proposed development on the flood plain. The output tables are enclosed here and referenced later in this report.

- <u>HEC-RAS Scenario 1</u>: Original HEC-RAS Model provided by the TRCA herein referred to as the Predevelopment HEC-RAS Model.
- <u>HEC-RAS Scenario 2</u>: Updated HEC-RAS Model with modified cross-sections sections for modifications to the watercourse and flood plain to improve conveyance to aid with improvement to natural heritage features and watercourse features herein referred to as the Post Development Model.

It is proposed to manage the existing flood condition and modifications to such on the subject site and to balance both water levels and cut-fill balance on the site located at 8281 Healey Road. This will be completed through providing compensation lands for floodplain loss in order to provide both additional flood plain volume as well as improving on natural heritage features and wetlands in the area.

As discussed during meetings with TRCA staff modifications to the floodplain within the site will be considered due to the minimal volumes loss of volumes within the proposed development area due to the shallow spread of the floodplain into the development.

The HEC-RAS post development model will therefore show a net zero impact to the change in elevations or improvement to the floodplain post development. The site will be graded such that it provides flood volume to the floodplain where loss of floodplain volume occurs. The site will be graded up within the site such that the floodplain limit is off the subject site. Setbacks will be established based on the flood line given here.

The "fill" thus created by the proposed development will thereafter be compensated-for by a "cut" within the site. The calculations and analysis for this approach are as follows.

2. Subject Proposed Development & Grading

The setbacks from the critical flood elevations appear on the enclosed Floodplain & Conceptual Grading Plans, Appendix C.

It is proposed to grade the subject site such that the critical Regional Flood elevation and 100 year storm – established in post-development conditions in Section 6 of this report - are comparable to the predevelopment conditions. Refer to the enclosed Concept Grading Plan for the proposed grades relative to the floodwater elevation as well as the critical setback.

The proposed building's FFE has not been established as the development limits need to be determined, it is expected that the FFE will be significantly higher than the Regional Flood Elevation based on preliminary conceptual layouts and concept grading plans. Additionally the site grading will be established from the access at Healey Road to the north which will establish the FFE at a higher elevation in relation to the flood plain elevations.

It is proposed to provide a compensating flood volume to compensate for the flood volume lost as a result of the proposed site grading. This required volume was determined as follows.

3. Flood Volume Cut-Fill Analysis

There is presently (pre-development) a volume of 28,440.2m³ of flood storage volume (active storage) within the site. The following analysis shows that 28,723.2m³ is provided post-development as active storage, therefore the proposed development does not represent a reduction in available volume post-development.

The TRCA's *Balanced Cut and Fill Procedure* provides criteria for analysis of *Active Floodplain Storage*. That document defines active floodplain storage as storage which is located within the effective flow area of the floodplain where the storage is formed by the floodplain areas which are normally modelled by HEC-RAS to develop flood levels.

Presently, pre-development, there is only active floodplain storage provided within the site. The above TRCA criteria requires that where active storage exists and a Cut-Fill Balance is provided, active storage is replaced with active storage post-development (not passive or dead storage). Thus, the site has been graded to provide equivalent storage volume post-development as compared to pre-development by providing additional volume in the area of the site's southeast corner where it has been lost in the site's middle, within the (revised) active flow area.

The methodology for the cut-fill balance is as follows.

- Pre-development volume a Volume TIN was prepared to determine the predevelopment active storage volume. The Volume TIN was prepared using Autodesk AutoCAD Civil3D 2021. The Volume TIN and the volume analysis results are provided in Figure 1 on the following page. The volume TIN was assembled as follows:
 - a. Pre-Development flood elevations were given by the Scenario 1 HEC-RAS model and existing floodplain mapping. A pre-development flood 'surface' or TIN was prepared by projecting horizontally the flood elevation over the area within the site where flooding would occur in the Regional Storm based on the existing topography and pre-development flood elevations from the Scenario 1 HEC-RAS model.
 - i. We note that this methodology results in a slightly different predevelopment flood line than as given in the pre-development flood mapping provided by the TRCA – the flood line extends farther into the site. This analysis is more conservative because it is based on a topographic survey prepared using a total station rather than Lidar (as per the existing flood line mapping). The resulting pre-development flood volume is larger than it would be were it based on the provided flood mapping, which is conservative.
 - b. Existing site topography was taken from the original topographic survey by Speight, Van Nostrand & Gibson Ltd. of July 2019.
 - c. The Volume TIN was prepared by projecting the pre-development flood surface to the existing topography to determine the pre-development volume. Refer to results in Figure 1.
- 2. Post-development volume similarly to pre-development, a *Volume TIN* was prepared to determine post-development active storage volume. The post-development TIN was

also prepared using Autodesk AutoCAD Civil3D 2021. The Volume TIN and the volume analysis results are provided in Figure 2 on the following page. The volume TIN was assembled as follows:

- a. For the purpose of identifying that the post-development active flood volume is the same or more than pre-development, flood elevation was taken as per HEC-RAS Scenario 1 – pre-development. That is, if the post-development volume were based on the HEC-RAS Scenario 2, this would skew the conclusion as to whether more or less active volume is provided given that the flood elevation would be different.
- b. The post-development topography TIN was prepared by merging the postdevelopment proposed grading (where proposed) with the existing topography (where proposed to remain; it within the main channel in the east-west run along the site's south side).
- c. The post-development active flood storage volume TIN was prepared by projecting the pre-development flood surface to the post-development TIN. Refer to results in Figure 2.

Figure 1 - Pre-Development Active Storage Flood Volume



Figure 2 - Post-Development Active Storage Flood Volume



4. HEC-RAS Floodplain Conveyance Model & Floodplain Impacts

As shown in the above volume compensation analysis, the existing flood channel is proposed to be reconfigured to accommodate the proposed development.

There are five existing HEC-RAS Cross-Sections in the Scenario 1 HEC-RAS analysis within the subject site: 1561.551, 1561.404, 1561.256, 1561.120 and 1560.977. This is considered a sufficient number of sections to adequately model the pre-development and post-development flood cut-fill balance and conveyance impacts of the subject site, therefore no additional sections were added to the model in either scenario.

The methodology for the two scenarios HEC-RAS analysis is as follows.

4.1. Scenario 1: Pre-Development

The pre-development HEC-RAS model prepared by Cole Engineering 2018 for the TRCA was determined to be accurate relative to the existing topography and was thus used to represent pre-development conditions.

Refer to the Floodplain Plan (Appendix C) for the location of the HEC-RAS cross-sections through the subject site and existing flood line.

It is not necessary to adjust the existing sections or add new ones to accurately model the pre-development scenario. As discussed above – existing topography within and adjacent-to the subject site was given in an original topographic survey by Speight, Van Nostrand & Gibson Ltd. of July 2019. Various elevations were compared between that original survey and the existing HEC-RAS model (based on the cross-sections on the Floodplain Cross-Sections Plan – Appendix X). It was determined that the topographic elevations coded into the existing HEC-RAS sections accurately represents existing topography given by the topographic survey, typically within 0.05-0.10m.

Scenario 1 HEC-RAS results tables are provided in Appendix X and Table 1, below, provides the pre-development Scenario 1 HEC-RAS results summary.

4.2. Scenario 2: Post-Development

The methodology for the post-development HEC-RAS model is as follows. The existing Scenario 1 model was modified to reflect the proposed grading and conclusions provided on that basis.

The proposed grading appears in section in the Cross-Sections Plan (Appendix C) which provide the proposed grading and existing topography (from the topographic survey). The proposed grading was modelled in the HEC-RAS model as enclosed with this report.

Figure 3, below, shows how the proposed grading was merged with the existing topography in HEC-RAS Station 1561.404, for example. Refer to the enclosed HEC-RAS model for the complete revised geometry through the five sections which are within the site and for which the geometry was modified. Refer to Appendix C for the Scenario 2 HEC-RAS results table. Table 2, below, summarizes the results.

Note that an n-value of 0.035 was used in the main-channel where the main channel is proposed to be re-graded (refer to the Functional Grading Plan). An n-value of 0.08 was used in the overbank areas.



Figure 3 - HEC-RAS Station 1561.404 with Post-Development Grading

4.3. Results & Discussion

The HEC-RAS model results in the foregoing Scenarios is described as follows. Refer to the appended detailed output files for additional results. Refer to the enclosed Grading Plan for the location of the stations relative to the subject site.

Table 2 - HEC-RAS Model Results -	· Flood Elevation (m) -	Stations within subject site &	immediately upstream/downstream

Station	Scenario ⁻	1: Pre-develop Elev (TRCA App	ment Model V vation roved Model)	Vater Surface	Scenario 2: Post Development Model Water Surfa Elevation			
	2-Year Storm	5-Year Storm	100-Y Storm	Regional Storm	2-Year Storm	5-Year Storm	100-Y Storm	Regional Storm
1561.762	242.36	242.49	242.85	242.85	242.36	242.49	242.86	242.84
1561.698	241.87	241.94	242.20	242.19	241.87	241.94	242.15	242.16
1561.551	241.25	241.33	241.61	241.60	241.00	241.12	241.46	241.45
1561.404	240.75	240.86	241.08	241.07	240.59	240.72	241.04	241.03
1561.256	239.85	240.01	240.50	240.49	239.42	239.52	239.99	239.98
1561.120	239.38	239.51	239.96	239.95	239.13	239.24	239.59	239.58
1560.977	238.92	239.00	239.32	239.31	238.92	239.00	239.31	239.30
1560.820	238.07	238.17	238.51	238.50	238.07	238.17	238.51	238.50

The following discussion is drawn from the above HEC-RAS results summary, detailed results in Appendix C, enclosed HEC-RAS model and the enclosed Flood Line Plan (Appendix C).

- 1. The post-development flood line is the same elevation or lower post-development (scenario 2) as compared to pre-development (scenario 1) in all storm events. It follows that the flood risk to adjacent properties will be no greater than pre-development by the proposed development.
- 2. The channel cross-section area has been reduced within the flood area in Stations 1561.551, 1561.404 and 1561.256 however, as discussed above, the flood elevation is the same or less than pre-development. This is given that the n-value of 0.035 can be safely applied over a wider portion of the main channel than pre-development, as the channel will be re-graded in a manner that permits this.
- 3. Post-development (Scenario 2) flood elevations are plotted on the Flood Line Drawing (Appendix C) note that the flood lines are plotted based on the flood elevations given in Table 2 and the original topographic survey prepared for this site. The post-development flood line external of the site, to the east, is plotted as extending in some cases farther east into the neighbour's property than the pre-development flood line, whereas the flood elevation is actually lower than pre-development. This discrepancy is because the pre-development flood line as plotted on the drawing is as given in the prior modelling/flood line mapping rather than the site's original topographic survey.

5. Conclusions

The following conclusions are drawn from the foregoing analysis.

- The proposed development falls within the regulated TRCA floodplain associated with the Don Valley. The floodplain limits were previously established as given in a HEC-RAS analysis by Cole Engineering in 2018 which was provided to The Odan/Detech Group and which forms the basis for the post-development analysis herein.
- 2. The proposed development can be graded such that the flood line falls generally outside the subject property, or so as to provide a 10m setback from the flood line.
- 3. 28,440.2m³ of pre-development active storage flood volume requires compensation in the proposed development to maintain the hydraulic function of the floodplain. This was determined by a cut-fill analysis using Autodesk AutoCAD Civil3D.
- 4. It is proposed to re-grade the site to provide 28,723.2m³ of active flood storage volume post-development. This is greater than the pre-development active flood storage volume, therefore the TRCA's criteria for Cut-Fill Balance is satisfied.
- 5. The pre-development HEC-RAS model (Scenario 1) was modified to represent the proposed grading within the subject site thereby creating Scenario 2, post-development HEC-RAS model.
- 6. When comparing the HEC-RAS Scenario 2 (post-development) results to Scenario 1 (pre-development), it is evident that the water elevations are the same or lower than existing. It is therefore concluded that there is no additional flood impact to adjacent properties by the proposed development.
- 7. There floodplain does not impact the path of any emergency vehicles to access the site.

7. SOILS REPORT

A geotechnical study has been conducted by EXP. The report is titled "**Preliminary Geotechnical Investigation**" "**8281 Healey Road**" project number MRK-00254710-A0 dated 2019-08-12.

The underlying soils are Clayey Silt Till and Sandy Silt Till.

