March 24, 2020 Reference:18-569

The Corporation of the City of Sarnia
Engineering Department
255 Christina Street N.
Sarnia, ON
N7T 7N2

Attention: Jay Vanvlymen, Development Engineering Technologist

Reference: 1873 London Line, Sarnia; Proposed Subdivision Development Pumping Station 29 Assessment.

Greck and Associates Limited (Greck) has been retained by JR Capital Holdings Inc (JR) to oversee the engineering design for the proposed subdivision at 1873 London Line in Sarnia, Ontario. This letter has been prepared for the City of Sarnia's (City) review and to obtain acceptance of calculated existing and future sanitary flows to Pumping Station 29 (PS29). We are also seeking confirmation from the City that PS54 will be capable of servicing at a minimum the additional proposed development flow and the City's considerations for future development. The City's acceptance of flows will initiate an assessment of options to replace and/or retrofit PS29.

A Functional Servicing Report (FSR) for the proposed subdivision development, was submitted to the City in September 2019. The FSR proposed the sanitary sewer be connected to the existing sanitary manhole located at the entrance of 1873 London Line, Sarnia, ON. This existing sanitary manhole drains westward to PS29 via a 400mm gravity sanitary sewer. In addition to the subject property PS 29 services a total area of 59.24ha includes commercial, industrial and residential land uses.

PS29 pumps sewage through a 200mm forcemain westward, under the Telfer Drain to a gravity sewer on Blackwell Sideroad, which ultimately flows to PS54. We understand the City has concerns that PS29 currently does not have the capacity of accommodating existing flow conditions and therefore may not have capacity for additional flows from the proposed subdivision.

In addition to recent email correspondence, a meeting was held on January 28, 2020 with Greck, City, and JR to discuss options to address PS29 and how the City's infrastructure can accommodate the proposed development. To date the following information has been provided from the City:

- Confirmation that the current capacity of PS29 is 23.66 l/s as per the 1976 C of A,
- PS54 has sufficient capacity to accommodate the proposed development, and
- A theoretical infiltration/inflow (I/I) factor of 0.6 L/S/ha is to be used for calculating all existing sewer system flow to PS29. To account for large storm evens ("Peak Instantaneous Wet Weather Inflow").

We have since reviewed the background information provided by the City and calculated existing and future flows using the City's theoretical design criteria and recommendations. **Table 1** summarizes the results. A drainage map and the supporting design calculation sheets have been appended with this letter for review.

Table 1 - Sanitary Design Calculations, Total Flow Summary for PS29 and PS54

Flow Scenario	Design Criteria	Total Flow (L/S)	
Pumps Station #		PS29	PS54
Pump Capacity as per C of A		23.66	63.70
Existing	Existing I/I = 0.6 L/S/Ha	45.61	-
Existing + Proposed Development (10.42 L/S)	Existing I/I = 0.6 L/S/Ha + I/I=0.1L/S/Ha (1873 London Line)	56.04	-
Future - 10 Year	Existing I/I = 0.6 L/S/Ha + I/I=0.1L/S/Ha Growth: +10% Pop., +25% Comm., +15% Ind.	59.89	-
Future - 20 Year	Existing I/I = 0.6 L/S/Ha + I/I=0.1L/S/Ha Growth: +20% Pop., +50% Comm., +30% Ind.	63.50	-
Future - 40 Year	Existing I/I = 0.6 L/S/Ha + I/I=0.1L/S/Ha Growth: +20% Pop., +100% Comm., +100% Ind.	72.18	-

In summary, it was found that the existing flow to PS29 is 45.61 L/S. The proposed subdivision would add an additional sanitary flow of 10.42 L/S. As such, the minimum total flow to be considered for PS29 and PS54, pending City's review and acceptance of this modelling, would be 56.04 L/S. We also request the City's provide feedback as it pertains to their expectations accommodating future flows for PS29 and PS54.

Our analysis shows a significant contrast in theoretical flow compared to the existing pumping capacity at PS29. For reference, an I/I of 0.1 L/S/Ha was used to calculate flows and resulted in an existing flow of 23.59 L/S compared to the 45.61 L/S. We suggest the city re-evaluate a 0.6 L/S/ha I/I. Some justification from the City's supporting the preferred I/I rate would be appreciated.

