S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Functional Servicing Report

2107 & 2119 OLD LAKESHORE ROAD

CITY OF BURLINGTON

OLD LAKESHORE (BURLINGTON) INC.

January 2020

SLA File: 18048

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1.0 INTRODUCTION AND BACKGROUND

1.1 OVERVIEW

S. Llewellyn & Associates Limited has been retained by Old Lakeshore (Burlington) Inc. to provide Consulting Engineering services for the proposed development at 2107 and 2119 Old Lakeshore Road in the City of Burlington (see Figure 1.0 for location plan). This report will outline the functional servicing strategy for the proposed development.

The proposed development consists of demolishing two existing commercial buildings and constructing a 27-storey high rise tower. The 27-storey building will contain a total of 150 residential units, underground parking and retail space.

This Functional Servicing Report will provide detailed information of the proposed servicing scheme for this development. Please refer to the preliminary site engineering plans prepared by S. Llewellyn and Associates Limited and the site plan prepared by Graziani & Corazza Architects Inc. for additional information.

1.2 BACKGROUND INFORMATION

The following documents were referenced in the preparation of this report:

Ref. 1: MOE Stormwater Management Practices Planning and Design Manual (Ministry of Environment, March 2003)

Ref. 2: City of Burlington Standard Drawings (City of Burlington, March 2004)

Ref. 3: Halton Region Water and Wastewater Linear Design Manual (Halton Region, April 2019)

Ref. 4: Erosion & Sediment Control Guidelines for Urban Construction (December 2006)

Ref. 5: Hydrogeological Investigation, 2107 & 2119 Old Lakeshore Road Burlington, (Terraprobe Inc. January 12, 2017)

Ref. 6: Geotechnical Investigation, 2107 & 2119 Old Lakeshore Road Burlington, (Terraprobe Inc. December 21, 2016)

Ref. 7: Response to Geotechnical and Hydrogeological Comments, (Grounded Engineering Inc. January 20, 2020)



Figure 1.0 – Location Plan

2.0 STORMWATER MANAGEMENT

The following stormwater management (SWM) criteria will be applied to the site, in accordance with the City of Burlington:

Quantity Control
The stormwater discharge from the subject site in the post-development condition shall be controlled to the pre-development condition discharge rates, or less during all storm events.

Quality Control
The stormwater runoff from the post-development condition will meet Level 1 (Enhanced) stormwater quality control (80% TSS removal, 90% average annual runoff treatment).

Erosion Control
Erosion and sediment control measures will be implemented in accordance with the standards of the City of Burlington.

2.1 PRE-DEVELOPMENT CONDITIONS

In the pre-development condition, the 0.2 ha site currently contains two low-rise buildings and paved parking areas. The site is bound by Lakeshore Road to the north, a commercial property to the west and Old Lakeshore Road to the east and south.

The topography of the site generally slopes towards existing catchbasins located on the municipal roads adjacent to the site. There is an existing 525mmø storm sewer flowing east along Old Lakeshore Road and an existing 825mmø storm sewer flowing east along Lakeshore Road. The 525mmø storm sewer connects into the 825mmø storm sewer at the intersection of Lakeshore and Old Lakeshore Road. Ultimately, runoff from the subject site discharges into Rambo Creek approximately 60m away.

One catchment area has been identified in the pre-development condition. Catchment 101's drainage area represents runoff from the entire site. See Table 2.1 below and the Post-Development Storm Drainage Area Plan in Appendix A for details.

Table 2.1- Pre-Development Catchment Area

Catchment ID	Description	Area (ha)	% Imp.	Runoff Coefficient
101	Subject Site	0.20	80	0.77

The pre-development condition for the subject lands was evaluated using hydrologic modelling. This analysis was performed using the SWMHYMO hydrologic modelling program developed by J.F. Sabourin & Associates. A summary of the results can be found in Table 2.2 below. The detail SWMHYMO input/output information can be found in Appendix A.

Table 2.2- Pre-Development Site Discharge

Storm Event	Catchment 101 Discharge Rate (l/s)
2-Year	25
5-Year	40
10-Year	46
25-Year	54
50-Year	60
100-Year	66

2.2 POST-DEVELOPMENT CONDITIONS

It is proposed to develop the site by demolishing two existing commercial buildings and construct a 27-storey high rise tower. The 27-storey building will contain a total of 150 residential units, underground parking and retail space. It is proposed to service the site with a private storm sewer system, designed and constructed in accordance with the City of Burlington standards.

One catchment area, Catchment 201, has been identified in the post-development condition. Catchment 201 represents drainage from the entire site, which will ultimately discharge into Rambo Creek via the 825mmø storm sewer along Lakeshore Road. See Table 2.3 below and the Post-Development Storm Drainage Area Plan in Appendix A for details.

Table 2.3- Post-Development Catchment Area

Catchment ID	Description	Area (ha)	% Imp.	Runoff Coefficient
201	Subject Site	0.20	94	0.86

Permanent Dewatering Control

It is required to provide a permanent subfloor drainage system, as it is proposed to construct five stories of underground parking. The proposed building will contain a sump pump system which will direct any groundwater to the proposed stormwater storage vault. A hydrogeological investigation (Ref. 5) was completed on-site to determine the ground water conditions and dewatering requirements. It was determined that ground water takings of 0.024 L/s are possible. However, this ground water seepage rate was determined based on the assumption of a four-storey underground parking garage. Further analysis was completed by Grounded Engineering Inc. (Ref. 7) and determined that a five-storey underground parking garage would generate a ground water seepage rate of 0.035 L/s. This flow rate will be accounted for in the discharge rate leaving the site.

Water Quantity Control

It is required to provide quantity control measures to the proposed storm sewer system to prevent the overall post-development stormwater discharge rates from exceeding pre-development discharge rates. It is proposed to install a 150mmø orifice pipe at 0.5% grade (Refer to Preliminary Site Servicing Plan).

With the installation of the above note orifice pipe, it is required to provide stormwater storage during all storm events. It is proposed to install a stormwater storage vault within the level 1 underground parking garage. This storage vault will be cast into the foundation of the high-rise tower. A summary of the Stage-Storage-Discharge Calculations can be seen in Table 2.4 below and in Appendix A.

Table 2.4- Post-Development Condition Stage-Storage-Discharge (Catchment 201)

Elevation (m)	Vault Volume (m^3)	Discharge (l/s)
77.53 (orifice pipe invert/bottom of tank)	0	0
78.13 (0.6m depth of storage)	30	48.5
78.70 (top of tank)	58	67.7

The post-development condition for the subject lands was evaluated using hydrologic modelling. This analysis was performed using the SWMHYMO hydrologic modelling program developed by J.F. Sabourin & Associates. A summary of the results can be

found in Table 2.5 below. The detail SWMHYMO input/output information can be found in Appendix A.

Table 2.5 - Post-Development Condition Site Discharge (Catchment 201)

Storm Event	Catchment 201 Discharge (L/s)	Total Discharge (L/s)[A]	Allowable Discharge (L/s)[B]	Reduction (%)	Required Storage (m^3)
2-Yr Event	25	15.035	25	30	15.8
5-Yr Event	33	33.035	40	17	20.5
10-Yr Event	38	38.035	46	17	23.6
25-Yr Event	44	44.035	54	18	27.5
50-Yr Event	48	48.035	60	20	30.4
100-Yr Event	51	51.035	66	23	33.5

[A]= Controlled Discharge Via Orifice Pipe + Ground Water Discharge (0.035L/s)
[B]= Pre-Development Flow Rates (Catchment 101)

This analysis determined the following:

- Discharge rates in the post-development condition will not exceed pre-development condition discharge rates.
- The installation of 1.5m-150mmø orifice pipe at 0.5% grade will provide effective quantity control for the subject site.
- Sufficient stormwater storage is provided on-site. Catchment 201 provides 58m^3 of storage, whereas only 34m^3 of storage is required during a 100-year storm event.

Water Quality Control

The proposed development is required to achieve a Level 1 “Normal” (80% TSS removal, 90% average annual runoff treatment) level of water quality protection. To achieve this criterion, discharge from Catchment 201 will be subject to treatment from a Hydroguard oil/grit separator before ultimately discharging to the 825mmø storm sewer along Lakeshore Road. The Hydroworks sizing software was used to determine the required size of Hydroguard Unit for the site. It was determined that a HG-4 will provide 84% TSS removal and 93% average annual runoff treatment, which satisfies the requirements for an” Enhanced” level for quality control. See Hydroworks sizing procedures in Appendix A for details.

Hydroguard units require inspection and maintenance as per the manufacture’s specifications to ensure the unit operate properly. Refer to the Hydroguard Maintenance Manual in Appendix A for details.

2.3 SEDIMENT AND EROSION CONTROL

In order to minimize erosion during the grading and site servicing period of construction, the following measures will be implemented:

- Install sediment control (silt sacks) in the nearby existing catchbasins to ensure that no untreated runoff enters the existing conveyance system.

To ensure and document the effectiveness of the erosion and sediment control structures, an appropriate inspection and maintenance program is necessary. The program will include the following activities:

- Inspection of the erosion and sediment controls (e.g. silt fences, sediment traps, outlets, vegetation, etc.) with follow up reports to the governing municipality; and

- The developer and/or his contractor shall be responsible for any costs incurred during the remediation of problem areas.

Details of the proposed erosion & sediment control measures will be provided on the Erosion and Sediment Control Plans, which will be provided upon final design.

3.0 SANITARY SEWER SERVICING

3.1 PRE-DEVELOPMENT CONDITIONS

There are two existing sanitary mains which are located adjacent to the subject site. There is an existing 450mmø sanitary sewer along Lakeshore Road and an existing 200mmø sanitary sewer along Old Lakeshore Road. There are two existing sanitary laterals, which are currently servicing the two existing commercial buildings on-site. Each lateral connects into the 450mmø sanitary trunk main along Lakeshore Road.

3.2 SANITARY DEMAND

Sanitary discharge from the site was estimated in accordance with the Halton Region Water and Wastewater Linear Design Manual (Ref. 3). Tables 3.1 and 3.2 summarizes the sanitary sewer discharge rate for the subject lands.

Table 3.1- Post-Development Sanitary Sewer Discharge (Residential Units)				
Population [A]	Avg. Demand [B] (l/s)	Peaking Factor [C]	Infiltration [D] (l/s)	**Peak Flow [E] (l/s)**
750 persons	2.39	3.88	0.057	**9.33**

[A]: Population = (25 x 1 bdr units x 2 cap/bdr) + (25 x 2 bdr units x 2 cap/bdr) + (100 x 3 bdr units x 2 cap/bdr) = 750 persons
[B]: Average demand = 275 l/cap/day x population
[C]: Peaking Factor = $1+((14/(4+P^{0.5}))$ with P expressed in thousands Min=2.0
[D]: Infiltration flow based on 0.286 l/ha/sec infiltration rate x Site Area (0.2 hectares)
[E]: Peak Flow = (Average Flow x Peaking Factor) + Infiltration

Table 3.2 - Post-Development Sanitary Sewer Discharge (Retail Units)					
Total Floor Area [A] (ha)	Population [B]	Avg. Demand [C] (l/s)	Peaking Factor [D]	Infiltration [E] (l/s)	**Peak Flow [F] (l/s)**
0.06	6 persons	0.02	4.44	0.057	**0.15**

[A]: Total Floor Area = retail floor area
[B]: Light Commercial Areas = 90 persons/hectare
[C]: Average demand = 24.75 m^3/ha/day x total floor area
[D]: Peaking Factor = $1+((14/(4+P^{0.5}))$ with P expressed in thousands Min=2.0
[E]: Infiltration flow based on 0.286 l/ha/sec infiltration rate x Site Area (0.2 hectares)
[F]: Peak Flow = (Average Flow x Peaking Factor) + Infiltration

Total Sanitary Sewer Discharge = 9.33 l/s + 0.15 l/s
Total Sanitary Sewer Discharge = 9.48 l/s

3.3 PROPOSED SANITARY SERVICING AND CAPACITY ANALYSIS

The proposed high-rise tower will be serviced by a private 200mmø sanitary sewer system, designed and constructed in accordance with the Halton Region standards. It is proposed to connect the 200mmø sanitary sewer to the existing 200mmø sanitary sewer along Old Lakeshore Road, as the 450mmø sanitary sewer along Lakeshore Road is a trunk main.

The minimum grade of the proposed 200mmø sanitary will be 2.0%. At this minimum grade, the proposed sanitary sewer will have a capacity of 0.046m^3/s (46 l/s). therefore, the proposed 200mmø sanitary sewer at 2.0% grade is adequately sized to service the proposed development.

4.0 DOMESTIC AND FIRE WATER SUPPLY SERVICING

4.1 PRE-DEVELOPMENT CONDITIONS

The existing municipal water distribution system consists of a 300mmø distribution watermain along Lakeshore Road and Old Lakeshore Road. The existing 300mmø watermain along Old Lakeshore Road has been proposed to service the proposed development.

4.2 DOMESTIC WATER DEMAND

Water demand for the site was estimated in accordance with the Halton Region Water and Wastewater Linear Design Manual (Ref. 3). Tables 4.1 and 4.2 summarizes the domestic water demand requirements for the Average Daily, Maximum Daily and Peaking Hourly demand scenarios.

Table 4.1 - Post-Development Domestic Water Demand (Residential Units)

Population [A]	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
750 persons	2.39	2.25	4	**5.38**	**9.56**

[A]: Population = (25 x 1 bdr units x 2 cap/bdr) + (25 x 2 bdr units x 2 cap/bdr) + (100 x 3 bdr units x 2 cap/bdr) = 750 persons
[B]: Average Daily Demand = 275 l/cap/day x population
[C]: Max. Daily Peaking Factor = 2.25 (refer to sentence 2.4.2 in Ref.3)
[D]: Max. Hourly Peaking Factor = 4.00 (refer to Table 2-2 in Ref. 3)
[E]: Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor
[F]: Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

Table 4.2 - Post-Development Domestic Water Demand (Retail Units)

Total Floor Area [A] (ha)	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
0.06	0.02	2.25	2.25	**0.05**	**0.05**

[A]: Population = 90 persons/hectare = 6 persons
[B]: Average Daily Demand = 275 l/cap/day x population
[C]: Max. Daily Peaking Factor = 2.25 (refer to sentence 2.4.2 in Ref.3)
[D]: Max. Hourly Peaking Factor = 2.25 (refer to Table 2-2 in Ref. 3)
[E]: Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor
[F]: Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

Total Max. Daily Demand = 5.38 l/s + 0.05 l/s
Total Max. Daily Demand = 5.43 l/s

Total Max. Hourly Demand = 9.56 l/s + 0.05 l/s
Total Max. Hourly Demand = 9.61 l/s

4.3 FIRE FLOW DEMAND

Fire flow demands for development are governed by a number of guidelines and criteria, such as the Water Supply for Public Fire Protection (Fire Underwriters Survey, 1999), Ontario Building Code (OBC), and various codes and standards published by the National Fire Protection Association (NFPA). Since the FUS criteria provides adjustment for sprinklered buildings (OBC does not), the FUS method was used to determine the fire flow demand for the proposed development.

The high-rise tower is a fire-resistive construction building (C=0.6), with non-combustible occupancy (-25% correction) and sprinkler system (-50% correction). Exposure corrections are based on the following:

North Face: 5% correction (30.1m to 45m)
South Face: 10% correction (20.1m to 30m)
East Face: 0% correction (>45m)
West Face: 15% correction (10.1m to 20m)
Total: 30% correction

Based on the hydrant flow test conducted by Jackson Waterworks, the theoretical maximum available flow rate is **348 l/s**. It is estimated that the required fire flow for the proposed development will be **133 l/s**. Therefore, the water distribution system has adequate pressure and capacity to service the subject site. See Fire Flow Demand Requirements in Appendix B for calculations and details.