8. EROSION AND SEDIMENT CONTROL

Since the new construction will utilize excavation, erosion control must be utilized. Silt fence, multiple silt ponds, interception swales and rock check dams will be incorporated around the site. In order to prevent erosion use of erosion blankets, silt sacks, scarification of exposed soil and use of a sediment pond will be implemented on site at the time of construction. In addition a mud mat will be utilized at the construction entrance. A plan for erosion and sediment control will be prepared in accordance with Town, TRCA and current Erosion and Sediment Control Guidelines for Urban Development upon determining the exact development limits through the Functional Servicing and Storm Water Management stage.

9. CONCLUSIONS

From our investigation the Site is serviceable with sanitary, to be extended from Coleraine Drive and storm sewers to downstream SWM pond as well as water supply for domestic and firefighting purposes. In addition gas and hydro services are available, capacities are to be confirmed, however based on surrounding development there will be sufficient capacity available to the development from Colerain Drive. There is adequate access from Coleraine Drive to the site.

The alterations proposed to the flood plain will not alter the current floodplain elevations both on the current and adjacent development. Flood Plain volumes have been maintained or improved on.

The site is favourable for the Future Industrial Development.

10. **REFERENCES**:

- 1. Bolton Community Plan, Employment Lands and North Hill Supermarket Site, Comprehensive Environmental Impact Study and Management Plan, Phase 3 report, Aquafor Beech Limited, June 21, 2012 (Implementation).
- 2. Regional Municipality of Peel, Bolton Urban Community Water and Wastewater Analysis, AECOM, Markham office, Revision 4, Final Report, March 2010.
- 3. Storm water Management Planning and Design Manual, Ontario Ministry of the Environment, March 2003.
- Region of Peel, North Bolton Elevated Tank, "Storm Water Management Report", Project Nos. 09-1115, 09-1970, CIMA Partners, Kitchener Office, September 7, 2012.
- 5. Ritchie Bros. Auctioneers, Coleraine Drive, "Site Stormwater management calculations", Town of Caledon, Aquafor Beech Limited, July 29, 1997.
- 6. **"Town Of Caledon Development Standards, Policies and Guidelines**", Version 4, January 2009.
- 7. City of Toronto "DESIGN GUIDELINES FOR 'GREENING' SURFACE PARKING LOTS", November 2007.
- 8. New Jersey Storm Water Best Management Practices Manual, April 2004.
- 9. EPA SWMM 5, Build 5.0.022, Manual.
- 10. LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT MANUAL, 2008, by Credit Valley Conservation Authority and Toronto Region Conservation Authority.
- 11. **THE EROSION AND SEDIMENTATION CONTROL GUIDELINES FOR URBAN CONSTRUCTION** prepared by the Greater Golden Horseshoe Area Conservation Authorities.

Respectfully Submitted; The Odan Detech Group Inc.



John Krpan, M.S.C.E., P.Eng.

Mark Harris, Dipl. Tech.

DATE

APPENDIX A

Aerial Photo of Site



APPENDIX B

Concept Sanitary Sewer (Fig. SAN)



	NO.	REVISIONS	DATE	BY	PROJECT:
D FROM 9056.	1	1ST SUBMISSION	JULY 31/20	M.H.H.	
6 \$.					8281 HEALEY ROAD
					CALEDON, ONTARIO
NGS AND ARE REFERRED TO THE					CLIENT :
N ON PLAN 43R-30545,] 8281 HEALEY ROAD GP L
					c/o ONE PROPERTIES
					333 BAY ST SUITE 2710.
ARE TYPICALLY SHOWN IN METRES					TOBONTO ON M5H 2B2
G BY 0.3048.					

APPENDIX C

Concept Storm Sewer (Fig. STM) Pre & Post Development Flood Plain Mapping (Fig. FPM) Scenario 1, Pre-Development, HEC-RAS Model output Table Scenario 2, Post-Development, HEC-RAS Model output Table





242.00																					
241.00		-	+																		-
240.00		7							-												
239.00	+		+																		
238.00															238.6 237.6	6 0					
237.00																					
236.00			-				-	· ·						<u> </u>			· · ·	\neq		<u> </u>	-
235.00			_			PRO	P 3	- 1	63.27	'm 9	 75mn	nø Ci	ONC	STM	© 0.	35 % -					
234.00			_																		
520	515 5	10	50	5 5(0 4	95.4		85 /		75 4		65 4	60.4	55 /	50.4	15 1	10.1	35 /	30 1	25 1	



BOUNDARY DATA DERIVED FROM INFORMATION FROM R. AVIS SURVEYING INC.

DISTANCES AND ELEVATIONS ON THIS PLAN AR AND CAN BE CONVERTED TO FEET BY DIVIDING

	NO.	REVISIONS	DATE	ΒY	PROJECT:
) FROM 056.	1	1ST SUBMISSION	JULY 31/20	M.H.H.	
95.					8281 HEALEY ROAD
IGS AND ARE REFERRED TO THE					
UN FLAN 43R-30345,					
					333 BAY ST SUITE 2710.
RE TYPICALLY SHOWN IN METRES 5 BY 0.3048.					TORONTO, ON. M5H 2R2

FIG. STM

ENGINEER

5 1 Ni N 1 N. 6 50 Or O or APPROXIMATE FLOOD PLAIN COMPENSATION (CUT) EXISTING **DRAIN 2020** (Zd +2.06Z) 92'067×2 (Zd M. SO,ZC ເດ 00 242 201.015 FLOODPLAIN 10m SETBACK POST DEVELOPMENT FLOODPLAIN 1 241.60 741^{.610} NOTES: **BENCH MARK** ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING THE WORK THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL THE TOWN OF CALEDON BENCHMARK No. 758056. **ELEVATION** PUBLISHED ELEVATION - 251.263 metres. LIABILITY FOR DAMAGE TO THEM. THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY SITE DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS. ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK. BEARING NOTE: BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE REFERRED TO THE THIS DRAWING IS NOT TO BE SCALED. NORTHEASTERLY LIMIT OF PART 1 AS SHOWN ON PLAN 43R-30545, HAVING A BEARING OF N45°52'40"W. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, METRIC NOTE: EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY R. AVIS SURVEYING INC. KEY PLAN SUBJECT DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES BOUNDARY DATA DERIVED FROM INFORMATION FROM R. AVIS SURVEYING INC. AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048. LANDS Scale : N.T.S.



