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- Streetscapes & Public Amenities
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39 Years

Southbridge Port Hope

Servicing and Stormwater Management Report

Revised January 25th, 2022

Engineering excellence. Planning progress. Liveable landscapes.

SERVICING AND STORMWATER MANAGEMENT REPORT

SOUTHBRIDGE PORT HOPE
65 WARD STREET / 20 HOPE STREET SOUTH,
PORT HOPE, ONTARIO

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

June 14, 2021
Revised November 12th, 2021
Revised January 25th, 2022

Novatech File: 120226
Ref No. R-2021-091

Engineers, Planners & Landscape Architects

January 25th, 2022

Municipality of Port Hope
5 Mill Street South
Port Hope, ON
L1A 2S6

Attention: Tom Dodds, Director of Community Development

Dear Sir:

Reference: Southbridge Port Hope
65 Ward Street / 20 Hope Street South, Port Hope, ON
Servicing and Stormwater Management Report
Our File No. : 120226

Please find enclosed the revised 'Servicing and Stormwater Management Report' for the above noted development.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

Cara Ruddle, P. Eng.
Senior Project Manager | Land Development Engineering

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed Southbridge Long Term Care Facility at 65 Ward Street / 20 Hope Street South within the Municipality of Port Hope. This report will support a Site Plan Application for the subject development. **Figure 1** Key Plan shows the site location.

2.0 EXISTING CONDITIONS

The site is currently 1.08 hectares in size. The site is bounded to the west by Princess Street, to the north by Ward Street, to the east by Hope Street and the south by residential homes. There are currently 4 buildings and associated parking areas within the property including a large two storey brick building which is the Hope Street Terrace long term care home (65 Ward Street / 20 Hope Street South), a two storey brick residential building (18 Hope Street), a one storey brick maintenance building and a three storey brick building which was previously the Port Hope Villa (hospital facility, 65 Ward Street). The topography generally slopes towards the north western corner towards the intersection of Princess Street and Ward Street. **Figure 2** shows the existing site conditions.

3.0 PROPOSED DEVELOPMENT

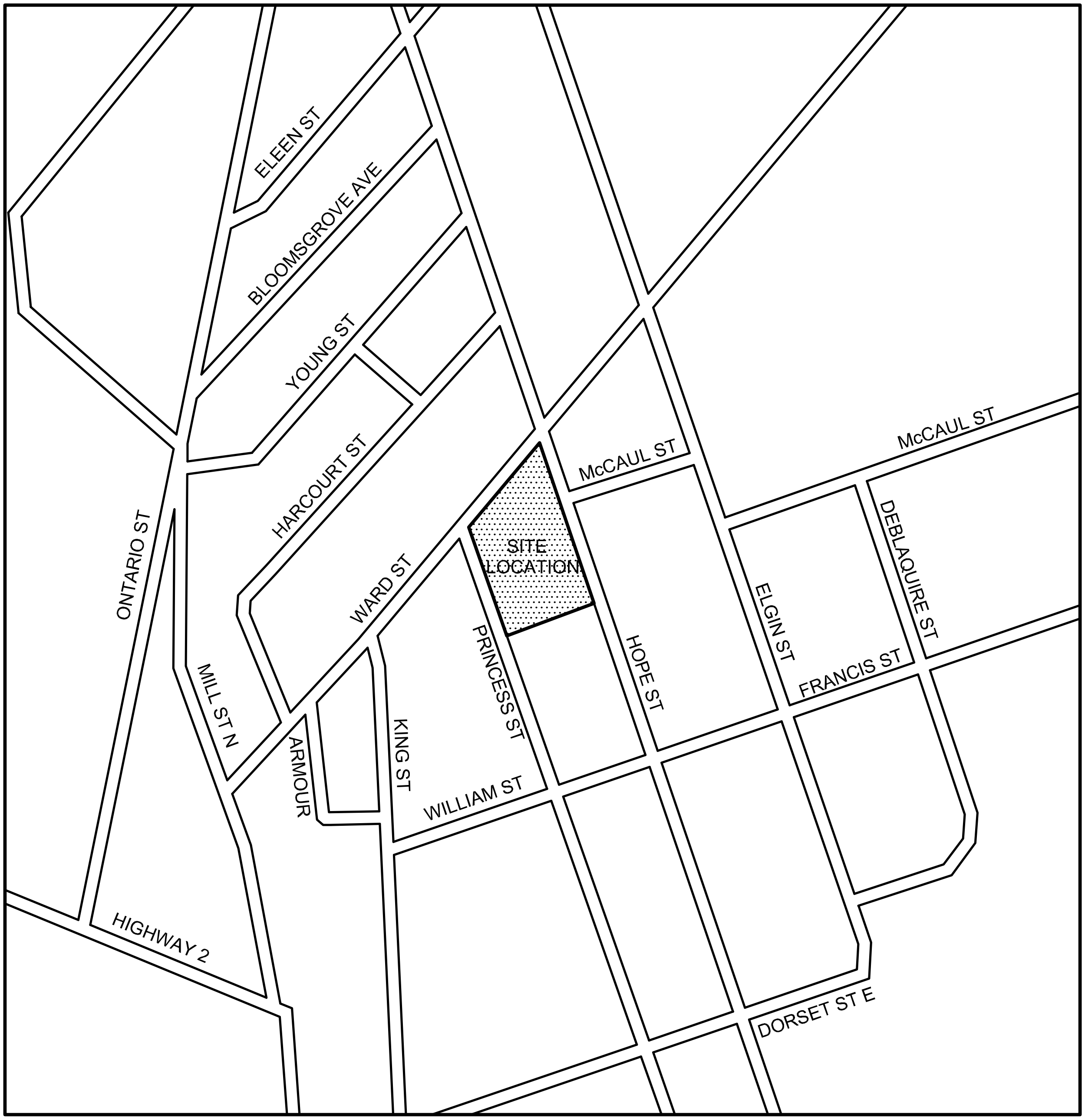
It is proposed to develop the site with a 7-storey long term care facility. The existing Hope Terrace long term care facility will be maintained and operational while the new facility is built. Once the new facility is built and operational the existing facility will be demolished. Refer to **Figure 3** for the proposed site layout.

4.0 SITE CONSTRAINTS

A geotechnical investigation was completed for the subject development entitled 'Geotechnical Investigation, Proposed Residential Building, 65 Ward Street, Port Hope, Ontario' prepared by Terraprobe Inc., dated December 11, 2019. The report noted that the site has a fill layer underlain by glacial till consisting of clayey silt or silty sand. No bedrock was encountered in any of the boreholes. Also, an Environmental Activity and Sector Registry (EASR) may be required for dewatering purposes depending on groundwater conditions at the time of construction.

5.0 WATER SERVICING

There is an existing 150mm diameter watermain along Princess Street, an existing 150mm diameter watermain along Ward Street and a 200mm diameter watermain along Hope Street South. It is proposed to service the building by connecting a 200mm diameter water service to the existing watermain along Hope Street South. There are existing hydrants along Princess Street, Ward Street and Hope Street that can provide fire protection. The existing hydrant along Ward Street is within 45 metres of the proposed siamese connection at the front of the proposed building. Refer to the General Plan of Services (120226-GP2) for water servicing information.



M:\2020\120226\CAD\Design\Figures\SWM\120226 - FIG 1.dwg, SITE PLAN FIG2, May 20, 2021 - 11:11am, lcolbran

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20 HOPE STREET
PORT HOPE, ONTARIO

KEY PLAN

MAY 2021 120226 FIG 1

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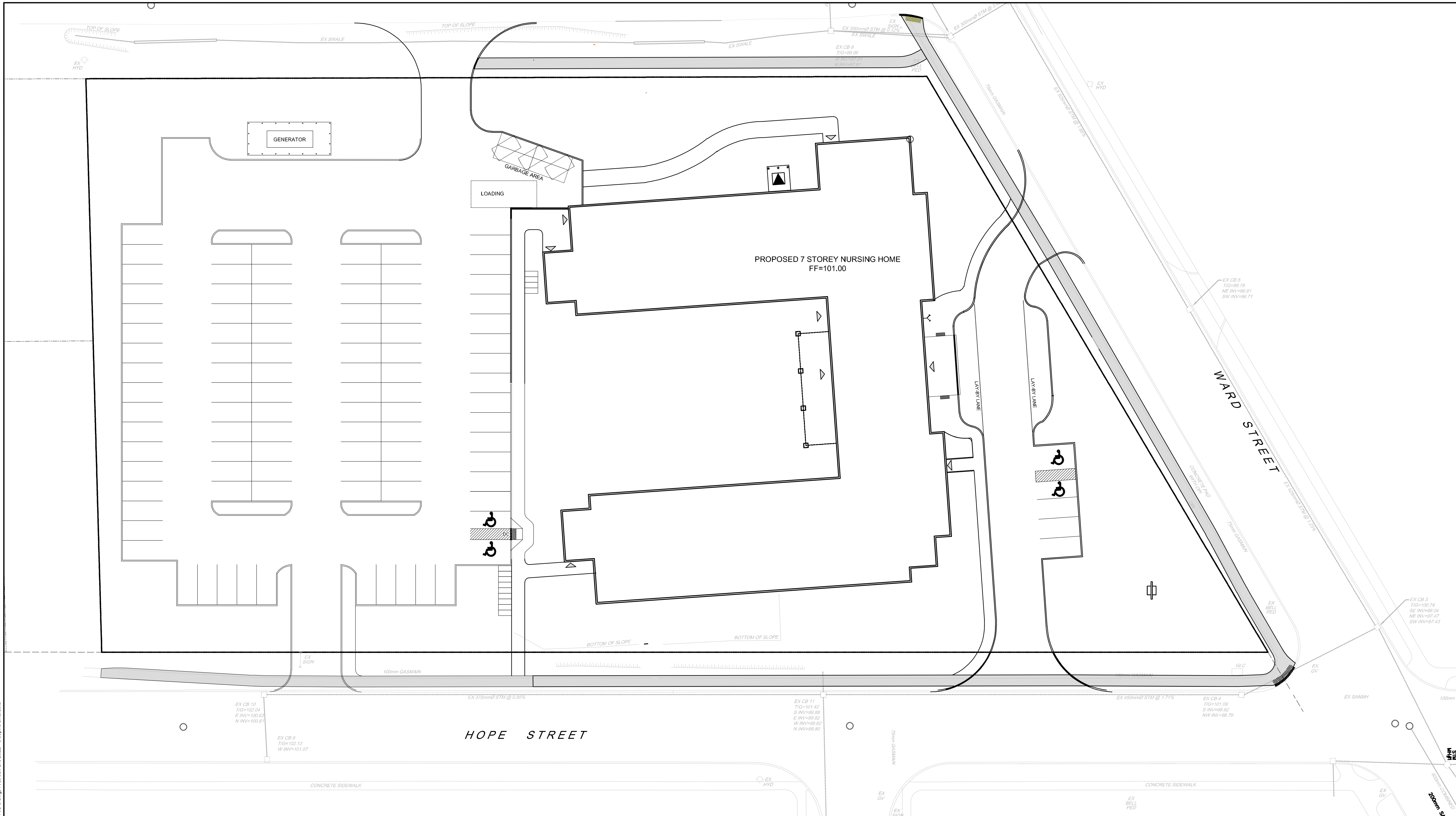
20 HOPE STREET
PORT HOPE, ONTARIO

EXISTING CONDITIONS PLAN

MAY 2021 120226 FIG 2



20 HOPE STREET
PORT HOPE, ONTARIO

PROPOSED DEVELOPMENT

JAN 2022 120226 FIG 3

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M:\2020\120226\CAD\Design\Figures\SWM\120226 - FIG 3.dwg, FIG, Jan 21, 2022 - 3:55pm, dmarsha

The MOE Design guidelines provides a range for domestic water demands between 270 to 450 L/cap/day. Therefore, to determine a specific demand for the proposed development, the OBC Section 8: Sewer Systems was used. Table 8.2.1.3.B allocates a daily design sanitary flow of 450L/bed/day for "Long-Term Care Homes". The flow rate of 450L/bed/day was used for the average water demand for the proposed nursing home. The water demand has been calculated based on 192 beds and the results are summarized as follows:

Avg Day = 1.00 L/s
Max. Day = 2.75 L/s
Peak Hourly Demand = 4.13 L/s

The required fire demand was calculated using the Fire Underwriters Survey (FUS) Guidelines. The proposed building is to be sprinklered with the siamese connection located by the front entrance of the building. The required fire demand was calculated to be 1,321 USGPM (or 5,000 L/min). Refer to **Appendix A** for a copy of the water calculations.

Water demands and fire flow calculations were provided to CIMA to add to the Municipality's water model and provide boundary conditions. A reported entitled "Water Distribution System Hydraulic Modelling for Development at 20 Hope Street South" was subsequently prepared to discuss the impacts the development would have on the surrounding water infrastructure. This report has been included in **Appendix D.** The analysis determined that there was an available fire flow of 9,000L/min in the vicinity of the site, which was greater than the required 5,000L/min. It was also recommended that a pressure reducing valve should be reviewed as part of the building's mechanical design. The report concluded that there was adequate fire flow for the proposed development and the pressure in the vicinity of the site would not be negatively affected.

6.0 SANITARY SERVICING

There is an existing 200mm diameter sanitary sewer on Princess Street, and a 375mm diameter sanitary sewer on Hope Street. There are existing 200mm diameter and 600mm diameter sanitary sewers sewer along Ward Street. It is proposed construct a private 200mm diameter sanitary service that will connect directly into the 600mm diameter sanitary sewer along Ward Street. Refer to the General Plan of Services (120226-GP2) for sanitary servicing information.

The Ontario Building Code Section 8: Sewage Systems was used to calculate the theoretical sanitary flows for the 7-storey nursing home. The sanitary flows are based on 192 beds and an average daily flows of 450L/day per bed. The total theoretical peak flow for the development is calculated to be 3.57L/s. Sanitary flow calculations are included in **Appendix B** for reference. Based on discussions with the Town, it is understood that the 600mm diameter sanitary sewer on Ward Street has no capacity issues.

7.0 STORM SERVICING

Stormwater from Princess Street drains into roadside ditches which drain to a catchbasin by the intersection of Princess Street and Ward Street. The existing catchbasin outlets to an existing 300mm diameter storm sewer which connects to the existing 525mm diameter and 900mm diameter storm sewer along Ward Street. There is also an existing 375mm diameter and 450mm diameter storm sewer along Hope Street.

It is proposed to service the property with a private storm sewer system ranging in size from 300mm to 450mm diameter. The private storm sewer system will outlet to the existing 525mm diameter storm sewer on Ward Street. The parking lot and landscaped area surface drainage will be directed towards catchbasins and conveyed to the private storm sewer system. Roof and foundation drainage from the proposed building will also be directed to the private storm sewer system. The storm servicing information is shown on the General Plan of Services (120226-GP2).

8.0 STORMWATER MANAGEMENT

8.1 Stormwater Management Criteria

A document entitled 'Technical and Engineering Guidelines for Stormwater Management Submissions', prepared by the Ganaraska Region Conservation Authority, dated December 2014 provides the stormwater management criteria for the proposed development. The subject site is located within the Ganaraska River watershed. The stormwater management criteria for this watershed is as follows:

- Quantity control of stormwater is required to pre-development conditions for storms up to and including the 100-year storm event.
- Quality control is to be provided to an enhanced level or 80% removal of total suspended solids.

8.2 Quantity Control

Stormwater from storms up to and including the 100-year storm event will be controlled to the 5-year pre-development condition prior to outletting to the existing 525mm diameter storm sewer along Ward Street. A runoff coefficient of 0.54 was used to calculate the allowable release rate of 153.6L/s.

Stormwater storage will be provided by ponding stormwater on the roof of the building as well as underground in storm sewers and on the surface in a landscaped area. Orifice controls in catchbasins and manholes and roof drain controls will be used to control the release of stormwater to the allowable release rate prior to outletting to the existing storm sewer along Ward Street.

A Post-Development Drainage Plan is provided in **Appendix C** which shows the proposed drainage areas and limits of 5 and 100 year storm event surface ponding. Stormwater management calculations including runoff coefficients, flows, storage required and storage provided for each of the drainage areas is provided in **Appendix C**. **Table 8** below summarizes these calculations.

Table 8 : Post-Development Stormwater Mangement Summary									
Area ID	Area (ha)	1:5 Year Weighted Cw	5 Year Storm Event			100 Year Storm Event			
			Release (L/s)	Ponding Depth (m)	Req'd Vol (cu.m)	Release (L/s)	Ponding Depth (m)	Req'd Vol (cu.m)	Max. Vol. Provided (cu.m.)
A1	0.190	0.90	9.0	0.06	28.2	14.6	0.13	56.2	80.4
A2-A5	0.230	0.44	26.9	N/A	N/A	29.0	N/A	12.1	12.2
A6-A11	0.650	0.58	98.8	N/A	N/A	102.1	0.30	46.3	46.3
A12	0.010	0.20	0.5	N/A	N/A	1.0	N/A	N/A	N/A
Total			**135.2**			**146.8**			
Allowable			**153.6**			**153.6**			

8.3 Quality Control

Oil Grit Separator (OGS) Unit

Quality control of stormwater shall be provided to an enhanced level of treatment or 80% removal of total suspended solids. Quality control of stormwater for the site will be provided through the installation of an oil grit separator unit. The proposed OGS unit is a PMSU2020_5 which will provide enhanced levels of water quality prior to discharging into the municipal sewers. The target level of protection for long term removal of 80% total suspended solids with an overall treatment of over 90% of the total runoff.

Refer to **Appendix C** for the CDS unit design, performance and annual TSS removal efficiency data.

Best Management Practices

Best Management Practices shall also be implemented to reduce transport of sediments and promote on-site groundwater recharge. The Best Management Practices to be implemented are as follows:

- The drainage system for the development will consists of grassed swales to convey runoff from primarily landscaped areas. Drainage from the hard-surfaced parking lots will discharge to a storm sewer which will directly convey stormwater to the oil grit system prior to its release from the site.
- Swales are to be vegetated and constructed at minimum grade, where possible.
- Stormwater from roof areas is considered to be ‘clean’ and with roof leaders draining to grassed yards and grassed swales, quality control of stormwater in these areas is not required.

8.4 Major Overland Flow Route

A major overland flow route will be provided for storms greater than the 100-year storm event. Stormwater will be directed to the existing road allowances surrounding the site (Princess Street, Ward Street and Hope Street). The major overland system is shown on the Grading Plan (Interim and Ultimate Conditions) (dwg 120226-GR1 & 2).

9.0 EROSION AND SEDIMENT CONTROL

9.1 Temporary Measures

Temporary erosion and sediment control measures will be implemented during construction. Silt fence, mud mats and filter socks in catchbasins will be used as erosion and sediment control measures.