Upon receiving The City's acceptance of existing and future flow calculations, Greck will undertake a feasibility analysis for several options to replace and/or retrofit PS29 and accommodate the proposed development, this includes cost-sharing opportunities with the City. As per the meeting of January 28, 2020 the City has indicated that JR will only be expected to pay for the sewer upgrades required to accommodate their proposed development. At this time, we will be considering the following options:

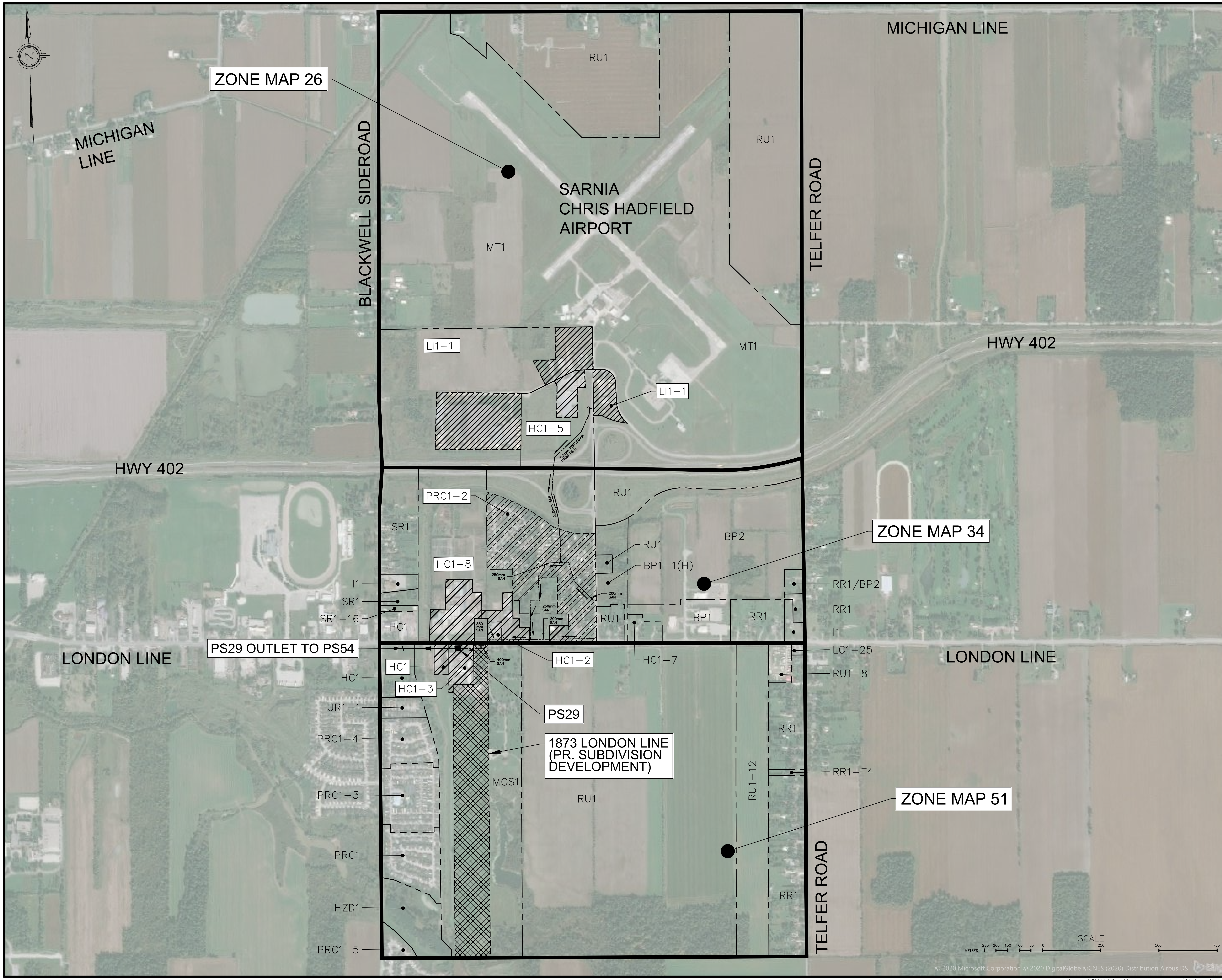
- New sanitary pumping station
- Overflow control tank
- Inverted siphon