Scenario 1 Pre-Development HEC-RAS Output Table

Reach1 1561782 43.10-14 2 year 5.03 24159 242.49 242.43 242.45 0.006090 1.72 8.78 4.05 0.78 Reach1 1561782 43.10-14 10 year 18.33 241.59 242.71 242.71 242.87 0.006690 2.15 27.11 28.22 0.72 Reach1 1561782 43.10-14 25 year 23.05 241.59 242.78 242.87 242.98 0.007988 2.39 29.98 85.15 0.76 Reach1 1561782 43.10-14 50 year 88.79 241.59 242.85 242.86 243.03 0.007286 2.48 33.31 87.70 0.77 Reach1 1561782 43.10-14 600 year 88.79 241.59 242.85 242.85 242.85 242.85 242.85 240.07 243.03 0.007286 2.46 32.55 87.18 0.77 Reach1 1561.698 43.10-13 5 year 5.03 241.38 241.87 241.87 20.10 12.34 89.38	Reach	River Sta	Profile Q (m3/s)	Total	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
Reach1 1661762 43:10-14 5-year 8.77 241.59 242.49 242.43 20.680 1.72 8.78 40.59 0.66 Reach1 1661762 43:10-14 10-year 23.05 241.59 242.71 242.87 242.94 0.006680 2.75 2.71 1 82.8 0.72 Reach1 1561762 43:10-14 100-year 20.15 241.59 242.82 242.82 242.94 0.006870 2.25 27.11 82.76 0.66 Reach1 1561762 43:10-14 300-year 85.76 241.59 242.85 242.85 243.00 243.02 24.68 240.01 243.02 24.68 240.59 243.30 0.007282 2.46 33.81 67.70 0.77 Reach1 1561.688 43:10-13 Syyear 5.77 241.38 241.87 241.95 0.013038 1.75 8.41 53.80 0.88 Reach1 1561.688 43:10-13 5.year 5.03 241.38 242.07 242.18 0.016509 2.72<	Reach1	1561.762 43.10-14	2-vear	5.03	241.59	242.36	242.19	242.45	0.005013	1.35	4.7Ó	17.81	0.58
Reacht 1661762 Alor Term	Reach1	1561.762 43.10-14	5-vear	8.77	241.59	242.49	242.43	242.63	0.006099	1.72	8.78	40.59	0.66
Reach1 1561 752 43:10-14 25-year 23:05 241.59 242.78 242.78 242.82 242.94 0.000570 2.25 27.11 82.82 0.72 Reach1 1561 752 43:10-14 100-year 30.15 241.59 242.82 242.82 242.90 0.007782 2.48 33.31 87.70 0.77 Reach1 1561 752 43:10-14 500-year 68.76 241.59 242.85 242.85 243.00 0.007268 2.48 33.31 87.70 0.77 Reach1 1561 762 43:10-14 Regional 29.41 241.59 243.07 243.07 243.00 0.007266 2.46 32.55 87.18 0.77 Reach1 1561 688 43:10-13 D-year 18.77 241.38 241.87 241.95 0.015030 1.75 8.41 53.80 0.87 Reach1 1561 688 43:10-13 D-year 18.77 241.38 242.07 242.07 242.00 0.015070 2.72 22.28 83.36 1.07	Reach1	1561.762 43.10-14	10-vear	18.33	241.59	242.71	242.71	242.87	0.006680	2.15	21.21	76.11	0.72
Reach1 1567 752 750 750 761 741 50 762 741 50 761 771 771 Reach1 1561 762 43.10-14 360 770 0.77 Reach1 1561 762 43.10-14 360 770 0.77 Reach1 1561 762 43.10-14 360 778 676 676 78 676 78 676 78 676 78 77 0.77 Reach1 1561 762 43.10-14 800 24.18 241.87 241.82 242.85 243.00 0.007266 2.46 32.55 87.18 0.77 Reach1 1561 698 43.10-13 2-year 8.3 241.84 241.94 242.05 0.01507 2.10 12.34 59.38 0.97 Reach1 1561 698 43.10-13 10-year 83.3 241.28 242.11 242.21 0.01502 2.75 2.92	Reach1	1561.762 43.10-14	25-vear	23.05	241.59	242.78	242.78	242.94	0.006570	2.25	27.11	82.82	0.72
Reach1 1561 782 43.10-14 100-year 30.15 241 59 242 85 242.03 0.007282 2.48 33.31 87.70 0.77 Reach1 1561 782 43.10-14 500-year 58.76 241.59 243.01 243.00 243.00 0.008809 3.10 54.09 100.27 0.88 Reach1 1561 762 43.10-14 Regional 29.41 241.59 242.85 243.03 0.007308 1.75 8.41 53.80 0.87 Reach1 1561 898 43.10-13 5-year 8.77 241.38 241.87 241.80 0.015072 2.10 12.34 59.88 0.97 Reach1 1561 898 43.10-13 C-year 28.05 241.38 242.17 242.01 0.015072 2.10 12.34 59.88 0.97 Reach1 1561 898 43.10-13 C-year 28.05 241.38 242.12 242.11 242.23 0.015609 2.72 26.88 83.16 106 Reach1 1561 898 43.10-13 CO-year 8.76	Reach1	1561.762 43.10-14	50-year	26.61	241.59	242.82	242.82	242.99	0.007098	2.39	29.98	85.15	0.76
Peach1 1561 762 43.0-14 350.year 48.79 241 59 243.01 243.07 243.00 243.00 243.00 243.00 250.0 47.88 97.66 0.84 Reach1 1561 762 43.10-14 Regional 29.41 241.59 243.07 243.03 0.007266 2.46 32.55 87.18 0.77 Reach1 1561 698 43.10-13 5-year 8.77 241.38 241.87 241.87 241.80 0.016302 2.50 22.06 81.35 1.06 Reach1 1561 698 43.10-13 10-year 18.33 241.38 241.22 242.02 0.016302 2.59 22.26 81.35 1.06 Reach1 1561 698 43.10-13 50-year 2.61 241.38 242.12 242.12 242.18 0.016509 2.72 26.28 83.36 1.07 Reach1 1561 698 43.10-13 50-year 5.67 2.75 2.87 2.85 2.68 87.76 1.06 Reach1 1561 698 43.10-13 80-year	Reach1	1561,762,43,10-14	100-vear	30.15	241.59	242.85	242.85	243.03	0.007262	2.48	33.31	87.70	0.77
Reach1 1561 72 43:10-14 500-year 58:7 243:07 243:07 243:07 243:03 0.008809 3:10 54:09 100:27 0.88 Reach1 1561 762 43:10-14 Regional 29.41 241:59 242.85 243:07 243:03 0.007266 2.46 32:55 87.18 0.77 Reach1 1561 698 43:10-13 5-year 6.77 241:38 241:94 241:04 241:05 0.016502 2:50 22:6 83:35 1.06 Reach1 1561 698 43:10-13 5-year 22:05 241:38 242:17 242:07 242:18 0.016502 2:72 26:28 83:36 1.07 Reach1 1561 698 43:10-13 50-year 26:61 241:38 242:17 242:27 0.015252 2:75 2:86 87:76 1.06 Reach1 1561 698 43:10-13 00-year 3:76 241:38 242:47 242:39 242:49 0.0127 0.18 21:76 243:30 242:07 242:07 242:07	Reach1	1561 762 43 10-14	350-year	48 79	241 59	243.01	243.01	243.22	0.008254	2.90	47.88	97.96	0.84
Reach1 1561.762 43.10-14 Regional 29.41 241.59 242.85 243.03 0.007266 2.46 32.55 87.18 0.77 Reach1 1561.698 43.10-13 2-year 5.03 241.38 241.97 241.87 241.93 0.013038 1.75 8.41 53.80 0.88 Reach1 1561.698 43.10-13 5-year 8.77 241.38 242.07 242.18 0.016630 2.59 2.22.68 81.35 1.06 Reach1 1561.698 43.10-13 10-year 16.33 241.38 242.17 242.27 0.016525 2.75 2.972 85.15 1.05 Reach1 1561.698 43.10-13 500-year 85.76 241.38 242.23 242.30 0.01372 3.19 58.97 120.60 1.03 Reach1 1561.698 43.10-13 500-year 85.76 241.32 242.16 242.30 0.01372 3.19 58.97 120.60 1.03 Reach1	Reach1	1561 762 43 10-14	500-vear	58 76	241.59	243.07	243.07	243.30	0.008809	3 10	54 09	100 27	0.88
Reach1 1561.688 43.10-13 2-year 5.03 241.38 241.87 241.94 241.95 0.013038 1.75 8.41 53.80 0.88 Reach1 1561.688 43.10-13 5-year 8.77 241.38 241.94 241.97 241.94 0.015072 2.10 12.34 69.38 0.97 Reach1 1561.689 43.10-13 5-year 2.05 241.38 242.07 242.07 242.18 0.016503 2.59 22.26 81.35 1.06 Reach1 1561.689 43.10-13 50-year 2.05 241.38 242.12 242.14 242.27 0.015419 2.83 2.86 87.76 1.06 Reach1 1561.688 43.10-13 50-year 8.76 241.38 242.21 242.31 0.015419 2.83 2.86 87.76 1.06 Reach1 1561.698 43.10-13 50-year 8.76 241.38 242.32 242.41 242.32 242.43 0.01372 3.95 8.97 1.060 1.03 Reach1 1561.551 43.10-12 50-year 8.77 241.32 241.42 242.30	Reach1	1561 762 43 10-14	Regional	29.41	241.59	242 85	242 85	243.03	0.007266	2 46	32 55	87 18	0.00
Reach1 1561.698 43.10-13 2-year 5.03 241.87 241.87 241.95 0.013038 1.75 8.41 53.80 0.88 Reach1 1561.698 43.10-13 10-year 18.33 241.38 241.94 241.94 242.07 242.18 0.016630 2.59 22.26 81.35 1.06 Reach1 1561.698 43.10-13 50-year 28.05 241.38 242.12 242.14 242.27 0.015525 2.75 28.72 85.15 1.05 Reach1 1561.698 43.10-13 500-year 28.61 241.38 242.20 242.12 242.21 0.015525 2.75 28.72 85.15 1.06 Reach1 1561.698 43.10-13 350-year 48.76 241.38 242.20 242.23 242.49 0.014264 3.14 50.82 11.767 1.05 Reach1 1561.698 43.10-13 S00-year 58.76 241.38 242.21 242.35 0.01372 3.19 58.97 120.60 1.03 Reach1 1561.691.31.0-12 2-year 5.03 240.75 241.25 241.26 0.	Redent		rtogional	20.11	211.00	212.00	212.00	210.00	0.001200	2.10	02.00	01110	0111
Reach1 1561698 43.10-13 5-year 8.77 241.38 241.94 242.03 0.016072 2.10 12.34 59.38 0.97 Reach1 1561698 43.10-13 25-year 23.05 241.38 242.17 242.23 0.016509 2.72 26.28 83.36 1.07 Reach1 1561698 43.10-13 100-year 30.15 241.38 242.16 242.11 242.23 0.015419 2.83 32.68 87.76 1.06 Reach1 1561698 43.10-13 100-year 30.15 241.38 242.20 242.43 0.015419 2.83 32.68 87.76 1.06 Reach1 1561698 43.10-13 500-year 58.76 241.38 242.20 242.24 0.015409 2.81 32.10 87.31 1.06 Reach1 1561598 43.10-12 S-year 8.77 241.38 242.44 242.30 0.01754 0.28 23.89 130.70 0.14 Reach1 15615413.10-12 S-year 8.77 241.33 241.34 0.001918 0.40 58.28 157.36 0.16	Reach1	1561.698 43.10-13	2-year	5.03	241.38	241.87	241.87	241.95	0.013038	1.75	8.41	53.80	0.88
Reach1 1561.698 43.10-13 10-year 18.33 241.38 242.07 242.18 0.016630 2.59 22.26 81.35 1.06 Reach1 1561.698 43.10-13 50-year 26.61 241.38 242.12 242.11 242.27 0.015525 2.75 29.72 85.15 1.05 Reach1 1561.698 43.10-13 300-year 30.15 241.38 242.20 242.12 242.21 0.015525 2.75 29.72 85.15 1.05 Reach1 1561.698 43.10-13 350-year 48.79 241.38 242.27 242.38 242.49 0.014264 3.14 50.82 117.67 1.05 Reach1 1561.551 43.10-12 2-year 5.03 240.75 241.38 242.49 242.16 242.16 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 240.75 241.33 241.34 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.07 240.75 241.49 241.46 0	Reach1	1561.698 43.10-13	5-year	8.77	241.38	241.94	241.94	242.03	0.015072	2.10	12.34	59.38	0.97
Reach1 1561.698 43.10-13 25-year 23.05 241.38 242.12 242.14 242.27 0.016509 2.72 25.28 83.36 1.07 Reach1 1561.698 43.10-13 100-year 30.15 241.38 242.16 242.14 242.27 0.015252 2.75 29.72 85.15 1.05 Reach1 1561.698 43.10-13 350-year 48.79 241.38 242.37 242.32 242.49 0.014264 3.14 50.82 117.67 1.05 Reach1 1561.698 43.10-13 S00-year 88.75 241.38 242.44 242.38 242.56 0.01372 3.19 56.97 12.060 1.03 Reach1 1561.551 43.10-12 5-year 8.77 241.75 241.35 241.44 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 241.75 241.49 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 241.75 241.49 0.001918 0.40 58.28 1	Reach1	1561.698 43.10-13	10-year	18.33	241.38	242.07	242.07	242.18	0.016630	2.59	22.26	81.35	1.06
Reach1 1561.698 43.10-13 50-year 26.61 241.38 242.16 242.14 242.27 0.015252 2.75 29.72 85.15 1.05 Reach1 1561.698 43.10-13 350-year 48.79 241.38 242.20 242.42 242.42 0.015419 2.83 32.68 87.76 1.05 Reach1 1561.698 43.10-13 50-year 58.76 241.38 242.19 242.38 242.56 0.013372 3.19 58.97 120.60 1.03 Reach1 1561.698 43.10-13 S0-year 5.03 240.75 241.25 241.26 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 240.75 241.33 241.34 0.001929 0.34 34.96 143.52 0.15 Reach1 1561.551 43.10-12 10-year 18.33 240.75 241.54 241.54 0.001929 0.34 34.96 143.52 0.16 Reach1 1561.551 43.10-12 50-year 28.61 240.75 241.54 241.54 0.002168 0.47 <t< td=""><td>Reach1</td><td>1561.698 43.10-13</td><td>25-year</td><td>23.05</td><td>241.38</td><td>242.12</td><td>242.11</td><td>242.23</td><td>0.016509</td><td>2.72</td><td>26.28</td><td>83.36</td><td>1.07</td></t<>	Reach1	1561.698 43.10-13	25-year	23.05	241.38	242.12	242.11	242.23	0.016509	2.72	26.28	83.36	1.07
Reach1 1561.698 43.10-13 100-year 30.15 241.38 242.22 242.15 242.31 0.015419 2.83 32.68 87.76 1.06 Reach1 1561.698 43.10-13 500-year 58.76 241.38 242.37 242.32 242.42 0.014264 31.4 50.82 117.67 1.05 Reach1 1561.698 43.10-13 500-year 58.76 241.38 242.19 242.16 242.30 0.015409 2.81 32.10 87.31 1.06 Reach1 1561.551 43.10-12 2-year 5.03 240.75 241.33 241.44 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 2-year 8.03 240.75 241.49 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 2-year 8.03 240.75 241.54 241.49 0.0017918 0.40 58.28 157.36 0.16 Reach1 1561.551 43.10-12 50-year 30.15 240.75 241.54 0.002167 0.48 78.18 166.29 <td< td=""><td>Reach1</td><td>1561.698 43.10-13</td><td>50-year</td><td>26.61</td><td>241.38</td><td>242.16</td><td>242.14</td><td>242.27</td><td>0.015525</td><td>2.75</td><td>29.72</td><td>85.15</td><td>1.05</td></td<>	Reach1	1561.698 43.10-13	50-year	26.61	241.38	242.16	242.14	242.27	0.015525	2.75	29.72	85.15	1.05
Reach1 1561.688 43.10-13 350-year 48.79 241.38 242.37 242.32 242.49 0.014264 3.14 50.82 117.67 1.05 Reach1 1561.688 43.10-13 Regional 29.41 241.38 242.44 242.38 242.56 0.013372 3.19 58.97 120.60 1.03 Reach1 1561.551 43.10-12 2-year 5.03 240.75 241.33 241.34 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 240.75 241.33 241.49 0.001929 0.34 34.96 143.52 0.15 Reach1 1561.551 43.10-12 2-year 23.05 240.75 241.54 241.54 0.001754 0.28 28.8 17.60 0.16 Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.54 241.54 0.002168 0.47 7.200 164.61 0.18 Reach1 1561.551 43.10-12 50-year 8.76 240.75 241.62 0.002160 0.47 7.200 164.61 0	Reach1	1561.698 43.10-13	100-year	30.15	241.38	242.20	242.15	242.31	0.015419	2.83	32.68	87.76	1.06
Reach1 1561.698 43.10-13 500-year 58.76 241.38 242.44 242.38 242.36 0.013372 3.19 58.97 120.60 1.03 Reach1 1561.698 43.10-13 Regional 29.41 241.38 242.16 242.30 0.015409 2.81 32.10 87.31 1.06 Reach1 1561.551 43.10-12 2-year 5.03 240.75 241.34 0.001918 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 10-year 18.33 240.75 241.34 0.001918 0.40 58.28 157.36 0.16 Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.57 241.58 0.002168 0.47 72.00 164.61 0.18 Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.76 241.76 241.78 0.002350 0.57 104.32 172.81 0.19 Reach1 1561.551 43.10-12 300-year 88.76 240.75 241.84 241.85 0.002371 0.60 117.38 175.36	Reach1	1561.698 43.10-13	350-year	48.79	241.38	242.37	242.32	242.49	0.014264	3.14	50.82	117.67	1.05
Reach1 1561.698 43.10-13 Regional 29.41 241.38 242.19 242.30 0.015409 2.81 32.10 87.31 1.06 Reach1 1561.551 43.10-12 2-year 5.03 240.75 241.25 241.34 0.001754 0.28 23.89 130.70 0.14 Reach1 1561.551 43.10-12 5-year 8.77 240.75 241.33 241.34 0.001929 0.34 34.96 143.52 0.15 Reach1 1561.551 43.10-12 25-year 23.05 240.75 241.57 241.54 0.002102 0.44 66.11 163.05 0.17 Reach1 1561.551 43.10-12 30-year 26.61 241.75 241.64 241.78 0.002167 0.48 78.18 166.29 0.18 Reach1 1561.551 43.10-12 30-year 48.79 240.75 241.76 241.78 0.002350 0.57 104.32 172.81 0.19 Reach1 1561.551 43.10-12 S0-year 48.79 240.75 241.86 0.002371 0.60 117.38 175.36 0.19 Re	Reach1	1561.698 43.10-13	500-year	58.76	241.38	242.44	242.38	242.56	0.013372	3.19	58.97	120.60	1.03
Reach11561.551 43.10.122-year5.03240.75241.25241.260.0017540.2823.89130.700.14Reach11561.551 43.10.1210-year8.77240.75241.33241.490.0019180.4058.28157.360.16Reach11561.551 43.10.1210-year18.33240.75241.54241.490.0019180.4058.28157.360.16Reach11561.551 43.10.1250-year26.61240.75241.54241.540.0021020.4466.11163.050.17Reach11561.551 43.10.12100-year30.15240.75241.67241.620.0021670.4878.18166.290.18Reach11561.551 43.10.12100-year30.15240.75241.76241.780.0023500.57104.32172.810.19Reach11561.551 43.10.12350-year48.79240.75241.60241.610.0023710.60117.38175.360.19Reach11561.551 43.10.12Regional29.41240.75241.60240.97240.850.005771.507.4369.820.61Reach11561.404 43.10.112-year 5.03239.94240.75240.75240.860.0057591.63162.591.680.66Reach11561.404 43.10.112-year 7.239.94240.75240.75240.850.0057071.507.4369.820.61Reach11561.404 43.10.112-year 7	Reach1	1561.698 43.10-13	Regional	29.41	241.38	242.19	242.16	242.30	0.015409	2.81	32.10	87.31	1.06