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Grading Plan (Interim and Ultimate Conditions) (dwg 120226-GR1 & 2) for additional information.

10.0 CONCLUSIONS AND RECOMMENDATIONS

- Water servicing for the proposed development will be provided by a private 200mm diameter water service that connects to the existing 200mm diameter watermain in Hope Street South.
- Sanitary servicing will be provided by a private 200mm diameter sanitary service that will connect to the existing 600mm diameter sanitary sewer on Ward Street.
- Quantity control of stormwater will be provided for storms up to and including the 100-year storm event. Stormwater will be stored underground in the storm sewer system, on the surface by ponding around catchbasins in landscaped areas and on building roofs. The allowable release rate for the site is 153.6 L/s and the post-development stormwater release rates are 135.6 L/s and 146.8 L/s for the 5 and 100-year events respectively.
- Quality control of stormwater will be provided through the installation of an Oil and Grit Separator Unit.
- An overland flow route is provided;
- Erosion and sediment control measures will be implemented prior to and during construction.

NOVATECH

Prepared by:

Larry Colbran
Senior Design Technologist
Land Development Engineering

Reviewed by:

Cara Ruddle, P.Eng
Senior Project Manager
Land Development Engineering

APPENDIX A
Water Servicing Information

NOVATECH
Engineers, Planners & Landscape Architects

JOB NO. 120226
May 2021

20 Hope Street
Southbridge Nursing Home
Water Demand

Water Demand						
Node	Residential			Demand (L/s)		
	Units	Total Pop		Avg Day	Max. Daily	Peak Hour
	Beds					
1	192	192		1.00	2.75	4.13

Notes:

<u>from Ontario Building code Table 8.2.1.3B:</u>		
- Nursing Homes, Rest Homes	450	L/Bed/Day
<u>Avg. Daily Demand:</u>		
- OBC	450	L/Bed/Day
<u>Max. Daily Demand:</u>		
- Domestic (MOE Drinking Water Design Guideline)	2.75	x Avg. Day
<u>Peak Hourly Demand:</u>		
- Domestic (MOE Drinking Water Design Guideline)	4.13	x Avg. Day

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	120226
Project Name:	Southbridge Port Hope
Date:	6/11/2021
Input By:	Paul Newcombe
Reviewed By:	Cara Ruddle

Legend: Input by User; No Information or Input Required

Building Description:	7 Storey Long Term Care Home
	Fire Resistive Construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame		1.5	0.6	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)	Yes	0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1900			
		Number of Floors/Storeys	7			
		Protected Openings (1 hr)	Yes			
		Area of structure considered (m^2)			**2,850**	
	F	**Base fire flow without reductions**				**7,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**5,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-2,975**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**1,785**
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**30%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**5,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**83**
				or	USGPM	1,321
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	1.75
		Required Volume of Fire Flow (m^3)			m^3	525

FUS - Fire Flow Calculations - User Guide - Fire Resistive

Novatech Project #:	120226
Project Name:	Southbridge Port Hope
Date:	6/11/2021
Input By:	Paul Newcombe
Reviewed By:	Cara Ruddle

- Please use the notes below as a guide when completing the FUS Fire Flow Calculations
- When in doubt, confirm construction material, firewalls, etc. with architect/owner
- When in doubt, err on conservative side

Note: This form only applies for Fire Resistive

Enter a description of the building or unit being considered, i.e. use/most stringent condition/address

Summary		
Construction Type	Fire Resistive Construction	
Floor Area Considered	2,850	m^2
Occupancy Reduction	-15%	
Sprinkler Reduction	-50%	
Exposure Surcharge	30%	
Total Fire Flow	5,000	L/min

Project Manager Review

Date: ____________________

Name: ____________________

Signature: ____________________

Base Fire Flow

1 **Construction Material**

Does not apply for this form
Does not apply for this form
Does not apply for this form
Only Use if can be confirmed with client/architect (ISO Cl 5)
Only Use if can be confirmed with client/architect (ISO Cl 6)

2 **Floor Area**

If considered gross floor area, then enter 1 floor/storey. If Fire wall, then reduce footprint accordingly.

Un-Protected **5** = number of floors above first 2, up to max of 10 floors total

Do vertical openings have minimum 1 hour rating between floors? Confirm this with the architect.

Protected **2** =number of additional immediately adjoining floors to be considered, up to 2

Do vertical openings have minimum 1 hour rating between floors? Confirm this with the architect.

Reductions or Surcharges

3 **Occupancy hazard reduction or surcharge**

Residential - with no garage
Residential - with garage
General Commercial - Generally, no reduction
Check usage with FUS
Check usage with FUS

4 **Sprinkler Reduction**

Only Use if can be confirmed with client/architect
Only Use if can be confirmed with client/architect

5 **Exposure Surcharge (cumulative %)**

For Fire walls: FUS considers a Fire wall to have a minimum 2 hour rating per NBC.

Results

6 NOTE: Refer to City Technical Bulletin ISDTB-2014-02 for additional considerations to cap this value at 10,000L/min

If IGPM is needed, divide USGPM by 1.20095

7 For Rural areas, or where required

APPENDIX B
Sanitary Servicing Information

PROJECT #: 120226
PROJECT NAME: SOUTHBRIDGE NURSING HOME
LOCATION: 20 HOPE STREET, PORT HOPE

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: MAY 2021

Sanitary Design Sheet

LOCATION			DOMESTIC				INFILTRATION		Total Flow (l/s)	PIPE					
			TOTAL												
AREA	FROM	TO	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Total Area (ha)	Infilt. Flow (l/s)		Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q_{full} (%)
1	BUILDING	SANMH 1	192	192	3.3	3.32	1.1	0.25	3.57	200	1.00	25.0	32.8	1.04	10.9%

Design Parameters:

from Ontario Building code Table 8.2.1.3B:

- Average Domestic Flow (Rest/Nursing Homes)	450	L/person/day
- Extraneous Flows	0.23	l/s/ha
Residential Peaking Factor	Harmon Equation	

DATE: 6/14/2021
PREPARED BY: NOVATECH

M:\2020\120226\DATA\Calculations\Sewer Calcs\SAN\120226 -San Design.xls

APPENDIX C
Stormwater Management Calculations

RATIONAL METHOD

The Rational Method was used to determine both the allowable runoff as well as the post-development runoff for the proposed site. The equation is as follows:

$Q=2.78\ CIA$

Where:
Q is the runoff in L/s
C is the weighted runoff coefficient*
I is the rainfall intensity in mm/hr**
A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_p \times C_p) + (A_{imp} \times C_{imp})}{A_{tot}}$$

Where:
A_p is the pervious area in hectares
C_p is the pervious area runoff coefficient (C_{perv}=0.20)
A_{imp} is the impervious area in hectares
C_{imp} is the impervious area runoff coefficient (C_{imp}=0.90)
A_{tot} is the catchment area (A_{perv} + A_{imp}) in hectares

** The rainfall intensity is taken from the Port Hope Stormwater Management Guidelines and can be calculated as follows:

5 Year Design Storm
$I=2464 / (t + 16)$

100 Year Design Storm
$I=5588 / (t + 28)$

Note: The post-development C values are to be increased by 25% for the 1:100 year event (max. C_{imp}=1.0).

Project: Southbridge Nursing Home
Location: 20 Hope Street, Port Hope

DATE: November 2021

NOVATECH ENGINEERING CONSULTANTS LTD.

Storm Sewer Design Sheet

LOCATION		AREA (Ha)			FLOW					PROPOSED SEWER							
FROM	TO	TOTAL AREA	R= 0.2	R= 0.9	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
CBMH 4	OGS UNIT	0.230	0.150	0.080	0.28	0.28	10.00	94.77	26.90	381.0	1.00	96.0	183.10	1.60	1.00	156.20	0.15
CBMH 12	STMMH 5	0.650	0.300	0.350	1.04	1.04	10.00	94.77	98.80	381.0	0.40	23.0	115.80	1.01	0.38	17.00	0.85
BUILDING	STMMH 5	0.190	0.000	0.190	0.48	0.48	10.00	94.77	9.00	254.0	1.00	5.0	62.10	1.22	0.07	53.10	0.14
STMMH 5	OGS UNIT	0.000	0.000	0.000	0.00	1.52	10.38	93.41	107.80	381.0	1.00	8.5	183.10	1.60	0.09	75.30	0.59
OGS UNIT	STMMH 6	0.000	0.000	0.000	0.00	1.80	10.47	93.10	134.70	381.0	0.85	17.0	168.81	1.48	0.19	34.11	0.80

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Port Hope Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) Highlighted peak flows are controlled flows

TABLE 1A: Allowable Runoff Coefficient "C"

Area	"C"
Total	0.54
1.080	

TABLE 1B: Allowable Flows

Outlet Options	Area (ha)	"C"	Tc (min)	$Q_{5\ Year}$ (L/s)
Princess Street	1.080	0.54	10.0	**153.6**

Time of Concentration	Tc=	10.0	min
Intensity (5 Year Event)	I_5=	94.77	mm/hr
Intensity (100 Year Event)	I_{100}=	147.05	mm/hr

100 year Intensity = 5588 / (Time in min + 28)
5 year Intensity = 2464 / (Time in min + 16)

Equations:
Q = 2.78 x C x I x A
Where:
C is the runoff coefficient
I is the rainfall intensity, Port Hope IDF
A is the total drainage area

TABLE 2A: Post-Development Runoff Coefficient "C" - A1 Controlled Roof Area

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.190	Roof	0.190	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 2B: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A1 Controlled Roof Area

0.19 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	10	94.77	45.05	9.0	36.05	21.63
	15	79.48	37.79	9.0	28.79	25.91
	20	**68.44**	**32.54**	**9.0**	**23.54**	**28.24**
	25	60.10	28.57	9.0	19.57	29.35
	30	53.57	25.46	9.0	16.46	29.63

TABLE 2C: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A1 Controlled Roof Area

0.19 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	10	147.05	77.67	14.6	63.03	37.82
	15	129.95	68.64	14.6	54.00	48.60
	20	**116.42**	**61.49**	**14.6**	**46.85**	**56.22**
	25	105.43	55.69	14.6	41.05	61.58
	30	96.34	50.89	14.6	36.25	65.25

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, Port Hope IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

Table 2D: Roof Drain Flows

Roof Drains		
Roof Area	1900	m^2
Qty	12	
Type	Accutrol RD-100-A-ADJ	
Setting	3/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.87	L/s (ea)
Design Flow 4" of head	1.10	L/s (ea)
Design Flow 5" of head	1.34	L/s (ea)
Design Flow 6" of head	1.58	L/s (ea)

Table 2E: Total Roof Storage

Storm Event	Roof Drain ID	**Avg Area Per Roof Drain (m^2)	Avg Ponding Depth Per Roof Drain (m)	*Total Volume Per Drain (m^3)	Total Roof Storage Volume (m^3)	Total Volume (m^3) Required
5 Year	RD 1-25	158.3	0.0635	3.35	40.22	28.24
Max Storage	RD 1-25	158.3	0.1270	6.70	80.43	56.22

*Note: Ponding volumes calculated using cone equation:
**Note: Roof Drain Area accounts for 10% loss for roof furniture

TABLE 3A: Post-Development Runoff Coefficient "C" - A2-A5

			5 Year Event		100 Year Event	
Area	0.4	Ha	"C"	C_{avg}	"C" + 25%	$^*C_{avg}$
Total	Hard	0.080	0.90	0.44	1.00	0.51
0.230	Roof	0.000	0.90		1.00	
	Soft	0.150	0.20		0.25	

TABLE 3B: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A2-A5

0.230 =Area (ha)
0.443 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	**10**	**94.77**	**26.87**	**26.9**	**0.00**	**0.00**
	15	79.48	22.54	26.9	-4.33	-3.90
	20	68.44	19.41	26.9	-7.46	-8.95
	25	60.10	17.04	26.9	-9.83	-14.74
	30	53.57	15.19	26.9	-11.68	-21.03

TABLE 3C: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A2-A5

0.23 =Area (ha)
0.511 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	10	147.05	48.03	29.0	19.03	11.42
	15	**129.95**	**42.45**	**29.0**	**13.45**	**12.10**
	20	116.42	38.03	29.0	9.03	10.83
	25	105.43	34.44	29.0	5.44	8.16
	30	96.34	31.47	29.0	2.47	4.45

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, Port Hope IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

TABLE 3D: Structure information

Structures	Size Dia.(mm)	Area (m^2)	T/G	Inv IN	Inv OUT
CBMH 4	1200	1.13	95.75	98.11	98.06
CBMH 3	1200	1.13	99.70	98.24	98.19
CBMH 2	1200	1.13	100.50	98.80	98.75
CB 1	600	0.37	100.50	N/A	99.05

TABLE 3E: Pipe information

Structures	Size Dia.(mm)	Length	Inv UP	Inv DOWN
CB1 - CBMH4	300	85.00	99.05	98.11

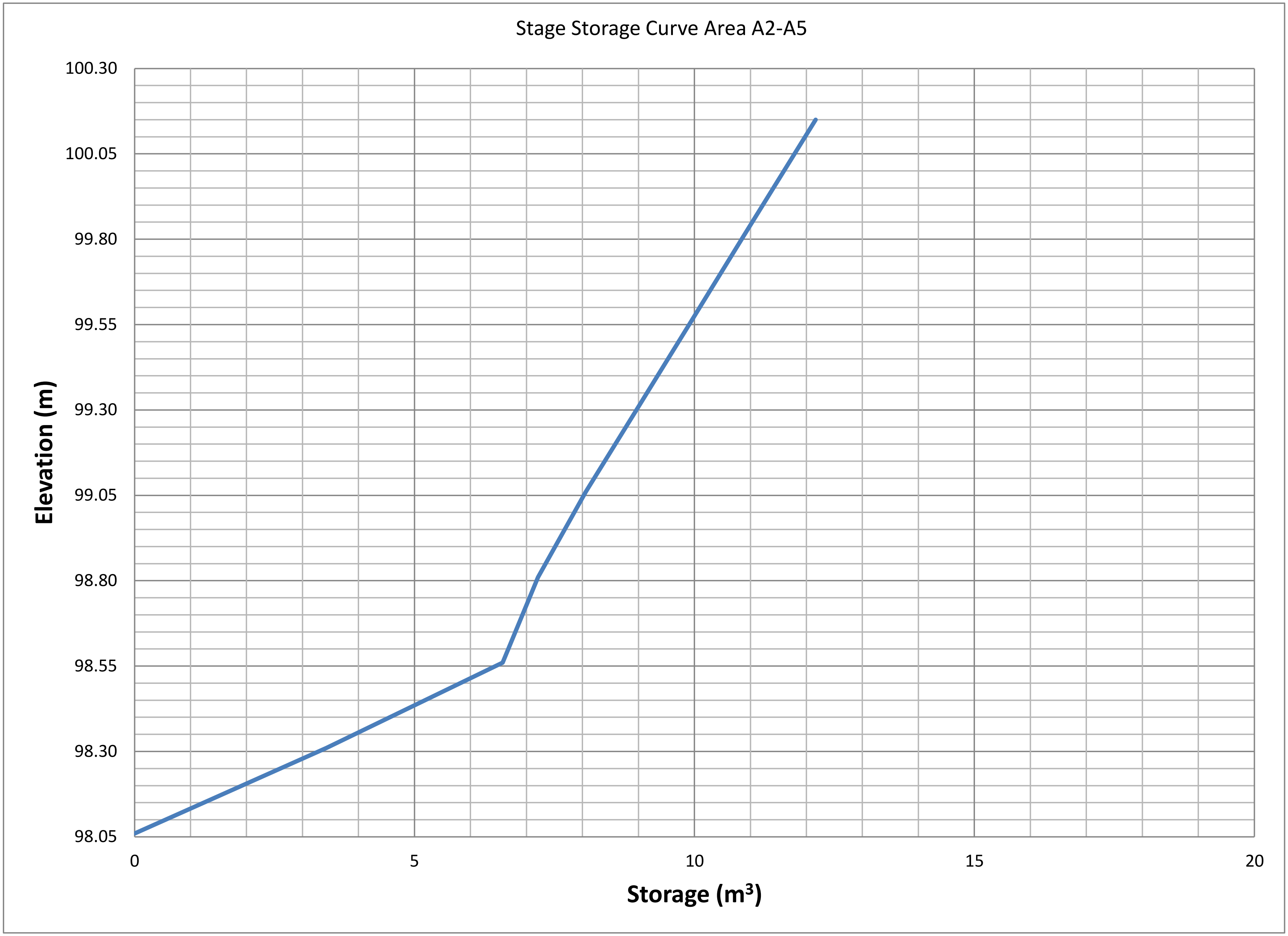
TABLE 3F: Storage Provided - A2-A5

Area A-3: Storage Table								
Elevation (m)	System Depth (m)	CBMH 4 Volume (m^3)	CBMH 3 Volume (m3)	CBMH 2 Volume (m3)	CB 1 Volume (m^3)	Pipe Volume (m^3)	Underground Volume (m^3)*	**Total Volume (m^3)**
98.060	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
98.310	0.25	0.28	0.14	0.00	0.00	3.00	0.42	**3.42**
98.560	0.50	0.57	0.42	0.00	0.00	6.01	0.57	**6.57**
98.810	0.75	0.85	0.70	0.07	0.00		0.63	**7.21**
99.060	1.00	1.13	0.98	0.35	0.00		0.85	**8.06**
99.310	1.25	1.41	1.27	0.63	0.10		0.94	**9.00**
99.560	1.50	1.70	1.55	0.92	0.19		0.94	**9.94**
99.810	1.75	1.98	1.83	1.20	0.28		0.94	**10.88**
100.100	2.04	2.31	2.16	1.53	0.39		1.09	**11.97**
100.150	2.09	2.36	2.22	1.58	0.41		0.19	**12.16**

TABLE 3G: Orfice Sizing information - A2-A5

Control Device					
Tempest MHF		B			
Design Event	**Flow (L/S)**	**Head (m)**	**Elev (m)**	**Outlet dia. (mm)**	**Volume (m^3)**
1:5 Year	26.9	1.89	100.10	300.00	0.00
1:100 Year	29.0	1.94	100.15	300.00	12.10

**The design Head is calculated based on the centre of the pipe



Stage Storage Curve Area A2-A5
Elevation (m)
100.30
100.05
99.80
99.55
99.30
99.05
98.80
98.55
98.30
98.05
0
5
10
15
20
Storage (m³)

TABLE 4A: Post-Development Runoff Coefficient "C" - A6-A11

			5 Year Event		100 Year Event	
Area	0.4	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.350	0.90	0.58	1.00	0.65
0.650	Roof	0.000	0.90		1.00	
	Soft	0.300	0.20		0.25	