4.4 PROPOSED WATER SERVICING AND ANALYSIS

The proposed water servicing for the subject site consists of installing a 200mmø watermain which will be split at property line to provide a 100mmø domestic and 200mmø fire water service for the proposed development. The proposed 200mmø watermain will connect into the existing 300mmø watermain along Lakeshore Road. Water services for the site are to be designed and constructed in accordance with the Halton Region standards.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that the proposed development located at 2107 and 2119 Old Lakeshore Road can be constructed to meet the requirements of the City of Burlington and Halton Region. Therefore, it is recommended that:

- The development be graded and serviced in accordance with the Preliminary Grading Plan and the Preliminary Servicing Plan prepared by S.Llewellyn & Associates Limited.

- Discharge rates in the post-development condition will not exceed pre-development condition discharge rates.

- The installation of 1.5m-150mmø orifice pipe at 0.5% grade will provide effective quantity control for the subject site.

- Sufficient stormwater storage is provided on-site. Catchment 201 provides 58m^3 of storage, whereas only 34m^3 of storage is required during a 100-year storm event.

- A Hydroguard HG4 oil/grit separator be installed as per the Preliminary Site Servicing Plan and this report to provided effective stormwater quality control.

- Erosion and sediment controls be installed as described in this report to meet City of Burlington requirements.

- The proposed water and sanitary servicing systems be installed as per this report to adequately service the proposed development.

- This report be used as the basis for the servicing and stormwater management design. All design data, assumptions and calculations will be confirmed and/or updated as part of the future Site Plan Approval submission.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

Prepared by:

S. LLEWELLYN & ASSOCIATES LIMITED

C.Dougan, Dipl.T

S. Llewellyn, P.Eng.



APPENDIX A
STORMWATER MANAGEMENT INFORMATION

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9/3/2019 5:41:30 PM - Colin Dougan

LAKESHORE ROAD

EX. MH
T/G=79.50
E.INV=77.35±
W.INV.=77.35±

EX. 825mmø STM.

EX. MH
T/G=78.55
E.INV=76.60±
W.INV.=76.65±

EX. CB
T/G=80.61

EX. CB
T/G=78.85

EX. CONCRETE CURB

EX. APPROACH

EX. ILS

EX. LSA

EX. SIGN

EX. BBOX

EX. 0.3ø TREE

EX. CABLE BOX

EX. 0.4ø TREE

EX. 0.2ø TREE

EX. BELL BOX

EX. SRW

EX. 0.3ø TREE

EX. ILS

EX. CRW

EX. TSBOX

EX. DCB
T/G=78.25

EX. CONCRETE CURB

EX. RAMP

EX. CB
T/G 81.51

101
0.20
80
0.77

EX. STUCCO & METAL SIDED BUILDING
No. 2107

EX. METAL-CLAD & CONCRETE BLOCK BUILDING
No. 2119

EX. GM

EX. PARKING

EX. CORR STONES

EX. HEDGE

EX. CONCRETE

EX. PORCH

EX. PAINTED APP.

EX. CEDARS

EX. CONCRETE CURB

EX. BOARD FENCE

EX. APPROACH

EX. CORB

EX. 2 STOREY BRICK BUILDING
No. 2101

EX. SIGN

EX. 50mmø GASMAIN

EX. CONCRETE CURB

EX. MH
T/G=80.48
E.INV.=77.80±
W.INV.=78.05±

EX. CB
T/G=80.28

EX. 450mmø STM.

OLD LAKESHORE ROAD

EX. CB
T/G=81.08

EX. PBOX

EX. STEPS

EX. PORCH

EX. CONCRETE SIDEWALK

EX. APPROACH

EX. 525mmø STM.

LEGEND

101
0.20
80
0.77

DRAINAGE AREA I.D.
DRAINAGE AREA (ha)
PERCENT IMPERVIOUS
RUNOFF COEFFICENT

PERVIOUS AREA

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:300

PROJECT: 2107 OLD LAKESHORE ROAD
PROJECT No.: 18048

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LAKESHORE ROAD

EX. MH
T/G=79.50
E.INV=77.35±
W.INV.=77.35±

EX. 825mmø STM.

MH1
(OPSD 701.011)
T/G 78.65
S.INV. 77.45
W.INV. 76.98±
E.INV. 76.98±

EX. MH
T/G=78.55
E.INV=76.60±
W.INV.=76.60±

EX. CB
T/G=80.61

EX. ILS

EX. CONCRETE CURB

EX. CB
T/G=78.85

EX. APPROACH

EX. CABLE BOX

EX. 0.3ø TREE

EX. 0.4ø TREE

EX. 0.5ø TREE

EX. BELL BOX

EX. LSA

EX. SRW

EX. CRW

EX. SIGN

EX. BBOX

EX. HEDGE

EX. CURB STONES

EX. PARKING

EX. CB
T/G 81.51

AD1
T/G 80.55

TD1
(KLASSICK K300)
T/G 79.63

AD3
T/G 79.53

AD4
T/G 79.53

NOTE:
PERMANENT SUBFLOOR DRAINAGE SYSTEM IS TO BE PUMPED & DISCHARGE TO PROP. STORMWATER STORAGE VAULT.
(REFER TO MECH. FOR DETAILS)

EX. METAL-CLAD & CONCRETE BLOCK BUILDING No. 2119

201
0.20
94
0.86

EX. GM

EX. PORCH

EX. STEPS

EX. PAINTED AREA

AD2
T/G 80.65

EX. BOARD FENCE

EX. 2 STOREY BRICK BUILDING No. 2101

EX. 0.28 TREE

EX. 0.27ø TREE

EX. CEDAR

EX. PBOX

EX. CB
T/G=81.08

EX. 450mmø STM.

OLD LAKESHORE ROAD

EX. 525mmø STM.

EX. 50mmø GASMAIN

EX. MH
T/G=80.48
E.INV=77.80±
W.INV.=78.05±

EX. CB
T/G=80.28

8.0m-375mmø
STM. @ 0.5%
(c/w INSULATION)

OGS1
(HYDROGUARD HG-4)
T/G 78.90
N.INV. 77.49
S.INV. 77.52

EX. DCB
T/G=78.25

EX. TSBOX

1.5m-150mmø
STM. @ 0.5%
(ORIFICE PIPE)

CAST-IN-PLACE STORMWATER STORAGE VAULT
TANK VOLUME=58m³
TOP OF TANK=78.70
BOTTOM OF TANK=77.53
(CONTRACTOR TO PROVIDE SHOP DWG'S)
(REFER TO DETAIL)

N

LEGEND

201
0.20
94
0.86

DRAINAGE AREA I.D.
DRAINAGE AREA (ha)
PERCENT IMPERVIOUS
RUNOFF COEFFICENT

PERVIOUS AREA

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:300

PROJECT: 2107 OLD LAKESHORE ROAD
PROJECT No.: 18048

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1/21/2020 1:50:00 PM - Colin Dougan

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Project: 2107 Old Lakeshore Road		Project No. 18048	
Date: Jan/2020	Designer: Colin Dougan	Scale: N/A	Pg. 1 of 1
Subject: Catchment Parameters			

Catchment 101

Total Area = 2029 m^2

Pervious Area = 402 m^2

Impervious Area = 1627 m^2

$$C = \frac{(0.25 \times 402) + (0.9 \times 1627)}{2029}$$

$C = 0.77$

$$\% \text{ Impervious} = \frac{1627}{2029} \times 100\%$$

% Impervious = 80%

Catchment 201

Total Area = 2029 m^2

Pervious Area = 131 m^2

Impervious Area = 1898 m^2

$$C = \frac{(0.25 \times 131) + (0.9 \times 1898)}{2029}$$

$C = 0.86$

$$\% \text{ Impervious} = \frac{1898}{2029} \times 100\%$$

% Impervious = 94%

2107 2119 Old Lakeshore Road
Burlington Ontario

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

STAGE-STORAGE-DISCHARGE CALCULATIONS

Outlet Device No. 1 (Quantity)

Type:	Orifice Pipe
Diameter (mm)	**150**
Area (m^2)	0.01767
Invert Elev. (m)	77.53
Disch. Coeff. (C_d)	0.8
Discharge (Q) =	$C_d A (2 g H)^{0.5}$