Reach11561.551 43.10-125-year8.77240.75241.33241.340.0019290.3434.96143.520.15Reach11561.551 43.10-1210-year18.33240.75241.49241.490.0019180.4058.28157.360.16Reach11561.551 43.10-1225-year23.05240.75241.54241.540.0021020.4466.11163.050.17Reach11561.551 43.10-1250-year26.61240.75241.67241.580.0021670.4878.18166.290.18Reach11561.551 43.10-12350-year48.79240.75241.76241.780.0023710.60117.38175.360.19Reach11561.551 43.10-12500-year58.76240.75241.60241.610.0021720.4876.83165.840.19Reach11561.551 43.10-12Regional29.41240.75241.60240.850.0057071.507.4369.820.61Reach11561.404 43.10-112-year5.03239.94240.75240.09241.990.0054591.63162.591.680.61Reach11561.404 43.10-112-year8.77239.94240.86240.97241.990.0054591.6316.2591.680.61Reach11561.404 43.10-112-year8.77239.94241.06240.97241.990.0054591.6316.2591.680.66Reach11561.404 43.10-1120-year <td>Reach1</td> <td>1561.551 43.10-12</td> <td>2-year</td> <td>5.03</td> <td>240.75</td> <td>241.25</td> <td></td> <td>241.26</td> <td>0.001754</td> <td>0.28</td> <td>23.89</td> <td>130.70</td> <td>0.14</td>	Reach1	1561.551 43.10-12	2-year	5.03	240.75	241.25		241.26	0.001754	0.28	23.89	130.70	0.14
Reach1 1561.551 43.10-12 10-year 18.33 240.75 241.49 241.49 0.001918 0.40 58.28 157.36 0.16 Reach1 1561.551 43.10-12 50-year 23.05 240.75 241.54 241.54 0.002102 0.44 66.11 163.05 0.17 Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.57 241.58 0.002168 0.47 72.00 164.61 0.18 Reach1 1561.551 43.10-12 350-year 48.79 240.75 241.61 241.62 0.002167 0.48 78.18 166.29 0.18 Reach1 1561.551 43.10-12 350-year 48.76 240.75 241.84 241.85 0.002371 0.60 117.38 175.86 0.19 Reach1 1561.404 43.10-11 Regional 23.9.94 240.75 240.85 0.005707 1.50 7.43 69.82 0.61 Reach1 1561.404 43.10-11 5-year 8.77 23.9.94 241.06 240.97 241.99 0.006302 1.98 30.76 114.96 0.68	Reach1	1561.551 43.10-12	5-year	8.77	240.75	241.33		241.34	0.001929	0.34	34.96	143.52	0.15
Reach1 1561.551 43.10-12 25-year 23.05 240.75 241.54 241.54 0.002102 0.44 66.11 163.05 0.17 Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.57 241.58 0.002168 0.47 72.00 164.61 0.18 Reach1 1561.551 43.10-12 350-year 48.79 240.75 241.76 241.78 0.002350 0.57 104.32 172.81 0.19 Reach1 1561.551 43.10-12 500-year 58.76 240.75 241.60 241.78 0.002371 0.60 117.38 175.36 0.19 Reach1 1561.551 43.10-12 Regional 29.41 240.75 241.60 240.85 0.002371 0.60 117.38 175.36 0.19 Reach1 1561.404 43.10-11 2-year 5.03 239.94 240.75 240.85 0.005707 1.50 7.43 69.82 0.61 Reach1 1561.404 43.10-11 10-year 18.33 239.94 241.00 240.97 240.94 0.005459 1.63 16.25 91.68 0.61	Reach1	1561.551 43.10-12	10-year	18.33	240.75	241.49		241.49	0.001918	0.40	58.28	157.36	0.16
Reach1 1561.551 43.10-12 50-year 26.61 240.75 241.57 241.58 0.002168 0.47 72.00 164.61 0.18 Reach1 1561.551 43.10-12 100-year 30.15 240.75 241.61 241.62 0.002167 0.48 78.18 166.29 0.18 Reach1 1561.551 43.10-12 350-year 48.79 240.75 241.76 241.78 0.002371 0.60 117.38 175.36 0.19 Reach1 1561.551 43.10-12 Regional 29.41 240.75 241.60 241.61 0.002172 0.48 76.83 165.84 0.19 Reach1 1561.404 43.10-11 2-year 5.03 239.94 240.75 240.85 0.005707 1.50 7.43 69.82 0.61 Reach1 1561.404 43.10-11 5-year 8.77 239.94 240.86 240.97 241.61 0.005459 1.63 16.25 91.68 0.61 Reach1 1561.404 43.10-11 10-year 18.33 239.94 241.00 240.97 241.08 240.95 1.63 16.25 91.68 0.61	Reach1	1561.551 43.10-12	25-year	23.05	240.75	241.54		241.54	0.002102	0.44	66.11	163.05	0.17
Reach11561.551 43.10-12100-year30.15240.75241.61241.620.0021670.4878.18166.290.18Reach11561.551 43.10-12350-year48.79240.75241.76241.780.0023500.57104.32172.810.19Reach11561.551 43.10-12500-year58.76240.75241.84241.850.0023710.60117.38175.360.19Reach11561.551 43.10-12Regional29.41240.75241.60241.610.0021720.4876.83165.840.18Reach11561.404 43.10-112-year 5.03239.94240.75240.75240.86240.940.0054591.6316.2591.680.61Reach11561.404 43.10-115-year 8.77239.94240.75240.97241.00240.97241.990.0063021.9830.76114.960.68Reach11561.404 43.10-110-year18.33239.94241.00240.97241.140.0058642.0038.09119.860.66Reach11561.404 43.10-1125-year23.05239.94241.105241.180.0055662.0143.52122.580.65Reach11561.404 43.10-1150-year26.61239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-1150-year26.61239.94241.12241.062.0778.55183.750.60	Reach1	1561.551 43.10-12	50-year	26.61	240.75	241.57		241.58	0.002168	0.47	72.00	164.61	0.18
Reach11561.551 43.10-12350-year48.79240.75241.76241.780.0023500.57104.32172.810.19Reach11561.551 43.10-12500-year58.76240.75241.84241.850.0023710.60117.38175.360.19Reach11561.551 43.10-12Regional29.41240.75241.60241.610.0021720.4876.83165.840.18Reach11561.404 43.10-112-year 5.03239.94240.75240.75240.850.0057071.507.4369.820.61Reach11561.404 43.10-115-year 8.77239.94240.75240.75240.940.0054591.6316.2591.680.61Reach11561.404 43.10-1110-year18.33239.94241.00240.97241.090.0063021.9830.76114.960.68Reach11561.404 43.10-1125-year23.05239.94241.106240.99241.140.0058642.0038.09119.860.66Reach11561.404 43.10-1150-year26.61239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-11350-year36.76239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-11350-year86.76239.94241.12241.480.0041762.1097.32228.930.59 <td>Reach1</td> <td>1561.551 43.10-12</td> <td>100-year</td> <td>30.15</td> <td>240.75</td> <td>241.61</td> <td></td> <td>241.62</td> <td>0.002167</td> <td>0.48</td> <td>78.18</td> <td>166.29</td> <td>0.18</td>	Reach1	1561.551 43.10-12	100-year	30.15	240.75	241.61		241.62	0.002167	0.48	78.18	166.29	0.18
Reach11561.551 43.10-12500-year Regional58.76 29.41240.75 240.75241.84 241.60241.85 241.600.002371 0.600.60 117.38175.36 165.840.19 0.18Reach11561.551 43.10-122-year 5.03 29.94239.94 240.75240.75 240.75241.60241.81 240.750.002371 241.610.60 0.002172117.38 0.48175.36 76.830.19 165.84Reach11561.404 43.10-112-year 5.03 29.94239.94 240.86240.75 240.86240.86 240.940.005459 0.0054591.63 1.6316.25 16.2591.68 91.680.61 0.68Reach11561.404 43.10-11 	Reach1	1561.551 43.10-12	350-year	48.79	240.75	241.76		241.78	0.002350	0.57	104.32	172.81	0.19
Reach11561.551 43.10-12Regional29.41240.75241.60241.610.0021720.4876.83165.840.18Reach11561.404 43.10-112-year 5.03239.94240.75240.75240.75240.850.0057071.507.4369.820.61Reach11561.404 43.10-115-year 8.77239.94240.86240.97240.97240.940.0054591.6316.2591.680.61Reach11561.404 43.10-1110-year18.33239.94241.00240.97241.090.0063021.9830.76114.960.68Reach11561.404 43.10-1125-year23.05239.94241.06240.99241.140.0058442.0038.09119.860.66Reach11561.404 43.10-1150-year26.61239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-11350-year48.79239.94241.33241.19241.400.0044602.0778.55183.750.60Reach11561.404 43.10-11350-year58.76239.94241.42241.24241.480.0041762.1097.32228.930.59Reach11561.404 43.10-11Regional29.41239.94241.14241.07241.220.0053482.0248.49137.330.64Reach11561.404 43.10-11Regional29.41239.94241.42241.24241.48 <td>Reach1</td> <td>1561.551 43.10-12</td> <td>500-year</td> <td>58.76</td> <td>240.75</td> <td>241.84</td> <td></td> <td>241.85</td> <td>0.002371</td> <td>0.60</td> <td>117.38</td> <td>175.36</td> <td>0.19</td>	Reach1	1561.551 43.10-12	500-year	58.76	240.75	241.84		241.85	0.002371	0.60	117.38	175.36	0.19
Reach11561.404 43.10-112-year 5.03239.94240.75240.75240.75240.850.0057071.507.4369.820.61Reach11561.404 43.10-115-year 8.77239.94240.86240.86240.97241.090.0054591.6316.2591.680.61Reach11561.404 43.10-1110-year18.33239.94241.00240.97241.090.0063021.9830.76114.960.68Reach11561.404 43.10-1125-year23.05239.94241.06240.99241.140.0058842.0038.09119.860.66Reach11561.404 43.10-1150-year26.61239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-11350-year48.79239.94241.42241.400.0044602.0778.55183.750.60Reach11561.404 43.10-11500-year58.76239.94241.42241.24241.480.0041762.1097.32228.930.59Reach11561.404 43.10-11Regional29.41239.94241.14241.07241.220.0053482.0248.49137.330.64Reach11561.256 43.10-102-year 5.03239.10239.85239.61239.870.0073220.689.8940.730.30Reach11561.256 43.10-105-year 8.77239.10240.01239.73240.030.0057490	Reach1	1561.551 43.10-12	Regional	29.41	240.75	241.60		241.61	0.002172	0.48	76.83	165.84	0.18
Reach1 1561.404 43.10-11 5-year 8.77 239.94 240.86 240.94 0.005459 1.63 16.25 91.68 0.61 Reach1 1561.404 43.10-11 10-year 18.33 239.94 241.00 240.97 241.09 0.006302 1.98 30.76 114.96 0.68 Reach1 1561.404 43.10-11 25-year 23.05 239.94 241.06 240.99 241.14 0.005884 2.00 38.09 119.86 0.66 Reach1 1561.404 43.10-11 50-year 26.61 239.94 241.15 241.08 241.22 0.005434 2.04 49.13 137.47 0.65 Reach1 1561.404 43.10-11 100-year 30.15 239.94 241.33 241.22 0.005434 2.04 49.13 137.47 0.65 Reach1 1561.404 43.10-11 350-year 48.79 239.94 241.42 241.40 0.004460 2.07 78.55 183.75 0.60 Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 <td>Reach1</td> <td>1561.404 43.10-11</td> <td>2-year 5.03</td> <td>239.94</td> <td>240.75</td> <td>240.75</td> <td></td> <td>240.85</td> <td>0.005707</td> <td>1.50</td> <td>7.43</td> <td>69.82</td> <td>0.61</td>	Reach1	1561.404 43.10-11	2-year 5.03	239.94	240.75	240.75		240.85	0.005707	1.50	7.43	69.82	0.61
Reach1 1561.404 43.10-11 10-year 18.33 239.94 241.00 240.97 241.09 0.006302 1.98 30.76 114.96 0.68 Reach1 1561.404 43.10-11 25-year 23.05 239.94 241.06 240.99 241.14 0.005884 2.00 38.09 119.86 0.66 Reach1 1561.404 43.10-11 50-year 26.61 239.94 241.11 241.05 241.18 0.005566 2.01 43.52 122.58 0.65 Reach1 1561.404 43.10-11 100-year 30.15 239.94 241.15 241.08 241.22 0.005434 2.04 49.13 137.47 0.65 Reach1 1561.404 43.10-11 350-year 48.79 239.94 241.33 241.19 241.40 0.004460 2.07 78.55 183.75 0.60 Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 97.32 228.93 0.59 Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14	Reach1	1561.404 43.10-11	5-year 8.77	239.94	240.86	240.86		240.94	0.005459	1.63	16.25	91.68	0.61
Reach11561.404 43.10-1125-year23.05239.94241.06240.99241.140.0058842.0038.09119.860.66Reach11561.404 43.10-1150-year26.61239.94241.11241.05241.180.0055662.0143.52122.580.65Reach11561.404 43.10-11100-year30.15239.94241.15241.08241.220.0054342.0449.13137.470.65Reach11561.404 43.10-11350-year48.79239.94241.33241.19241.400.0044602.0778.55183.750.60Reach11561.404 43.10-11500-year58.76239.94241.42241.24241.480.0041762.1097.32228.930.59Reach11561.404 43.10-11Regional29.41239.94241.14241.07241.220.0053482.0248.49137.330.64Reach11561.256 43.10-102-year 5.03239.10239.85239.61239.870.0073220.689.8940.730.30Reach11561.256 43.10-105-year 8.77239.10240.01239.73240.030.0057490.7117.3653.590.28	Reach1	1561.404 43.10-11	10-year	18.33	239.94	241.00	240.97	241.09	0.006302	1.98	30.76	114.96	0.68
Reach1 1561.404 43.10-11 50-year 26.61 239.94 241.11 241.05 241.18 0.005566 2.01 43.52 122.58 0.65 Reach1 1561.404 43.10-11 100-year 30.15 239.94 241.15 241.08 241.22 0.005434 2.04 49.13 137.47 0.65 Reach1 1561.404 43.10-11 350-year 48.79 239.94 241.33 241.19 241.40 0.004460 2.07 78.55 183.75 0.60 Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 97.32 228.93 0.59 Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14 241.07 241.22 0.005348 2.02 48.49 137.33 0.64 Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.	Reach1	1561.404 43.10-11	25-year	23.05	239.94	241.06	240.99	241.14	0.005884	2.00	38.09	119.86	0.66
Reach1 1561.404 43.10-11 100-year 30.15 239.94 241.15 241.08 241.22 0.005434 2.04 49.13 137.47 0.65 Reach1 1561.404 43.10-11 350-year 48.79 239.94 241.33 241.19 241.40 0.004460 2.07 78.55 183.75 0.60 Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 97.32 228.93 0.59 Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14 241.07 241.22 0.005348 2.02 48.49 137.33 0.64 Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 0.71 17.36 53.59 0.28	Reach1	1561.404 43.10-11	50-year	26.61	239.94	241.11	241.05	241.18	0.005566	2.01	43.52	122.58	0.65
Reach1 1561.404 43.10-11 350-year 48.79 239.94 241.33 241.19 241.40 0.004460 2.07 78.55 183.75 0.60 Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 97.32 228.93 0.59 Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14 241.07 241.22 0.005348 2.02 48.49 137.33 0.64 Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 <	Reach1	1561.404 43.10-11	100-vear	30.15	239.94	241.15	241.08	241.22	0.005434	2.04	49.13	137.47	0.65
Reach1 1561.404 43.10-11 500-year 58.76 239.94 241.42 241.24 241.48 0.004176 2.10 97.32 228.93 0.59 Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14 241.07 241.22 0.005348 2.02 48.49 137.33 0.64 Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 0.71 17.36 53.59 0.28	Reach1	1561.404 43.10-11	350-vear	48.79	239.94	241.33	241.19	241.40	0.004460	2.07	78.55	183.75	0.60
Reach1 1561.404 43.10-11 Regional 29.41 239.94 241.14 241.07 241.22 0.005348 2.02 48.49 137.33 0.64 Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 0.71 17.36 53.59 0.28	Reach1	1561.404 43.10-11	500-vear	58.76	239.94	241.42	241.24	241.48	0.004176	2.10	97.32	228.93	0.59
Reach1 1561.256 43.10-10 2-year 5.03 239.10 239.85 239.61 239.87 0.007322 0.68 9.89 40.73 0.30 Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 0.71 17.36 53.59 0.28	Reach1	1561.404 43.10-11	Regional	29.41	239.94	241.14	241.07	241.22	0.005348	2.02	48.49	137.33	0.64
Reach1 1561.256 43.10-10 5-year 8.77 239.10 240.01 239.73 240.03 0.005749 0.71 17.36 53.59 0.28	Reach1	1561.256 43.10-10	2-vear 5.03	239,10	239.85	239.61		239.87	0.007322	0.68	9.89	40.73	0.30
	Reach1	1561.256 43.10-10	5-year 8.77	239.10	240.01	239.73		240.03	0.005749	0.71	17.36	53.59	0.28