TABLE 4B: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A6-11

0.65 =Area (ha)
0.58 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	**10**	**94.77**	**98.80**	**98.8**	**0.00**	**0.00**
	15	79.48	82.86	98.8	-15.94	-14.34
	20	68.44	71.35	98.8	-27.45	-32.94
	25	60.10	62.65	98.8	-36.15	-54.22
	30	53.57	55.84	98.8	-42.96	-77.32

TABLE 4C: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A6-11

0.65 =Area (ha)
0.65 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	5	169.33	200.07	102.1	97.97	29.39
	10	147.05	173.74	102.1	71.64	42.99
	15	**129.95**	**153.54**	**102.1**	**51.44**	**46.30**
	20	116.42	137.55	102.1	35.45	42.54
	25	105.43	124.57	102.1	22.47	33.71

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, Port Hope IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

TABLE 4D: Structure information

Structures	Size Dia.(mm)	Area (m^2)	T/G	Inv IN	Inv OUT
CBMH 12	1200	1.13	99.70	98.10	98.09
CBMH 11	1200	1.13	99.70	98.33	98.22
STMMH 10	1200	1.13	99.70	98.54	98.49
CBMH 8	1200	1.13	99.70	98.61	98.56
CBMH 7	1200	1.13	99.70	98.71	98.66
CB 9	600	0.36	99.70	N/A	98.78
CB 6	600	0.36	99.70	N/A	98.93

TABLE 4E: Pipe information

Structures	Size Dia.(mm)	Length	Inv UP	Inv DOWN
CB1 - CB2	250	18.30	98.93	98.10

TABLE 4F: Storage Provided - A6-A11

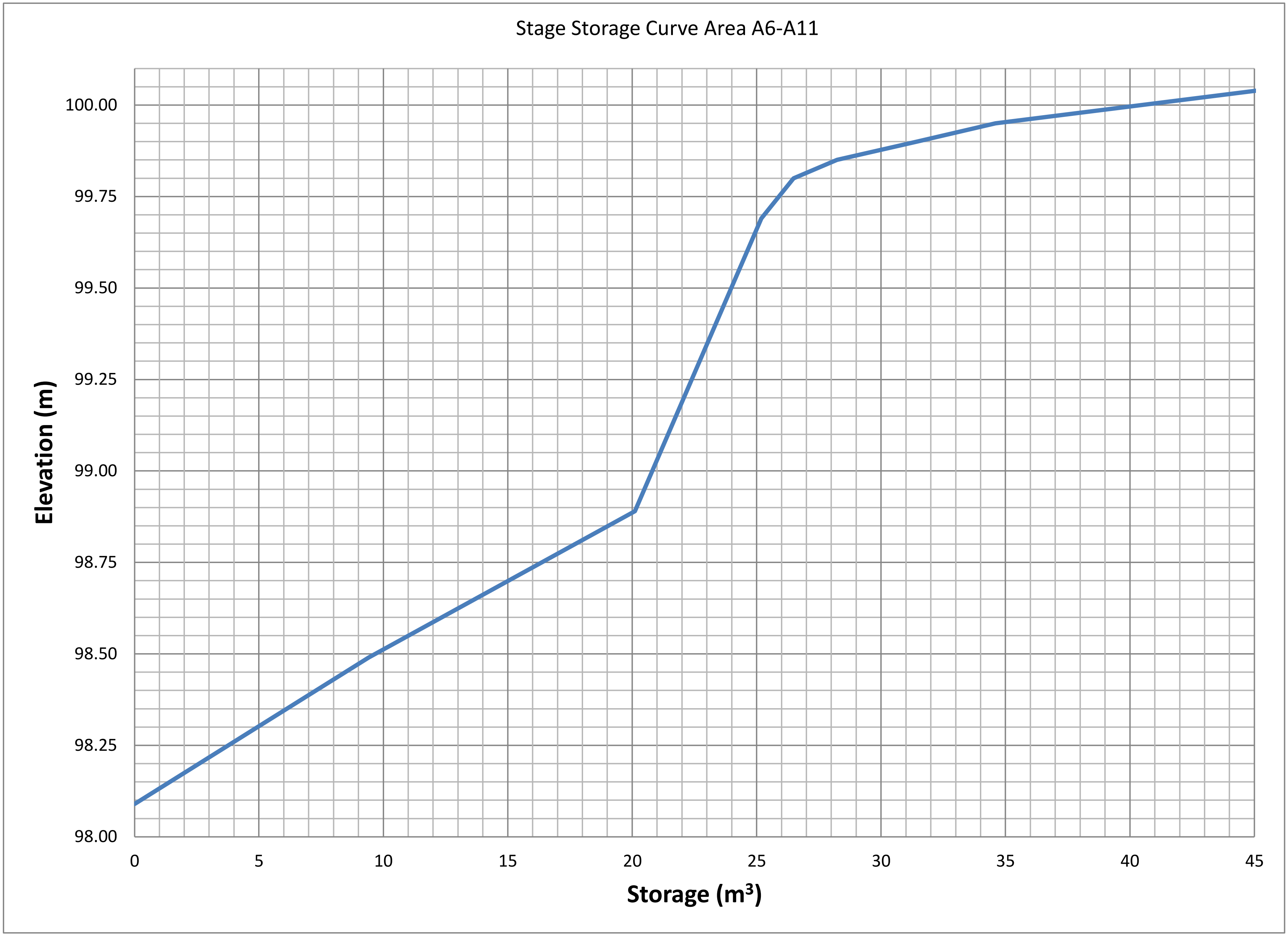
Area A-4: Storage Table

Elevation (m)	System Depth (m)	CBMH 12 Volume (m^3)	CBMH 11 Volume (m3)	STMMH 10 Volume (m3)	CBMH 8 Volume (m3)	CBMH 7 Volume (m3)	CB 9 Volume (m3)	CB 6 Volume (m^3)	Pipe Volume (m^3)	Underground Volume (m^3)*	Surface Ponding Volume (m³)	**Total Volume (m^3)**
98.090	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
98.490	0.40	0.45	0.31	0.00	0.00	0.00	0.00	0.00	8.66	9.42	0.00	**9.42**
98.890	0.80	0.90	0.76	0.45	0.37	0.26	0.04	0.00	17.32	20.11	0.00	**20.11**
99.290	1.20	1.36	1.21	0.90	0.83	0.71	0.18	0.13		22.64	0.00	**22.64**
99.690	1.60	1.81	1.66	1.36	1.28	1.16	0.33	0.27		25.19	0.00	**25.19**
99.800	1.71	1.93	1.79	1.48	1.40	1.29	0.37	0.31		25.89	0.59	**26.48**
99.850	1.76	1.99	1.84	1.54	1.46	1.35	0.39	0.33		26.21	2.02	**28.23**
99.900	1.81	2.05	1.90	1.59	1.52	1.40	0.40	0.35		26.53	4.92	**31.45**
99.950	1.86	2.10	1.96	1.65	1.57	1.46	0.42	0.37		26.85	7.75	**34.60**
100.050	1.96	2.22	2.07	1.76	1.69	1.57	0.46	0.40		27.49	18.82	**46.31**

TABLE 4G: Orfice Sizing information - A6-A11

Control Device					
Tempest HF		E			
Design Event	**Flow (L/S)**	**Head (m)**	**Elev (m)**	**Outlet dia. (mm)**	**Volume (m³)**
1:5 Year	98.8	1.49	99.70	250.00	0.00
1:100 Year	102.1	1.79	100.00	250.00	46.30

**The design Head is calculated based on the centre of the pipe



Stage Storage Curve Area A6-A11
Elevation (m)
100.00
99.75
99.50
99.25
99.00
98.75
98.50
98.25
98.00
0
5
10
15
20
25
30
35
40
45
Storage (m³)

TABLE 5A: Post-Development Runoff Coefficient "C" - A12

			5 Year Event		100 Year Event	
Area	0.4	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.20	1.00	0.25
0.010	Roof	0.000	0.90		1.00	
	Soft	0.010	0.20		0.25	

TABLE 6B: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-12

0.010 =Area (ha)
0.20 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	**10**	**94.77**	**0.53**	**0.53**	**0.00**	**0.00**
	15	151.63	0.84	0.53	0.31	0.28
	20	150.86	0.84	0.53	0.31	0.37
	25	150.09	0.83	0.53	0.30	0.46
	30	149.33	0.83	0.53	0.30	0.54

TABLE 6C: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-12

0.01 =Area (ha)
0.25 = C

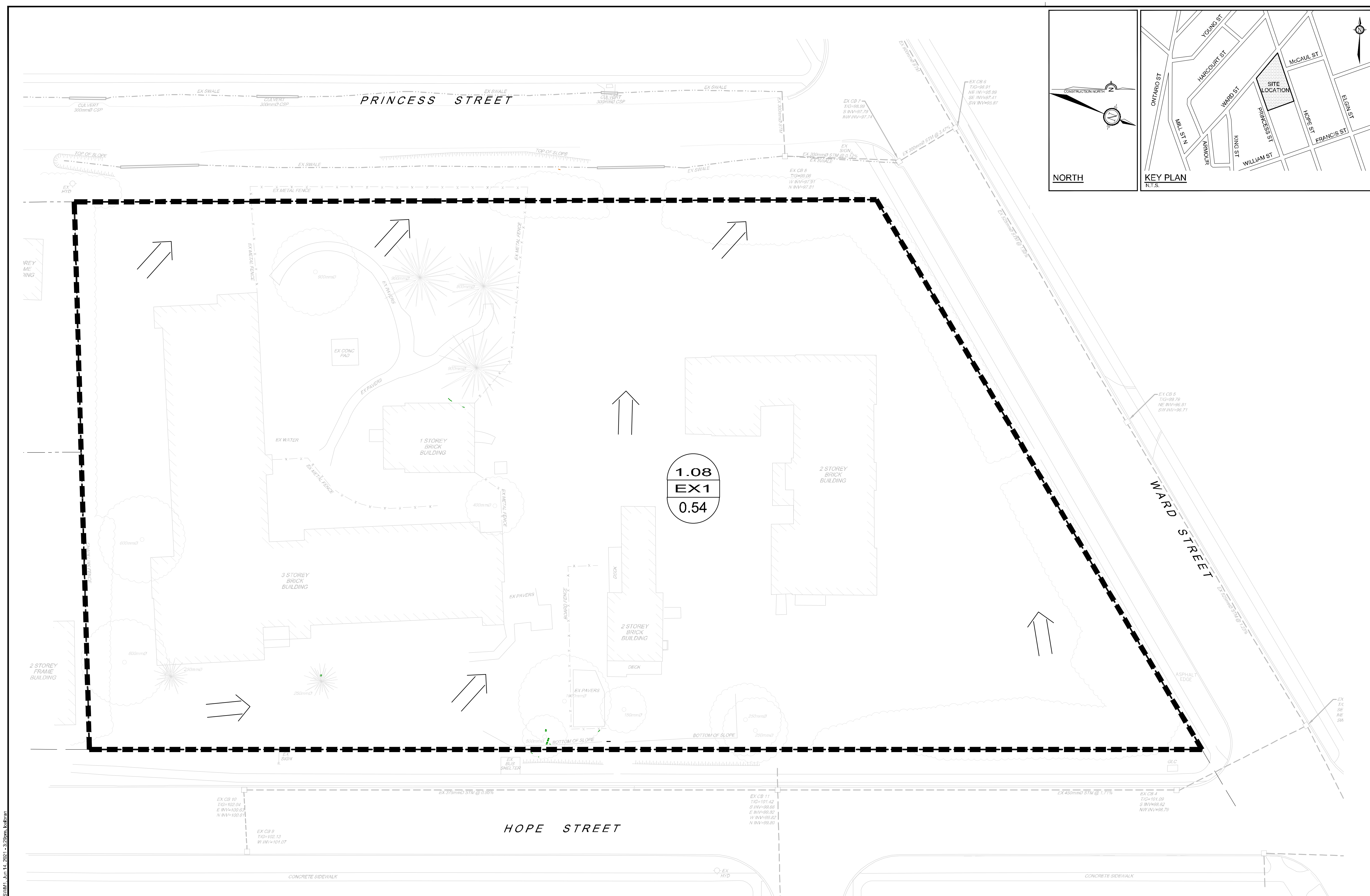
Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	**10**	**147.05**	**1.02**	**1.02**	**0.00**	**0.00**
	15	129.95	0.90	1.02	-0.12	-0.11
	20	116.42	0.81	1.02	-0.21	-0.26
	25	105.43	0.73	1.02	-0.29	-0.43
	30	96.34	0.67	1.02	-0.35	-0.63

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, City of Ottawa IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

Table 8: Post-Development Stormwater Mangement Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	Oulet Location	Orifice	5 Year Storm Event				100 Year Storm Event			
					Release (L/s)	Head (m)	Req'd Vol (cu.m)	Max. Vol. Provided (cu.m.)	Release (L/s)	Head	Req'd Vol (cu.m)	Max. Vol. Provided (cu.m.)
A1	0.190	0.90	STMMH 5	RD-100-A-ADJ	9.0	0.06	28.24	40.22	14.6	0.13	56.22	80.43
A2-A5	0.230	0.44	CBMH 4	TEMPEST MHF B	26.9	1.89	0.00	12.16	29.0	1.94	12.10	12.16
A6-A11	0.650	0.58	CBMH 12	TEMPEST HF E	98.8	1.49	0.00	46.31	102.1	1.79	46.30	46.31
A12	0.010	0.20	WARD ST	N/A	0.5	N/A	N/A	N/A	1.0	N/A	N/A	N/A
Total					**135.2**				**146.8**			
Allowable					**153.6**				**153.6**			



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES 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 WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPLICATION	JUNE 14/21	CJR

SCALE: N.T.S.

DESIGN	LSC
CHECKED	CJR
DRAWN	LSC
CHECKED	CJR
APPROVED	CJR

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
MUNICIPALITY OF PORT HOPE
20 HOPE STREET SOUTH

DRAWING NAME
SOUTHBRIDGE CARE HOMES
PORT HOPE NURSING HOME
PRE-DEVELOPMENT STORMWATER MANAGEMENT DRAINAGE AREA PLAN

PROJECT No. 120226
REV: REV 1
DRAWING No. 120226-SWM1

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES 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 WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3	REVISED PER MUNICIPALITY COMMENTS	JAN 25/22	CJR
2	REVISED PER MUNICIPALITY COMMENTS	NOV 12/21	CJR
1	ISSUED FOR SITE PLAN APPLICATION	JUNE 14/21	CJR

SCALE
1:250

DESIGN LSC
CHECKED CJR
DRAWN LSC
CHECKED CJR
APPROVED CJR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
C.J. RUDDLE
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
MUNICIPALITY OF PORT HOPE
65 WARD STREET / 20 HOPE STREET SOUTH

DRAWING NAME
SOUTHBRIDGE CARE HOMES
PORT HOPE NURSING HOME
POST-DEVELOPMENT STORMWATER MANAGEMENT DRAINAGE AREA PLAN - ULTIMATE CONDITIONS

PROJECT No. 120226
REV REV 2
DRAWING No. 120226-SWM2

CONTECH ENGINEERED SOLUTIONS

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD BASED ON A FINE PARTICLE SIZE DISTRIBUTION

CDS TECHNOLOGIES

Project Name:	20 Hope Street, Long Term Care Home	**Engineer:**	**NOVATECH**
Location:	Port Hope	**Contact:**	**Paul Newcombe, EIT**
OGS #:	OGS	**Report Date:**	11-Nov-21

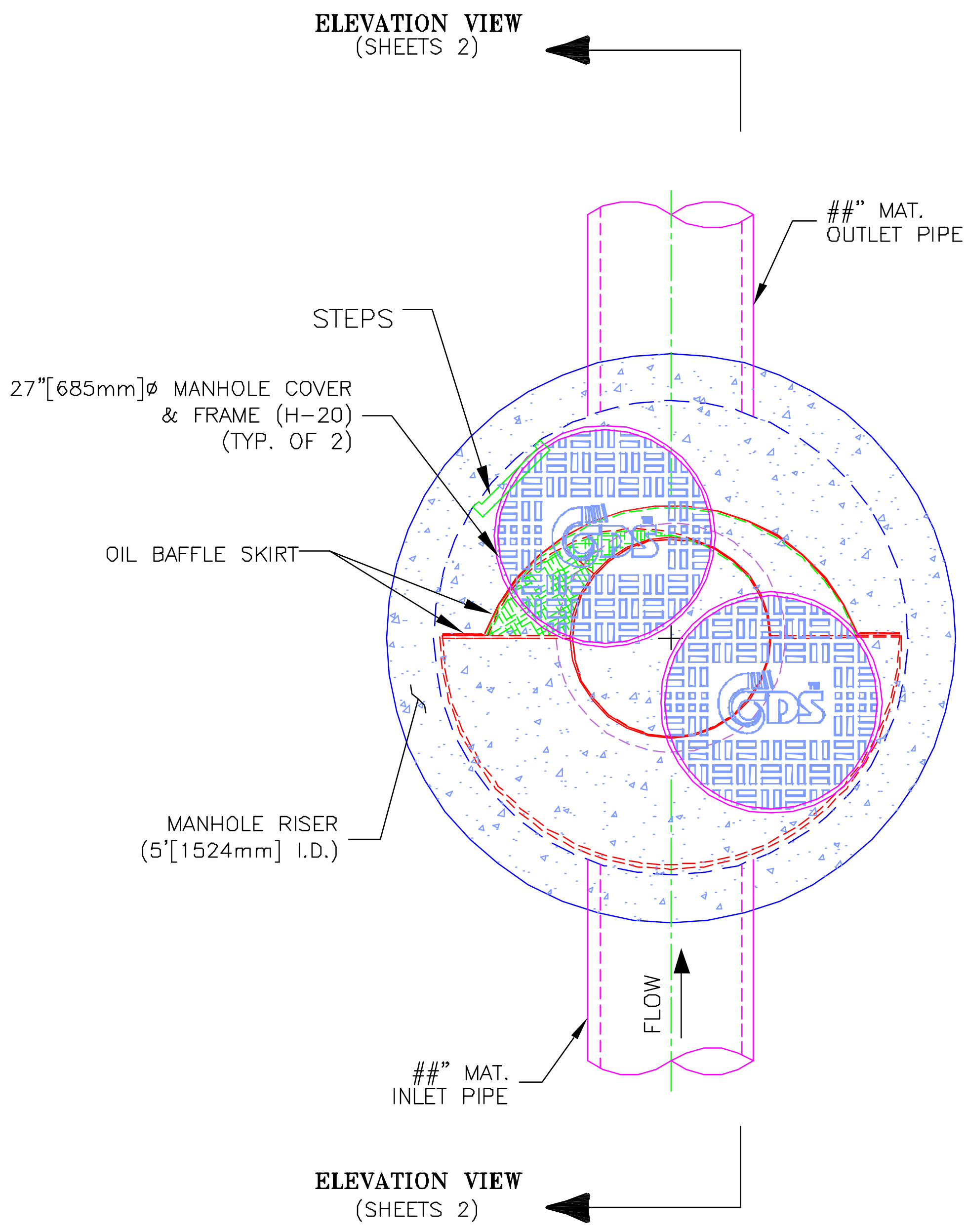
Area	1.1	ha	**Rainfall Station #**	211	
Weighted C	0.60		**Particle Size Distribution**	FINE	
CDS Model	2020		**CDS Treatment Capacity**	31	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.5%	9.5%	0.9	0.9	2.9	98.0	9.3
1.0	10.4%	19.9%	1.8	1.8	5.9	97.2	10.1
1.5	8.9%	28.8%	2.8	2.8	8.8	96.3	8.6
2.0	8.1%	36.9%	3.7	3.7	11.8	95.5	7.8
2.5	7.3%	44.2%	4.6	4.6	14.7	94.6	6.9
3.0	5.6%	49.9%	5.5	5.5	17.7	93.8	5.3
3.5	5.1%	55.0%	6.4	6.4	20.6	92.9	4.7
4.0	4.1%	59.0%	7.3	7.3	23.6	92.1	3.8
4.5	3.2%	62.2%	8.3	8.3	26.5	91.3	2.9
5.0	3.3%	65.5%	9.2	9.2	29.4	90.4	3.0
6.0	6.4%	71.9%	11.0	11.0	35.3	88.7	5.7
7.0	4.7%	76.6%	12.8	12.8	41.2	87.0	4.1
8.0	4.1%	80.7%	14.7	14.7	47.1	85.4	3.5
9.0	2.8%	83.5%	16.5	16.5	53.0	83.7	2.3
10.0	2.0%	85.5%	18.3	18.3	58.9	82.0	1.6
15.0	7.3%	92.8%	27.5	27.5	88.3	73.5	5.4
20.0	3.7%	96.5%	36.7	31.2	100.0	59.6	2.2
25.0	2.5%	99.1%	45.9	31.2	100.0	47.7	1.2
30.0	0.2%	99.3%	55.0	31.2	100.0	39.7	0.1
35.0	0.5%	99.7%	64.2	31.2	100.0	34.1	0.2
40.0	0.3%	100.0%	73.4	31.2	100.0	29.8	0.1
45.0	0.0%	100.0%	82.6	31.2	100.0	26.5	0.0
50.0	0.0%	100.0%	91.7	31.2	100.0	23.8	0.0
							88.7