				Outlet No. 1		Outlet No. 2		Outlet No. 3		Outlet No. 4		
	Elevation	Tank Volume	Active Storage Volume	H	Discharge	H	Discharge	H	Discharge	H	Discharge	Total Discharge
	m	m^3	m^3	m	m^3/s	m	m^3/s	m	m^3/s	m	m^3/s	m^3/s
Orifice Invert	77.53	0	0	0.000	0.0000							0.0000
0.60m Depth	78.13	30	30	0.600	0.0485							0.0485
Top of Tank	78.70	28	58	1.170	0.0677							0.0677

```
2     Metric units
*#*************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#                BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#*************************************************************************|
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
                    BURL_002.stm
*
READ STORM          STORM_FILENAME "STORM.001"
*
*#*************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#*************************************************************************|
*# CATCHMENT 101 - Existing Condition
*
CALIB STANDHYD      ID=[1], NHYD=["101"], DT=[1](min), AREA=[0.20](ha),
                    XIMP=[0.80], TIMP=[0.80], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[68],
                    Pervious   surfaces: IAper=[11.95](mm), SLPP=[10](%),
                                         LGP=[10](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[3.0](%),
                                         LGI=[20](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
**#*************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#*************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
CALIB STANDHYD      ID=[2], NHYD=["201"], DT=[1](min), AREA=[0.20](ha),
                    XIMP=[0.94], TIMP=[0.94], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[98],
                    Pervious   surfaces: IAper=[0.52](mm), SLPP=[0.1](%),
                                         LGP=[0.1](m), MNP=[0.250], SCP=[0](min)
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.0](%),
                                         LGI=[10](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
**#*************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
ROUTE RESERVOIR     IDout=[3],   NHYD=["201"],  IDin=[2],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                     (cms) - (ha-m)
                                      0.0 ,  0.0
                                    0.0485 ,  0.0030
                                    0.0677 ,  0.0058
                                       -1  ,  -1    (max twenty pts)
                          IDovf=[4], NHYDovf=["OVF"]
*%-----------------|-------------------------------------------------------|
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
```

```
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                     BURL_005.stm
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[010]
                     BURL_010.stm
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[025]
                     BURL_025.stm
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[050]
                     BURL_050.stm
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                     BURL_100.stm
*
*%-----------------|-------------------------------------------------------------|
FINISH
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9   =========
                                                          9   9  9   9   # 3902680
        StormWater Management HYdrologic Model            999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.com                   *********
 ********************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: S. Llewellyn & Associates Ltd                +++++++++
 +++++++++                Burlington            SERIAL#:3902680       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
 *********          Maximum value for ID numbers  :     10            *********
 *********          Max. number of rainfall points: 105408            *********
 *********          Max. number of flow points    : 105408            *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2020-01-21     TIME: 13:11:45     RUN COUNTER: 000477          *
 ********************************************************************************
 * Input   filename: Z:\projects\18048\SWMHYMO\18048.dat                        *
 * Output  filename: Z:\projects\18048\SWMHYMO\18048.out                        *
 * Summary filename: Z:\projects\18048\SWMHYMO\18048.sum                        *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#*****************************************************************************|
*
  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
--------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on      0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=BURL_002.stm
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#*****************************************************************************|
*
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 2-YR BURLINGTON CHICAGO STORM (4-HR DURA
| Ptotal=  32.34 mm|    Comments: 2-YR BURLINGTON CHICAGO STORM (4-HR DURA
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   2.193 |   1.17  17.083 |   2.17   5.221 |   3.17   2.635
              .33   2.511 |   1.33  68.163 |   2.33   4.444 |   3.33   2.448
              .50   2.955 |   1.50  22.413 |   2.50   3.884 |   3.50   2.289
              .67   3.627 |   1.67  11.979 |   2.67   3.459 |   3.67   2.151
              .83   4.775 |   1.83   8.270 |   2.83   3.126 |   3.83   2.031
             1.00   7.239 |   2.00   6.374 |   3.00   2.857 |   4.00   1.925

--------------------------------------------------------------------------------
002:0003----------------------------------------------------------------------
*
*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#**************************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .16          .04
     Dep. Storage     (mm)=       1.00        11.95
     Average Slope     (%)=       3.00        10.00
     Length            (m)=      20.00        10.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      68.16         3.31
               over (min)        1.00         8.00
     Storage Coeff.  (min)=        .82 (ii)    8.22 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.20          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .00          .030 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.333
     RUNOFF VOLUME    (mm)=      31.34         2.97        25.668
     TOTAL RAINFALL   (mm)=      32.34        32.34        32.342
     RUNOFF COEFFICIENT   =        .97          .09          .794

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004----------------------------------------------------------------------
**#**************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#**************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .19          .01
     Dep. Storage     (mm)=       1.00          .52
     Average Slope     (%)=       1.00          .10
     Length            (m)=      10.00          .10
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      68.16        64.44
               over (min)        1.00         1.00
     Storage Coeff.  (min)=        .75 (ii)    1.32 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.25          .90
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .038 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.333
     RUNOFF VOLUME    (mm)=      31.34        27.36        31.103
     TOTAL RAINFALL   (mm)=      32.34        32.34        32.342
     RUNOFF COEFFICIENT   =        .97          .85          .962

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0005----------------------------------------------------------------------
**#**************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(201   )    |
| OUT<03:(201   )    |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .068  .5800E-02
                             .049  .3000E-02   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .038     1.333     31.103
     OUTFLOW<03: (201   )        .20      .025     1.350     31.103
    OVERFLOW<04: (OVF   )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   67.016
                    TIME SHIFT OF PEAK FLOW         (min)=     1.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1582E-02

--------------------------------------------------------------------------------
002:0006----------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
  ** END OF RUN :   4

********************************************************************************




--------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
--------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on      0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=BURL_005.stm
--------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
```

```
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#**************************************************************************|
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 5-YR BURLINGTON CHICAGO STORM (4-HR DURA
| Ptotal=  41.70 mm|    Comments: 5-YR BURLINGTON CHICAGO STORM (4-HR DURA
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   2.963 |   1.17  21.285 |   2.17   6.805 |   3.17   3.535
               .33   3.374 |   1.33  88.094 |   2.33   5.834 |   3.33   3.293
               .50   3.946 |   1.50  27.774 |   2.50   5.128 |   3.50   3.087
               .67   4.803 |   1.67  15.072 |   2.67   4.590 |   3.67   2.908
               .83   6.247 |   1.83  10.561 |   2.83   4.165 |   3.83   2.751
              1.00   9.295 |   2.00   8.234 |   3.00   3.820 |   4.00   2.612

------------------------------------------------------------------------------
005:0003----------------------------------------------------------------------
*
*#**************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#**************************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .16          .04
     Dep. Storage     (mm)=      1.00        11.95
     Average Slope     (%)=      3.00        10.00
     Length            (m)=     20.00        10.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=     88.09         9.36
               over (min)        1.00         6.00
     Storage Coeff.  (min)=      .74 (ii)    5.62 (ii)
     Unit Hyd. Tpeak (min)=      1.00         6.00
     Unit Hyd. peak  (cms)=      1.26          .20
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .04          .00          .040 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.333
     RUNOFF VOLUME    (mm)=     40.70         5.93        33.742
     TOTAL RAINFALL   (mm)=     41.70        41.70        41.696
     RUNOFF COEFFICIENT   =       .98          .14          .809

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------
**#**************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#**************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .19          .01
     Dep. Storage     (mm)=      1.00          .52
     Average Slope     (%)=      1.00          .10
     Length            (m)=     10.00          .10
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=     88.09        84.91
               over (min)        1.00         1.00
     Storage Coeff.  (min)=      .68 (ii)    1.18 (ii)
     Unit Hyd. Tpeak (min)=      1.00         1.00
     Unit Hyd. peak  (cms)=      1.31          .97
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .05          .00          .049 (iii)
     TIME TO PEAK    (hrs)=      1.32         1.33         1.333
     RUNOFF VOLUME    (mm)=     40.70        36.57        40.448
     TOTAL RAINFALL   (mm)=     41.70        41.70        41.696
     RUNOFF COEFFICIENT   =       .98          .88          .970

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0005----------------------------------------------------------------------
**#**************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
--------------------
| ROUTE RESERVOIR  |    Requested routing time step =  1.0 min.
|  IN>02:(201   )  |
| OUT<03:(201   )  |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                          .000  .0000E+00    |     .068  .5800E-02
                          .049  .3000E-02    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .049     1.333     40.448
     OUTFLOW<03: (201   )        .20      .033     1.350     40.448
    OVERFLOW<04: (OVF   )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   66.924
                  TIME SHIFT OF PEAK FLOW        (min)=    1.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2049E-02

------------------------------------------------------------------------------
005:0006----------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
  ** END OF RUN :   9

********************************************************************************




--------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
-------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 010
    NSTORM=   1
           #  1=BURL_010.stm
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*#**************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#**************************************************************************|
*
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 10-YR BURLINGTON CHICAGO STORM (4-HR DUR
| Ptotal=  48.00 mm|    Comments: 10-YR BURLINGTON CHICAGO STORM (4-HR DUR
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   3.423 |   1.17  24.501 |   2.17   7.852 |   3.17   4.083
               .33   3.898 |   1.33 101.139 |   2.33   6.733 |   3.33   3.805
               .50   4.558 |   1.50  31.955 |   2.50   5.920 |   3.50   3.567
               .67   5.545 |   1.67  17.363 |   2.67   5.300 |   3.67   3.360
               .83   7.210 |   1.83  12.175 |   2.83   4.810 |   3.83   3.179
              1.00  10.719 |   2.00   9.497 |   3.00   4.413 |   4.00   3.019

------------------------------------------------------------------------------
010:0003----------------------------------------------------------------------
*
*#**************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#**************************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .16          .04
     Dep. Storage     (mm)=      1.00        11.95
     Average Slope     (%)=      3.00        10.00
     Length            (m)=     20.00        10.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    101.14        15.81
               over (min)        1.00         5.00
     Storage Coeff.  (min)=      .70 (ii)    4.66 (ii)
     Unit Hyd. Tpeak (min)=      1.00         5.00
     Unit Hyd. peak  (cms)=      1.29          .24
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .04          .00          .046 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.38         1.333
     RUNOFF VOLUME    (mm)=     47.00         8.35        39.274
     TOTAL RAINFALL   (mm)=     48.00        48.00        48.004
     RUNOFF COEFFICIENT   =       .98          .17          .818

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
010:0004----------------------------------------------------------------------
**#**************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#**************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .19          .01
     Dep. Storage     (mm)=      1.00          .52
     Average Slope     (%)=      1.00          .10
     Length            (m)=     10.00          .10
     Mannings n            =      .013         .250
```

```
     Max.eff.Inten.(mm/hr)=     101.14        98.24
               over (min)         1.00         1.00
     Storage Coeff.  (min)=        .64 (ii)    1.12 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.34         1.00
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .05          .00          .056 (iii)
     TIME TO PEAK    (hrs)=       1.32         1.33         1.333
     RUNOFF VOLUME    (mm)=      47.00        42.81        46.752
     TOTAL RAINFALL   (mm)=      48.00        48.00        48.004
     RUNOFF COEFFICIENT   =        .98          .89          .974

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
010:0005----------------------------------------------------------------------
**#*************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(201   )   |
| OUT<03:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .068  .5800E-02
                           .049  .3000E-02   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .056     1.333     46.752
     OUTFLOW<03: (201   )        .20      .038     1.350     46.752
    OVERFLOW<04: (OVF   )        .00      .000      .000      .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   67.019
                  TIME SHIFT OF PEAK FLOW         (min)=     1.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2359E-02

------------------------------------------------------------------------------
010:0006----------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
  ** END OF RUN :  24

********************************************************************************
```

```
-------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
-------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 025
    NSTORM=   1
           #  1=BURL_025.stm
------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*#*************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#*************************************************************************|
*
------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*
-------------------
| READ STORM       |    Filename: 25-YR BURLINGTON CHICAGO STORM (4-HR DUR
| Ptotal=  56.03 mm|    Comments: 25-YR BURLINGTON CHICAGO STORM (4-HR DUR
-------------------
            TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
             hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
             .17   4.010 |   1.17  28.592 |   2.17   9.185 |   3.17   4.782
             .33   4.566 |   1.33 117.720 |   2.33   7.879 |   3.33   4.457
             .50   5.337 |   1.50  37.274 |   2.50   6.929 |   3.50   4.178
             .67   6.491 |   1.67  20.279 |   2.67   6.204 |   3.67   3.937
             .83   8.435 |   1.83  14.230 |   2.83   5.632 |   3.83   3.725
            1.00  12.531 |   2.00  11.105 |   3.00   5.167 |   4.00   3.538


------------------------------------------------------------------------------
025:0003----------------------------------------------------------------------
*
*#*************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#*************************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .16          .04
     Dep. Storage     (mm)=      1.00        11.95
     Average Slope     (%)=      3.00        10.00
     Length            (m)=     20.00        10.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     117.72        25.27
               over (min)         1.00         4.00
     Storage Coeff.  (min)=        .66 (ii)    3.94 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.33          .28
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .05          .00          .054 (iii)
     TIME TO PEAK    (hrs)=       1.32         1.37         1.333
     RUNOFF VOLUME    (mm)=      55.03        11.88        46.400
     TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
     RUNOFF COEFFICIENT   =        .98          .21          .828

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
025:0004----------------------------------------------------------------------
**#*************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#*************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .19          .01
     Dep. Storage     (mm)=      1.00          .52
     Average Slope     (%)=      1.00          .10
     Length            (m)=     10.00          .10
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     117.72       115.13
               over (min)         1.00         1.00
     Storage Coeff.  (min)=        .60 (ii)    1.05 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.38         1.04
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .06          .00          .065 (iii)
     TIME TO PEAK    (hrs)=       1.32         1.33         1.333
     RUNOFF VOLUME    (mm)=      55.03        50.77        54.775
     TOTAL RAINFALL   (mm)=      56.03        56.03        56.030
     RUNOFF COEFFICIENT   =        .98          .91          .978

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
025:0005----------------------------------------------------------------------
**#*************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(201   )   |
| OUT<03:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .068  .5800E-02
                           .049  .3000E-02   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .065     1.333     54.775
     OUTFLOW<03: (201   )        .20      .044     1.350     54.775
    OVERFLOW<04: (OVF   )        .00      .000      .000      .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   67.110
                  TIME SHIFT OF PEAK FLOW         (min)=     1.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2753E-02

------------------------------------------------------------------------------
025:0006----------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*
  ** END OF RUN :  49

********************************************************************************
```

```
-------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
-------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=BURL_050.stm
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
```

```
*#************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#************************************************************************|
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 50-YR BURLINGTON CHICAGO STORM (4-HR DUR
| Ptotal=  61.96 mm|    Comments: 50-YR BURLINGTON CHICAGO STORM (4-HR DUR
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   4.451 |   1.17  31.613 |   2.17  10.180 |   3.17   5.306
              .33   5.067 |   1.33 129.819 |   2.33   8.734 |   3.33   4.946
              .50   5.921 |   1.50  41.194 |   2.50   7.683 |   3.50   4.637
              .67   7.198 |   1.67  22.439 |   2.67   6.881 |   3.67   4.369
              .83   9.350 |   1.83  15.757 |   2.83   6.247 |   3.83   4.135
             1.00  13.879 |   2.00  12.303 |   3.00   5.733 |   4.00   3.927

--------------------------------------------------------------------------------
050:0003----------------------------------------------------------------------
*
*#************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#***********************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .16          .04
     Dep. Storage     (mm)=      1.00        11.95
     Average Slope     (%)=      3.00        10.00
     Length            (m)=     20.00        10.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    129.82        32.05
               over (min)        1.00         4.00
     Storage Coeff.  (min)=       .63 (ii)    3.62 (ii)
     Unit Hyd. Tpeak (min)=      1.00         4.00
     Unit Hyd. peak  (cms)=      1.35          .30
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .06          .00          .060 (iii)
     TIME TO PEAK    (hrs)=      1.32         1.37         1.333
     RUNOFF VOLUME    (mm)=     60.96        14.75        51.720
     TOTAL RAINFALL   (mm)=     61.96        61.96        61.962
     RUNOFF COEFFICIENT   =       .98          .24          .835

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
050:0004----------------------------------------------------------------------
**#***********************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
**#***********************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
----------------------
                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .19          .01
     Dep. Storage     (mm)=      1.00          .52
     Average Slope     (%)=      1.00          .10
     Length            (m)=     10.00          .10
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    129.82       127.42
               over (min)        1.00         1.00
     Storage Coeff.  (min)=       .58 (ii)    1.01 (ii)
     Unit Hyd. Tpeak (min)=      1.00         1.00
     Unit Hyd. peak  (cms)=      1.40         1.07
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .07          .00          .072 (iii)
     TIME TO PEAK    (hrs)=      1.30         1.33         1.333
     RUNOFF VOLUME    (mm)=     60.96        56.66        60.704
     TOTAL RAINFALL   (mm)=     61.96        61.96        61.962
     RUNOFF COEFFICIENT   =       .98          .91          .980

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
050:0005----------------------------------------------------------------------
**#***********************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(201   )    |
| OUT<03:(201   )    |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .068  .5800E-02
                            .049  .3000E-02   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .072     1.333     60.704
     OUTFLOW<03: (201   )        .20      .048     1.350     60.704
    OVERFLOW<04: (OVF   )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   67.171
                    TIME SHIFT OF PEAK FLOW         (min)=     1.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3042E-02

--------------------------------------------------------------------------------
050:0006----------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
  ** END OF RUN :  99

****************************************************************************




--------------------
| START            |  Project  dir.: Z:\projects\18048\SWMHYMO\
--------------------  Rainfall dir.: Z:\projects\18048\SWMHYMO\
    TZERO =   .00 hrs on      0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=BURL_100.stm
--------------------------------------------------------------------------------
100:0002----------------------------------------------------------------------
*#************************************************************************|
*#  Project Name: 2107 & 2119 OLD LAKESHORE ROAD
*#               BURLINGTON, ONTARIO
*#  JOB NUMBER  : 18048
*#       Date   : January 2020
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 18048.DAT
*#************************************************************************|
*
--------------------------------------------------------------------------------
100:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 100-YR BURLINGTON CHICAGO STORM (4-HR DU
| Ptotal=  67.72 mm|    Comments: 100-YR BURLINGTON CHICAGO STORM (4-HR DU
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   4.865 |   1.17  34.553 |   2.17  11.126 |   3.17   5.800
              .33   5.538 |   1.33 141.892 |   2.33   9.547 |   3.33   5.406
              .50   6.472 |   1.50  45.024 |   2.50   8.397 |   3.50   5.068
              .67   7.868 |   1.67  24.526 |   2.67   7.521 |   3.67   4.776
              .83  10.219 |   1.83  17.223 |   2.83   6.828 |   3.83   4.519
             1.00  15.170 |   2.00  13.447 |   3.00   6.266 |   4.00   4.292

--------------------------------------------------------------------------------
100:0003----------------------------------------------------------------------
*
*#************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
**#***********************************************************************|
*# CATCHMENT 101 - Existing Condition
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 01:101    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .16          .04
     Dep. Storage     (mm)=      1.00        11.95
     Average Slope     (%)=      3.00        10.00
     Length            (m)=     20.00        10.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    141.89        41.00
               over (min)        1.00         3.00
     Storage Coeff.  (min)=       .61 (ii)    3.32 (ii)
     Unit Hyd. Tpeak (min)=      1.00         3.00
     Unit Hyd. peak  (cms)=      1.37          .35
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .06          .00          .066 (iii)
     TIME TO PEAK    (hrs)=      1.32         1.35         1.333
     RUNOFF VOLUME    (mm)=     66.72        17.74        56.928
     TOTAL RAINFALL   (mm)=     67.72        67.72        67.724
     RUNOFF COEFFICIENT   =       .99          .26          .841

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0004----------------------------------------------------------------------
**#***********************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
```

```
*#
**#*************************************************************************|
*# CATCHMENT 201 - Proposed Condition Controlled
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .20
| 02:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .19          .01
     Dep. Storage     (mm)=       1.00          .52
     Average Slope     (%)=       1.00          .10
     Length            (m)=      10.00          .10
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     141.89       139.65
                 over (min)        1.00         1.00
     Storage Coeff.  (min)=        .56 (ii)     .97 (ii)
     Unit Hyd. Tpeak (min)=       1.00         1.00
     Unit Hyd. peak  (cms)=       1.42         1.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .079 (iii)
     TIME TO PEAK    (hrs)=       1.30         1.33         1.333
     RUNOFF VOLUME    (mm)=      66.72        62.39        66.464
     TOTAL RAINFALL   (mm)=      67.72        67.72        67.724
     RUNOFF COEFFICIENT   =        .99          .92          .981

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  98.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
100:0005---------------------------------------------------------------------
**#*************************************************************************|
*# ROUTE CATCHMENT 201 THROUGH ORIFICE PIPE SYSTEM
*
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(201   )   |
| OUT<03:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .068  .5800E-02
                           .049  .3000E-02   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (201   )        .20      .079     1.333     66.464
     OUTFLOW<03: (201   )        .20      .051     1.350     66.464
    OVERFLOW<04: (OVF   )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   64.189
                  TIME SHIFT OF PEAK FLOW         (min)=     1.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3347E-02

-------------------------------------------------------------------------------
100:0006---------------------------------------------------------------------
* RUN REMAINING DESIGN STORMS (CITY OF BURLINGTON 5 TO 100-YR)
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
      FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2020-01-21     at 13:11:47
===============================================================================
```

Hydroworks Sizing Summary

2107 & 2119 Old Lakeshore Road
City of Burlington

01-21-2020

Recommended Size: HG 4

A Hydroguard HG 4 is recommended to provide 80 % annual TSS removal based on a drainage area of .2 (ha) with an imperviousness of 94 % and Hamilton RBG, Ontario rainfall for the ETV Canada particle size distribution.

The recommended Hydroguard HG 4 treats 93 % of the annual runoff and provides 84 % annual TSS removal for the Hamilton RBG rainfall records and ETV Canada particle size distribution.