Reach1	1561.256 43.10-10	10-year	18.33	239.10	240.27	239.91	240.29	0.004508	0.78	33.64
Reach1	1561.256 43.10-10	25-year	23.05	239.10	240.37	239.97	240.39	0.004244	0.81	41.16
Reach1	1561.256 43.10-10	50-year	26.61	239.10	240.44	240.00	240.46	0.004153	0.84	47.06
Reach1	1561.256 43.10-10	100-year	30.15	239.10	240.50	240.04	240.52	0.004014	0.86	52.83
Reach1	1561.256 43.10-10	350-year	48.79	239.10	240.75	240.18	240.77	0.003812	0.95	78.77
Reach1	1561.256 43.10-10	500-year	58.76	239.10	240.86	240.23	240.88	0.003817	1.00	108.98
Reach1	1561.256 43.10-10	Regional	29.41	239.10	240.49	240.03	240.51	0.004061	0.86	51.60
Reach1	1561 120 43 10-09	2-vear	5.03	238 71	230 38	230 00	230 30	0 002123	0.40	13 31
Reach1	1561 120 43 10-09	5-vear	8 77	238 71	230.50	230.00	230.53	0.002125	0.40	18.01
Reach1	1561 120 43 10-09	10-vear	18 33	238 71	239.75	239.17	239.55	0.002000	0.68	29 15
Reach1	1561 120 43 10-09	25-vear	23.05	238 71	239.84	239.38	239.87	0.003395	0.00	23.10
Reach1	1561 120 43 10-09	50-year	26.61	238.71	239.04	239.30	233.07	0.003333	0.75	37.21
Reach1	1561 120 43 10-09	100-year	20.01	230.71	239.91	239.41	239.93	0.003470	0.73	JO 34
Reach1	1561 120 43 10-09	350-year	18 70	230.71	239.90	239.45	239.99	0.003032	0.00	40.34 67.05
Reach1	1561 120 43 10 00	500 year	40.79 59.76	230.71	240.20	239.02	240.22	0.004050	0.99	07.0J 92.75
Reach1	1561.120.43.10-09	Dogional	20.70	230.71	240.29	239.09	240.32	0.004009	1.04	03.75
Reaction	1501.120 45.10-09	Regional	29.41	230.71	239.90	239.43	239.90	0.003649	0.03	39.52
Reach1	1560.977 43.10-08	2-year	5.03	238.47	238.92	238.76	238.92	0.005948	0.40	13.08
Reach1	1560.977 43.10-08	5-year	8.77	238.47	239.00	238.82	239.01	0.006028	0.48	18.79
Reach1	1560.977 43.10-08	10-year	18.33	238.47	239.16	238.91	239.18	0.006155	0.63	30.19
Reach1	1560.977 43.10-08	25-year	23.05	238.47	239.23	238.94	239.25	0.006170	0.68	35.04
Reach1	1560.977 43.10-08	50-year	26.61	238.47	239.27	238.97	239.30	0.006201	0.71	38.52
Reach1	1560.977 43.10-08	100-year	30.15	238.47	239.32	238.99	239.35	0.006153	0.75	42.42
Reach1	1560.977 43.10-08	350-year	48.79	238.47	239.51	239.11	239.55	0.006329	0.90	60.14
Reach1	1560.977 43.10-08	500-year	58.76	238.47	239.60	239.15	239.64	0.006389	0.96	71.04
Reach1	1560.977 43.10-08	Regional	29.41	238.47	239.31	238.99	239.33	0.006129	0.74	41.39
Reach1	1560.820 43.10-07	2-vear	5.03	237.72	238.07		238.08	0.005295	0.43	11.51
Reach1	1560.820 43.10-07	5-vear	8.77	237.72	238.17		238.18	0.005112	0.50	18.29
Reach1	1560.820 43.10-07	10-vear	18.33	237.72	238.35		238.37	0.004904	0.62	32.52
Reach1	1560 820 43 10-07	25-vear	23.05	237 72	238 42		238 44	0.004830	0.67	38 55
Reach1	1560 820 43 10-07	50-year	26.60	237 72	238 47		238 49	0.004768	0.69	42 80
Reach1	1560 820 43 10-07	100-vear	30.15	237 72	238 51		238 53	0.004782	0.00	46 78
Reach1	1560 820 43 10-07	350-vear	48 79	237 72	238 71		238 74	0.004641	0.83	66 45
Reach1	1560 820 43 10-07	500-vear	58 76	237 72	238.80		238.83	0.004611	0.88	75 92
Reach1	1560 820 43 10-07	Begional	20.70	237.72	238 50		238.53	0.004011	0.00	16.00
Reactin	1300.020 43.10-07	Regional	23.41	201.12	230.30		200.00	0.004771	0.72	40.00
Reach1	1560.680 43.10-06	2-year	5.03	236.40	237.18	237.07	237.20	0.008013	0.69	8.80
Reach1	1560.680 43.10-06	5-year	8.77	236.40	237.28	237.12	237.31	0.007935	0.76	12.69
Reach1	1560.680 43.10-06	10-year	18.33	236.40	237.48		237.52	0.007829	0.85	21.17
Reach1	1560.680 43.10-06	25-year	23.05	236.40	237.56		237.60	0.007774	0.91	24.83
Reach1	1560.680 43.10-06	50-year	26.61	236.40	237.61		237.66	0.007680	0.94	27.64
Reach1	1560.680 43.10-06	100-year	30.15	236.40	237.67		237.72	0.007436	0.97	30.57
Reach1	1560.680 43.10-06	350-year	48.79	236.40	237.90		237.97	0.006937	1.10	44.94
Reach1	1560.680 43.10-06	500-year	58.76	236.40	238.02		238.08	0.006524	1.13	53.07