Removal Efficiency Adjustment[2] =	6.5%
Predicted Net Annual Load Removal Efficiency =	**82.2%**
Predicted % Annual Rainfall Treated =	**98.2%**

1 - Based on 32 years of hourly rainfall data from Canadian Station 6166418, Peterborough ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

PLAN VIEW

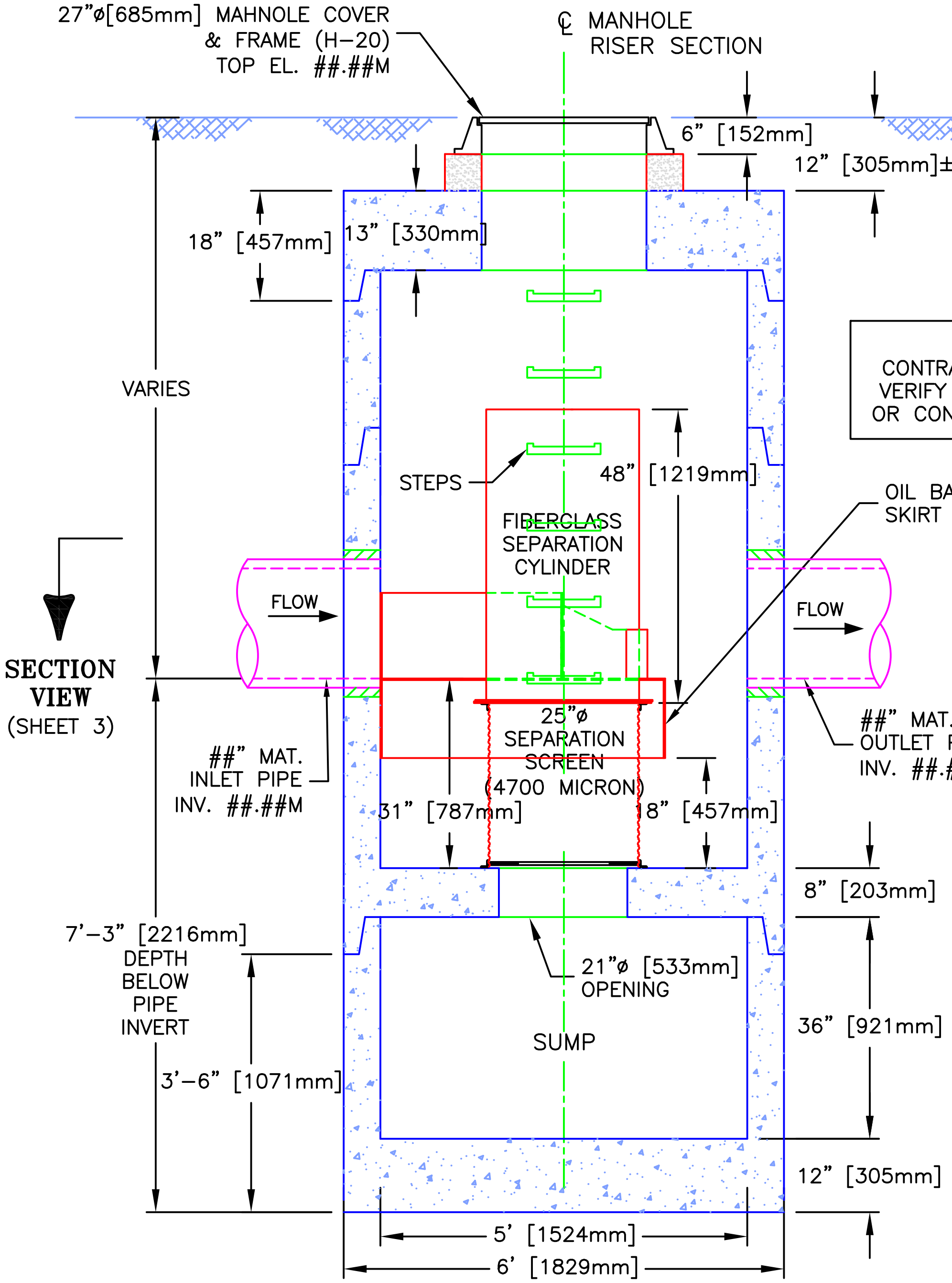


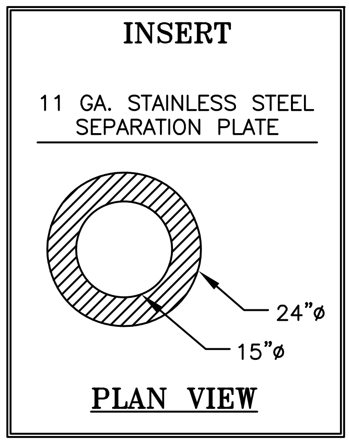
MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB#	XX-##-###	SCALE 1" = 2'
		DATE	##/##/##	SHEET
		DRAWN	INITIALS	1
		APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW





MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB#	XX-##-###	SCALE 1" = 2.5'
		DATE	##/##/##	SHEET 2
		DRAWN	INITIALS	
		APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

APPENDIX D
CIMA Water Modelling Report

Novatech Engineers, Planners & Landscape Architects

Water Distribution System Hydraulic Modelling for Development at 20 Hope Street South

CIMA Project No. C14-0452
July 5, 2021

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Novatech Engineers, Planners & Landscape Architects

Water Distribution System Hydraulic Modelling for Development at 20 Hope Street South

July 5, 2021

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Water Distribution System Hydraulic Modelling for Development at 20 Hope Street

Project No. C14-0452

PREPARED BY: ______________________
Dan Campbell

VERIFIED BY: ______________________
William McCrae, P.Eng.

CIMA+
415 Baseline Road West, 2nd Floor
Bowmanville, Ontario L1C 5M2

July 5, 2021

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1. Introduction

1.1 Background

CIMA Canada Inc. (CIMA) was retained by Novatech Engineers, Planners & Landscape Architects (Novatech) to complete hydraulic modelling of the Port Hope water distribution system to assess a proposed development at 20 Hope Street South. Novatech have been retained to design elements of the site servicing for the expansion of an existing building located on the northern portion of 20 Hope Street South. The existing building to be re-developed is proposed to be a retirement residence with a footprint of ± 1,900 m^2 and will ultimately include seven (7) stories. It is our understanding that the intent of the proposed building design (renovation and expansion of the existing building) is to build to a relatively high standard from a fire protection perspective. The construction material is to be a modified fire resistive material, interior building openings are to be protected and a sprinkler system is to be installed.

The purpose of this hydraulic modelling report is to confirm:

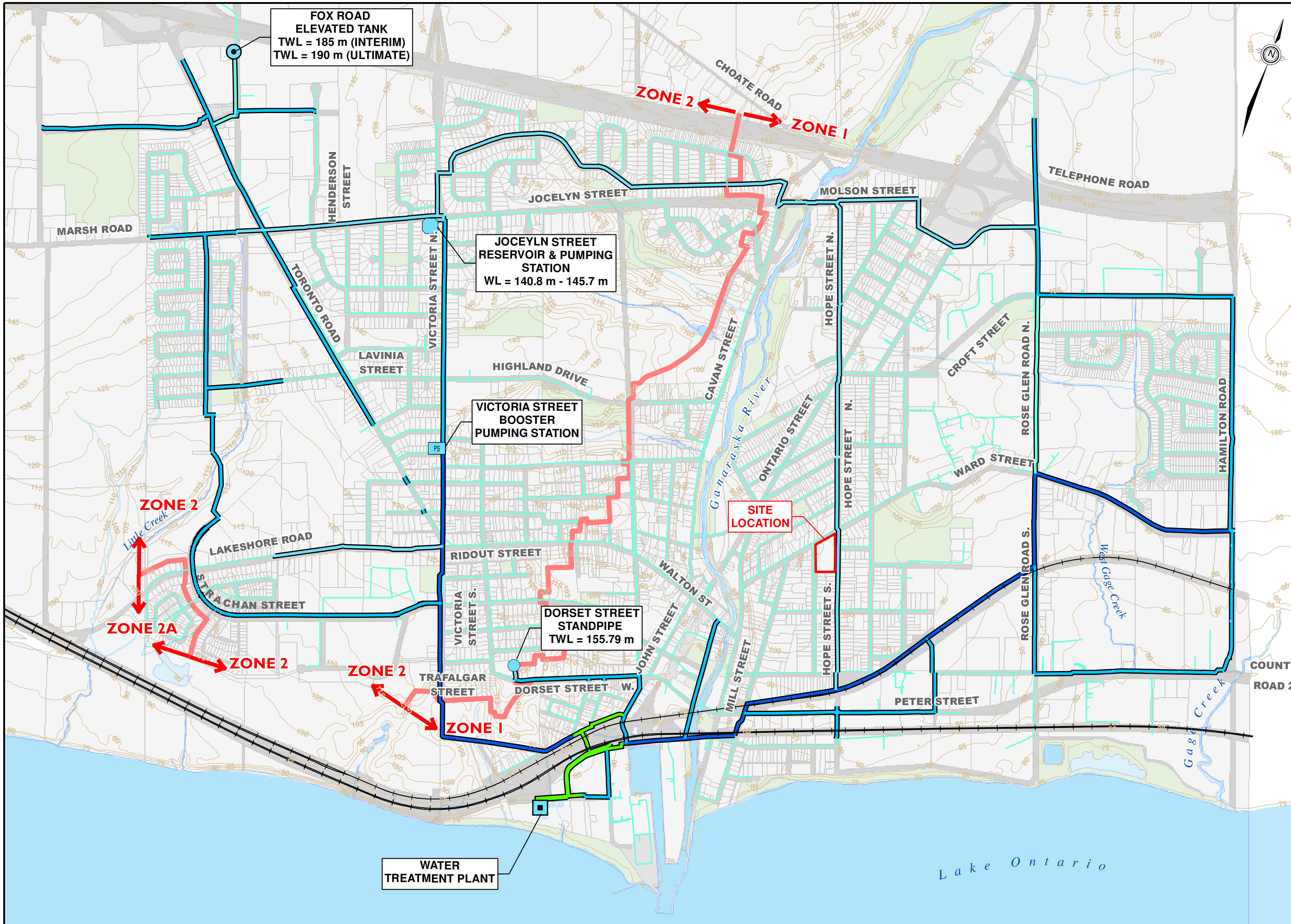
- That the existing watermains servicing the site are capable of meeting current and projected domestic demands under various scenarios without adverse impact on the distribution system.
- That the existing water distribution system servicing the site is capable of supplying sufficient fire flow.

Correspondence received from Novatech indicates a required fire flow of 5,000 L/min for the proposed building. CIMA+ has not reviewed the accuracy of these calculations or the compliance of the proposed building design with the assumptions of the calculations.

Figure 1 indicates the location of the proposed development in the context of the Municipality of Port Hope (MPH) water distribution system.

2. Existing Port Hope Water Distribution System

The Port Hope Drinking Water System is classified as a Large Municipal Residential drinking water system that serves the urban community of Port Hope with a current estimated population of 12,500. The local topography of the Port Hope urban (serviced) area includes a sizable elevation differential with ground elevations ranging between ±75 m and ±150 m, as a result the water distribution system is divided into two (2) pressure zones (Pressure Zone 1 and Pressure Zone 2). **Figure 1** highlights the divisions between the pressure zones and the location of other key facilities within the Port Hope water distribution system.



LEGEND

Water Supply & Storage

- Water Treatment Plant
- PS Booster Pumping Station
- Elevated Tank
- Standpipe
- Reservoir
- Existing Watermain

Existing Trunk Watermain

- 150 - 250 mm
- 300 mm
- 400/450 mm
- 500 mm
- 600 mm

Other Features

- Pressure Zone Boundary
- Contour (5m Interval)
- 20 Hope Street South Site Location

CIMA+

CLIENT:

MUNICIPALITY OF PORT HOPE

PROJECT NAME:

20 HOPE STREET SOUTH RECONSTRUCTION

SHEET TITLE:

EXISTING DISTRIBUTION SYSTEM & SITE LOCATION

SCALE:

0 0.05 0.1 0.2 0.3 0.4
kilometres
1:15,000

FIGURE No:

FIGURE 1

PROJECT No: C14-0452

DATE: 6/29/2021

Raw water is obtained from Lake Ontario and treated at the Port Hope Water Treatment Plant (WTP). The High Lift Pumping System at the WTP is equipped with five (5) High Lift Pumps (HLPs) that deliver treated water to the distribution system.

2.1 Pressure Zone 1

Pressure Zone 1 (Zone 1) encompasses the lower elevation areas located within the Ganaraska River valley as well as the lands east of the river. Elevations within pressure Zone 1 generally range between ±75m along the shoreline of Lake Ontario to ±120m along the boundary between the pressure zones and at high points in the north east portion of the urban area.

In addition to servicing a sizable residential population, Zone 1 includes Port Hope's historic downtown core area as well as the majority of the industrial and commercial development within the Port Hope urban area.

Water is supplied directly to Zone 1 by the HLPs at the WTP, which draw water from a two-cell 5,000 m^3 in-ground treated water reservoir. The individual capacities of the HLPs at the WTP are summarized in **Table 1**.

Table 1: High Lift Pump Capacities

Pump	Horsepower	Discharge (L/s)	Head (m)
HLP1	100 (VFD)	63.66	79.9
HLP2	200 (VFD)	115.80	79.9
HLP3	250 (VFD)	173.60	79.9
HLP4	200 (VFD)	115.80	79.9
HLP5	250 (VFD)	173.60	79.9

Under normal operating conditions the hydraulic grade line in Zone 1 is governed by the water level in the Dorset Street Sandpipe, which has an Overflow Water Level (OWL) of ±156.75 m. The Dorset Street Standpipe is a 22.86 m (75 ft) tall cylindrical tank with a diameter of 7.77 m (25.5 ft) providing a total storage volume of 1,083 m^3. The Dorset Street Standpipe normally operates between a lower level set point of 18.00 m (elevation ± 151.89 m) when the HLPs are operated at a discharge pressure control set point of 780 kPa to fill the tank and an upper level set point of 21.90 m (elevation ± 155.79 m) when the HLPs are operated at a discharge pressure control set point of 710 kPa.

2.2 Pressure Zone 2

Pressure Zone 2 (Zone 2) encompasses the higher elevation areas west of the Ganaraska River valley. Elevations within the Zone 2 service area range between ± 95 m and ±150 m. Historically, most development in Zone 2 has been located above an elevation of ± 120 m. Newer developments in the southwest corner of Zone 2 are located below an elevation of ± 120 m and are equipped with localized pressure reducing valves (PRVs) either on individual water services or on local watermains supplying individual developments. Phases 3 & 4 of the Mason Homes development have individual PRVs while Phase 2 of the Mason Homes development is located in a separate pressure zone that is created by PRVs on Maple Boulevard and Lakeshore Road. Phase 1 of this development (Monarch) is serviced privately through a pressure reducing, backflow prevention and metering facilitity.

The HLPs at the WTP deliver water to the Victoria Street Booster Pumping Station (BPS) via a 500 mm transmission main. The Victoria Street BPS is equipped with three pumps, the individual capacities of which are summarized in **Table 2**.

Table 2: Victoria Street BPS Pump Capacities

Pump	Horsepower	Discharge (L/s)	Head (m)
P2501	50 (VFD)	57.39	40.54
P2503	25	37.88	36.58
P2504	20	24.98	28.96

The Victoria Street BPS supplies water directly to the Zone 2 distribution system as well as directly to the Jocelyn Street Reservoir via a 300 mm feedermain on Victoria Street North. Constructed in 1977 the Jocelyn Street Reservoir consists of a single celled in-ground reservoir with a storage capacity of 2,270 m^3 and a pumping station that delivers water to the Zone 2 service area. Water levels in the Jocelyn Street Reservoir range between ±140.8 m and ±145.7 m. The Jocelyn Street Reservoir and Pumping Station (PS) is equipped with 3 pumps, the individual capacities of which are summarized in **Table 3.**

Table 3: Jocelyn Street Reservoir PS Pump Capacities

Pump	Horsepower	Discharge (L/s)	Head (m)
P2001	15	17.35	48.77
P2002	15	17.35	48.77
P2003	100 (fire pump)	157.73	37.19

The operation of pumps at the Victoria Street BPS and the Jocelyn Street PS are controlled by the water level in the Fox Road Elevated Tank (ET) located at the north end of Fox Road (See **Figure 1**). The Fox Road ET, with a total capacity of 3,000 m^3, is a composite structure with a welded steel tank supported on a concrete pedestal. The current operating strategy for the Fox Road ET involves using an interim TWL of ±185.0 m, which is considered sufficient to service lands within the current urban boundary including the recent 2019 expansion of the system to service to the hamlet of Welcome located north of Highway 401. Under ultimate full build-out conditions, the operating strategy for the Fox Road ET can be modified, with the water level increased to the ultimate TWL of ±190.0 m to service additional lands north of Highway 401 – including those with higher elevations along Cranberry Road. Increasing the TWL in the Fox Road ET will require upgrades to the pumps at the Victoria Street BPS as well as adjustments to the existing pressure zone boundary (division) between Pressure Zones 1 & 2.