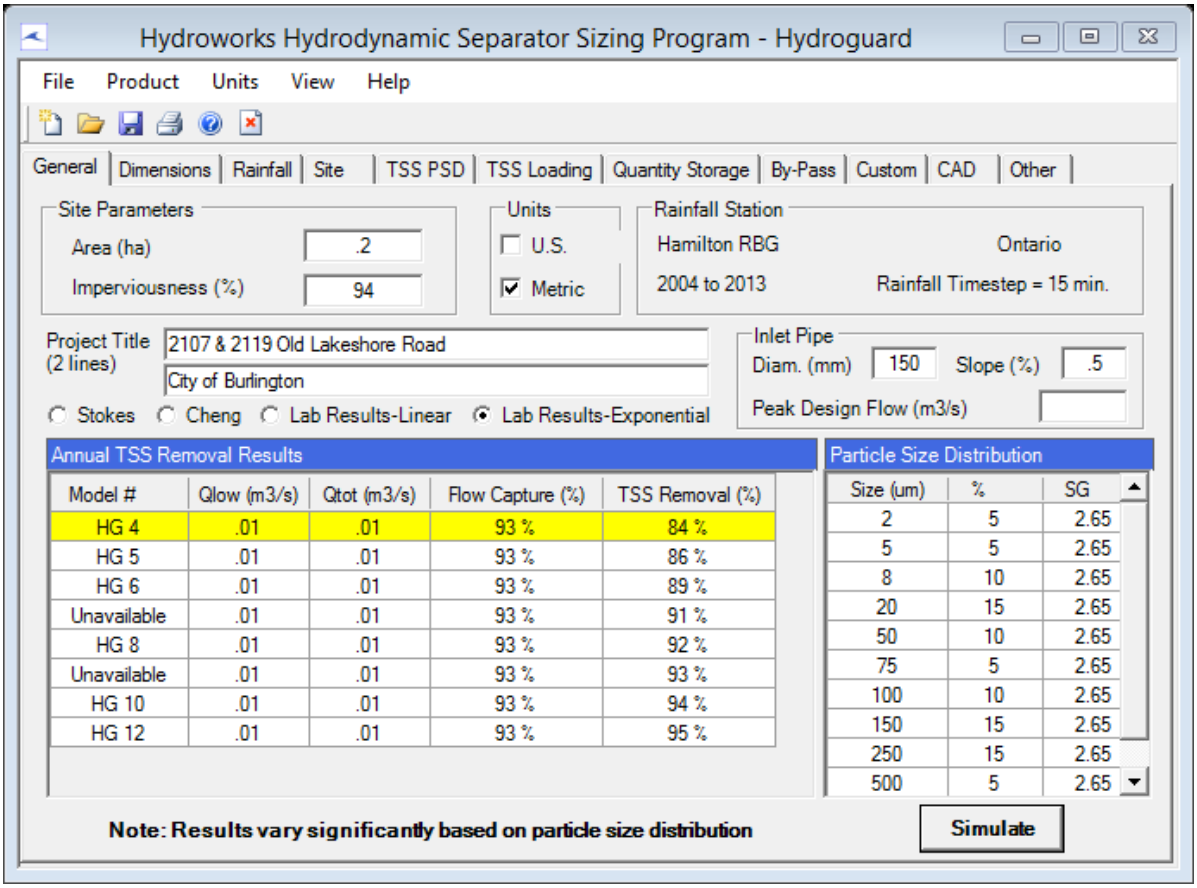
The Hydroguard has a headloss coefficient (K) of 1.6. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .01 (m3/s) for the given 150 (mm) pipe diameter at .5% slope. The headloss was calculated to be 30 (mm) based on a flow depth of 150 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

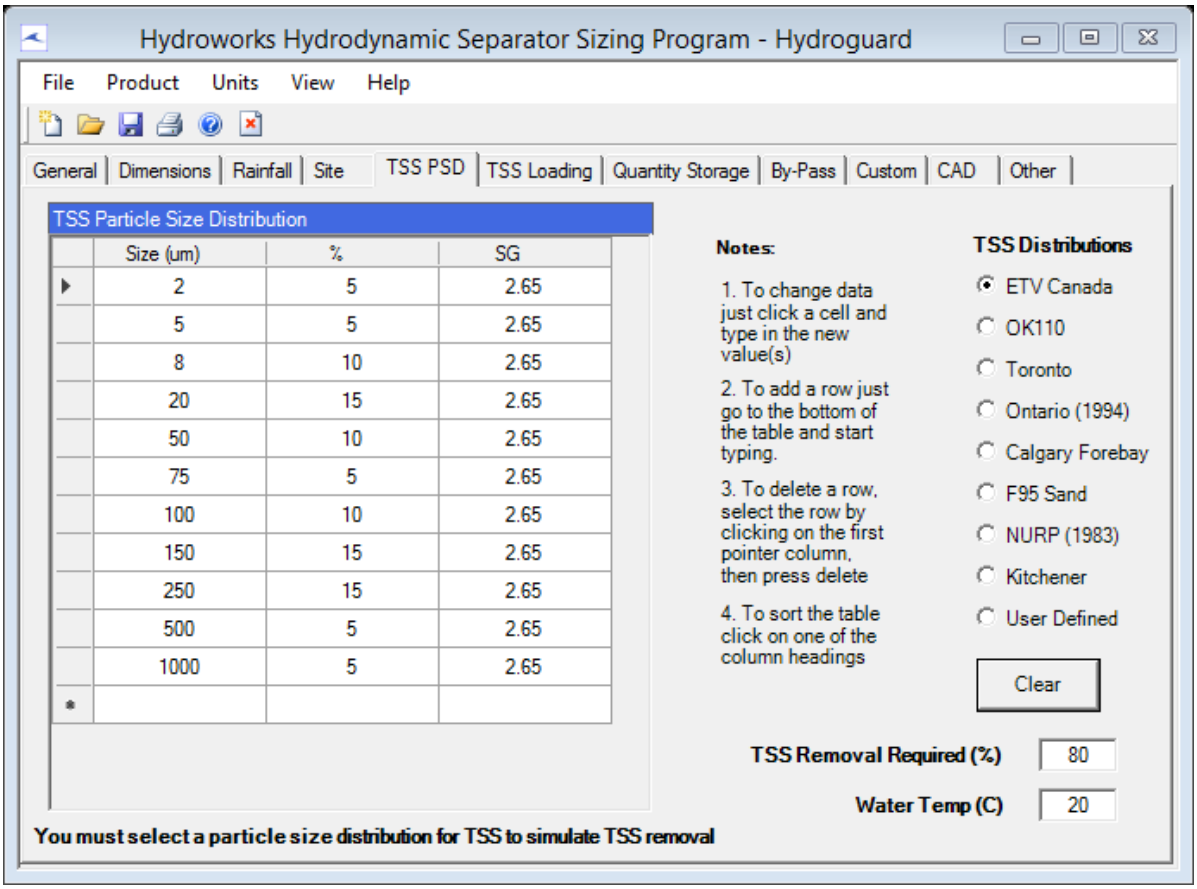
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the Hydroguard . Design liability is only valid for lawsuits brought within the United States where Hydroworks has its corporate headquarters.

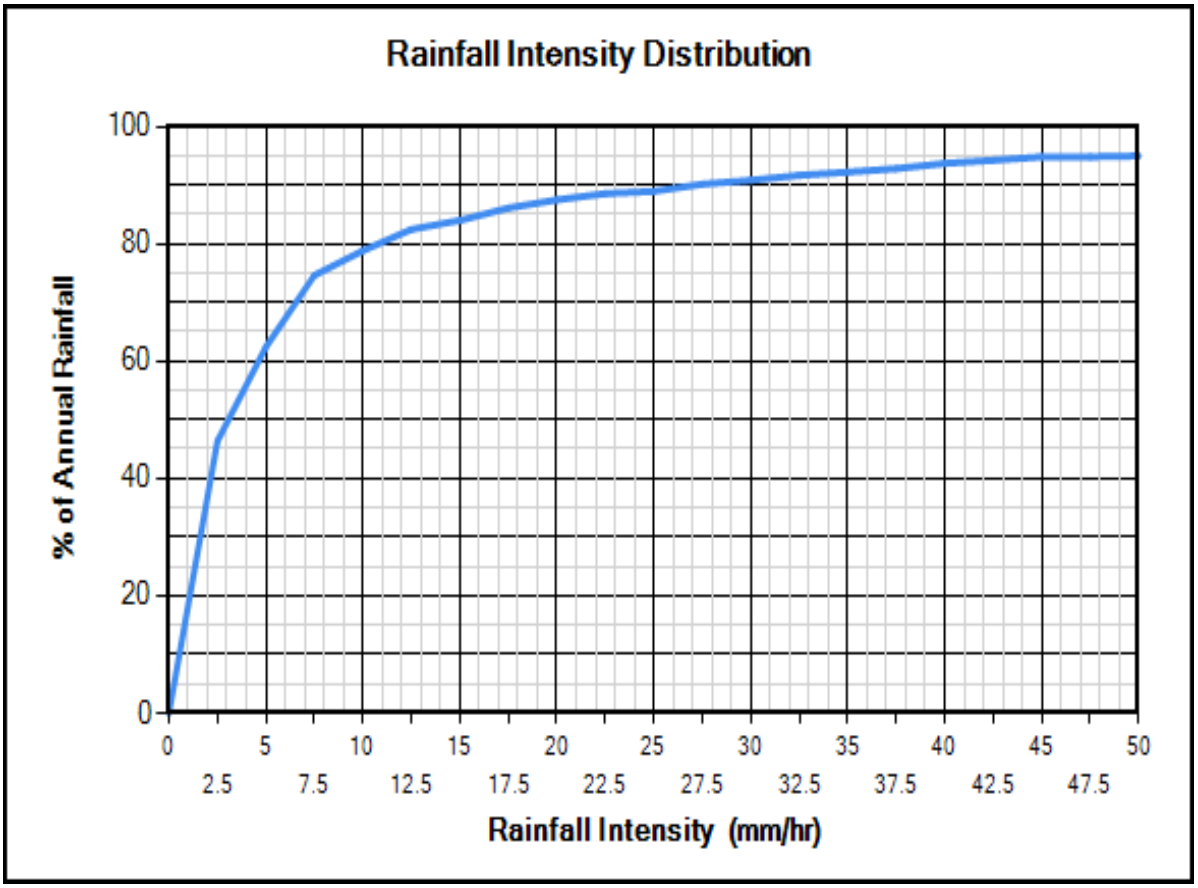
TSS Removal Sizing Summary



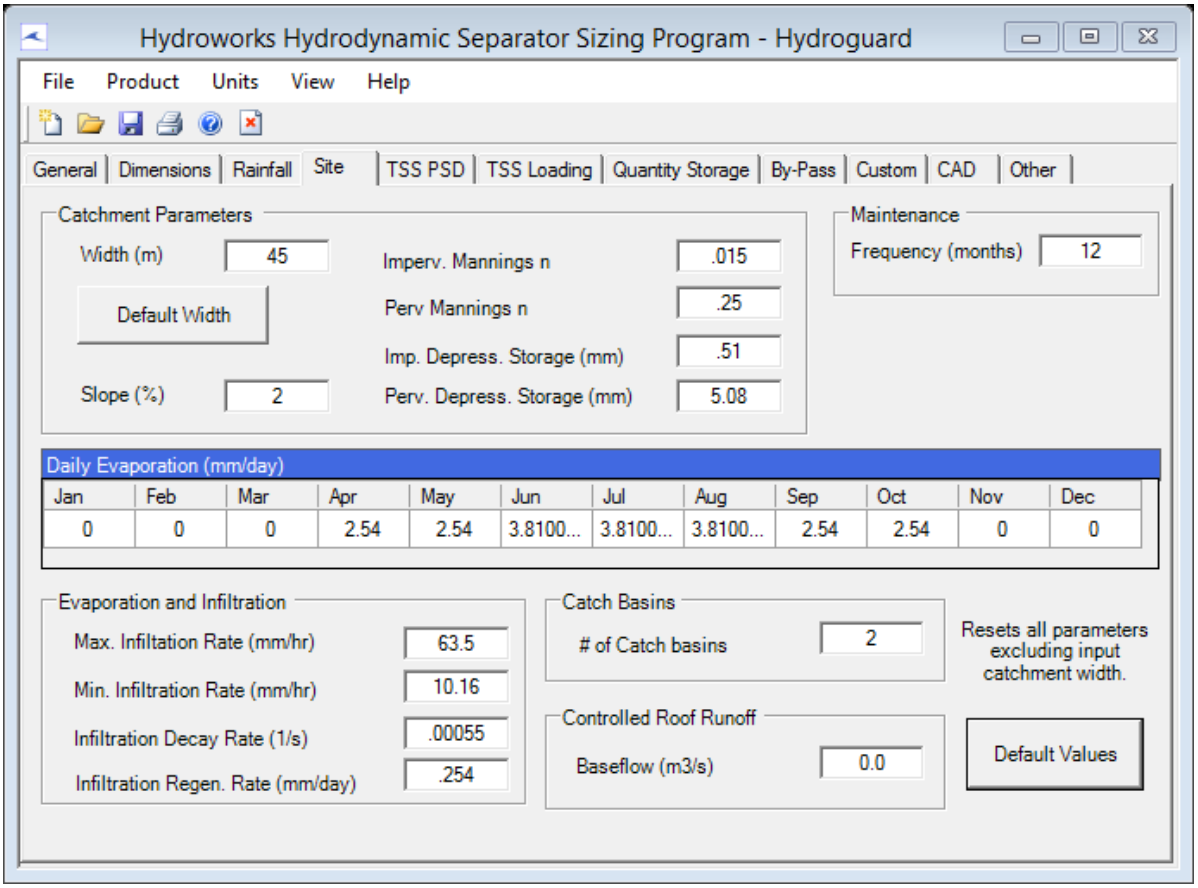
TSS Particle Size Distribution



Rainfall Station - Hamilton RBG, Ontario(2004 to 2013)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - Hydroguard

File Product Units View Help

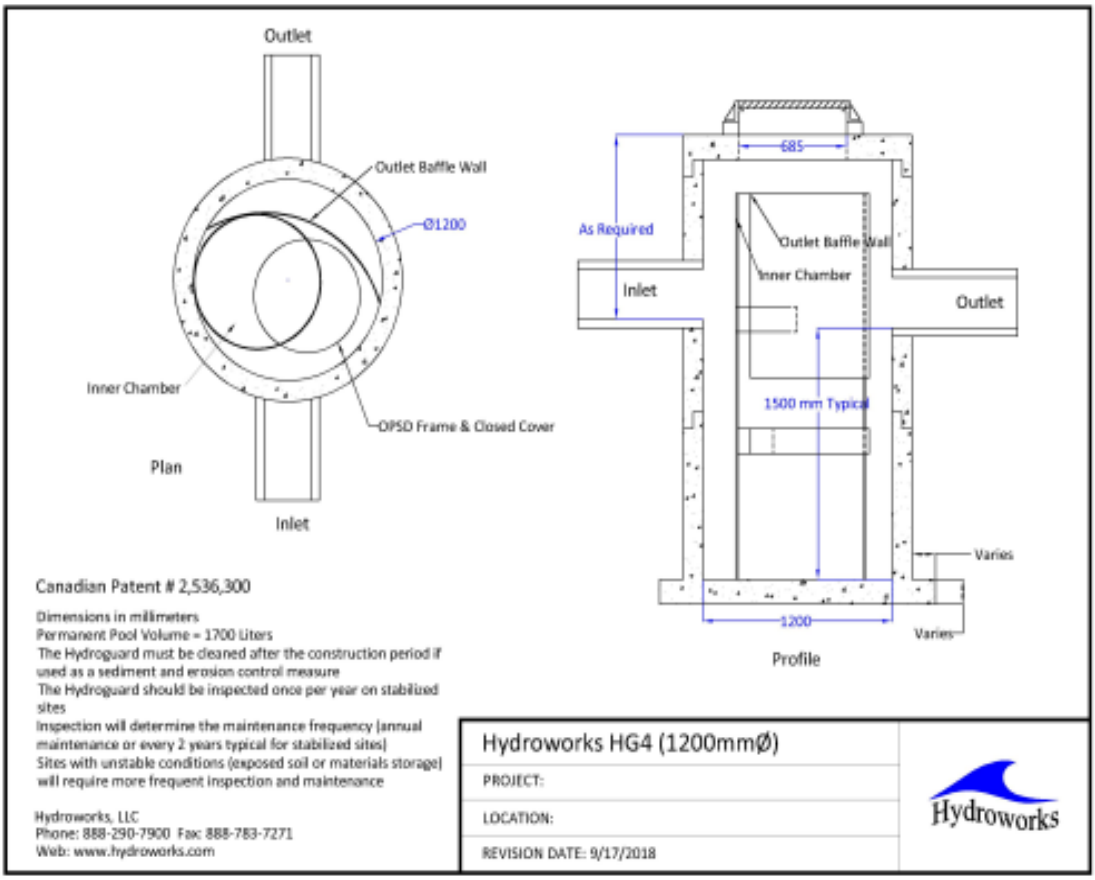
General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Other