71.37	0.26
78.96	0.25
87.59	0.25
94.02	0.25
116.03	0.25
216.44	0.26
93.28	0.25
36.85	0.17
40.82	0.19
49.65	0.22
52.81	0.23
54.88	0.24
58.70	0.25
159.29	0.27
181.91	0.27
57.42	0.25
62.40	0.25
68.10	0.26
74.14	0.29
76.56	0.29
78.82	0.29
84.24	0.29
110.25	0.31
137.36	0.32
81.34	0.29
54.74	0.24
76.21	0.25
83.70	0.26
88.47	0.26
90.58	0.26
93.94	0.26
105.70	0.27
109.20	0.27
93.57	0.27
36.88	0.31
37.78	0.32
46.26	0.33
50.56	0.33
53.34	0.33
55.74	0.33
67.95	0.33
73.72	0.33

Reach1	1560.680 43.10-06	Regional	29.41	236.40	237.65		237.70	0.007532	0.96	29.89
Reach1	1560.547 43.10-05	2-year	5.03	235.53	236.02		236.09	0.008492	1.46	7.25
Reach1	1560.547 43.10-05	5-year	8.77	235.53	236.15		236.23	0.007958	1.69	11.27
Reach1	1560.547 43.10-05	10-year	18.33	235.53	236.39		236.49	0.007402	2.08	19.85
Reach1	1560.547 43.10-05	25-year	23.05	235.53	236.49		236.60	0.007011	2.19	23.78
Reach1	1560.547 43.10-05	50-year	26.61	235.53	236.56		236.68	0.006878	2.28	26.67
Reach1	1560.547 43.10-05	100-year	30.15	235.53	236.62		236.75	0.006802	2.37	29.29
Reach1	1560.547 43.10-05	350-year	48.79	235.53	236.91		237.07	0.006491	2.74	42.74
Reach1	1560.547 43.10-05	500-year	58.76	235.53	237.04		237.22	0.006416	2.90	49.42
Reach1	1560.547 43.10-05	Regional	29.41	235.53	236.61		236.74	0.006724	2.34	28.89
Reach1	1560.383 43.10-04	2-year	5.03	234.60	235.23		235.24	0.003570	0.50	10.64
Reach1	1560.383 43.10-04	5-year	8.77	234.60	235.37		235.39	0.003666	0.59	15.67
Reach1	1560.383 43.10-04	10-year	18.33	234.60	235.64		235.66	0.003789	0.75	26.18
Reach1	1560.383 43.10-04	25-year	23.05	234.60	235.73		235.76	0.004021	0.82	30.09
Reach1	1560.383 43.10-04	50-year	26.61	234.60	235.79		235.83	0.004111	0.86	33.01
Reach1	1560.383 43.10-04	100-year	30.15	234.60	235.86		235.90	0.004160	0.90	35.92
Reach1	1560.383 43.10-04	350-year	48.79	234.60	236.11		236.17	0.004724	1.09	48.35
Reach1	1560.383 43.10-04	500-year	58.76	234.60	236.24		236.30	0.004838	1.17	54.81
Reach1	1560.383 43.10-04	Regional	29.41	234.60	235.83		235.87	0.004290	0.90	34.89
Reach1	1560.237 43.10-03	2-year	5.03	233.85	234.32	234.31	234.40	0.011102	1.44	6.31
Reach1	1560.237 43.10-03	5-year	8.77	233.85	234.40	234.39	234.51	0.012228	1.76	9.52
Reach1	1560.237 43.10-03	10-year	18.33	233.85	234.56	234.53	234.72	0.013710	2.30	15.81
Reach1	1560.237 43.10-03	25-year	23.05	233.85	234.64	234.60	234.81	0.012709	2.41	19.13
Reach1	1560.237 43.10-03	50-year	26.61	233.85	234.69	234.63	234.87	0.012394	2.51	21.50
Reach1	1560.237 43.10-03	100-year	30.15	233.85	234.74	234.69	234.93	0.012169	2.59	23.70
Reach1	1560.237 43.10-03	350-year	48.79	233.85	234.98	234.87	235.20	0.010219	2.87	35.85
Reach1	1560.237 43.10-03	500-year	58.76	233.85	235.09	234.97	235.33	0.009842	3.02	41.60
Reach1	1560.237 43.10-03	Regional	29.41	233.85	234.75	234.68	234.92	0.011039	2.49	24.11
Reach1	1560.111 43.10-02	2-year	5.03	232.29	233.12		233.14	0.008922	0.86	9.42
Reach1	1560.111 43.10-02	5-year	8.77	232.29	233.26		233.28	0.007738	0.91	14.34
Reach1	1560.111 43.10-02	10-year	18.33	232.29	233.53		233.56	0.006404	1.00	24.65
Reach1	1560.111 43.10-02	25-year	23.05	232.29	233.63		233.66	0.006537	1.08	28.56
Reach1	1560.111 43.10-02	50-year	26.61	232.29	233.70		233.73	0.006611	1.12	31.40
Reach1	1560.111 43.10-02	100-year	30.15	232.29	233.77		233.81	0.006492	1.16	34.44
Reach1	1560.111 43.10-02	350-year	48.79	232.29	234.01		234.07	0.007510	1.40	45.68
Reach1	1560.111 43.10-02	500-year	58.76	232.29	234.15		234.22	0.007459	1.47	52.45
Reach1	1560.111 43.10-02	Regional	29.41	232.29	233.71		233.75	0.007678	1.22	31.95
Reach1	1560.000 43.10-01	2-year	5.03	231.96	232.38		232.41	0.005163	1.14	9.74
Reach1	1560.000 43.10-01	5-year	8.77	231.96	232.50		232.54	0.006091	1.45	13.40
Reach1	1560.000 43.10-01	10-year	18.33	231.96	232.71		232.79	0.007711	2.04	20.98
Reach1	1560.000 43.10-01	25-year	23.05	231.96	232.80		232.89	0.007758	2.22	24.74

55.19	0.33
29.02	0.72
32.88	0.73
38.62	0.75
39.98	0.74
41.96	0.75
43.08	0.75
49.65	0.77
52.89	0.77
42.95	0.75
32.80	0.22
36.42	0.23
42.35	0.24
43.83	0.25
44.82	0.26
46.09	0.26
50.94	0.29
53.31	0.30
45.62	0.27
37.02	0.80
38.87	0.87
42.23	0.95
43.39	0.95
45.19	0.95
46.31	0.95
52.20	0.92
54.59	0.92
46.54	0.91
34.45	0.34
36.51	0.33
39.55	0.31
41.13	0.32
42.35	0.32
43.62	0.32
47.85	0.36
50.85	0.36
42.59	0.35
31.10	0.56
33.15	0.64
39.25	0.76
41.79	0.78

Reach1	1560.000 43.10-01	50-year	26.61	231.96	232.86	232.96	0.007659	2.32	27.50
Reach1	1560.000 43.10-01	100-year	30.15	231.96	232.91	233.02	0.008063	2.46	29.47
Reach1	1560.000 43.10-01	350-year	48.79	231.96	233.37	233.46	0.004367	2.36	52.80
Reach1	1560.000 43.10-01	500-year	58.76	231.96	233.54	233.63	0.003992	2.43	62.46
Reach1	1560.000 43.10-01	Regional	29.41	231.96	233.05	233.12	0.004533	2.02	36.05

43.07	0.78
43.88	0.81
55.86	0.64
59.52	0.62
48.49	0.62

Scenario 2 Post-Development HEC-RAS Output Table

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. (m)	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
Reach1	1561.762 43.10-14	2-vear	5.03	241.59	242.36	242.19		242.45	0.005019	1.35	4.7Ó	17.80	0.58
Reach1	1561.762 43.10-14	5-vear	8.77	241.59	242.49	242.43		242.63	0.006103	1.72	8.77	40.58	0.66
Reach1	1561.762 43.10-14	10-vear	18.33	241.59	242.71	242.71		242.87	0.006672	2.15	21.23	76.12	0.72
Reach1	1561.762 43.10-14	25-vear	23.05	241.59	242.77	242.77		242.94	0.007086	2.31	26.11	81.86	0.75
Reach1	1561.762.43.10-14	50-year	26.61	241.59	242.82	242.81		242.99	0.007149	2.39	29.88	85.07	0.76
Reach1	1561 762 43 10-14	100-vear	30 15	241 59	242.86	242 85		243.03	0.007057	2 45	33 74	87.97	0.76
Reach1	1561 762 43 10-14	350-year	48 79	241 59	243.03	243.00		243 22	0.007471	2 79	49.85	98 79	0.80
Reach1	1561 762 43 10-14	500-vear	58 76	241 59	243 10	243.07		243 30	0.007892	2.70	56 51	101 41	0.83
Reach1	1561 762 43 10-14	Regional	29 41	241.50	243.10	240.07		243.00	0.007313	2.57	32.46	87 10	0.00
Redent	1301.702 43.10 14	Regional	20.41	241.00	242.04	272.07		240.00	0.007010	2.77	52.40	07.10	0.11
Reach1	1561.698 43.10-13	2-year	5.03	241.38	241.87	241.87		241.95	0.013038	1.75	8.41	53.80	0.88
Reach1	1561.698 43.10-13	5-year	8.77	241.38	241.94	241.94		242.03	0.015048	2.10	12.35	59.40	0.97
Reach1	1561.698 43.10-13	10-year	18.33	241.38	242.08	242.08		242.18	0.015871	2.55	22.63	81.47	1.04
Reach1	1561.698 43.10-13	25-year	23.05	241.38	242.11	242.11		242.23	0.019076	2.88	24.93	82.44	1.15
Reach1	1561.698 43.10-13	50-year	26.61	241.38	242.14	242.14		242.27	0.019690	3.01	27.34	83.96	1.18
Reach1	1561.698 43.10-13	100-year	30.15	241.38	242.16	242.15		242.30	0.021394	3.20	28.97	84.65	1.23
Reach1	1561.698 43.10-13	350-year	48.79	241.38	242.32	242.32		242.48	0.020298	3.58	44.22	110.54	1.24
Reach1	1561.698 43.10-13	500-year	58.76	241.38	242.39	242.38		242.54	0.018886	3.65	52.43	118.29	1.22
Reach1	1561.698 43.10-13	Regional	29.41	241.38	242.16	242.16		242.29	0.019419	3.06	29.45	84.90	1.18
Reach1	1561.551 43.10-12	2-year	5.03	240.75	241.00	241.02			0.002500	0.18	9.50	41.54	0.15
Reach1	1561.551 43.10-12	5-year	8.77	240.75	241.12	241.14			0.002342	0.25	15.70	61.70	0.15
Reach1	1561.551 43.10-12	10-year	18.33	240.75	241.31	241.33			0.002356	0.36	32.08	107.03	0.17
Reach1	1561.551 43.10-12	25-year	23.05	240.75	241.37	241.39			0.002493	0.40	38.72	114.21	0.18
Reach1	1561.551 43.10-12	50-year	26.61	240.75	241.42	241.44			0.002452	0.42	44.32	118.84	0.18
Reach1	1561.551 43.10-12	100-vear	30.15	240.75	241.46	241.48			0.002431	0.44	49.32	122.01	0.18
Reach1	1561.551 43.10-12	350-vear	48.79	240.75	241.64	241.67			0.002422	0.52	72.47	133.95	0.19
Reach1	1561.551 43.10-12	500-vear	58.76	240.75	241.72	241.75			0.002429	0.56	83.43	138.13	0.19
Reach1	1561.551 43.10-12	Regional	29.41	240.75	241.45	241.48			0.002430	0.44	48.33	121.36	0.18
Reach1	1561,404 43,10-11	2-vear	5.03	239.92	240.59	240.44		240.62	0.003551	0.81	6.18	22.29	0.49
Reach1	1561,404,43,10-11	5-vear	8.77	239.92	240.72	240.53		240.75	0.003621	0.83	10.59	58.86	0.62
Reach1	1561.404 43.10-11	10-vear	18.33	239.92	240.90	240.76		240.93	0.003785	0.73	25.24	92.00	0.44
Reach1	1561 404 43 10-11	25-vear	23.05	239.92	240.98	240.80		241.00	0.003425	0.70	32 76	95 78	0.38
Reach1	1561 404 43 10-11	50-vear	26.61	239.92	241 01	240.82		241.04	0.003658	0.74	36 19	99.48	0.39
Reach1	1561 404 43 10-11	100-vear	30.15	239.92	241.04	240.84		241.07	0.003866	0.77	39.26	100 49	0.39
Reach1	1561 404 43 10-11	350-vear	48 79	239.92	241.01	240.93		241.07	0.003436	0.81	60.25	107 54	0.34
Reach1	1561 404 43 10-11	500-year	58 76	239.92	241.20	240.97		241.20	0.000400	0.85	70.02	109.48	0.33
Reach1	1561 404 43 10-11	Regional	29 41	239 92	241.04	240.87		241.07	0.000027	0.77	38 31	100.40	0.40
	1001.404 40.10-11	regional	20.71	200.02	271.00	270.07		271.00	0.000001	0.11	00.01	100.20	0.40
Reach1	1561.256 43.10-10	2-year	5.03	238.83	239.42	239.42		239.53	0.022427	1.54	3.69	17.40	1.05
Reach1	1561.256 43.10-10	5-year	8.77	238.83	239.52	239.52		239.68	0.020030	1.84	5.48	18.94	1.06