Figure 2 below summarizes the start/stop set points for the pumps at the Victoria Street BPS and Jocelyn Street Reservoir and PS under the current Fox Road ET operating strategy.

Scenario	Victoria Street Booster Stn.			Jocelyn Street Pumping Stn.		
MHD	P1	P3	P4	P1	P2	P3
ADD	**P1**	P3	P4	**P1**	P2	P3
MDD/PHD	**P1**	**P3**	P4	**P1**	P2	P3
	P1	**P3**	P4	**P1**	**P2**	P3
	P1	**P3**	P4	**P1**	**P2**	P3
MDD+FF	*P1*	**P3**	P4	**P1**	**P2**	**P3**

Legend
P1 Pump Off
P1 Pump On
P1 Pump Normally On, But Assumed Out of Service per FUS Guidelines

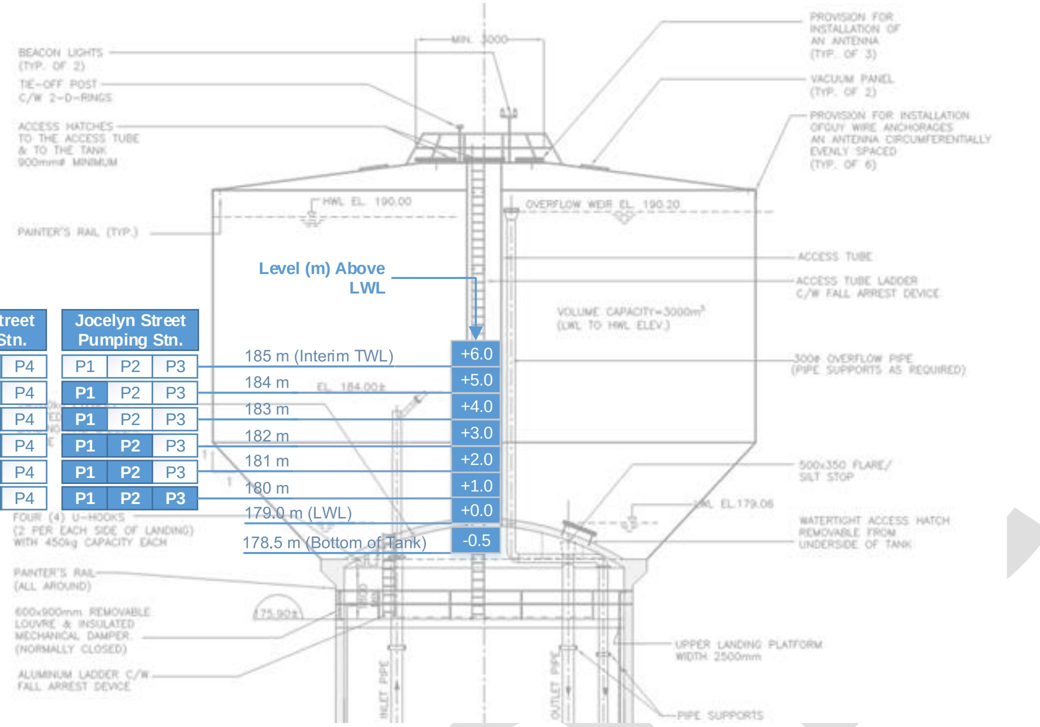


Figure 2: Zone 2 Pump Start Set Points

It is noted that the pump currently in service as Pump 1 (designated as P2501 in Table 2) at the Victoria Street BPS replaced two pumps previously designated as P1 and P2. The pumps that remain in service at the Victoria Street BPS are designated P1, P2 and P3 or alternately P2501, P2503 and P2504.

3. Site Context

The proposed development is located within Pressure Zone 1 in the central portion of the Port Hope urban area, and is situated at an elevation of ±101 m. Generally, the infrastructure in the area has been planned to support residential and institutional related development.

3.1 Existing Distribution System

The water distribution system in the general vicinity of the site consists of a well connected network of 150 mm dia. and 200 mm dia. watermains.The following water distribution system exists in the direct vicinity of the site:

- Existing Hope Street Watermain: a 200 mm dia. watermain runs along Hope Street and acts as a sub-trunk watermain. It extends ±2,000 m between the 500 mm dia. trunk watermain to the south within the CP railway corridor and the 200 mm dia. watermain on Molson Street to the north. There are numerous interconnections with the rest of the Zone 1 distribution system over this length.
- Existing Princess Street Watermain: a 150 mm dia. watermains runs ±550 m along the entire length of Princess Street between Dorset Street to the south and Ward Street to the north.

- Existing Ward Street Watermain: a 150 mm dia. watermain runs along Ward Street along the northern boundary of the 20 Hope Street South property. It intersects both the 150 mm dia. watermain on Princess Street and the 200 mm dia. watermain on Hope Street.

Figure 3 illustrates the general layout of the water distribution system in the central area of Port Hope and provides an overview of the site location of 20 Hope Street South.

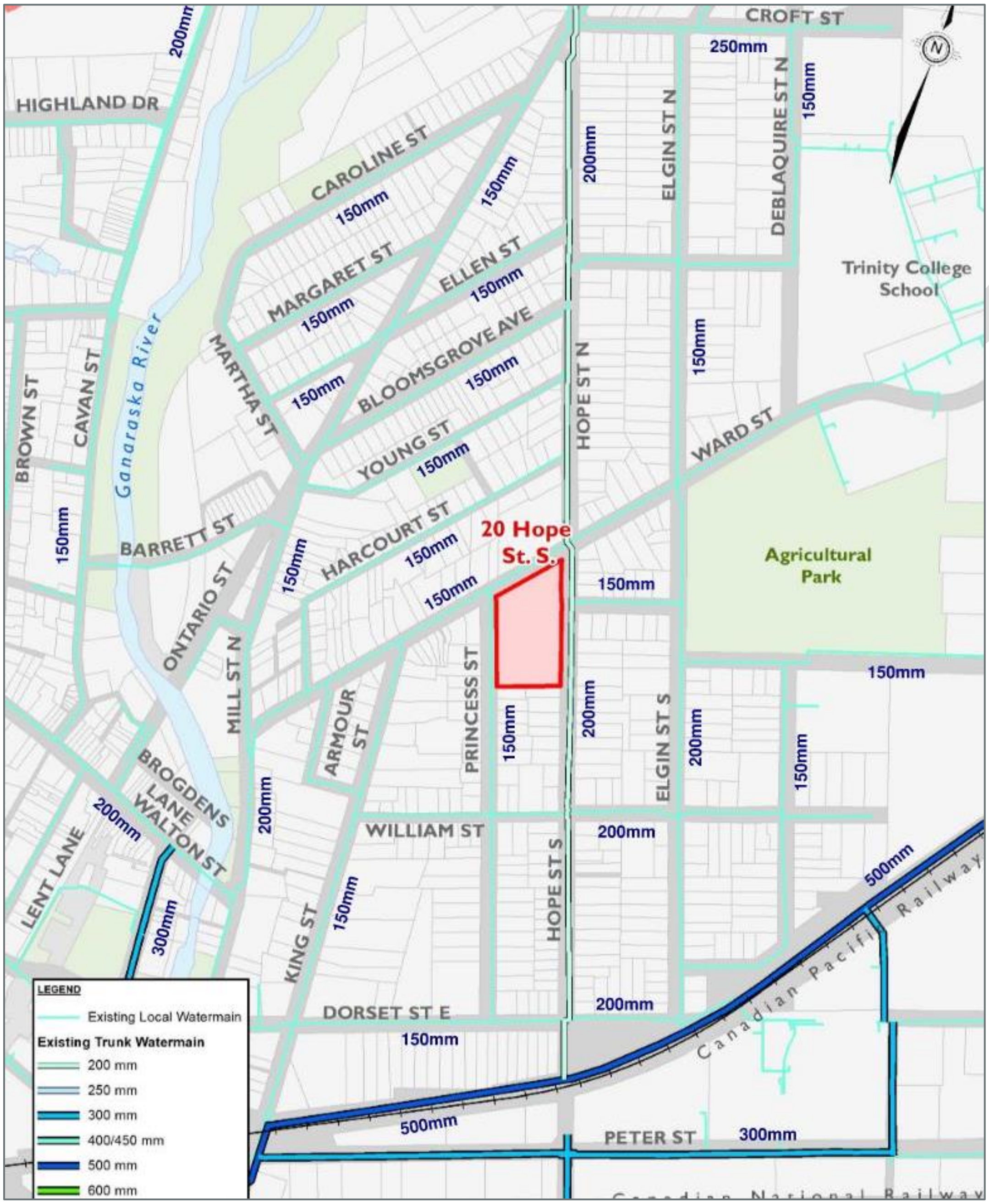


Figure 3: Existing Water Distribution System

3.2 Proposed Site Infrastructure and Water Demand

As described in Section 1.1 the proposed development at 20 Hope Street South is understood to be a retirement residence. At this time detailed drawings have not been provided, but it is our understanding that the site will be serviced from a connection to the existing Princess Street watermain.

The expected water demands assocaited with the proposed development have been calculated and provided by Novatech for average day demand, maximum day demand and peak hour demand conditions. Minimum hour demands are based on a factor of 0.60 which is applied to average day demand. These demands are summarized in Table 4.

Table 4: Site Specific Water Demands

Demand Scenario	Calculated Demand (L/s)
Minimum Hour Demand (MHD)	0.6
Average Day Demand (ADD)	1.0
Maximum Day Demand (MDD)	2.75
Peak Hour Demand (PHD)	4.13

Novatech also supplied a calaculated sprinkler demand of 32.93 L/s (522 gpm). The sprinkler flow is further discussed in Section 5.2.

For clarity it is noted that all modelling scenarios also include existing system demands.

4. Hydraulic Model Setup

The Port Hope water distribution system hydraulic model has been developed using the InfoWater software package developed by Innovyze. The model integrates a variety of information with the intention of being used for planning level analysis. **Appendix A** provides a description of the overall model setup with respect to information sources, water demand, demand factors and other general modelling parameters.

4.1 Scenario Setup

The MPH hydraulic model is configured with five (5) base scenarios that are analyzed under steady state conditions. For each scenario the demand, pump operation and tank level assumptions are set to reflect a range of conditions that are typically considered in the design of water distribution systems and actual operation of the MPH system.

- Minimum Hour Demand (MHD);
- Average Day Demand (ADD);
- Maximum Day Demand (MDD);
- Peak Hour Demand (PHD); and
- Maximum Day Demand (MDD) + Fire Flow (FF).

Pump settings for ADD, MDD, PHD and MHD scenarios are based on input from Port Hope staff and the established pump sequencing for pumping facilities in Zone 1 and Zone 2. Pump settings for the MDD+FF scenario are based on guidelines prepared by the Fire Underwriters Survey (FUS).

FUS guidelines generally indicate the pumping capacity, in conjunction with storage, should be sufficient to sustain maximum day demand plus required fire flow when the two most important pumps are out of service. This approach is consistent with MOE guidelines for determining firm rated pumping station capacities for systems with no floating storage. However, FUS guidelines also state:

For smaller municipalities (usually up to about 25,000 population) the relative infrequency of fires is assumed as largely offsetting the probability of a serious fire occurring when two pumps are out of service.

Considering these guidelines and the presence of floating storage in both pressure zones, the MDD+FF scenario includes the assumption that that the one most important (largest) pump in each pressure zone is out of service (off-line). As outlined below and in **Table 5,** the pumps assumed to be out of service (off-line) are:

- HLP5 at the WTP, which is one of the two largest (identical) high lift pumps responsible for supplying water to both Zone 1 and Zone 2 under high demand conditions; and
- Pump 1 (P2501) at the Victoria Street BPS, which is the most important pump for supplying water into Zone 2, as it is the largest pump at the Victoria BPS with a capacity of 1000 gallons per minute (3,785 L/min).

Table 6 details the assumptions regarding the water level in floating storage facilities in both pressure zones. The quantity of treated water available in reservoirs (non-floating storage) to sustain pumping over extended durations is assumed to be adequately provided for by the design of those facilities and is not considered as part of this analysis.

Table 5: Pump Settings for Modelling Scenarios

Facility	Pump	Description	MHD	ADD	MDD	PHD	MDD+FF
WTP (HLP System)	HLP1	100 HP (VFD)	-	On	-	-	-
	HLP2	200 HP (VFD)	-	-	On	-	On
	HLP3	250 HP (VFD)	-	-	-	On	On
	HLP4	200 HP (VFD)	-	-	-	-	On
	HLP5	250 HP (VFD)	-	-	-	-	Offline
Victoria Street BPS	P2501 (P1)	50 HP (VFD)	-	On	On	On	Offline
	P2502 (P2)	Removed	n/a	n/a	n/a	n/a	n/a
	P2003 (P3)	25 HP	-	-	On	On	On
	P2004 (P4)	20 HP	-	-	-	-	On
Jocelyn Street Reservoir & PS	P2001 (P1)	15 HP Small Duty	-	On	On	On	On
	P2002 (P2)	15 HP Small Duty	-	-	-	-	-
	P2003 (P3)	100 HP Fire Pump	-	-	-	-	On

Table 6: Floating Storage Settings for Modelling Scenarios

Facility	Top Water Level (m)	Low Water Level (m)	Bottom of Tank	Low Water Level + (m)				
				ADD	MDD	PHD	MHD	MDD+FF
Fox Road Elevated Tank	185.0 Int. 190.0 Ult. 190.2 O/F	179.0	178.5	+5.0	+4.0	+4.0	+6.0	+4.0
				=184.0	=183.0	=183.0	=185.0	=183.0
Dorset Street Standpipe	155.79 Typ. 156.75 O/F	133.89	133.89	21.9	17.2	17.2	21.9	17.2
				=155.79	=151.09	=151.09	=155.79	=155.79

5. Scenario Results

MECP (MOE) Design Guidelines for Drinking-Water Systems (2008) provide the following recommendations with respect to pressures within municipal water distribution systems.

The system should be designed to maintain a minimum pressure of 140 kPa (20 psi) at ground level at all points in the distribution system under maximum day demand plus fire flow conditions. The normal operating pressure in the distribution system should be approximately 350 to 480 kPa (50 to 70 psi) and not less than 275 kPa (40 psi). Pressures outside of this range may be dictated by distribution system size and/or topography.

The maximum pressures in the distribution system should not exceed 700 kPa (100 psi) to avoid damage to household plumbing and unnecessary water and energy consumption

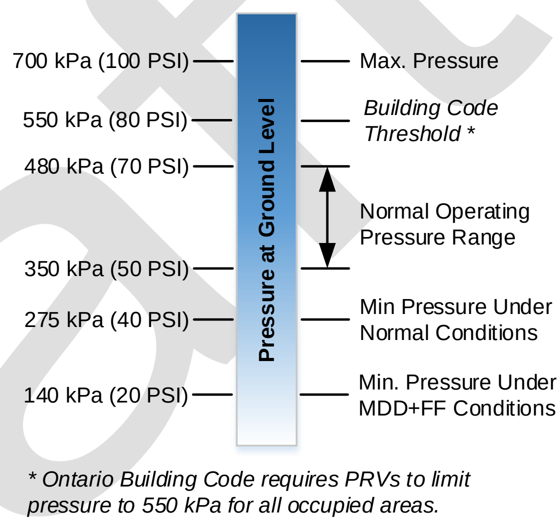


Figure 4: MOE Operating Pressure Recommendations

The following sections of this report summarize system pressures under various demand scenarios. It should be noted that the varied topography of Zone 1 results in a wide range of pressures some of which are outside current guidelines due to historic conditions.

5.1 Distribution System Pressures

5.1.1 Zone 1 System Pressures

Table 7 summarizes the minimum and maximum distribution system pressures in Zone 1, based on hydraulic modelling for all demand scenarios, under existing conditions and proposed conditions which include demands for 20 Hope Street South.

Table 7: Zone 1 System Pressures

Scenario	Pressure (kPa)			
	Minimum Pressure		Maximum Pressure	
	Existing	Proposed	Existing	Proposed
MHD	338	338	778	778
ADD	332	332	773	772
MDD	311	311	759	759
PHD	257	254	722	721

Pressures in Zone 1 are not significantly impacted by the proposed development of 20 Hope Street South. Pressures are also generally all above the recommended minimum normal operating pressure of 275 kPa (40 PSI). The only exception to this occurs under the peak hour demand scenario where pressures at the highest elevations of pressure zone 1 (Trinity College School) fall below 275 kPa (40 PSI). This occurs under existing conditions and is only slightly worsened by the proposed demand associated with the 20 Hope Street South Development.

Maximum pressures in Zone 1 exceed the recommended maximum pressure of 700 kPa (100 PSI) under all existing and proposed conditions scenarios. It is noted that Zone 1 includes a significant range of elevations between +75 m and +120 m. As a result, under existing conditions, pressures in excess of 700 kPa occur in areas near the shores of Lake Ontario within pressure zone 1 (e.g. Cameco PHCF & WTP area and the area along Peter Street east of Rose Glen Road). The development of 20 Hope Street South has no impact on the high pressures that exist in this area.

5.1.2 Local Distribution System Pressures

Table 8 summarizes the modelled pressures for key junctions in the vicinity of the proposed development site.

Table 8: Local System Pressures

Scenario	Pressure (kPa)							
	Princess Street @ 20 Hope Street S. (Elev. ±101.4 m)		Princess Street @ Dorset Street E. (Elev. ± 95.7 m)		Ward Street @ Hope Street S. (Elev. ± 101.2 m)		Harcourt Street @ Ward Street (Elev. ± 95.7 m)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
MHD	529	528	584	584	531	530	585	584
ADD	523	523	579	579	525	525	579	579
MDD	509	509	565	565	511	511	566	565
PHD	471	468	527	525	472	471	527	525

There is no significant impact to pressures within the local distribtution system resultant from the inclusion of the proposed demand assoicated with the 20 Hope Street South development. It is noted that under all scenarios with the additional 20 Hope Street South development demand in place, the pressures local to the site are between 468 kPa (67.9 PSI) and 584 kPa (84.7 PSI). These pressures are not always within the recommended normal operating range of 350 kPa (50 PSI) to 480 kPa (70 PSI) which is largely due to the aforementioned varying topography within Zone 1. Although outside of the MECP (MOE) Design Guidelines for recommended normal operating pressures, the pressures local to the 20 Hope Street South development are considered adequate. However, because they exceed 550 kPa (80 PSI) the building's internal piping design should consider losses on site and determine if a pressure reducing valve (PRV) will be required to limit pressures in occupied spaces to not more than 5050 (80 PSI).