Dimensions and Capacities

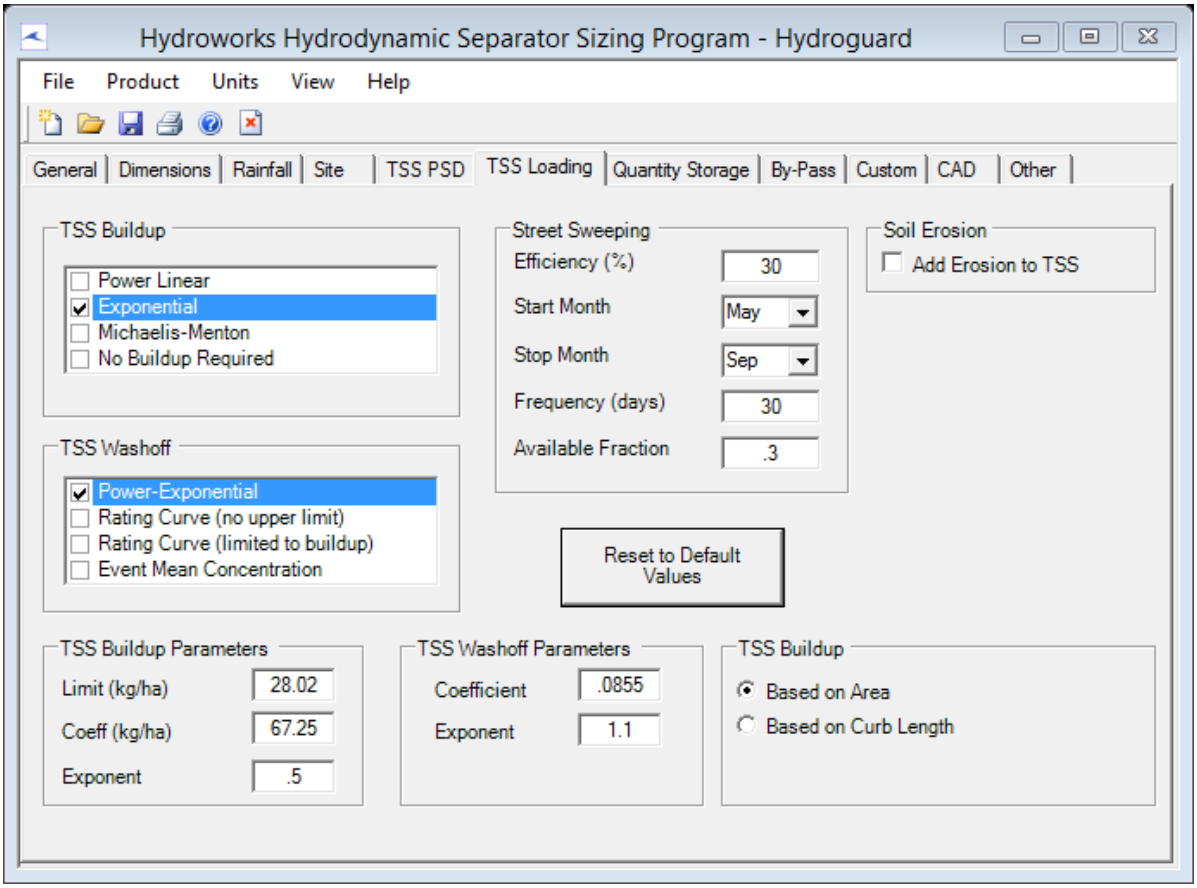
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HG 4	1.22	1.52	278	1.3	1.8
HG 5	1.52	1.68	507	2.2	3.1
HG 6	1.83	1.83	832	3.4	4.8
Unavailable	2.13	1.98	1274	5	7.1
HG 8	2.44	2.13	1850	7	9.9
Unavailable	2.74	2.44	2692	10.2	14.4
HG 10	3.05	2.74	3614	14.4	20
HG 12	3.66	3.35	6663	25.3	35.2

Depth = Depth from outlet invert to inside bottom of tank

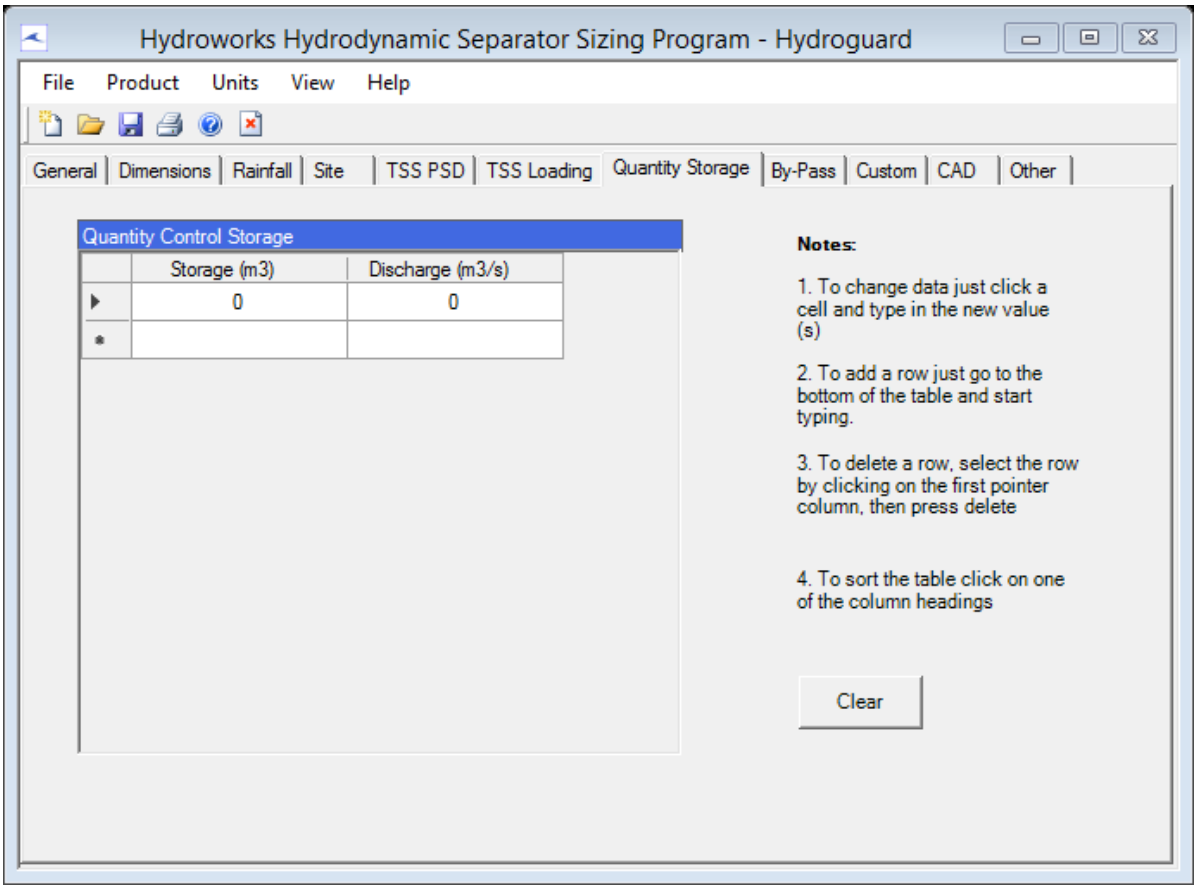
Generic HG 4 CAD Drawing



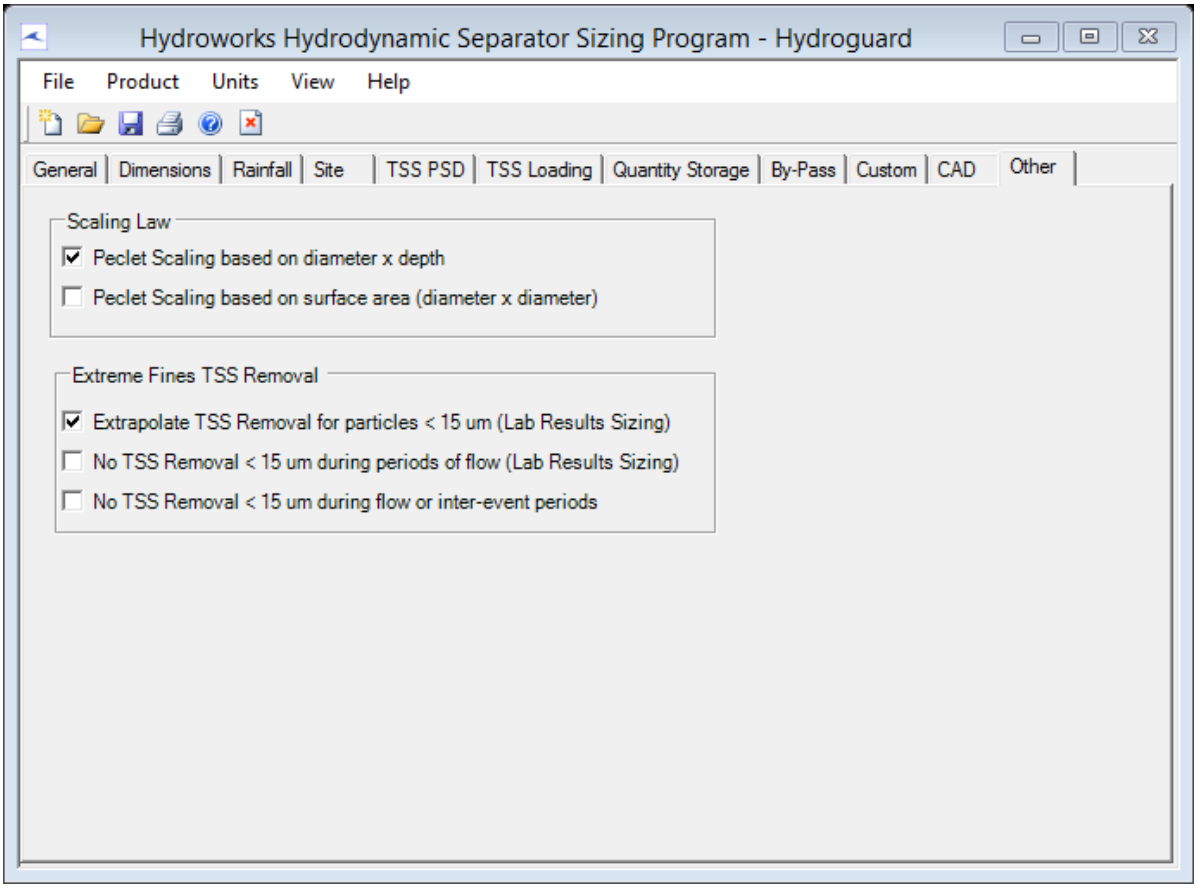
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Hydroworks Sizing Program - Version 4.9
Copyright Hydroworks, LLC, 2019



Hydroworks® Hydroguard

Maintenance Manual

Version 1.3

Introduction

The Hydroguard is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The Hydroguard is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their Hydroguard.

Hydroworks® HG Operation

The Hydroworks HG separator is unique since it treats both high and low flows in one device, but maintains separate flow paths for low and high flows. Accordingly, high flows do not scour out the fines that are settled in the low flow path since they are treated in a separate area of the device as shown in Figure 1.

The HG separator consists of three chambers:

1. an inner chamber that treats low or normal flows
2. a middle chamber that treats high flows
3. an outlet chamber where water is discharged to the downstream storm system

Under normal or low flows, water enters the middle chamber and is conveyed into the inner chamber by momentum. Since the inner chamber is offset to one side of the structure the water strikes the wall of the inner chamber at a tangent creating a vortex within the inner chamber. The vortex motion forces solids and floatables to the middle of the inner chamber. The water spirals down the inner chamber to the outlet of the inner chamber which is located below the inlet of the inner chamber and adjacent to the wall of the structure but above the floor of the structure. Floatables are trapped since the outlet of the inner chamber is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while the outlet of the inner chamber draws water from the wall of the inner chamber.

The water leaving the inner chamber continues into the middle chamber, again at a tangent to the wall of the structure. The water is then conveyed through an outlet baffle wall (high and low baffle). This enhances the collection of any floatables or solids not removed by the inner chamber. Water flowing through the baffles then enters the outlet chamber and is discharged into the downstream storm drain.

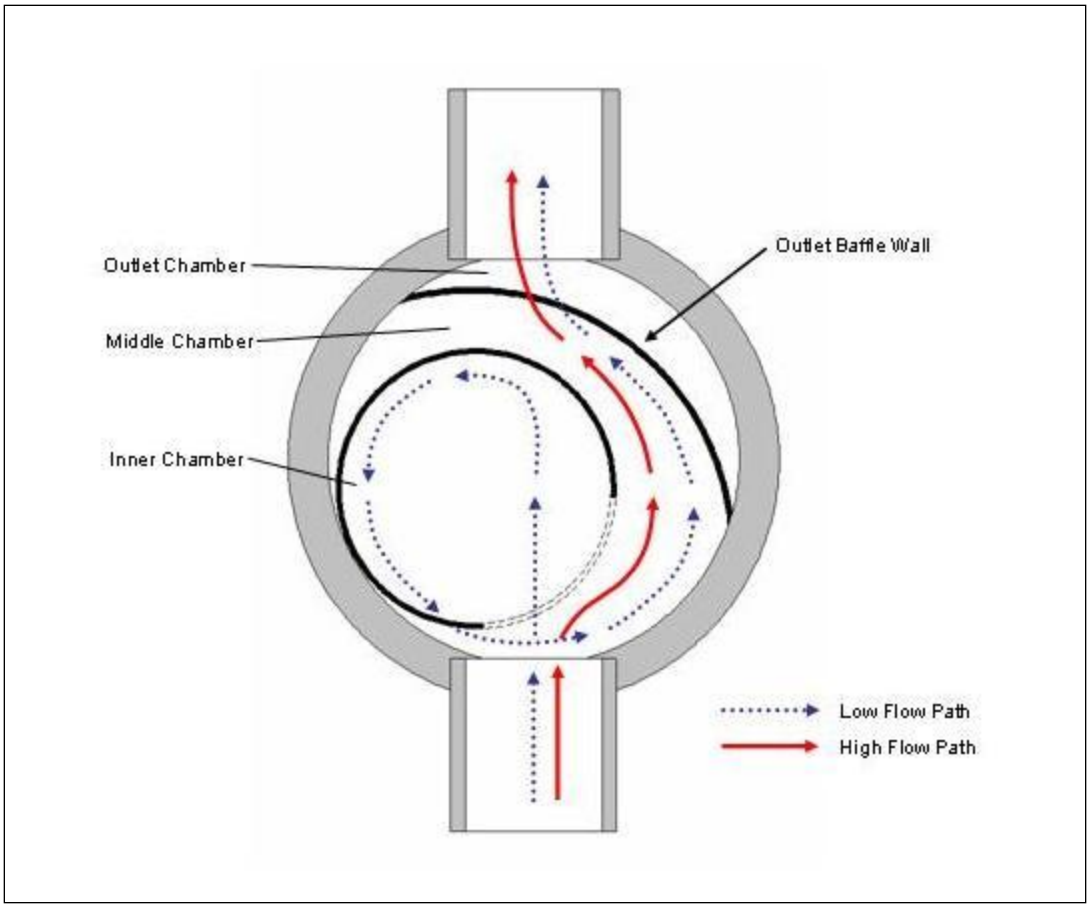


Figure 1. Hydroworks HG Operation – Plan View

During high flows, the flow rate entering the inner chamber is restricted by the size of the inlet opening to the inner chamber. This restriction of flow rate into the inner chamber prevents scour and re-suspension of solids from the inner chamber during periods of high flow. This is important since fines, which are typically considered highly polluted, are conveyed during low/normal flows.

The excess flow is conveyed directly into the middle chamber where it receives treatment for floatables and solids via the baffle system. This treatment of the higher flow rates is important since trash and heavier solids are typically conveyed during periods of higher flow rates. The Hydroworks HG separator is revolutionary since it incorporates low and high flow treatment in one device while maintaining separate low and high flow paths to prevent the scour and re-suspension of fines.

Figure 2 is a profile view of the HG separator showing the flow patterns for low and high flows.