Reach1	1561.256 43.10-10	10-year	18.33	238.83	239.77	239.77	239.97	0.012173	2.12
Reach1	1561.256 43.10-10	25-year	23.05	238.83	239.82	239.82	240.08	0.013308	2.37
Reach1	1561.256 43.10-10	50-vear	26.61	238.83	239.91	239.91	240.16	0.010827	2.34
Reach1	1561.256 43.10-10	100-vear	30.15	238.83	239.99	239.99	240.21	0.009329	2.32
Reach1	1561.256 43.10-10	350-vear	48.79	238.83	240.18	240.18	240.47	0.009453	2.71
Reach1	1561.256 43.10-10	500-vear	58.76	238.83	240.27	240.27	240.57	0.009331	2.86
Reach1	1561.256 43.10-10	Regional	29.41	238.83	239.98	239.98	240.20	0.009250	2.29
		. tog.orial							
Reach1	1561.120 43.10-09	2-year	5.03	238.49	239.13	238.93	239.14	0.000710	0.50
Reach1	1561.120 43.10-09	5-vear	8.77	238.49	239.24	238.99	239.25	0.000755	0.58
Reach1	1561.120 43.10-09	10-year	18.33	238.49	239.42	239.11	239.43	0.000904	0.75
Reach1	1561.120 43.10-09	25-year	23.05	238.49	239.49	239.14	239.50	0.000971	0.82
Reach1	1561.120 43.10-09	50-year	26.61	238.49	239.54	239.17	239.56	0.000988	0.86
Reach1	1561.120 43.10-09	100-vear	30.15	238.49	239.59	239.18	239.61	0.001001	0.90
Reach1	1561.120 43.10-09	350-vear	48.79	238.49	239.81	239.28	239.83	0.001093	1.07
Reach1	1561.120 43.10-09	500-vear	58.76	238.49	239.91	239.32	239.93	0.001156	1.16
Reach1	1561.120 43.10-09	Regional	29.41	238.49	239.58	239.18	239.60	0.001002	0.89
		gioria							
Reach1	1560.977 43.10-08	2-year	5.03	238.47	238.92	238.76	238.93	0.006059	0.28
Reach1	1560.977 43.10-08	5-year	8.77	238.47	239.00	238.82	239.01	0.006036	0.37
Reach1	1560.977 43.10-08	10-year	18.33	238.47	239.16	238.92	239.17	0.006077	0.51
Reach1	1560.977 43.10-08	25-year	23.05	238.47	239.22	238.95	239.24	0.006055	0.55
Reach1	1560.977 43.10-08	50-vear	26.61	238.47	239.27	238.98	239.29	0.006057	0.57
Reach1	1560.977 43.10-08	100-year	30.15	238.47	239.31	239.00	239.34	0.006061	0.59
Reach1	1560.977 43.10-08	350-vear	48.79	238.47	239.51	239.10	239.54	0.006141	0.68
Reach1	1560.977 43.10-08	500-vear	58.76	238.47	239.59	239.15	239.63	0.006232	0.71
Reach1	1560.977 43.10-08	Regional	29.41	238.47	239.30	239.00	239.32	0.005994	0.58
		5							
Reach1	1560.820 43.10-07	2-year	5.03	237.72	238.07	238.08		0.005295	0.43
Reach1	1560.820 43.10-07	5-year	8.77	237.72	238.17	238.18		0.005111	0.50
Reach1	1560.820 43.10-07	10-year	18.33	237.72	238.35	238.37		0.004904	0.62
Reach1	1560.820 43.10-07	25-year	23.05	237.72	238.42	238.44		0.004830	0.67
Reach1	1560.820 43.10-07	50-year	26.61	237.72	238.47	238.49		0.004768	0.69
Reach1	1560.820 43.10-07	100-year	30.15	237.72	238.51	238.53		0.004782	0.72
Reach1	1560.820 43.10-07	350-year	48.79	237.72	238.71	238.74		0.004641	0.83
Reach1	1560.820 43.10-07	500-year	58.76	237.72	238.80	238.83		0.004611	0.88
Reach1	1560.820 43.10-07	Regional	29.41	237.72	238.50	238.53		0.004771	0.72
		U U							
Reach1	1560.680 43.10-06	2-year	5.03	236.40	237.18	237.07	237.20	0.008021	0.70
Reach1	1560.680 43.10-06	5-year	8.77	236.40	237.28	237.12	237.31	0.007934	0.76
Reach1	1560.680 43.10-06	10-year	18.33	236.40	237.48	237.52		0.007826	0.85
Reach1	1560.680 43.10-06	25-year	23.05	236.40	237.56	237.60		0.007770	0.91
Reach1	1560.680 43.10-06	50-year	26.61	236.40	237.61	237.66		0.007678	0.94
Reach1	1560.680 43.10-06	100-year	30.15	236.40	237.67	237.72		0.007436	0.97
Reach1	1560.680 43.10-06	350-year	48.79	236.40	237.90	237.97		0.006936	1.10
Reach1	1560.680 43.10-06	500-year	58.76	236.40	238.02	238.08		0.006523	1.13

11.64	32.32	0.91
13.56	35.66	0.97
17.52	49.21	0.89
21.25	54.11	0.84
32.89	65.67	0.88
39.05	70.56	0.89
20.85	53.93	0.89
28.86	117.49	0.22
41.89	121.88	0.23
64.14	123.10	0.27
72.61	123.52	0.28
79.16	123.84	0.28
85.38	124.14	0.29
112.57	125.47	0.31
124.31	126.04	0.32
83.98	124.08	0.29
13.69 19.73 31.59 36.70 40.43 44.34 62.77 73.58 43.40	71.58 75.24 79.81 81.87 84.05 88.34 111.04 136.19 85.64	0.23 0.24 0.26 0.27 0.27 0.27 0.27 0.28 0.29 0.27
11.51	54.74	0.24
18.29	76.21	0.25
32.52	83.70	0.26
38.55	88.47	0.26
42.80	90.58	0.26
46.78	93.94	0.26
66.45	105.70	0.27
75.92	109.20	0.27
46.00	93.57	0.27
8.80	36.88	0.31
12.69	37.78	0.32
21.17	46.26	0.33
24.83	50.56	0.33
27.64	53.34	0.33
30.57	55.74	0.33
44.95	67.95	0.33
53.08	73.72	0.33

Reach1	1560.680 43.10-06	Regional	29.41	236.40	237.65	237.70		0.007528	0.96
Reach1	1560.547 43.10-05	2-year	5.03	235.53	236.02	236.09		0.008492	1.46
Reach1	1560.547 43.10-05	5-year	8.77	235.53	236.15	236.23		0.007959	1.69
Reach1	1560.547 43.10-05	10-year	18.33	235.53	236.39	236.49		0.007405	2.08
Reach1	1560.547 43.10-05	25-year	23.05	235.53	236.49	236.60		0.007013	2.19
Reach1	1560.547 43.10-05	50-year	26.61	235.53	236.56	236.68		0.006879	2.28
Reach1	1560.547 43.10-05	100-vear	30.15	235.53	236.62	236.75		0.006802	2.37
Reach1	1560.547 43.10-05	350-vear	48.79	235.53	236.91	237.07		0.006492	2.74
Reach1	1560.547 43.10-05	500-year	58.76	235.53	237.04	237.22		0.006418	2.90
Reach1	1560.547 43.10-05	Regional	29.41	235.53	236.61	236.74		0.006726	2.34
Reach1	1560.383 43.10-04	2-year	5.03	234.60	235.23	235.24		0.003571	0.50
Reach1	1560.383 43.10-04	5-year	8.77	234.60	235.37	235.39		0.003666	0.59
Reach1	1560.383 43.10-04	10-year	18.33	234.60	235.64	235.66		0.003788	0.75
Reach1	1560.383 43.10-04	25-year	23.05	234.60	235.73	235.76		0.004019	0.82
Reach1	1560.383 43.10-04	50-year	26.61	234.60	235.79	235.83		0.004110	0.86
Reach1	1560.383 43.10-04	100-vear	30.15	234.60	235.86	235.90		0.004160	0.90
Reach1	1560.383 43.10-04	350-year	48.79	234.60	236.11	236.17		0.004723	1.09
Reach1	1560.383 43.10-04	500-vear	58.76	234.60	236.24	236.30		0.004836	1.17
Reach1	1560.383 43.10-04	Regional	29.41	234.60	235.83	235.87		0.004290	0.90
Reach1	1560.237 43.10-03	2-year	5.03	233.85	234.32	234.31	234.40	0.011102	1.44
Reach1	1560.237 43.10-03	5-year	8.77	233.85	234.40	234.39	234.51	0.012225	1.75
Reach1	1560.237 43.10-03	10-year	18.33	233.85	234.56	234.53	234.72	0.013713	2.30
Reach1	1560.237 43.10-03	25-year	23.05	233.85	234.64	234.60	234.81	0.012712	2.41
Reach1	1560.237 43.10-03	50-year	26.61	233.85	234.69	234.63	234.87	0.012395	2.51
Reach1	1560.237 43.10-03	100-year	30.15	233.85	234.74	234.69	234.93	0.012136	2.59
Reach1	1560.237 43.10-03	350-year	48.79	233.85	234.98	234.87	235.20	0.010222	2.87
Reach1	1560.237 43.10-03	500-year	58.76	233.85	235.09	234.97	235.33	0.009844	3.02
Reach1	1560.237 43.10-03	Regional	29.41	233.85	234.75	234.68	234.92	0.011042	2.49
Reach1	1560.111 43.10-02	2-year	5.03	232.29	233.12		233.14	0.008921	0.86
Reach1	1560.111 43.10-02	5-year	8.77	232.29	233.26		233.28	0.007737	0.91
Reach1	1560.111 43.10-02	10-year	18.33	232.29	233.53		233.56	0.006404	1.00
Reach1	1560.111 43.10-02	25-year	23.05	232.29	233.63		233.66	0.006536	1.08
Reach1	1560.111 43.10-02	50-year	26.61	232.29	233.70		233.73	0.006611	1.12
Reach1	1560.111 43.10-02	100-year	30.15	232.29	233.77		233.81	0.006521	1.16
Reach1	1560.111 43.10-02	350-year	48.79	232.29	234.01		234.07	0.007509	1.40
Reach1	1560.111 43.10-02	500-year	58.76	232.29	234.15		234.22	0.007459	1.47
Reach1	1560.111 43.10-02	Regional	29.41	232.29	233.71		233.75	0.007677	1.22
Reach1	1560.000 43.10-01	2-year	5.03	231.96	232.38		232.41	0.005162	1.14
Reach1	1560.000 43.10-01	5-year	8.77	231.96	232.50		232.54	0.006090	1.45
Reach1	1560.000 43.10-01	10-year	18.33	231.96	232.71		232.79	0.007711	2.04
Reach1	1560.000 43.10-01	25-year	23.05	231.96	232.80		232.89	0.007758	2.22

29.89	55.19	0.33
7.25 11.27 19.85 23.77 26.66 29.29 42.73 49.42 28.89	29.02 32.88 38.62 39.98 41.96 43.08 49.65 52.88 42.94	0.72 0.73 0.75 0.75 0.75 0.75 0.77 0.77
10.64	32.80	0.22
15.67	36.42	0.23
26.18	42.35	0.24
30.09	43.83	0.25
33.01	44.82	0.26
35.92	46.09	0.26
48.36	50.94	0.29
54.81	53.31	0.30
34.90	45.62	0.27
6.31	37.02	0.80
9.52	38.87	0.87
15.81	42.23	0.95
19.13	43.39	0.95
21.50	45.19	0.95
23.72	46.32	0.95
35.85	52.20	0.92
41.59	54.59	0.92
24.11	46.54	0.91
9.43	34.45	0.34
14.34	36.51	0.33
24.65	39.55	0.31
28.57	41.13	0.32
31.40	42.35	0.32
34.39	43.60	0.32
45.68	47.85	0.36
52.45	50.85	0.36
31.95	42.59	0.35
9.74	31.10	0.56
13.40	33.15	0.64
20.98	39.25	0.76
24.74	41.79	0.78

Reach1	1560.000 43.10-01	50-year	26.61	231.96	232.86	232.96	0.007654	2.32
Reach1	1560.000 43.10-01	100-year	30.15	231.96	232.91	233.02	0.007947	2.44
Reach1	1560.000 43.10-01	350-year	48.79	231.96	233.37	233.46	0.004367	2.36
Reach1	1560.000 43.10-01	500-year	58.76	231.96	233.54	233.63	0.003992	2.43
Reach1	1560.000 43.10-01	Regional	29.41	231.96	233.05	233.12	0.004533	2.02

27.50	43.07	0.78
29.62	43.96	0.80
52.80	55.86	0.64
62.46	59.52	0.62
36.05	48.49	0.62

APPENDIX D

Cole Engineering HEC-RAS Flood Plain Mapping Program - Sheet No. 172 HEC-RAS Cross Sections (Fig. XSEC)





246.00					
210.00					
245.00	-				
244.00					
243.00					
242.00					
0.44.00					
241.00					
240.00					
239.00					
_	5 (D 5	5 1	0 1	5









NOTES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING THE WORK THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABULTY FOR DAMAGE TO THEM LIABILITY FOR DAMAGE TO THEM. THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED.