5.2 Maximum Day Demand plus Fire Flow

To determine available fire flows the hydraulic model is used to simulate overall MDD+FF system conditions while iteratively testing flows at each junction until the flow is sufficient to cause residual pressure at that junction or another junction elsewhere in the distribution system (the critical junction) to drop below 140 kPa (20 PSI). This process is repeated for all junctions within the model.

It is noted that the resulting available fire flows represent the maximum flow at each junction when only that junction is providing fire flow and the critical junction is at a pressure of 140 kPa (20 psi). In this regard, flows cannot be considered in an additive fashion unless a specific analysis is undertaken to determine the combined capacity of two or more junctions.

For purposes of this analysis under MDD+FF conditions it is assumed that Port Hope water distribution is supplying a base demand of 124.7 L/s as summarized in Table 9.

Table 9: MDD+FF Base Demand

Demand Source	Demand (L/s)
Zone 1 MDD	52.21
Zone 2 MDD	36.81
20 Hope Street South MDD	2.75
20 Hope Street South Sprinkler Flow (522 gpm)	32.93
Total	**124.7**

5.2.1 Available Fire Flows

Based on hydraulic modelling, available fire flows in the vicinity of the 20 Hope Street South site are estimated to be 9,000 L/min while also supplying 127.4 L/s to meet system maximum day demands and the site's sprinkler system demand. At this flow rate (9,000 L/min) pressures on Princess Street in the vicinity of the site will be 140 kPa (20 psi) and pressures elsewhere in Zone 1 will range from over 690 kPa (100 psi) near the WTP to 310 kPa (45 psi) at the Zone 1 high-point near Trinity College School.

Floating storage in Zone 1 is limited and provided only by the Dorset Street Elevated Tank, which has a total volume of 1,083 m^3 and typical working volume of 220 m^3. In this regard, the majority of fire flow and maximum day demand will have to be provided from the WTP Reservoir by the highlift pumps.

With the largest pump on each discharge header out of service the three remaining highlift pumps have a firm capacity 295 L/s. In this regard, the highlift pumps can meet maximum day system demands and the site's sprinkler demand while also supplying 9,000 L/min (150 L/s) with remaining surplus pumping capacity as outlined in Table 10.

Table 10: MDD+FF Base Demand

Demand Source	Flow Rate (L/s)
Firm Highlift Pumping Capacity (2 largest pumps out of service)	295.00
Less Zone 1 MDD	52.21
Less Zone 2 MDD	36.81
Less 20 Hope South Street MDD	2.75
Less 20 Hope south Street Sprinkler Flow (522 gpm)	32.93
Less Fire Flow (9,000 L/min)	150.00
Surplus Firm Puming Capacity	**20.30**

Based on a volume of 2,460 m^3 in each of the two (2) reservoir cells the WTP Reservoir has total storage volume of 4,920 m^3. Assuming 80% of this volume is usable the pumped storage in Zone 1 can sustain MDD for the entire distribution system plus sprinkler flow 20 Hope Street and fire flow of 9,000 L/min for 238 minutes or approximately 4-hours without relying on available floating storage in Zone 1 or Zone 2 or any replenishment from the treatment process.

6. Summary & Recommendations

With consideration for the details in the foregoing sections the following conclusions and recommendations are provided with respect to proposed development at 20 Hope Street South and the local water distribution system:

- Pressures in Zone 1 range considerably and there are areas of less than ideal high and low pressures under existing conditions. These pressures are not significantly influenced by the proposed development.
- Pressures in the vicinity of the site are adequate under all scenarios and are not negatively influenced by the proposed development. The need for a pressure reducing valve to mitigate pressures in excess of 550 kPa (80 PSI) should be reviewed as part of the building's mechncial design.
- The available fire flow of 9,000 L/min from the municipal water distribution system outlined in this report is adequate when compared to the 5,000 L/min requirement provided by Novatech for the site based on FUS methodology. A copy of these calculations should be included with the submission of this report to the Municipality. CIMA+ has not reviewed the accuracy of these calculations or the compliance of the proposed building design with the assumptions of the calculations.
- With the two largest pumps out of service the highlift pumping system can sustain system-wide MDD plus a fire flow of 9,000 L/min for approximately 4 hours relying on 80% of the WTP reservoir capacity only.
- No additional watermain upgrades are recommended.

7. References

- Design Guidelines for Drinking Water Systems (2008) Ministry of the Environment (MOE).
- Water Supply for Public Fire Protection (1999) Fire Underwrites Survey (FUS).

A

Appendix A

Hydraulic Model Setup Parameters

1. Introduction

The Port Hope water distribution system hydraulic model has been built using the InfoWater software package developed by Innovyze. The model integrates a variety of information with the intention of being used for planning level analysis

- Pipe network data from the Municipality's ArcGIS-based water distribution system inventory mapping.
- Demand data derived from the Municipality's water billing and meter reading data.
- Junction elevation data extracted from the Northumberland Digital Elevation Model by the Ganaraska Region Conservation Authority.
- Pump curve data verified against design point data provided by the Municipality of Port Hope
- Pump sequencing and tank level set points provided by the Municipality of Port Hope
- Demand factors derived from water treatment plant flow data and Zone 2 flow meter data.

2. C-Factors

Extensive system-wide flow testing has not been undertaken recently in Port Hope. As a result, the Port Hope hydraulic model incorporates Hazen-Williams C-Factors for each of the pipe based on MOE's Design Guidelines for Drinking Water Systems. The typical C-Factors used in the hydraulic model are summarized in Table 1.

Table 1: MOE Recommended C-Factors

Pipe Diameter (Nominal)	C-Factor
150 mm or Less	100
200 mm – 250 mm	110
300 mm – 600 mm	120
Greater than 600 mm	130

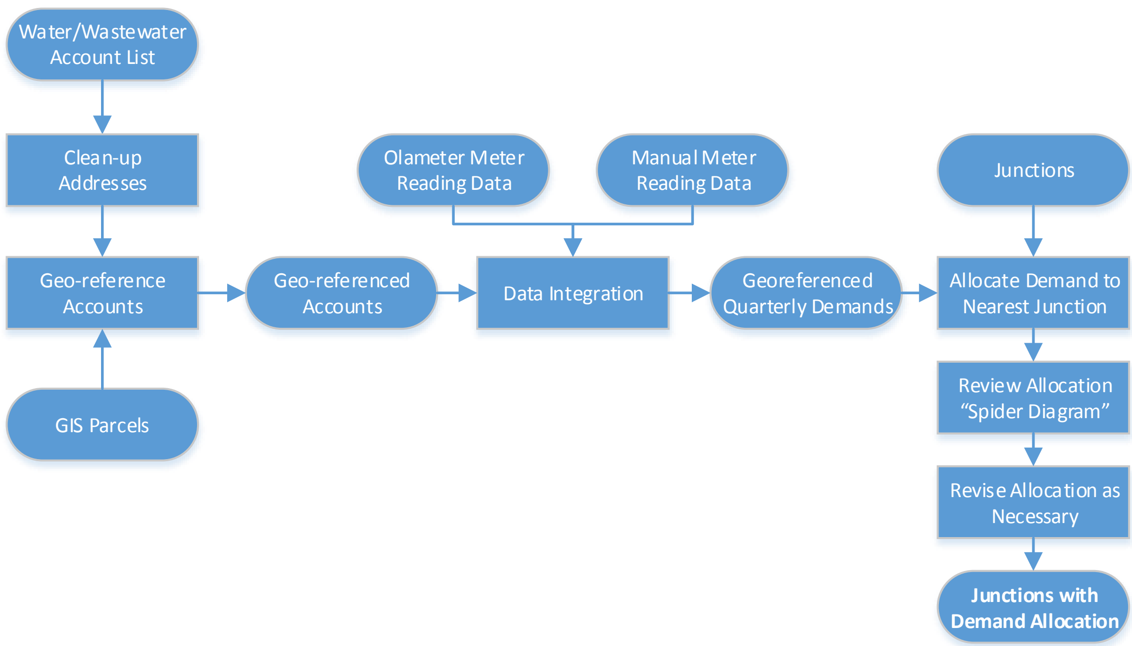
In an effort to further refine the current hydraulic model, which included a significant update of demand data in 2015 (see section 3), it is understood that the Municipality of Port Hope intends to undertake system-wide flow testing in the near future.

3. Water Demand

3.1 System-Wide Average Day Demand

Water demands within the Port Hope water distribution system have been established using quarterly water meter readings and water billing records from 2011 through 2014. Average Day Demand (ADD) for each account was calculated by averaging all quarters of available data and uniformly distributing the averaged values over a 24-hour day. These ADD demand values were then spatially distributed by using GIS tools to allocate each account to a junction within the hydraulic model. An overview of this process is provided in Figure 1. For properties within recently developed residential subdivisions where no historic meter reading/billing records exist an average residential quarterly demand value of 42 m^3 per property was included in the allocation process.

Figure 1: Spatial Demand Allocation Process



Unaccounted for water is considered to include the following:

- Unmetered uses such as firefighting and hydrant flushing
- Domestic use and irrigation at unmetered facilities owned by the Municipality
- Losses due to leakage, mainly in aging portions of the distribution system

Total quarterly demand derived from water meter readings and billing records was compared to aggregated quarterly production data to determine how much of the water supplied to the Port Hope water distribution system is considered unaccounted for.

Table 2 summarizes the comparison of production and metered consumption (including bulk water) and the resulting unaccounted for water which averages 19.99% of production. Based on this an allowance for unaccounted for water has been distributed uniformly to each junction in the hydraulic model.

Table 2: Unaccounted for Water

Quarter	Production at WTP (m^3)	Metered Consumption (m^3)	Metered Bulk Water (m^3)	Unaccounted Water (m^3)	Unaccounted for Water (%)
2012-Q1	353,302	321,235	209	31,858	9.02%
2012-Q2	454,651	353,239	1,754	99,658	21.92%
2012-Q3	484,804	358,175	6,198	120,430	24.84%
2012-Q4	456,549	354,053	2,200	100,296	21.97%
2013-Q1	404,913	342,174	203	62,536	15.44%
2013-Q2	446,220	377,263	1,569	67,388	15.10%
2013-Q3	460,866	339,030	2,994	118,842	25.79%
2013-Q4	472,716	323,673	583	148,460	31.41%
2014-Q1	448,861	383,937	95	64,829	14.44%
Average	**442,542**	**350,309**	**1,756**	**90,477**	**19.99%**

System-wide ADD estimated by the methods above totals 5,063 m^3/day and compares well to the average daily water flow delivered to the distribution system by the WTP, which is summarized in Table 3 below.

Table 3: WTP Supply to Distribution System

Year	Max Flow (m^3/day)	Average Flow (m^3/day)	Max Day Factor
2012	6,970	4,905	1.42
2013	6,785	4,933	1.37
2014	7,213	4,904	1.47
2015	7,135	4,563	1.56
2016	6,440	4,578	1.41
2017	5,733	4,391	1.31
Average	**6,713**	**4,712**	**1.42**

3.2 System-Wide Demand Factors

To support further analysis of the distribution system under the various scenarios listed below, demand factors were established to estimate system demands under minimum hour, maximum day and peak hour scenarios based on available average day demand data:

1. Minimum Hour Demand (MHD);
2. Average Day Demand (ADD);
3. Maximum Day Demand (MDD); and
4. Peak Hour Demand (PHD).

Records from the Port Hope WTP were used to establish the Maximum Day Demand (MDD) factor for the overall system of in the order of 1.42. Given the different mix of development found in Zone 1 compared to Zone 2 factors for each zone were analyzed and applied separately.

Based on the values presented in Table 4 an MDD peaking factor of 1.6 was established for Zone 1, which includes a mix of residential, industrial and commercial and institutional development with an average day demand of 3,397 m^3 for the period 2012-2015.

Table 4: Zone 1 MDD Peaking Factor

Year	Max Flow (m^3/day)	Average Flow (m^3/day)	Max Day Peaking Factor
2012	4,757	2,981	1.6
2013	5,373	3,585	1.5
2014	6,370	3,760	1.7
2015	5,610	3,173	1.8
Average	**5,527**	**3,397**	**1.6**

Based on the values presented in Table 4 an MDD peaking factor of 1.9 was established for Zone 2, which includes primarily residential development with only limited commercial and institutional development and no significant industrial development with an average day demand of 1,456 m^3 for the period 2012-2015.

Table 5: Zone 2 MDD Peaking Factor

Year	Max Flow (m^3/day)	Average Flow (m^3/day)	Max Day Peaking Factor
2012	3,666	1,925	1.9
2013	2,670	1,348	2.0
2014	2,203	1,144	1.9
2015	2,633	1,385	1.9
Average	**2,793**	**1,456**	**1.9**

The MHD and PHD factors used for this analysis were taken from the Ministry of Environment and Climate Change (MOECC) Design Guidelines for Drinking Water Systems for populations of 10,001 to 25,000. MHD, MDD and PHD factors are summarized in Table 6. It is noted that the MOECC design guidelines recommend a maximum day factor of 1.9 for systems servicing populations in the 10,001 to 25,000 range.

Table 6: Summary of Demand Factors

Demand Factor	Zone 1	Zone 2
Minimum Hour Demand (MHD)	0.60	0.60
Maximum Day Demand (MDD)	1.60	1.90
Peak Hour Demand (PHD)	2.85	2.85

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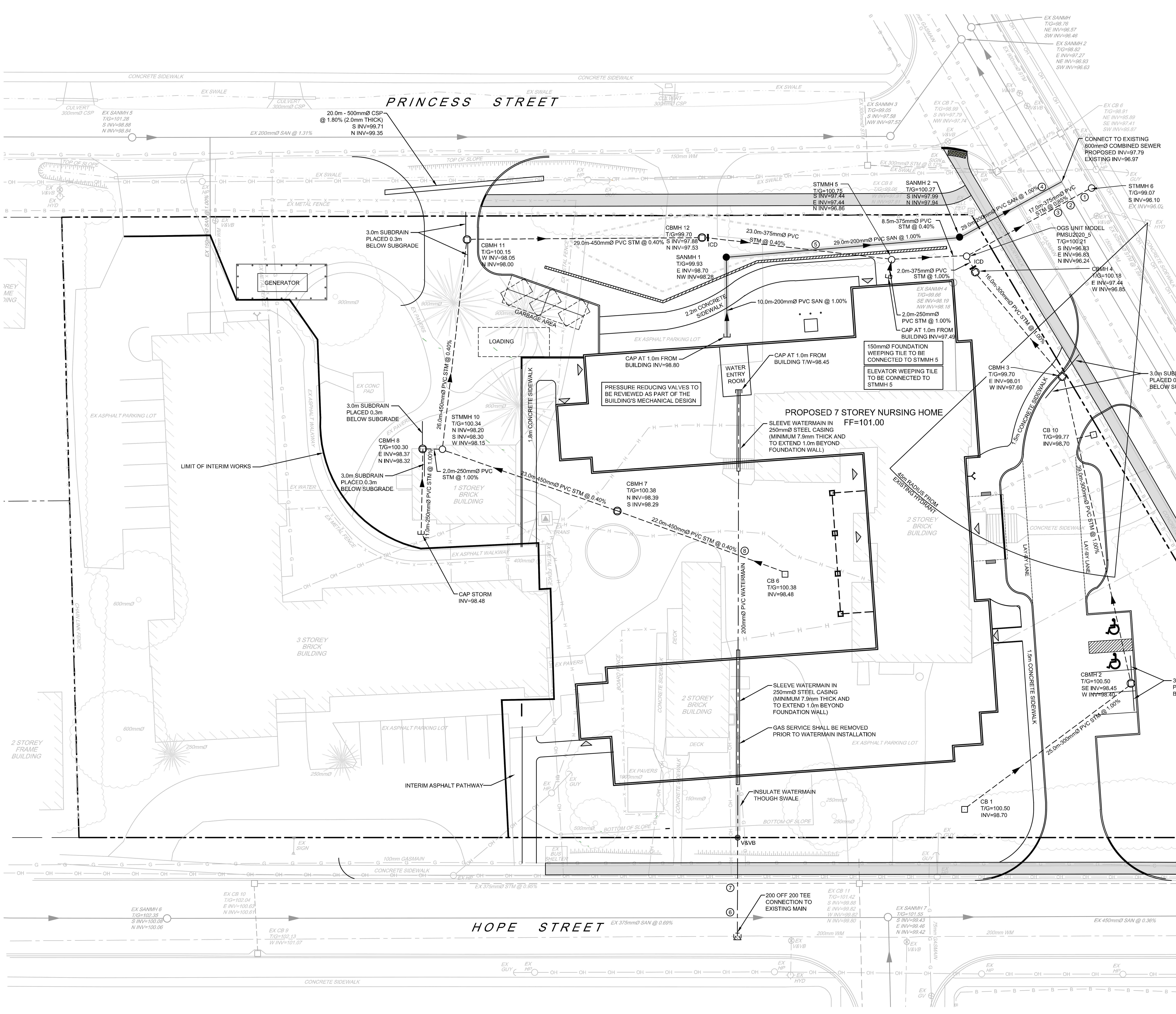
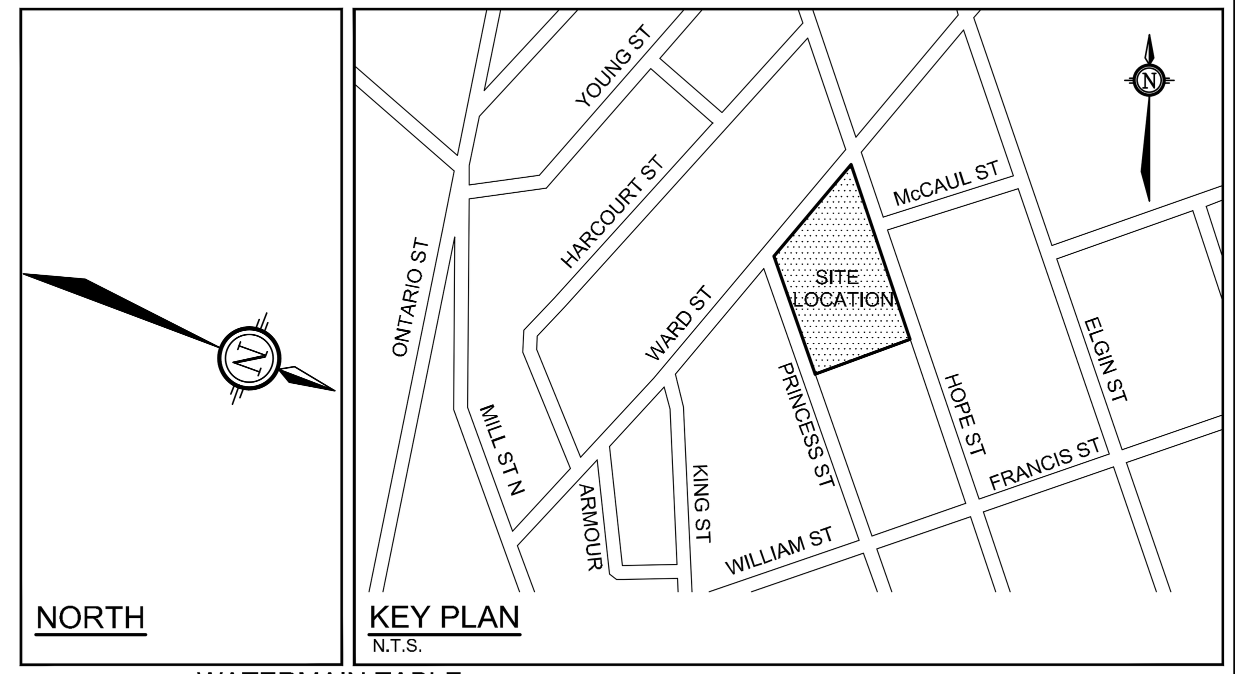
APPENDIX E
Drawings