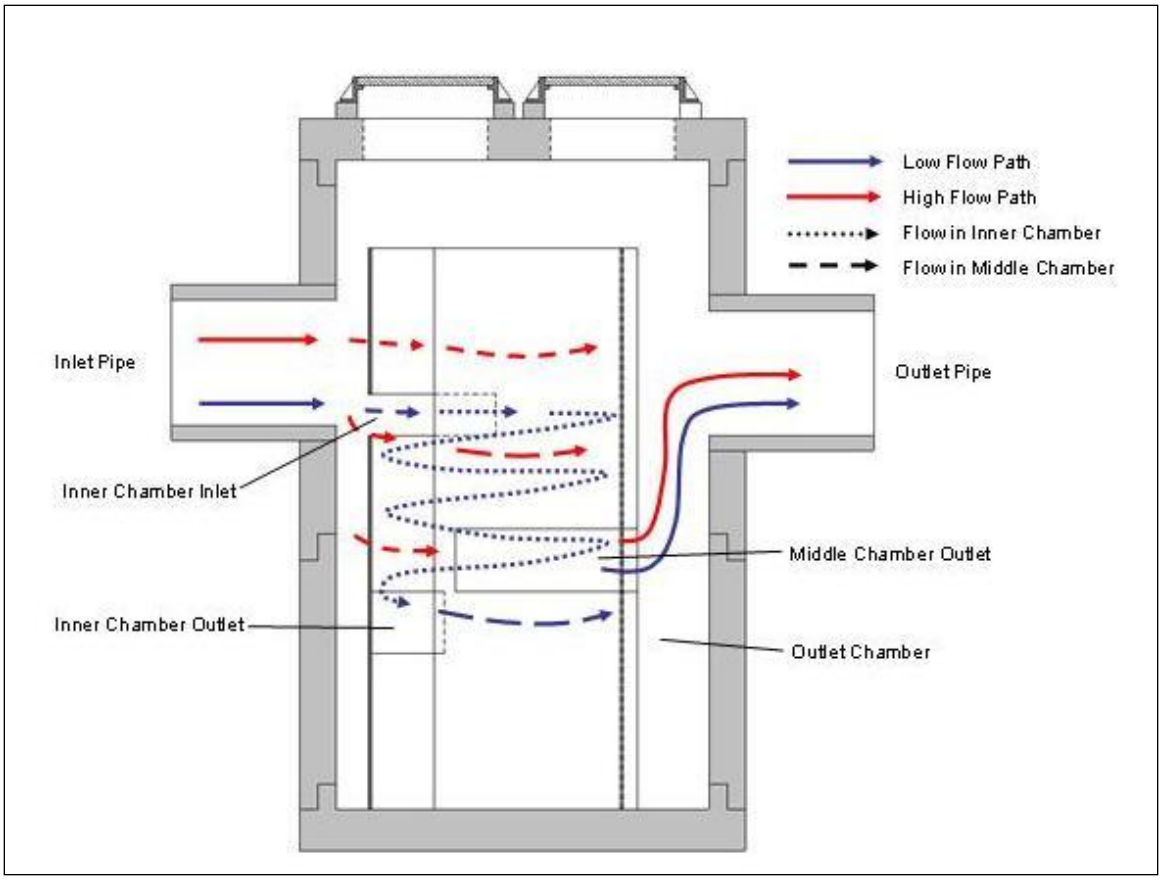
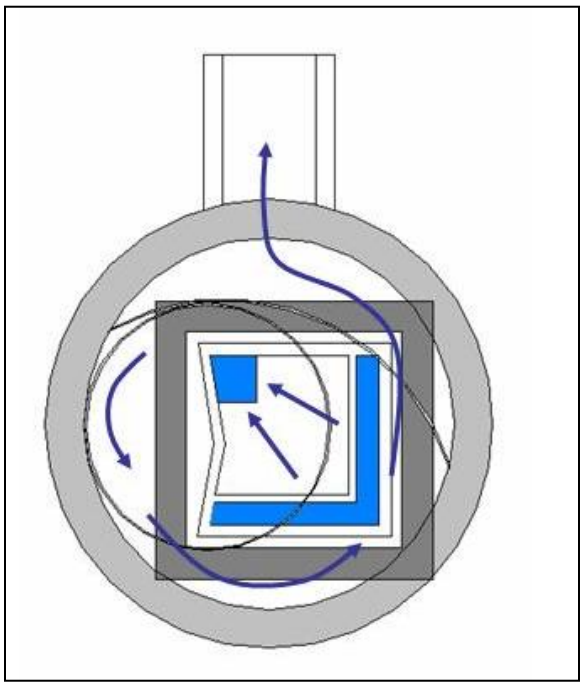


Figure 2. Hydroworks HG Operation – Profile View

The HG 4i is an inlet version of the HG 4 separator. There is a catch-basin grate on top of the HG 4i. Water flows directly into the inner chamber of the HG 4i through the catch-basin grate on top of the structure. The grate is oversized to allow maintenance of the entire structure. A funnel that sits underneath the grate on the top cap of the concrete itself directs the water into the inner chamber during normal flows and the middle chamber during high flows. Figures 3 and 4 show the flow paths for the HG 4i separator.

The inlet funnel is sloped towards the corner inlet and hence the wall of the inner chamber. Water moves in a circular direction in the inner chamber since water enters tangentially along the wall of the inner chamber due to the sloping funnel.

Water continues moving in a circular motion (vortex) through the rest of the structure (through the middle chamber and baffle wall) until it is discharged from the separator.



During periods of peak flow the water will back up from the corner inlet and overflow into two side overflow troughs which discharge directly into the middle chamber. These overflow troughs are covered from the surface such that water cannot directly fall through them (i.e. water must back up to enter the overflow troughs).

Accordingly this funnel provides the same separate flow paths for low and high flow as the other Hydroguard separators.

The whole funnel is removed for inspection and cleaning providing.

Figure 3. Hydroworks Hydroguard HG 4i Normal Flow Path

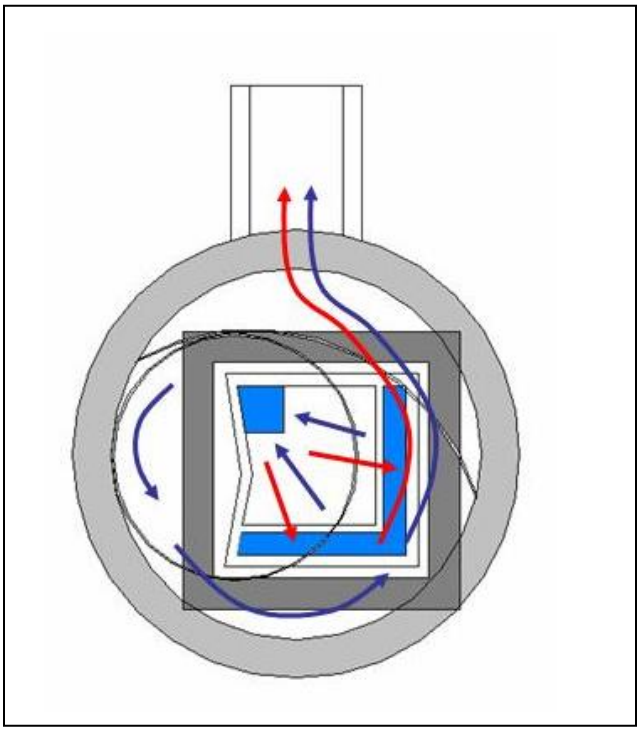


Figure 4. Hydroworks Hydroguard HG 4i Peak Flow Path

Inspection

Procedure

Although all parts of the Hydroguard should be inspected, inspection and maintenance should focus on the inner and middle chambers since this is where the pollutants (floatable and sinking) will accumulate.

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the separator. Multiple covers are provided on Hydroworks HG units to access all areas of the separator (The HG 4 may have a single larger 32” (800mm) cover due to the lack of space for multiple 24” (600mm) covers).

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HG separator should be inspected every two weeks and after every large storm (over 0.5” (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HG separator should be inspected once per year for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HG separator should be inspected more frequently (4 times per year). An initial annual inspection will indicate the required future frequency of maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HG unit is typically maintained using a vactor truck or clam shell bucket. There are numerous companies that can maintain the HG separator. Envirocalm, LLC, an affiliate company of Hydroworks offers inspection and maintenance services and can inspect and maintain the HG separator. (www.envirocalm.com).

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HG unit will typically take 1 to 2 hours.

Frequency

Construction Period

A HG separator can fill with construction sediment quickly during the construction period. The construction sediment will have a much coarser particle size distribution than the suspended solids during the post-development period. Accordingly, scour is not so much of a concern during the construction period compared to the separator filling up with solids. The Hydroguard must be maintained during the construction period when the depth of TSS/sediment reaches 27” (675 mm). This represents 75% of the maximum sediment storage capacity. It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall.

The HG separator should be maintained at the end of the construction period, prior to utilization for the post-construction period.

Post-Construction Period

The Hydroguard was independently tested by Alden Research Laboratory in 2008. A HG6 was tested for scour with initial sediment loads of 4.6 ft^3 and 9.3 ft^3. The results from these tests were almost identical. Therefore, the 9.3 ft^3 sediment load was used as 50% of the maximum sediment depth for maintenance in the calculation of the maintenance interval for the HG6 separator based on the NJDEP maintenance interval equation.

Maintenance Interval (months) = 3.565 x (Sediment Storage) / (MTFR x TSS Removal)

Maintenance Interval (HG6) = 3.565 x 9.3 / (1.67x 0.55) = 36 months

All values (flow, sediment storage) can be scaled by the surface area making the sediment depths and maintenance intervals equal for all separators.

The separator was loaded with the sediment in the inner chamber and middle chamber with the majority of sediment (80%) located in the inner chamber. The inner chamber for area represents approximately 44% of the separator surface area. The inner chamber is 4 ft (1200 mm) in diameter in the HG6. Therefore the 50% sediment depth for the HG6 in the inner chamber would be:

9.3 ft^3 x 0.80 / (3.14 x 4 ft^2) x 12 in/ft = 7.1 inches (175 mm)

Accordingly the 100% sediment volume would represent 14.2” (350 mm) of sediment depth in the inner chamber.

The HG separator must be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall. It should also be maintained once the accumulated TSS/sediment depths are greater than 14” (350 mm) in the inner chamber. For typical stabilized post-construction sites (parking lots, streets) it is anticipated that maintenance will be required annually or once every two years. More frequent or less frequent maintenance will be required depending on individual site conditions (traffic use, stabilization, storage piles, etc.). The long term maintenance frequency can be established based on the maintenance requirements during the first several years of operation if site conditions do not change.

HYDROGUARD INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

Hydroguard	**Yes**	**No**
Incorrect access orientation	☐ ***	☐
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____"

Routine Measurements

Floating debris depth	**< 0.5" (13mm)**	☐	**>0.5" 13mm)**	☐*
Floating debris coverage	**< 25% of surface area**	☐	**> 25% surface area**	☐ *
Sludge depth	**< 14" (350mm)**	☐	**> 14" (350mm)**	☐ *****

Other Comments: _____
_____
_____

* Maintenance required
** Repairs required
*** Further investigation is required

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

APPENDIX B
WATER ANALYSIS INFORMATION

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Project Number: **18048**
Project Name: **2107 & 2119 Old Lakeshore Road**
Date: **January 2020**

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 1999).

An estimate of the fire flow required is given by the following formula:

$$F = 220\,C\sqrt{A} \qquad \textbf{(1)}$$

where:

F the required fire flow in litres per minute
C coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A Total floor area in square metres

				(1)		(2)			(3)		(4)		Final Adjusted Fire Flow	
Building / Location	# of Storeys	**Total GFA (m^2)**	Type of Construction	***Fire Flow "F"***		***Occupancy***			***Sprinkler***		***Exposure***			
				(l/min)	(l/s)	%	Adjustment (l/min)	**Adjusted Fire Flow (l/min)**	%	Adjustment (l/min)	%	Adjustment (l/min)	**(l/min)**	**(l/s)**
Condominium	**27**	**4717**	**0.6**	9000	150.0	**-25**	-2250.0	**6750.0**	**-50**	-3375.0	70	4725.0	**8000**	**133**

(2) Occupancy	
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No Charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

Minimum credit for systems designed to NFPA 13 is 30%.

If the domestic and fire services are supplied by the same municipal water system, then take an additional 10%.

If the sprinkler system is fully supervised (ie. annunciator panel that alerts the Fire Dept., such as a school), then an additional 10% can be taken. Maximum credit = 50%.

(4) Exposure		
0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
30.1 to 45m	5%	exceed 75%

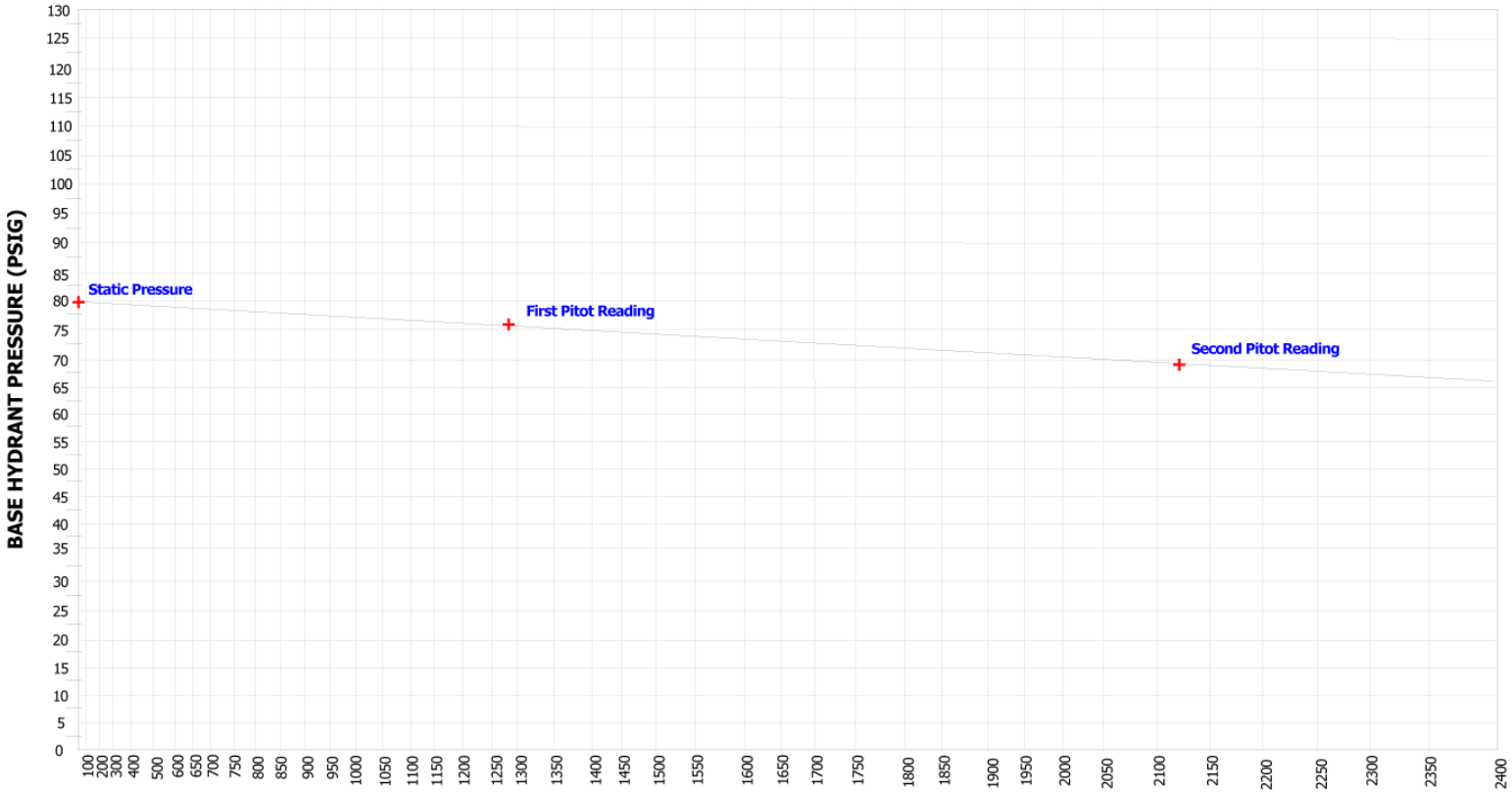
Side	Exposure (m)	Charge (%)
North =	**40**	**5**
South =	**28**	**10**
East =	**>45**	**0**
West =	**16**	**15**
Total Expoure =		***30***