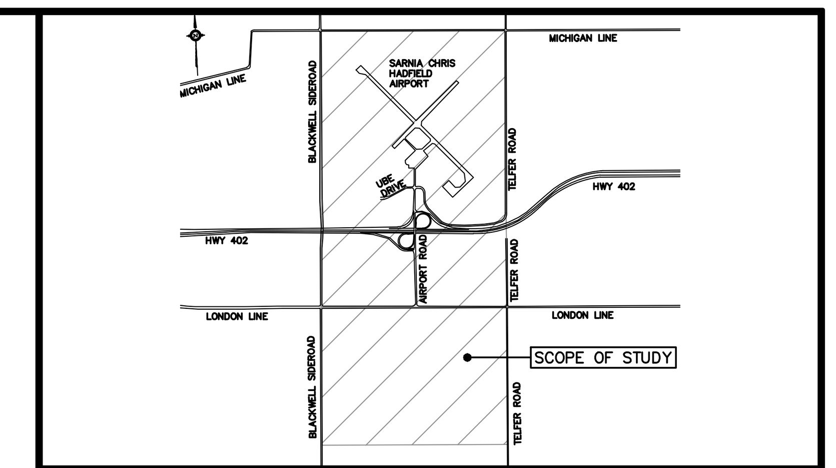
If you require additional information or have any questions, please feel free to contact me at (289) 657-9797 ext.222 or egreck@greck.ca. We look forward to the City's timely response.

GRECK AND ASSOCIATES LIMITED

Eric Greck, P.Eng.
Principal

cc. Rob Guttridge
JR Capital Holdings Inc.





KEY PLAN

N.T.S.

LEGEND

- ZONE MAP BOUNDARY
- ZONING SECTION BOUNDARY
- LIGHT INDUSTRIAL AREA INCLUDED FOR MODELING STUDY
- HIGHWAY COMMERCIAL AREA INCLUDED FOR MODELING STUDY
- EXISTING RESIDENTIAL AREA INCLUDED FOR MODELING STUDY
- 1873 LONDON LINE (PROPOSED SUBDIVISION DEVELOPMENT) INCLUDED FOR STUDY
- APPROXIMATE LOCATION OF EXISTING SANITARY SEWER MAINS WITH FLOW TO PS 29
- DIRECTION OF SANITARY FLOW
- HC1 ZONE AREA INCLUDED IN STUDY
- HC1 ZONE AREA NOT INCLUDED IN STUDY

ZONE CODE	ZONE CODE DESCRIPTIONS
BP	BUSINESS PARK
HC	HIGHWAY COMMERCIAL
HZD	HAZARD
I	INSTITUTIONAL
LC	LOCAL COMMERCIAL
LI	LIGHT INDUSTRIAL
MOS	MAJOR OPEN SPACE
MT	MAJOR TRANSPORTATION
PRC	PRIVATE RESIDENTIAL COMMUNITY
RR	RURAL RESIDENTIAL
RR-T	TEMPORARY USE (RURAL RESIDENTIAL)
RU	RURAL
SR	SUBURBAN RESIDENTIAL
UR	URBAN RESIDENTIAL

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL ZONING INFORMATION OBTAINED FROM CITY OF SARNIA ZONING BY-LAW 85 OF 2002.
3. NOT A LEGAL SURVEY.

BENCHMARK

BENCHMARK No. N/A
ELEVATION = N/A
LOCATION: N/A
DESCRIPTION: N/A

COMPLETED BY:
N/A

NO.	REVISION	DATE	BY	APPROVED
1	ISSUED FOR REVIEW	MAR 4, 2020	DV	EG

Greck
5770 Highway 7, Woodbridge, Ontario, L4L 1T8 www.greck.ca

CLIENT NAME:
J.R. CAPITAL HOLDINGS INC.

PROJECT NAME:

1873 LONDON LINE SUBDIVISON

1873 LONDON LINE, SARNIA,ON

DRAINAGE AREA MAP FOR PUMP STATION 29

DESIGNED BY: D.V.	SCALES:	PROJECT No. 18-569
CHECKED BY: J.N.	HORIZONTAL: 1:7500	DRAWING No. DAM-PS29
DRAWN BY: D.V.	VERTICAL:	SHEET No. 1
DATE: MAR 4, 2020	SHEET SIZE: 24"x36"	

Z:\Projects\2018\18-569 – 1873 London Line Subdivision\04_Analysis\Design Calculations\sanitary sewers\Existing sanitary sewer modelling\sanitary sewers\18-569_Existing Sanitary Modelling.dwg
Date Plotted: Mar 4, 2020 – 11:06 AM

CITY OF SARNIA
SANITARY SEWER MODELING FOR FLOW TO PS 29 (2020)

Project / Subdivision : 1873 London Line
Prepared by: Deven Verma
Consulting Engineer : Greck and Associates Limited
Checked by: Eric Greck P.Eng
Last Revised: March 20, 2020
Project No.: 18-569

Design Parameters (City)

Residential Density = 2.23 cap/unit
Residential = 330 L/cap/day
Light Industrial (LI) = 35 m^3/ha/day
Highway Commercial (HC) = 28 m^3/ha/day
Commercial(c)= 65 m^3/ha/day
Extran. Flow (i)= 0.6 L/s/ha