General Plan of Services Interim Conditions	(120226-GP1)
General Plan of Services Ultimate Conditions	(120226-GP2)
Grading Plan Interim Conditions	(120226-GR1)
Grading Plan Ultimate Conditions	(120226-GR2)
Noted and Details Plan	(120226-NDP)





WATERMAIN TABLE

CHAINAGE	FINISHED GRADE	TOP OF WATERMAIN	COMMENT
0+000	101.65	99.25±	EXISTING
0+012.5	101.87	99.47	VALVE & VALVEBOX
0+013.5	101.87	99.47	11.25° VERT BEND
0+018.6	100.85	98.45	11.25° VERT BEND
0+045.8	100.55	98.15	TOP OF WATERMAIN
0+069.1	N/A	98.45	WATER ENTRY ROOM

CROSSING TABLE

CROSSING NUMBER	CROSSING PIPE	CROSSING PIPE	DELTA
1	STM OBV EL=96.50	WAT INV EL=97.60±	1.10m
2	STM OBV EL=96.51	COMB INV EL=97.01	0.50m
3	STM OBV EL=96.52	SAN INV EL=97.33	0.81m
4	SAN OBV EL=97.35±	SAN INV EL=97.65	0.30m
5	STM OBV EL=97.85	SAN INV EL=98.01	0.16m
6	TOP WAT EL=99.25	SAN INV EL=99.56±	0.31m
7	TOP WAT EL=99.36	STM INV EL=100.03±	0.67m
8	TOP WAT EL=98.15	STM INV EL=98.45	0.30m

LEGEND

PROPERTY LINE
PROPOSED CURB
DC PROPOSED DEPRESSED CURB
PROPOSED WATER SERVICE
V&VB PROPOSED VALVE AND VALVE BOX
PROPOSED CAP
PROPOSED FIRE HYDRANT
PROPOSED SANITARY SERVICE c/w MANHOLE
PROPOSED STORM SEWER AND MANHOLE
PROPOSED SANITARY SEWER WITH INSULATION
PROPOSED BUILDING AND SERVICE ENTRANCE
DIRECTION OF FLOW
PROPOSED CATCHBASIN MANHOLE
PROPOSED CATCHBASIN
GM GAS METER
PROPOSED WATER METER
PROPOSED WATER REMOTE METER
ICD PROPOSED INLET CONTROL DEVICE
SWALE
PROPOSED RETAINING WALL
PROPOSED TRANSFORMER LOCATION
V&VC *EXISTING WATERMAIN C/W VALVE & VALVE CHAMBER*
EXISTING HYDRANT C/W VALVE & LEAD
SAN MH *EXISTING SANITARY MANHOLE & SEWER*
STM MH *EXISTING STORM MANHOLE & SEWER*
CB 1 *EXISTING CATCHBASIN*
EXISTING SWALE

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DESIGN LSC
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DRAWING NAME
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PORT HOPE NURSING HOME
GENERAL PLAN OF SERVICES
INTERIM CONDITIONS

PROJECT No. 120226
REV REV 5
DRAWING No. 120226-GP1

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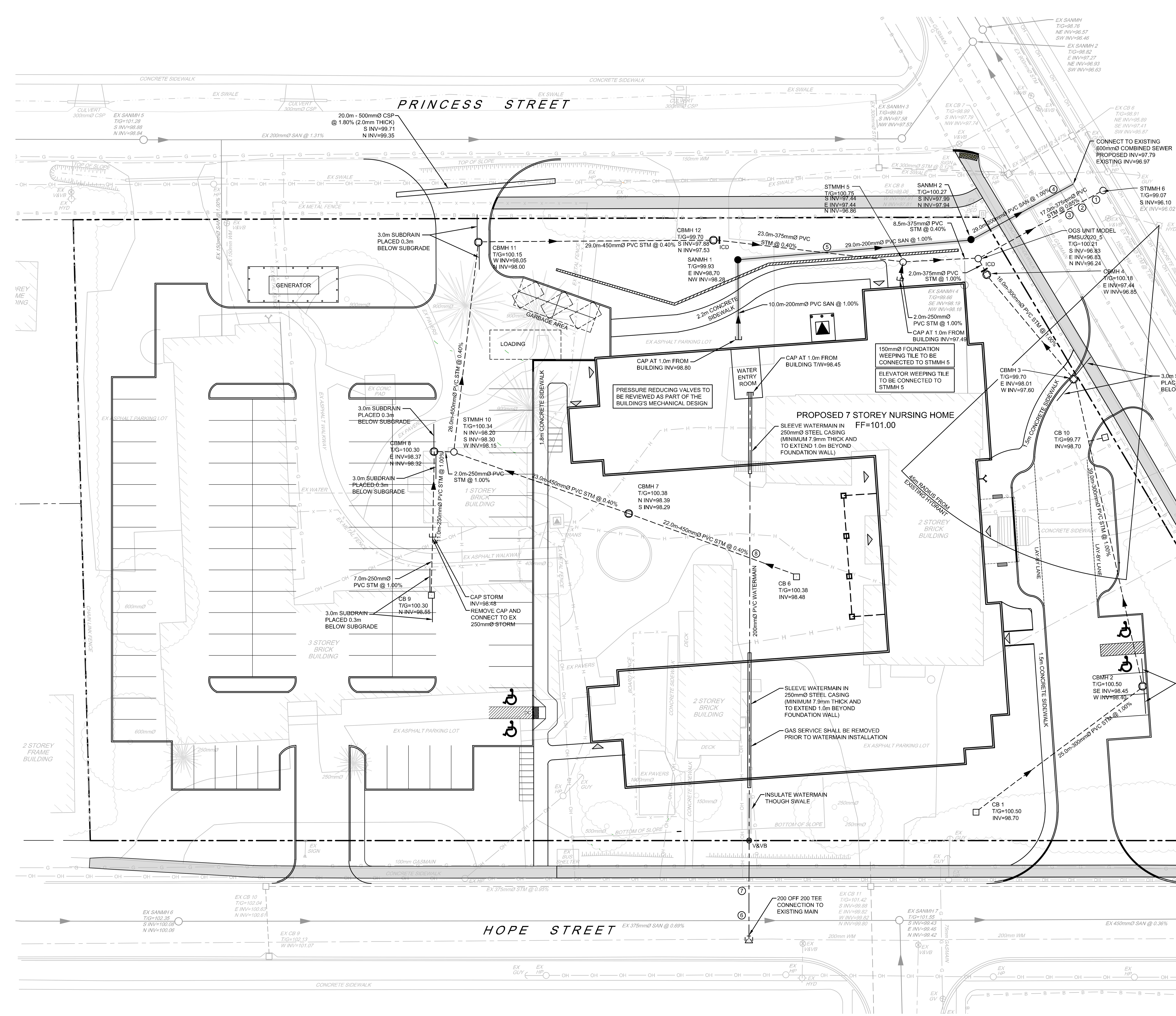

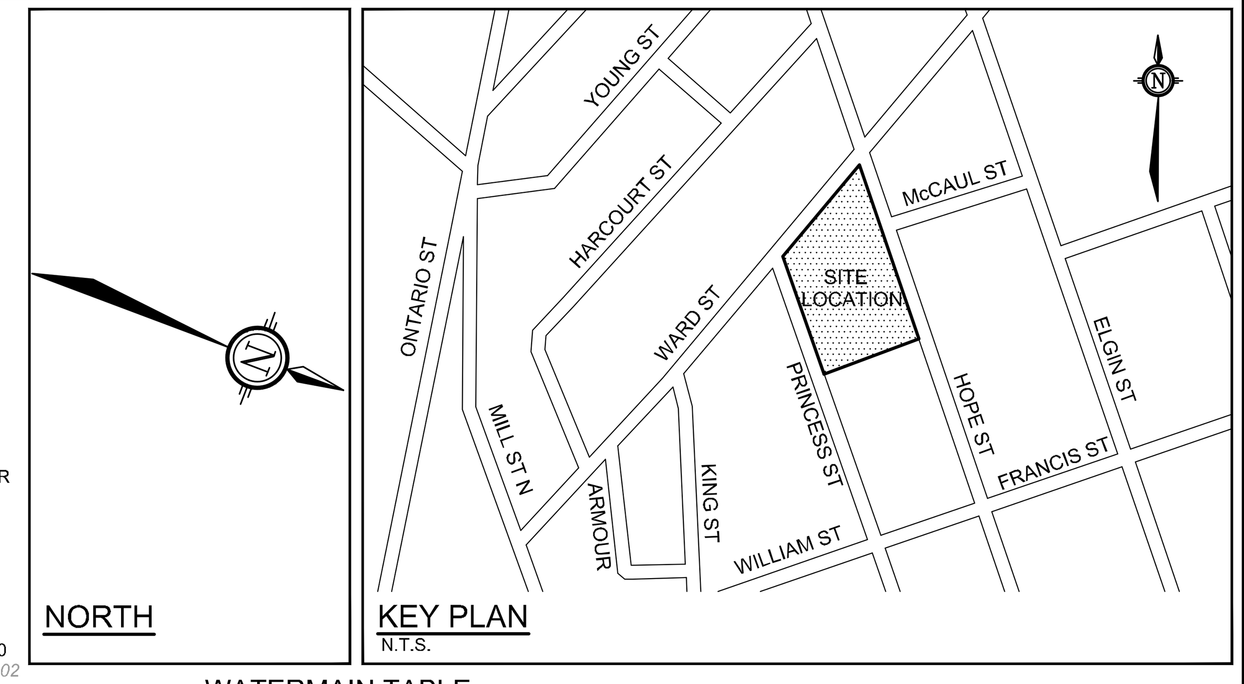

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5	STM OBV EL=97.87	SAN INV EL=98.17	0.30m
6	TOP WAT EL=99.25	SAN INV EL=99.56±	0.31m
7	TOP WAT EL=99.36	STM INV EL=100.03±	0.67m
8	TOP WAT EL=98.15	STM INV EL=98.45	0.30m

LEGEND

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DESIGN	LSC
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APPROVED	CJR

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65 WARD STREET / 20 HOPE STREET SOUTH

DRAWING NAME
SOUTHBRIDGE CARE HOMES
PORT HOPE NURSING HOME
GENERAL PLAN OF SERVICES
ULTIMATE CONDITIONS

PROJECT No. 120226
REV REV 5
DRAWING No. 120226-GP2

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REV REV 5
DRAWING No. 120226-GR2

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GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPALITY OF PORT HOPE BEFORE COMMENCING CONSTRUCTION. AN EXCAVATION PERMIT WILL BE REQUIRED FROM THE MUNICIPALITY PRIOR TO ANY WORKS ON PUBLIC PROPERTY.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $2,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED AND THE MUNICIPALITY OF PORT HOPE AS THIRD PARTY.
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE MUNICIPALITY OF PORT HOPE.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS. ALL CONTAMINATED MATERIAL (IF ANY) SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACE AREAS AND DIMENSIONS.
8. SAW CUT AND KEYGRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS.
9. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES AND GRADING PLAN INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS, ANY ALIGNMENT CHANGES, AND ALL SURFACE ELEVATION AS BUILT GRADES.
10. ASPHALT REINSTATEMENT LIMITS SHALL BE MARKED IN THE FIELD AND APPROVED BY THE MUNICIPALITY OF PORT HOPE PRIOR TO ASPHALT REINSTATEMENT COMMENCING.
11. ALL ELEVATIONS ARE GEODETIC. ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO THE CGVD1928: 1978 GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK AND 00819658142 HAVING PUBLISHED ORTHOMETRIC ELEVATION OF 95.64 . REFER TO ELLIOTT AND PARR (PETERBOROUGH)LTD. TOPOGRAPHIC PLAN OF LOTS 21-31 SMITH ESTATE PLAN IN THE MUNICIPALITY OF PORT HOPE COUNTY OF NORTHUMBERLAND.
12. REFER TO GEOTECHNICAL INFORMATION PROVIDED BY TERRAPROBE INC., FILE NO. 1-19-0660-01 DATED DECEMBER 11, 2019 FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
13. REFER TO THE DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT NO. R-2021-091, DATED JUNE 14, 2021 PREPARED BY NOVATECH.
14. REFER TO THE MUNICIPALITY OF PORT HOPE MINIMUM STANDARDS FOR DESIGN, CONSTRUCTION AND APPROVAL OF MUNICIPAL INFRASTRUCTURE AND RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT, SECTION 4 FOR ALL REQUIRED ROAD REINSTATEMENTS.

WATERMAIN NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	701	OPSS
THERMAL INSULATION IN SHALLOW TRENCHES	1109.030	OPSD
HYDRANT INSTALLATION	1105.010	OPSD
WATERMAIN (50mmØ +)	PVC DR 18 (UNLESS SPECIFIED OTHERWISE)	
WATERMAIN (<50mmØ)	PEX SDR9	
WATER SERVICES	PEX SDR9	

2. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL, RESTORATION, CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY THE CONTRACTOR.
3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.25m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.
6. DEVELOPERS CONTRACTOR IS TO FOLLOW THE MUNICIPALITY'S WATER COMMISSIONING PROTOCOL.
7. IT WILL BE THE RESPONSIBILITY OF THE DEVELOPER'S CONTRACTOR TO PERFORM ANY WATERMAIN CONNECTION(S) REQUIRED. THIS SHALL BE COMPLETED IN THE PRESENCE OF A DESIGNATED MUNICIPAL WATER OPERATOR AND THE SELECTED CONTRACTOR SHALL PROVE TO THE SATISFACTION OF THE MUNICIPALITY THAT THEY ARE COMPETENT TO PERFORM THE WORKS

SEWER NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
CATCHBASIN (600x600mm)	705.010	OPSD
CB, FRAME & COVER	400.020	OPSD
STORM / SANITARY MH FRAME & COVER	401.010	OPSD
SANITARY COVER	401.020	OPSD
SEWER TRENCH	410	OPSS
SANITARY SEWER	PVC SDR 35 (UNLESS SPECIFIED OTHERWISE)	
STORM SEWER (<450mmØ)	PVC SDR 35 (UNLESS SPECIFIED OTHERWISE)	
STORM SEWER (450mmØ +)	CONC CLASS 65D (UNLESS SPECIFIED OTHERWISE)	
WATERTIGHT FRAME & COVER	401.030	OPSD
SEWER INSULATION SHALLOW TRENCH	1109.030	OPSD

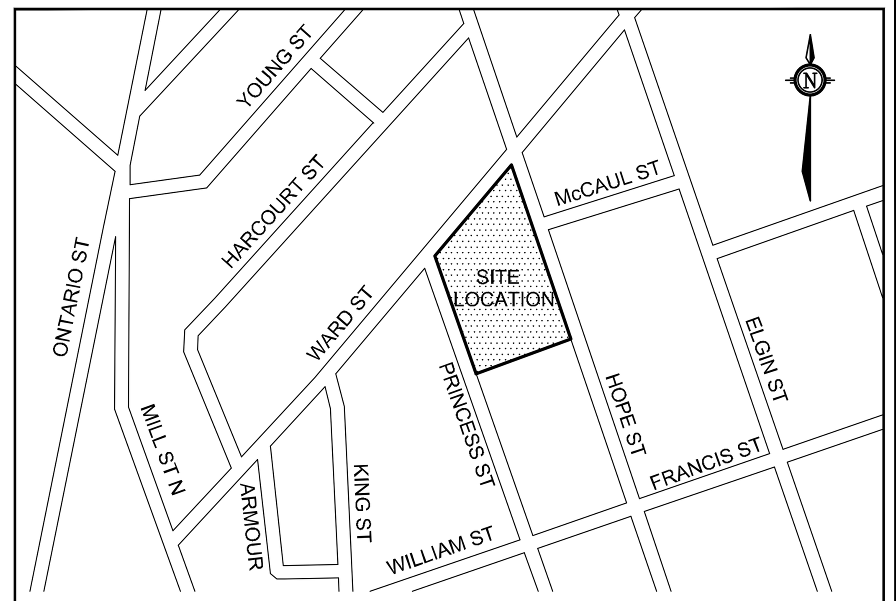
2. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
3. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
4. DYE TESTING IS TO BE COMPLETED ON SANITARY SERVICE TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN.
5. STORM MANHOLES AND CBMHS ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
6. SUBDRAIN INVERTS SHOULD BE APPROXIMATELY 300mm BELOW SUBGRADE LEVEL. THE SUBGRADE SURFACE SHOULD BE SHAPED TO PROMOTE WATER FLOW TO THE DRAINAGE LINES.
7. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.
8. LEAKAGE TESTING AS PER OPSS 410.07.16, 410.07.16.04 AND 407.07.24. IS TO BE COMPLETED ON ALL SANITARY SERVICES AND THE RESULTS ARE TO BE SUBMITTED TO THE MUNICIPALITY OF PORT HOPE - PUBLIC WORKS DEPARTMENT FOR CONSIDERATION IN SECURITY RELEASE FOLLOWING CONSTRUCTION.