JACKSON WATERWORKS

Telephone: (905) 547-6770
Toll Free: (800)-734-5732
E-mail: jww@bellnet.ca
Website: www.jacksonwaterworks.ca

FIRE HYDRANT FLOW TEST RESULTS

TEST #1 of 1



No. of Ports Open	Port Dia. (in)	Pitot Reading (psig)	Pitot Conversion (usgpm) Conversion Factor = 0	Residual Pressure (psig)
1	2.50	58	1278	76
2	2.50	40/40	2122	69
THEORETICAL FLOW @ 20psi			**5515**	

Test Date	11 October 2018
Test Time	2:45pm
Pipe Diameter (in)	12
Static Pressure (psig)	80

Site Information

Site Name or Developer Name	Old Lakeshor Burlington Inc.	Engineer/Architect: S. Llewellyn & Associates
Site Address/Municipality	Old Lakeshore Road @ Lakeshore Road, Burlington	
Location of Test Hydrant	Lakeshore Road, 1st East of #2119	
Location of Base Hydrant	Lakeshore Road, 1st West of #2119	
Comments	Testing has been completed in accordance with NFPA-291 guidelines wherever and whenever possible and practical. Conversion factors for pitot tube readings have been used depending on hose nozzle internal design and installation profile. Refer to attached cover letter for additional information.	
Verified By	Mark Schmidt	

221 Sherman Avenue North, Hamilton, Ontario L8L 6N2

APPENDIX C
PRELIMINARY ENGINEERING PLANS

DWG No.: 18048 – C100
PRELIMINARY GRADING PLAN
S:\18048\WORKING\Current\18048-Grading and Servicing.dwg

GENERAL NOTES:

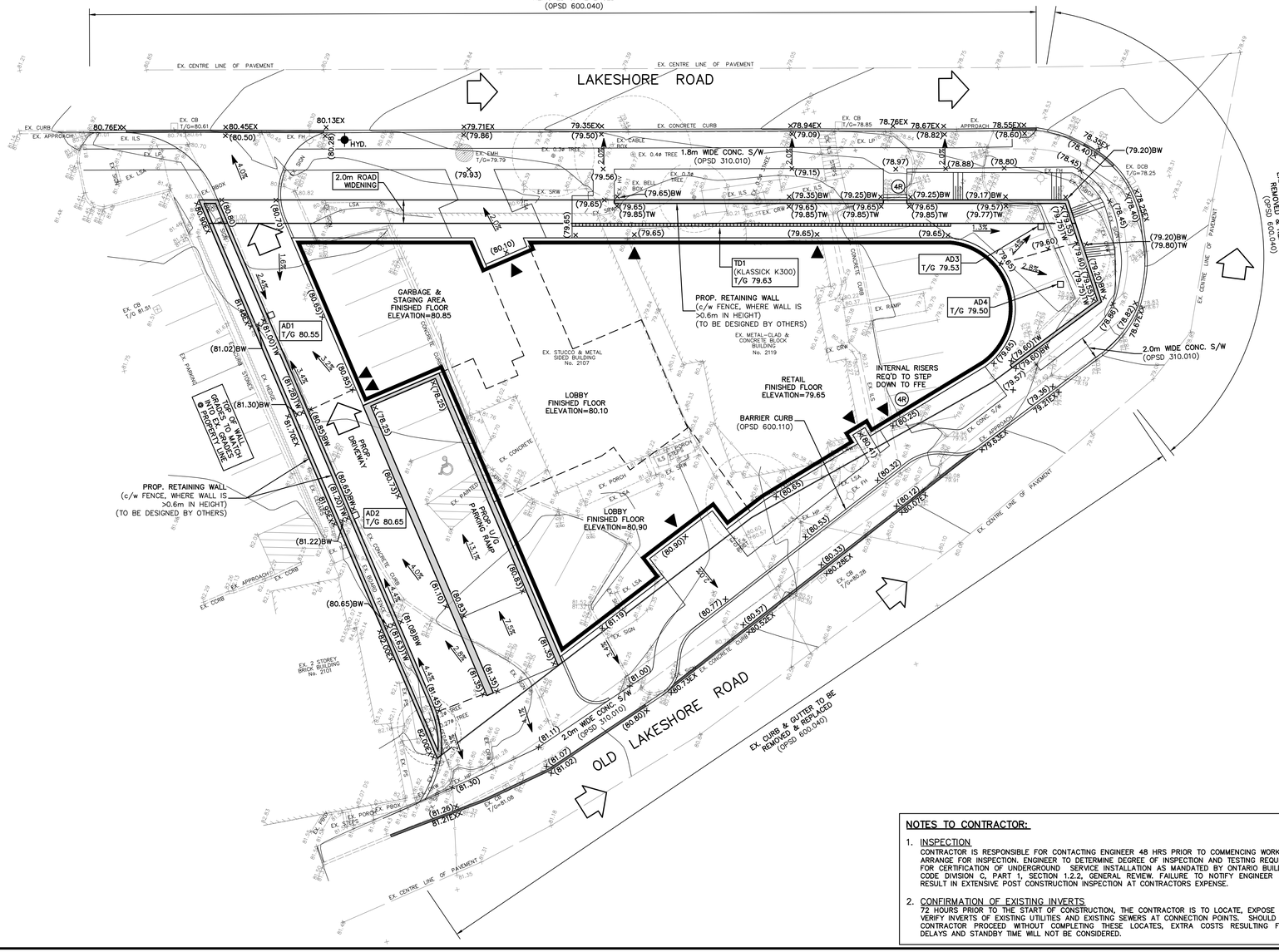
1. CONSTRUCTION OF SEWERS, AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT STANDARD DRAWINGS OF THE CITY OF BURLINGTON, THE REGIONAL MUNICIPALITY OF HALTON AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). THE TOWN AND THE REGION'S DRAWINGS SHALL TAKE PRECEDENCE OVER THE OPSD DRAWINGS.
2. ONTARIO PROVINCIAL STANDARD DRAWINGS TO BE READ IN CONJUNCTION WITH THE REGION OF HALTON REVISIONS.
3. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL OBTAIN ALL PERMITS FOR CONSTRUCTION.
5. FOR ALL SEWERS AND WATERMAIN IN FILL SECTIONS, THE COMPACTION SHALL BE VERIFIED PRIOR TO LAYING OF PIPE.
6. NO SUBSTITUTIONS WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE REGIONAL ENGINEER, CITY OF BURLINGTON OR THE ENGINEER.
7. ALL EXCAVATIONS TO BE BACKFILLED WITH SELECT NATIVE MATERIAL, APPROVED BY THE ENGINEER, TO 95% SPD.
8. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING SILT CONTROL DEVICES AS SHOWN ON THE DRAWINGS AND AS DIRECTED BY THE ENGINEER.
9. TREE PROTECTION PROCEDURES TO BE IMPLEMENTED IN ACCORDANCE WITH CITY OF BURLINGTON STANDARDS.
10. THESE PLANS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SEALED BY THE ENGINEER AND INDICATED ISSUED FOR CONSTRUCTION ON THE DRAWING.
11. THIS/THESE PLAN(S) IS/ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF S. LLEWELLYN AND ASSOCIATES LIMITED.
12. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THE APPROVED SET OF CONSTRUCTION DRAWINGS ARE FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER AND HIS AGENTS DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND /OR SUFFICIENCY. THE CONTRACTOR SHALL ASSUME LIABILITY FOR ANY DAMAGE TO EXISTING WORKS.
13. EXISTING TOPOGRAPHIC AND LEGAL INFORMATION TAKEN FROM PLANS PREPARED BY A.T. MCLAREN LIMITED, NOVEMBER 17, 2016.
14. SITE PLAN INFORMATION TAKEN FROM PLANS PREPARED BY GRAZIANI & CORAZZA ARCHITECTS.
15. THIS/THESE PLAN(S) TO BE READ IN CONJUNCTION WITH THE STORMWATER MANAGEMENT (SWM) REPORT PREPARED BY S. LLEWELLYN AND ASSOCIATES LIMITED.
16. THIS PLAN TO BE USED FOR SERVICING AND GRADING ONLY, FOR BUILDING LOCATION REFER TO TO THE SITE PLAN.
17. MUNICIPAL APPROVAL OF THESE DRAWINGS IS FOR MATERIAL AND COMPLIANCE WITH CITY OF BURLINGTON AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION OF THE WORKS BY THE CITY OF BURLINGTON STAFF DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS NOR RELIEVE THE CONTRACTOR OF CERTIFICATION OF ALL WORKS BY THE OWNER'S ENGINEER.
18. ALTERNATE MATERIALS MAY BE ACCEPTABLE PROVIDED WRITTEN APPROVAL HAS FIRST BEEN OBTAINED FROM THE CITY OF BURLINGTON AND THE THE ENGINEER.
19. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
    - ROAD CUT PERMITS
    - SEWER PERMITS
    - APPROACH APPROVAL PERMITS
    - RELOCATION OF SERVICES
    - COMMITTEE OF ADJUSTMENT
    - ENCROACHMENT AGREEMENTS
22. PRIOR TO CONSTRUCTION THE CONTRACTOR MUST:
    i. CHECK AND VERIFY ALL DIMENSIONS AND EXISTING ELEVATIONS WHICH INCLUDE BUT ARE NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS, EXISTING INVERTS AND REPORT FINDING IN WRITING TO THE ENGINEER.
    ii. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
    iii. VERIFY ALL FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS WHICH MY APPEAR ON THESE PLANS COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
    iv. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.
    v. NOTIFY THE ENGINEER OF THE PROPOSED CONSTRUCTION SCHEDULE FOR COORDINATION OF NECESSARY INSPECTIONS.
23. **THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE ENGINEER 48 HOURS PRIOR TO THE COMMENCING SITE WORKS TO ARRANGE FOR INSPECTION. THE ENGINEER SHALL DETERMINE THE EXTENT OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF THE UNDERGROUND SERVICE INSTALLATION AS MANDATED BY THE ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO MAKE SUITABLE ARRANGEMENTS FOR INSPECTION WILL LEAD TO POST CONSTRUCTION TESTING AND INSPECTION AS DETERMINED BY THE ENGINEER, THE COSTS OF WHICH INCLUDING ANY DELAYS IN CONSTRUCTION SHALL BE BOURNE BY THE CONTRACTOR. FULL PAYMENT FOR UN-INSPECTED WORKS MAY BE WITHHELD UNTIL THE COMPLETION OF THE POST CONSTRUCTION INSPECTION AND TESTING TO THE SATISFACTION OF THE ENGINEER.**
24. INSPECTION BY THE OWNER'S ENGINEER IS FOR CERTIFICATION AND GENERAL CONFORMANCE PURPOSES AND DOES NOT CERTIFY LINE AND GRADE OR IMPLY AN ASSURANCE OF QUALITY CONTROL. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THE INSTALLATION OF THE WORKS TO PROPER LINE, GRADE AND QUALITY TO CURRENT INDUSTRY STANDARDS.
25. ANY UTILITY RELOCATIONS AND RESTORATIONS DUE TO THE DEVELOPMENT TO BE UNDERTAKEN AT THE EXPENSE OF THE OWNER/DEVELOPER AND SHALL BE COORDINATED BY THE CONTRACTOR.
26. ALL RESTORATIONS AND RECONSTRUCTIONS SHALL BE TO COMPLETED TO MATCH EXISTING CONDITIONS OR BETTER AND ARE TO BE PERFORMED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF BURLINGTON.
27. SERVICING CONTRACTOR TO MAINTAIN A "CONFINED TRENCH CONDITION" IN ALL SEWER AND WATERMAIN INSTALLATION TRENCHES.
28. THE SITE SERVICING CONTRACTOR SHALL TERMINATE ALL SERVICES 1.0m FROM THE BUILDING FACE.
29. NO BLASTING WILL BE PERMITTED.

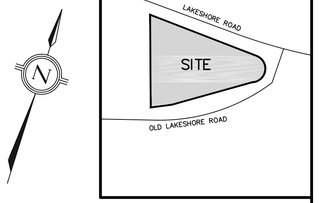
ROADWORKS:

1. APPROVED FILL, FREE OF DELETERIOUS AND ORGANIC MATERIAL AND BOULDERS SHALL BE COMPACTED TO A DRY DENSITY NOT LESS THAN 95% THAN THE STANDARD PROCTOR DENSITY. AFTER COMPACTION, SOIL DENSITY TESTS SHALL BE CONDUCTED TO ENSURE ADEQUATE COMPACTION AND STABILITY OF THE FILL AND TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER.
2. SUBGRADE TO BE PROOF ROLLED PRIOR TO PLACEMENT OF SUB BASE. UNSUITABLE MATERIAL TO BE REMOVED AND REPLACED WITH SELECT FILL OR GRANULAR "B" AND COMPACTED TO 98% SPD.
3. ASPHALTIC CONCRETE TO BE COMPACTED TO 97% MARSHALL DENSITY.
4. PAVEMENT STRUCTURE FOR INTERNAL ROADS SHALL CONSIST OF COMPACTED THICKNESSES OF: XXmm HL3 SURFACE ASPHALT XXmm HL8 BASE BINDER ASPHALT XXXmm GRANULAR "A" BASE COURSE XXXmm GRANULAR "B" SUB-BASE COURSE
5. BOULEVARDS TO BE SODDED WITH #1 NURSERY SOD ON A MINIMUM 150mm OF SELECT TOPSOIL.
6. MANHOLE FRAMES AND COVERS AND WATER VALVE BOXES SHALL BE SET FLUSH WITH BASE COURSE ASPHALT AND ADJUSTED TO FINAL GRADE AFTER INSTALLATION OF SURFACE ASPHALT AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-130.
7. TRAFFIC CONTROL SHALL BE MAINTAINED AT ALL TIMES FOR WORKS ON EXISTING ROADWAYS TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING. THE EXPENSE FOR THE ERECTION OF SIGNS, DELINEATORS AND OTHER TRAFFIC CONTROL DEVICES SHALL BE BORNE BY THE CONTRACTOR.
8. FOR STANDARD PARKING SPACE SIZE REFER TO SITE PLAN COMPLETED BY SAM ESPOSTO ARCHITECT INC.
9. ALL CURBING WITHIN PROPERTY LIMITS IS TO BE BARRIER CURB AS PER OPSD 600.110. CURBING ALONG ENTRANCE IS TO BE BARRIER CURB & GUTTER AS PER OPSD 600.040.

GRADING NOTES

1. ALONG ADJOINING PROPERTIES GRADE TO MEET EXISTING OR PROPOSED ELEVATIONS WITH SODDED SLOPES (MIN. 3H TO 1V) AND/OR RETAINING WALLS AS SPECIFIED.
2. ALL WALLS 1.0m OR HIGHER SHALL BE DESIGNED BY A P.ENG.
3. RETAINING WALLS 0.6m IN HEIGHT OR GREATER REQUIRE CONSTRUCTION OF A FENCE OR GUARD RAIL AT THE TOP OF THE REAR OF THE WALL. GUARDS FOR RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF EXTERIOR GUARDS AS CONTAINED IN THE ONTARIO BUILDING CODE.
4. TOP OF FOUNDATION WALLS FOR BUILDINGS SHALL BE 150mm (MIN) ABOVE FINISHED GRADE.
5. DRIVEWAY SLOPES SHALL NOT BE LESS THAN 2% AND NOT MORE THAN 7.0% REVERSED SLOPED DRIVEWAYS IN NEW DEVELOPMENTS ARE NOT PERMITTED. 7. IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER TO ALLOW THE DEVELOPER TO GRADE ON THE ADJACENT LANDS, OTHERWISE RETAINING WALLS MUST BE USED.
8. THE WRITTEN PERMISSION REQUIRED FROM THE ADJACENT LANDOWNER SHALL BE OBTAINED PRIOR TO ENTERING THE LANDS. SHOULD PERMISSION NOT BE OBTAINED OR IS WITHDRAWN PRIOR TO COMMENCING THE WORK, THEN THE DEVELOPER SHALL LIMIT HIS ACTIVITIES TO THE LIMITS OF THE DEVELOPMENT SITE.
9. DRIVEWAY AND DRIVEWAY APPROACHES SHALL BE LOCATED SUCH THAT HYDRO VAULTS AND OTHER STREET FURNITURE ARE A MIN. OF 1.2m FROM THE DRIVEWAY ENTRANCE CURB RADII.
10. ANY CHANGES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE CITY'S MANAGER OF DEVELOPMENT ENGINEERING.
11. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.