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY R. AVIS SURVEYING INC. BOUNDARY DATA DERIVED FROM INFORMATION FROM R. AVIS SURVEYING INC.

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

							24	4.50_																				24 STN 7	4.57	246.00
							STN 20	7.97	,																					245.00
					s	24 TN 20	2.80 7.42																							244.00
											_																			242.00
																												<u> </u>		241.00
																														240.00
165 170 5 51	0 175	180) 18	5 19	90 1	95 :	200	205	210	215	220	225	5 23	0 2	35 2·	40 2	245	250 2	55 2	60 :	265 2	70 27	5 28	0 28	35 29	0 29	95 3	00 3	05 31	0 315
							1										1				1									<u> </u>
													s	24 TN 22	1.46															245.00
																											244	4.45 /		244.00
241.12 N 154.72	51	242. N 166.	15 75																							S	TN 28	2.50		243.00
240.29				×									_242.5	55 204.31			242 STN	2.75 224.12 												242.00
151.60	$\overline{4}$				<u>241.99</u> STN 16	7.08																								241.00
40.21 TN 138.88																														239.00
145 150) 155	160	165	5 17	⁷ 0 17	75 1	80 1	185	190	195	200	205	210	D 21	5 22	20 2	25 2	30 2	35 24	40 2	245 2	50 255	5 260) 26	5 270	0 27	5 2	80 27	35 290	295
<u>N 1561</u>	<u>1.404</u>	<u> </u>																												
						STN	244.5 1244.0	6																		:	24 STN 34	 4.52_ 2.32		246.00
							242 78																							245.00
						STN	243.7	3																						244.00
_		_							¥																					243.00
																														241.00
													· — — .			+														240.00
								_	_	_																				239.00
								_	_	_																				238.00
200 20	15 210) 21	5 22	20 2	25 2	230	235	240	245	250	255	26	0 20	5 2	70 2	275	280	285 2	290 2	295	300	305 31	0 31	5 3	20 32	25 3	30 .	535 3	540 34	45 350
						2 STN 1	244.50_ 182.27	$\overline{\mathbf{A}}$																			STN	244.49 283.25	\mathbb{Z}	245.00
			S	<u>242</u> TN 17	<u>2.82</u> 1.56 \																									244.00
						\rangle																								243.00
					\square			24 ST	2.98 N 179	.51																				242.00
	STN	239.25 160.33	; - -																						~					241.00
												·			·															240.00
					238.72 STN 15	52.15																								238.00
140 145	150	155	160	165	5 170	0 17	75 18	80 1	185	190	195	200	205	210	0 215	5 22	:0 2:	25 23	0 23	5 24	40 24	5 250	255	260	265	270) 27	5 28	0 285	290
<u>ON 15</u>	<u>61.12</u>	<u>20</u>																												
																														242.00
																														241.00
																														240.00
																														239.00
175 180	185	190	195	200) 205	5 21	0 21	15 2	20	225	230	235	240	245	250) 25	5 26	0 26	5 270) 27	75 28) 285	290	295	300	305	310	5 31 8	5 320	325
																						DRAV	VING : H	EČ-	RAS	FL	00[)PL/	ĮN	DESIGN M
SED IN	NDU 281 H		AL		VEL	OPN	MEN	Т							DF		-01							CH	loss	S-SE	ECT		.	DRAWN
C		ON, O	NTAF	RIO						U			ONS		NG E	NGI		S												
							 -		-				The O 5230 9	dan/De SOUTH	tech Gr SERVI	roup In CE RO	c. P:(AD, BU	905) 632 RLINGT	-3811 F: DN, ON1	: (905) FARIO	632-336 L7L 5K	3								J
HEAL c/o O	EY NE	RC PRC)AC)PE	ע G RTI	iP ES	∟IN	1I TE	:D	SC	ALE: I	H: 1:5 V: 1:1	500 00		PROJE	CT NC 192): 33	, _0	D	ATE: JUN	E 20)20	1								APPROV J
	Ve	ТС			0710				sc	ALE		_					_					7				1				

ENGINEER

APPENDIX E

Concept Grading (Fig. SG) Topographic Survey



ARE TYPICALLY SHOWN IN METRES								8281 H c 33 TC	EALEY F /o ONE P 3 BAY ST PRONTO, (ROAD GP ROPERTIES SUITE 2710 DN. M5H 2R2
tres. RINGS AND ARE REFERRED TO THE							CLIEI		8281 HEA CALEDON	LEY ROAD I, ONTARIO
/ED FROM 58056.	NO.	T SUBMISSION	REVISIO	ONS	JU	DATE LY 31/20 N	BY PRO			
			282:48 282:48 (SDƏWRONAS)	50. C <u>x</u>	ی. مرکز انجاعی کرد مرکز انجاعی کردی کرد مرکز انجاعی کردی کردی کردی کردی کردی کردی کردی کرد		م. بریک M _u O <u>C</u> (sc		۰. حربی	10m FLOODPLA DEVELOF
56. 55. 542. 542.	ор С. С. К. С.	о. °б. ^{Суд} е ^{с ж} е	ن. ^د یجه		ى. بەرىپى مەربى	ج. ۲۰.	*'	`S.ONL	۳. PRE & POS	تريخي T DEVELOPMENT I
		۵ 241.85 •	Pr. S		¢.	62. Val.	TO.	to. 141	G. OX C	
	· · · · · · · · · · · · · · · · · · ·	CX.		°с. ⁴ д _с .	Cr. x ¹	S	C.	*0. ~~ ¹ *~~		
	نې ^۲ ۵۰. ^۲ ۵۰ ^۲ ۵۰	~. •			ао. 122.	°GONTO GOOME	^{ری} . ۳۳	OPOSED WE	TLAND SETBAC	· · · · · · · · · · · · · · · · · · ·
Science of the second s		09. 1×2. 66.	Q	^{60.}		°°°×°°°×°°°°×°°°°°°°°°°°°°°°°°°°°°°°°	ersert Nid	CB. CALL	VP. OP. OF.	Re of Ca
	^{جي} .	5. 5 ¹⁴² . ¹⁴² .	$\sum_{k' \in \mathcal{I}} \sum_{k' \in \mathcal{I}} $	te. ⁴ e. ₄ e. ₁ e1e1e1e.		×9 0420	C. C	Ex.	St. Oz	⁵ ×. ⁹ ⁶ 2.
	°o. ***			Program.	Low Flow	09. ×5	0%2	en line in the second s	042° 032°	Gr. Cr.
Critican Cri	یم بر 191.34 (۲۹ 45.163		C) ¹ x ² ^c ^c ^c ^c ^c ^c ^c ^c	to out a	A Cook	65.04 ° 65 ONL	soon Mul	(spamaea)	or o	Beier ere
So. So.	⁶ 0. ¹⁴⁷ .			60. ⁶ 6. ¹ ×2. ×	Solution for the second	op. Oz.	چن PRE	DEVELOPME	PŐŞT DEVELŐP A SZARZAN NT FLOÖB PLA	MENT FLÖOD PLAIN
A. S.	ox. og			91. ² 0. ¹ ² 2. ¹ ² 2.	<pre>></pre>	OB OCT	op. Oxe	18.04 °	X. V. X. ON	MATCH EX. EL. (3:1 MAX.)
Tr. Is. en	State State	•	PREDE	VELOPMENT FLO	U) the second se	دي. مخيره	AS. CAL	\$6. 0×2.	⁸ . 104	FLOODPLAIN SET
	**************************************	Post deve	LÖPMENT FLÖQD	PLAIN Q	°°°, (17)	€ • • • • • • • • • • • • •	NId		And	S. S.
4) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82) (241.82)	(242.06) [*]	241.76 (241.76) 1C 1C	(242.06) (242.06) Om FLOODPLAIN EVELOPMENT LIMI	SETBACK T	ر دیک (241.76)		(242.00)	(242.30) MATCH EX. (3:1 MA	EL. X.)	(242.14)
	<u>50)</u>	(240.40) X2 (241.40)	PROPOSED LIMIT	(240.25) (240.99) (240.99) (240.99) (240.99) (240.99) (240.99)		(240.72)		59.86) X Q Q X X X X X X X X X X X X X X X X	AB OF	
(240.32) (240.52) (240.52) (240.52) (240.52) (240.52)	(240.30) (240.30) (242) (242) (242) (242) (242) (242) (240) (24) (240) (240.87 240.87 (240.87) (240.87 (240.87)	240.61 [240.61] [240.25] [240.25] ×	240,40 95) (240.09) 40 (239.79) 8 (240.09) (240.09)		(239.81) (239.55) (239.84) (239.84) (239.84) (239.84)	9.75) 65' 56 (2 (45) (45) (45) (45)	239.91 (239 239.40) 239.10) (239 239.10) (239	2.33) 2.01) 2.31) (239) (239)	.38) (239.28) .37) (238.99)
240.74 (35.0) (240.81) (240.81) (240.78) $(240$	240 00 0.20 500 0.20 500 240,78			· · · · · · · · · · · · · · · · · · ·	02. 03. 0	Ø1.000	Vence Nrbo.	(Ed M. 02, 22.) (Ed M. 02, 22.) (Ed C. 52, 97 (Ed C. 52, 97 (Ed C. 64 (Ed C. 64 (Ed C. 64 (Ed C. 64) (Ed C. 64	1) 1) 1) 1) 1) 1) 1) 1) 1) 1)	. cfr. cfr.
EXISTING DITCH				SS. CAL.						
	CNMENT	ά. ⁶ .	Wire Fen	Ox.						
So. As. Sc.	to on a	S. JANO CZ	ce i "	LE. OUR						$\sum \int$
DEVELOPMENT FLOOD PLAI	N	Se. Se.	Bush and Bush	*9.00 04 ¹					N 438	
Tr. Ct.				UMDT 90. WA					2000	
	د. د. د ^م	S. C.	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			ኅ				
	96. ¹⁴ 2.	°c. °C.	rete Blockhur A							
op. To. or.	roi e a a a a a a a a a a a a a a a a a a	9 ^{2,2} 4,2	AS DE LAND	Asphalt						
° ° °	•	6		identity and a second sec						





	DENOTES	SURVEY MONUMENT FOUND
	"	SURVEY MONUMENT PLANTED
	**	WITNESS MONUMENT
	"	STANDARD IRON BAR
	**	SHORT STANDARD IRON BAR
	"	IRON BAR
	**	CUT CROSS
	**	NORTH, SOUTH, EAST, WEST
	**	ORIGIN UNKNOWN
	**	SPEIGHT, VAN NOSTRAND & GIBSON LIMITED, O. L. S.
		– PLAN DATED SEPT. 13, 2019
	**	PLAN 43R–38737
-	**	RADY-PENTEK & EDWARD SURVEYING LIMITED, O.L.S.
		– DATED SEPT. 20. 2018