EROSION AND SEDIMENT CONTROL NOTES:

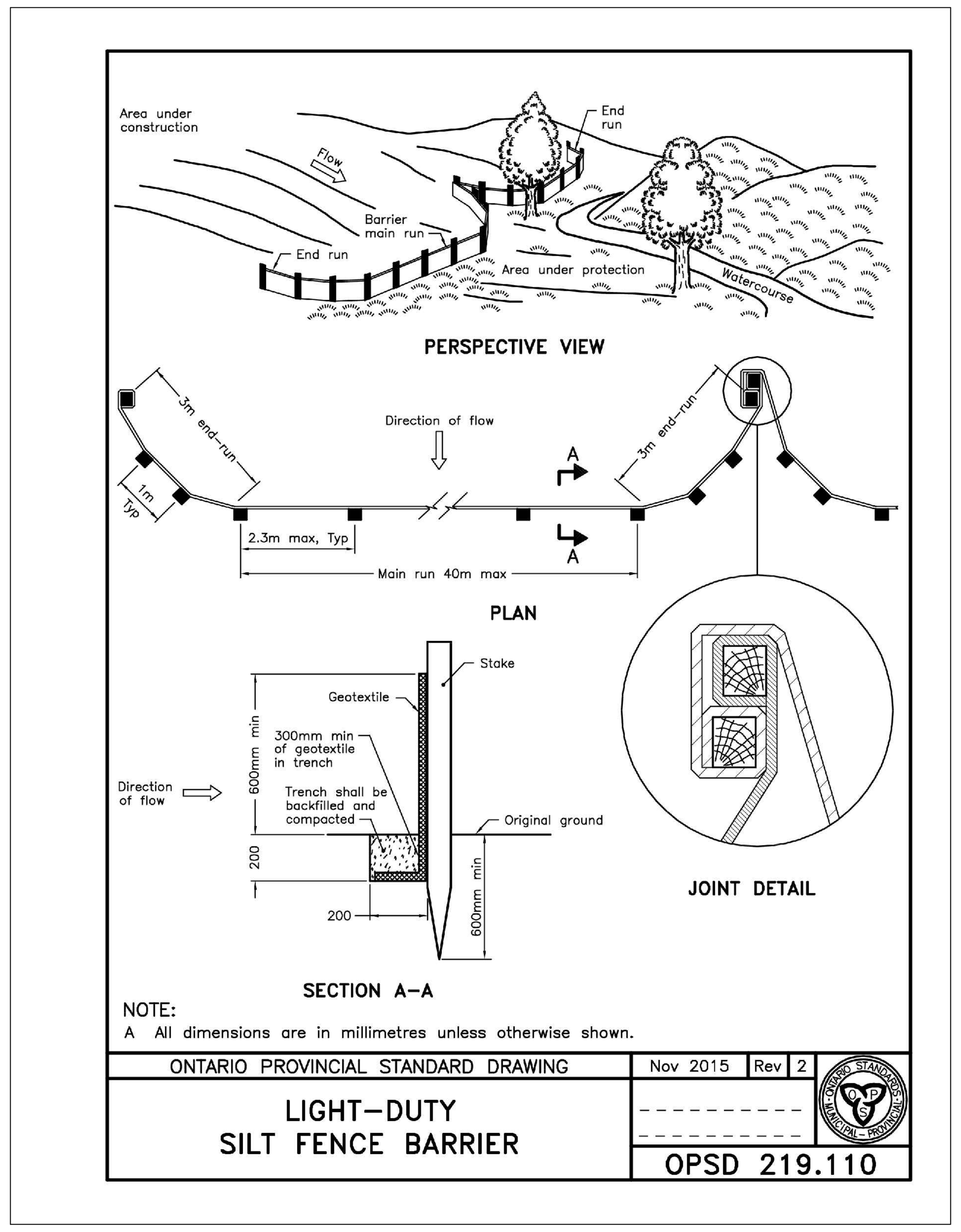
1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE MUNICIPALITY OF PORT HOPE, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO INSTALLING FILTER CLOTHS ACROSS MANHOLE/CATCHBASIN LIDS TO PREVENT SEDIMENTS FROM ENTERING STRUCTURES AND INSTALL AND MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.
2. THE CONTRACTOR SHALL PLACE FILTER SOCKS UNDER THE EXISTING AND PROPOSED CATCHBASIN AND MANHOLE GRATES FOR THE DURATION OF CONSTRUCTION AND WILL REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION.
3. LIGHT DUTY SILT FENCE AS PER OPSD 219.110 SHALL BE INSTALLED FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.
4. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
5. PROVIDE MUD MATS AT ALL CONSTRUCTION ACCESS POINTS TO MINIMIZE SEDIMENT TRANSPORT OFFSITE.

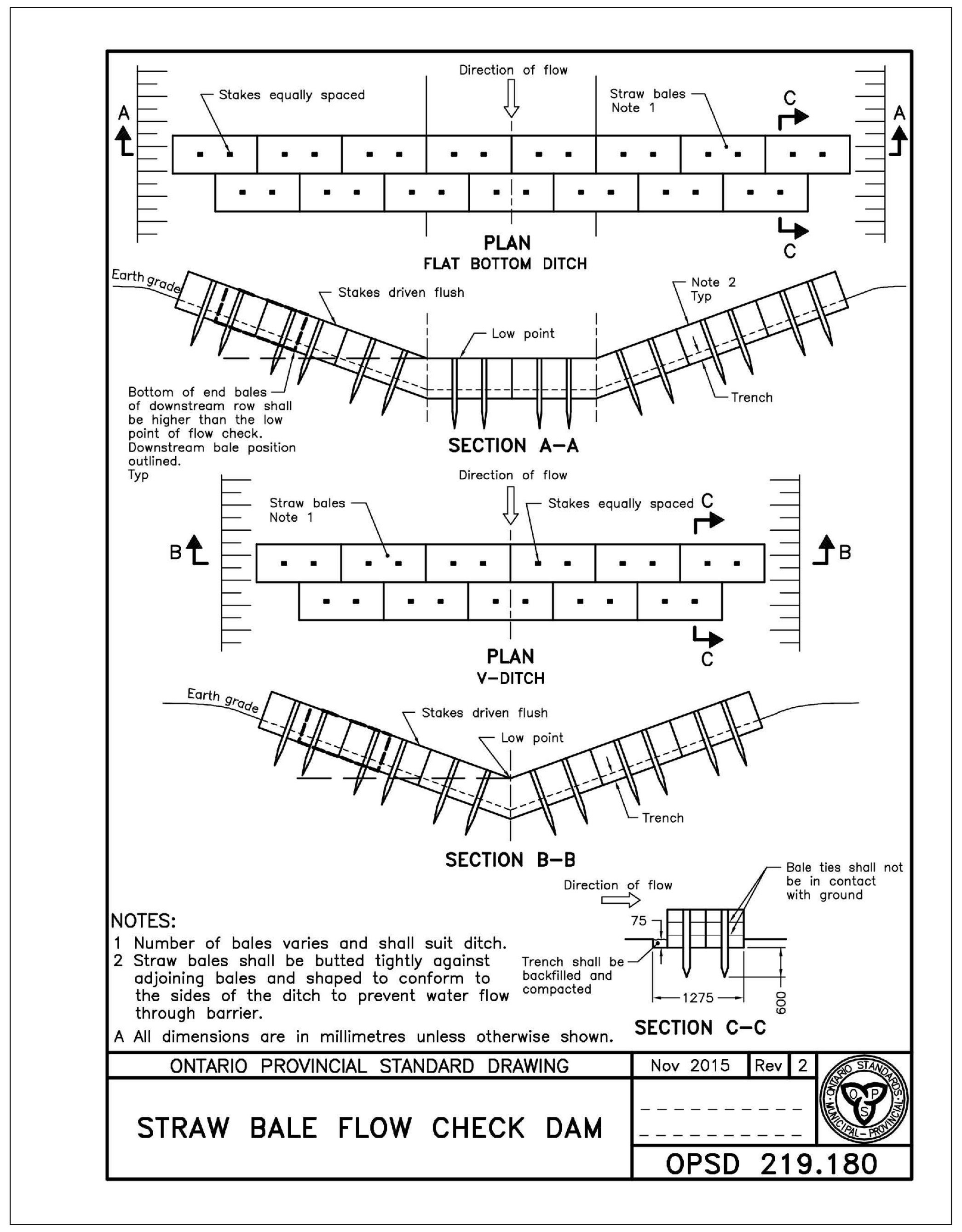
GRADING NOTES:

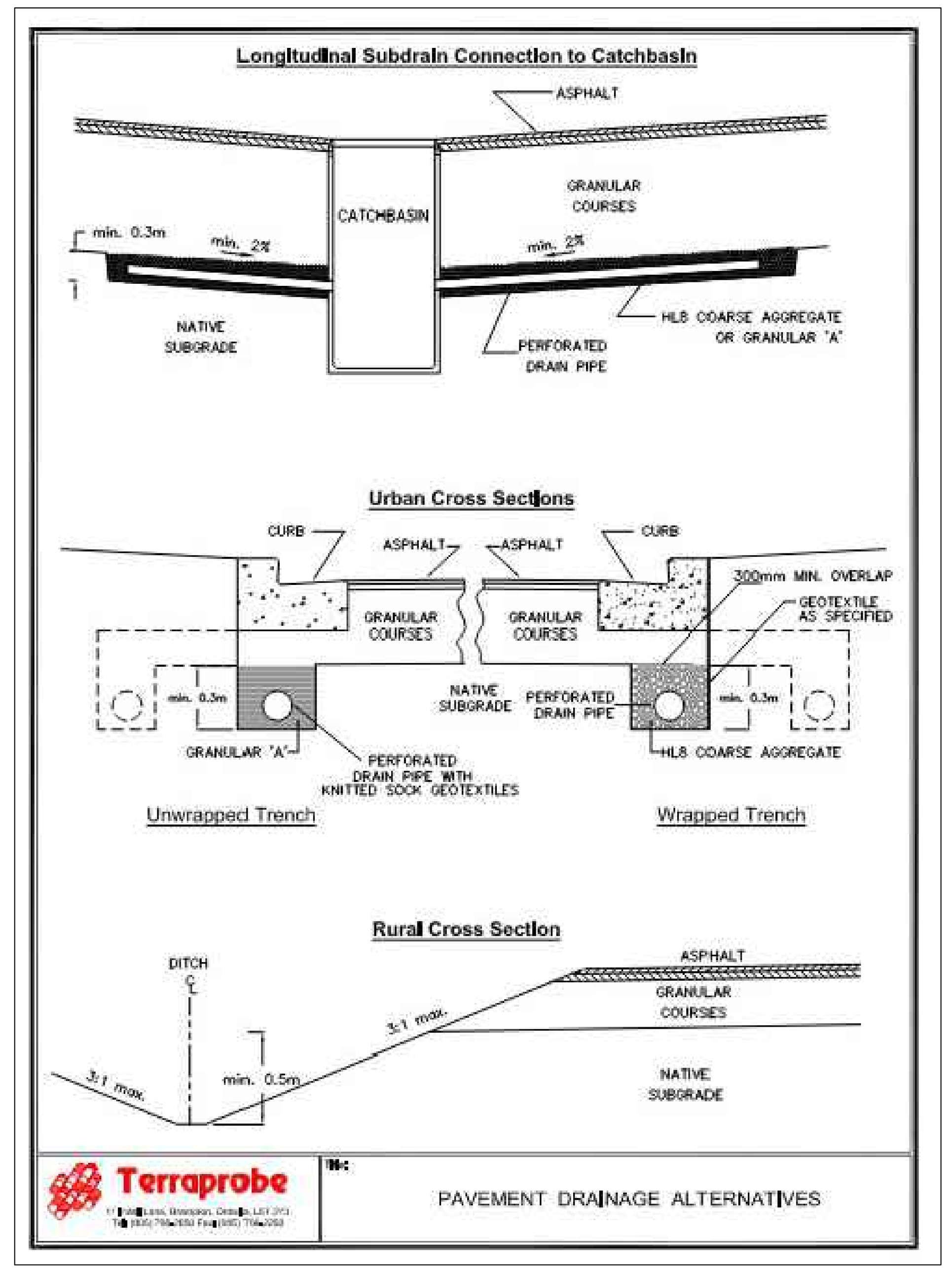
1) ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS.
2) EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL CONSULTANT.
3) ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS.
4) THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5) GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED TO PROVIDE POSITIVE DRAINAGE.
6) MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
7) ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER OPSD 600.110.



KEY PLAN
N.T.S.







PAVEMENT STRUCTURE:

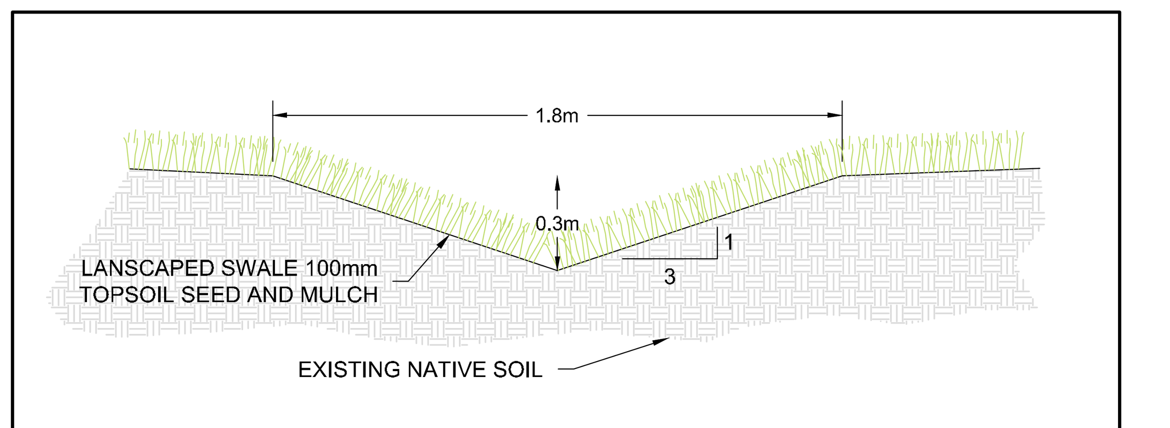
LIGHT DUTY PAVEMENT
50mm HL3
150mm GRANULAR "A"
375mm OPSS GRANULAR "B" TYPE II

HEAVY DUTY PAVEMENT
40mm HL3
80mm HL8
150mm OPSS GRANULAR "A"
450mm OPSS GRANULAR "B" TYPE II

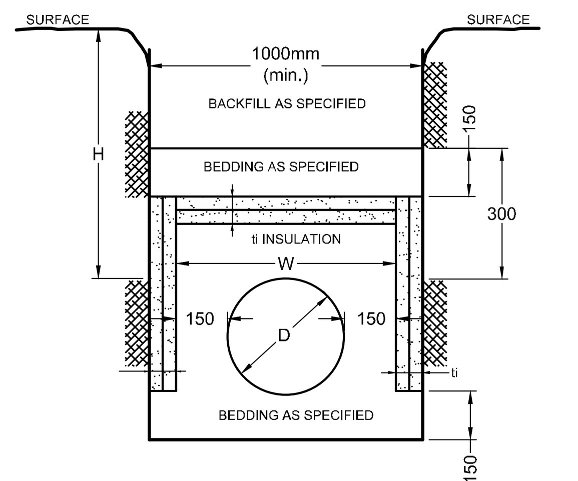
LEGEND

PROPERTY LINE
PROPOSED CURB
DC PROPOSED DEPRESSED CURB
PROPOSED WATER SERVICE
V&VB PROPOSED VALVE AND VALVE BOX
PROPOSED CAP
PROPOSED FIRE HYDRANT
PROPOSED SANITARY SERVICE c/w MANHOLE
PROPOSED STORM SEWER AND MANHOLE
PROPOSED STORM SEWER WITH INSULATION
PROPOSED SANITARY SEWER WITH INSULATION
PROPOSED BUILDING AND SERVICE ENTRANCE
DIRECTION OF FLOW
PROPOSED CATCHBASIN MANHOLE
PROPOSED CATCHBASIN
GM GAS METER
PROPOSED WATER METER
PROPOSED WATER REMOTE METER
ICD PROPOSED INLET CONTROL DEVICE
98.40 PROPOSED ELEVATION
98.40 EXISTING ELEVATION

98.40(S) PROPOSED SWALE ELEVATION
95.90TW PROPOSED GROUND ELEVATION AT TOP OF WALL
95.90BW PROPOSED GROUND ELEVATION AT BOTTOM OF WALL
H.P. PROPOSED HIGH POINT
2.0% SLOPE AND DIRECTION
SWALE
PROPOSED TERRACE (3:1 MAX)
OVER LAND FLOW DIRECTION
SILT FENCE BARRIER PER OPSD 219.110
PROPOSED STRAW BALE FLOW CHECK DAM
PROPOSED RETAINING WALL
V&VC EXISTING WATERMAIN C/W VALVE & VALVE CHAMBER
EXISTING HYDRANT C/W VALVE & LEAD
SAN MH EXISTING SANITARY MANHOLE & SEWER
STM MH EXISTING STORM MANHOLE & SEWER
CB 1 EXISTING CATCHBASIN
EXISTING SWALE



SWALE DETAIL



INSULATION DETAIL FOR SHALLOW SEWERS & WATERMAIN

SEWER & WATERMAIN INSULATION NOTES:

1. INSULATE ALL SEWER PIPES THAT HAVE LESS THAN 1.5m COVER AND ALL WATERMAIN WITH LESS THAN 2.4m OF COVER WITH EXPANDED POLYSTYRENE INSULATION AS PER OPSD 1109.030.
2. WHERE INSULATION IS REQUIRED PROVIDE MINIMUM 100mm THICKNESS. WATERMAINS TO HAVE NO LESS THAN 1.5m OF COVER AND SEWERS TO HAVE NO LESS THAN 1.2m OF COVER AT ANY POINT.

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES 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 WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
4	REVISED PER MUNICIPALITY COMMENTS	JAN 25/22	CJR
3	REVISED PER TOWN COMMENTS	NOV 12/21	CJR
2	ISSUED FOR BUILDING PERMIT	AUG 31/21	CJR
1	ISSUED FOR SITE PLAN APPLICATION	JUNE 14/21	CJR

SCALE
N.T.S.

DESIGN LSC
CHECKED CJR
DRAWN LSC
CHECKED CJR
APPROVED CJR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
C.J. RUDDLE
PROVINCE OF ONTARIO

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LOCATION
MUNICIPALITY OF PORT HOPE
65 WARD STREET / 20 HOPE STREET SOUTH

DRAWING NAME
SOUTHBRIDGE CARE HOMES
PORT HOPE NURSING HOME

NOTES AND DETAILS PLAN

PROJECT No. 120226
REV REV 4
DRAWING No. 120226-NDP

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PLANA1.DWG - 594mmx841mm