KEY MAP
N.T.S.

LEGEND:

×79.00	EXISTING GROUND ELEVATION
× (79.00)	PROPOSED GROUND ELEVATION
× 79.00EX	PROPOSED ELEVATION TO MATCH EXISTING
× (79.00)TW	PROPOSED TOP OF WALL ELEVATION
× (79.00)BW	PROPOSED BOTTOM OF WALL ELEVATION
2.0%	PROPOSED DIRECTION OF SHEET FLOW
	PROPOSED DRAINAGE BREAK LINE
	EXISTING CATCHBASIN
	PROPOSED AREA DRAIN
	PROPOSED MANDOOR
4R	NUMBER OF STEP RISERS REQUIRED
	EXISTING/RELOCATED HYDRANT
(TOP) 3:1 MAX (BOTTOM)	EMBANKMENT (SLOPE AS NOTED)
	OVERLAND FLOW ROUTE

NO.	DATE	BY	REVISIONS
1.	JAN/2020	CD	AS PER CITY COMMENTS

NOTES TO CONTRACTOR:

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3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	CD	CHK'D	SL
DRAWN	CD	CHK'D	SL

DATE: SEP. 16, 2019

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP: LICENSED PROFESSIONAL ENGINEER B.S. LLEWELLYN 90360 PROVINCE OF ONTARIO

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
Fax (905) 631-8927
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENT
OLD LAKESHORE (BURLINGTON) INC.
2069 LAKESHORE ROAD, BURLINGTON, ON L7R 1E2

PROJECT NAME
2107 & 2119 OLD LAKESHORE ROAD
CITY OF BURLINGTON

TITLE
PRELIMINARY GRADING PLAN

PROJECT No. 18048
DRAWING No. C100

NOTES TO CONTRACTOR:

1. INSPECTION
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFIRMATION OF EXISTING INVERTS
   72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

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Plotted: January 22, 2020 10:20:42 AM By: Colin Dougan

DWG No.: 18048 -C101
PRELIMINARY GRADING PLAN
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SANITARY SEWERS:

1. SANITARY SEWERS SHALL BE PVC. PVC PIPE IS TO BE BELL AND SPIGOT AND COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. COVER AND BEDDING MATERIAL FOR PVC PIPE SHALL BE GRANULAR 'A' MATERIAL AS PER OPSD 802.010 OR 802.013.
3. ALL TRENCH EXCAVATIONS ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL PLACED IN MAXIMUM 200mm LIFT THICKNESS WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% SPD, UNLESS OTHERWISE SPECIFIED.
4. SANITARY SEWER MANHOLES FRAME AND COVER AS PER OPSD 401.01.
5. MINIMUM SLOPE OF SANITARY SERVICE TO BE 2.0%.
6. SINGLE SERVICE CONNECTIONS TO BE MINIMUM 200mm DIA PIPE.
7. TAPPING AT EXISTING SANITARY SEWERS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
8. ALL SEWERS TO BE VIDEO INSPECTED.
9. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
10. ALL PVC SEWERS ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. SANITARY SEWERS SHALL ALSO BE TESTED FOR LEAKAGE (LOW AIR PRESSURE). PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

STORM SEWERS:

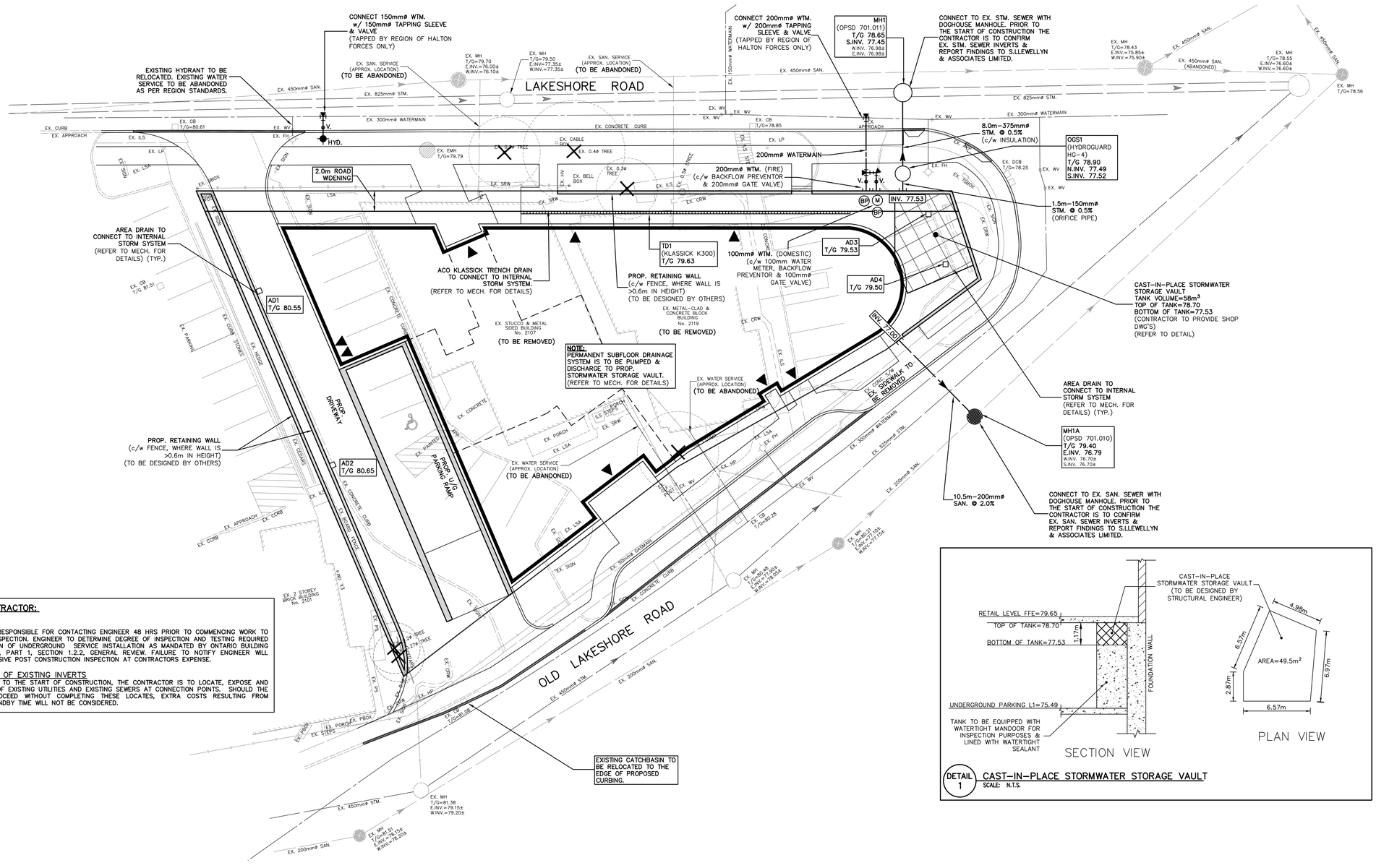
1. 300mm~450mm STORM SEWERS SHALL BE PVC, BELL AND SPIGOT AND SHALL COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SINGLE PVC STORM SEWER MAINS AND ALL RELATED CONNECTIONS SHALL BE HIGH PERFORMANCE CLEAR STONE (HL-8 GRADED) AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-188.
3. STORM SEWER MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010 AND 703.010 UNLESS OTHERWISE SPECIFIED. FRAME AND COVER AS PER OPSD 401.01 TYPE A. FRAMES TO BE STAMPED "DANGER" AND "STORM".
4. MANHOLE TOPS SHALL BE INITIALLY SET TO BASE COURSE ASPHALT ELEVATION AND ADJUSTED TO GRADE PRIOR TO PLACEMENT OF TOP LIFT OF ASPHALT.
5. ALL TRENCH EXCAVATIONS ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL PLACED IN MAXIMUM 200mm LIFT THICKNESS WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% SPD, UNLESS OTHERWISE SPECIFIED.
6. ALL SEWERS TO BE VIDEO INSPECTED.
7. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
8. ALL PVC SEWERS (SANITARY AND STORM) ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

WATERMAINS:

1. FLEXIBLE WATERMAIN PIPE UP TO 300mm DIAMETER TO BE P.V.C. DR-18 AND CONFORM TO A.W.W.A. C-900 WITH MECHANICAL JOINTS AS PER A.W.W.A. C-110, AND TO BE INSTALLED WITH A 10 GAUGE TRACER WIRE.
2. FLEXIBLE PIPE BEDDING TO BE OPSD 802.010 WITH COMPACTED GRANULAR 'A' MATERIAL.
3. ALL TRENCH EXCAVATIONS ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL PLACED IN MAXIMUM 200mm LIFT THICKNESS WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% SPD, UNLESS OTHERWISE SPECIFIED.
4. MINIMUM COVER TO BE 1.7m TO TOP OF PIPE.
5. DEFLECTION AT JOINTS NOT TO EXCEED 2.5 DEGREES AND SHALL BE EQUAL AT ALL JOINTS.
6. GATE VALVES AND BOXES FOR 150mm DIAMETER WATERMAINS AS PER A.W.W.A. STANDARD C-500 AND ARE TO OPEN TO THE LEFT (COUNTER CLOCKWISE).
7. HYDRANTS SHALL MEET THE REQUIREMENTS OF A.W.W.A. STANDARD C-502 AND SHALL BE SET IN ACCORDANCE WITH REGION OF HALTON, AND CITY OF BURLINGTON BUILDING DEPARTMENT STANDARDS, COMPLETE WITH STEAMER CONNECTIONS. THE 100mm STEAMER PORT SHALL FACE THE FIRE ROUTE AND SHALL BE UNOBSTRUCTED BY ANY PROPOSED LANDSCAPING.
8. HYDRANTS ARE TO INSTALLED AS PER OPSD 1105.010.
9. ALL FITTINGS TO HAVE MECHANICAL RESTRAINTS THAT MEET UNI-B-13-92.
10. CORROSION PREVENTION MUST BE PROVIDED AS PER THE FOLLOWING REQUIREMENTS:
    a. ALL WATERMAN, FITTINGS AND APPURTENANCES SHALL BE INSTALLED WITH A MINIMUM OF ONE ANODE PER LENGTH OF PIPE AND ONE ANODE PER ELECTRICALLY ISOLATED APPURTENANCE AND INSTALLED IN ACCORDANCE WITH OPSS 442 AND OPSD 1109.010 & 1109.011. ANODE INSTALLATION IS NOT REQUIRED WITHIN VALVE CHAMBERS, DRAIN CHAMBERS, AIR RELEASE CHAMBERS OR SWAB PORTS.
    b. ALL WELD CONNECTIONS SHALL BE COATED WITH "TC MASTIC" OR APPROVED EQUIVALENT.
    c. THERMITE WELD ALL ANODES TO NEW WATERMAIN FITTINGS AND APPURTENANCES WITH AN ARC STUD WELDING GUN AT APPROVED SETTINGS BASED ON WATERMAIN TYPE AND SIZE OR A CADWELDER AND CA-15 CARTRIDGE (OR EQUIVALENT). ANODE INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
    d. CONNECTING ANODES TO BOLTS IS NOT PERMITTED AS AN ACCEPTABLE METHOD OF INSTALLATION.
    e. ALL SACRIFICAL ANODES INSTALLED ON METALLIC WATERMAIN PIPE SHALL CONSIST OF A PACKAGED MAGNESIUM CASTING WITH A MINIMUM WEIGHT OF 14.5kg AND A LENGTH OF APPROXIMATELY 560mm.
    f. SACRIFICIAL ANODES INSTALLED ON FITTINGS AND APPURTENANCES SHALL BE A MINIMUM WEIGHT OF 11kg ZINC.
11. ALL TEMPORARY AND PERMANENT WATERMAIN PLUGS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH OPSD 1103.01.
12. TAPPING AT EXISTING WATERMAINS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
13. ALL WATER CUSTOMERS SUPPLIED BY A WATERMAIN TO BE SHUT DOWN SHALL BE NOTIFIED BY THE CONTRACTOR AT LEAST 72 HOURS IN ADVANCE OF THE SHUT DOWN AS PER REGION OF HALTON SPECIFICATIONS. NOTIFICATION SHALL TAKE PLACE UNDER THE ENGINEER'S DIRECTION.
14. MINIMUM HORIZONTAL SEPERATION BETWEEN WATERMAINS (INCLUDING PRIVATE SERVICES) AND STORM AND SANITARY SEWERS SHALL BE 2.5m. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 150mm OVER AND 500mm UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
15. WATER SERVICE CONNECTIONS (25mm DIA. TYPE 'K' SOFT COPPER) AS PER OPSD 1104.01 AND OPSD 1104.02.

RESTORATIONS:

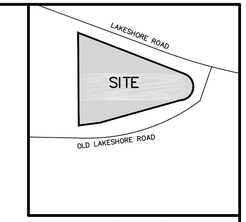
1. ALL TRENCH EXCAVATIONS WITHIN EXISTING ROAD ALLOWANCES SHALL BE AS BACKFILLED AS PER CITY OF BURLINGTON STANDARD DRAWING S-114, S-114A & S-114B.
2. EXISTING PRIVATE FENCING IS TO BE MAINTAINED THROUGHOUT CONSTRUCTION. WHERE REMOVAL OR RELOCATION OF FENCING IS NECESSARY IT SHALL BE RESTORED OR REPLACED TO ORIGINAL CONDITIONS OR BETTER UNDER THE DIRECTION OF THE ENGINEER.
3. DAMAGED CURB, GUTTER AND SIDEWALK TO BE REPLACED AS PER CITY OF BURLINGTON STANDARDS WITH 28 MPa CONCRETE TO EXISTING CONDITIONS OR BETTER.
4. PAVEMENT SURFACE ON KING ROAD TO BE REPAIRED BY CONTRACTOR AT THEIR EXPENSE IF DAMAGED BY CONSTRUCTION TRAFFIC. PAVEMENT RESTORATION ON KING ROAD TO BE AS PER CITY STANDARDS. ASPHALT MIX DESIGNS ARE TO BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO PAVING.



NOTES TO CONTRACTOR:

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2. CONFIRMATION OF EXISTING INVERTS
   72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

DETAIL 1 — CAST-IN-PLACE STORMWATER STORAGE VAULT
SCALE: N.T.S.



KEY MAP
N.T.S.

LEGEND:

- EXISTING CATCHBASIN
- PROPOSED AREA DRAIN
- EXISTING SANITARY/STORM MANHOLE
- PROPOSED SANITARY/STORM MANHOLE
- EX WV. ø V. EXISTING/PROPOSED GATE VALVE
- PROPOSED MANDOOR
- EXISTING/RELOCATED HYDRANT
- EXISTING TREE REMOVAL

NO.	DATE	BY	REVISIONS
1.	JAN/2020	CD	AS PER CITY COMMENTS

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DESIGN	CD	CHK'D	SL	DATE
DRAWN	CD	CHK'D	SL	SEP. 16, 2019

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP: LICENSED PROFESSIONAL ENGINEER B.S. LLEWELLYN 100308 PROVINCE OF ONTARIO

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
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email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENT
OLD LAKESHORE (BURLINGTON) INC.
2069 LAKESHORE ROAD, BURLINGTON, ON L7R 1E2

PROJECT NAME
2107 & 2119 OLD LAKESHORE ROAD
CITY OF BURLINGTON

TITLE
PRELIMINARY SITE SERVICING PLAN

PROJECT No. 18048
DRAWING No. C101

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Plotted: January 22, 2020 10:22:38 AM By: Colin Dougan