Design Equations

Q(p)= peak population flow (L/s)
Q(i) = $\frac{i \times A}{}$ = peak extraneous flow (L/s)
Q(hc) = $\frac{HC \times A(hc)}{86.4}$ = peak highway commercial flow (L/s)
Q(d) = Q(hc) + Q(c) + Q(Li)+Q(p)+Q(i) = peak design flow (L/s)

Q(c)* = $\frac{c \times A}{86.4}$ = peak commercial flow (L/s)
Q(Li) = $\frac{LI \times A(Li)}{86.4}$ = peak light industrial flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$)
Q = (P x q x M) / 86.4

Uncertaintity Factor = 1.1
M (Min) = 2
1873 London Line Design Flow* (L/s) = 10.42

Notes/Comments:
Extran. Flow of 0.6 L/s/ha given by City of Sarnia to be used for modelling of existing sanitary sewers. See Drawing DAM-PS29 for drainage area map and zone layout.

References:
All zoning information obtained from City of Sarnia Zoning By-Law 85 of 2002.

Design Calculations

Location					Individual Values							Cumulative Values						Cumulative Flow Data						
Area ID	From		To		Highway Commercial Area (ha)	Light Industrial Area (ha)	Commercial Area (ha)	Residential Area (ha)	Residential Units (Single+Semis)	Residential Population	Total Area (ha)	Highway Commercial Area (ha)	Light Industrial Area (ha)	Commercial Area (ha)	Residential Area (ha)	Residential Population	Total Area (ha)	Residential P.F.	Highway Commercial Flow (L/s)	Commercial Flow (L/s)	Light Industrial Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)
	MH #	Inv (m)	MH #	Inv (m)	A(hc)	A(Li)		A(p)	#	cap.		A(hc)	A(li)	A(c)	A(p)	P		M(p)	Q(hc)	Q(c)	Q(Li)	Q(p)	Q(i)	Q(d)
Zone 26	Zone 26	-	Zone 34	-	1.90	14.77					16.66	1.90	14.77				16.66		0.68		6.58		10.00	17.25
Zone 34	Zone 34	-	PS29	-	7.82			16.72	218	487	24.53	9.71	14.77		16.72	487	41.19	3.98	3.46		6.58	8.14	24.72	42.90
Zone 51	Zone 51	-	PS29	-	2.83						2.83	2.83					2.83		1.01				1.70	2.71
1873 London Line*	UPSTREAM	-	PS29	-			0.57	14.65	135	478	15.22			0.57	14.65	478	15.22	3.99		0.47		8.49	1.47	10.42
TOTAL	PS29	-	Outlet (TO PS 54)	-								12.54	14.77	0.57	31.37	965	59.24	3.81	4.47	0.47	6.58	16.63	27.88	56.04

*For detailed 1873 London Line calculations see 18-569 Sanitary Design Sheet, proposed development residential population based on residential density of 3.5 cap/unit

**Existing developed areas are assumed to have an extran. flow of 0.6 L/s/ha. Future/proposed development areas are assumed to have an extran. flow of 0.1 L/s/ha

Greck

CITY OF SARNIA

FUTURE SANITARY SEWER MODELING FOR FLOW TO PS 29 (10 YEARS)

Project / Subdivision : 1873 London Line
Prepared by: Deven Verma
Consulting Engineer : Greck and Associates Limited
Checked by: Eric Greck P.Eng
Last Revised: March 20, 2020
Project No.: 18-569

Design Parameters (City)

Residential Density = 2.23	cap/unit	Population Growth=	10%
Residential = 330	L/cap/day	Highway Commercial Growth =	25%
Light Industrial (LI) = 35	m^3/ha/day	Light Industrial Growth=	15%
Highway Commercial (HC) = 28	m^3/ha/day		
Commercial(c)= 65	m^3/ha/day		
Extran. Flow (i)= 0.6	L/s/ha		
Future area Extran. Flow= 0.1	L/s/ha		

Design Equations

Q(p)= peak population flow (L/s)

$Q(i) = i \times A$ = peak extraneous flow (L/s)

$Q(hc) = \frac{HC \times A(hc)}{86.4}$ = peak highway commercial flow (L/s)

Q(d) = Q(hc) + Q(c) + Q(Li)+Q(p)+Q(i) = peak design flow (L/s)

$Q(c)^* = \frac{c \times A}{86.4}$ = peak commercial flow (L/s)

$Q(Li) = \frac{LI \times A(Li)}{86.4}$ = peak light industrial flow (L/s)

P = population

M = peaking factor (Harmon)

P = p x # units / 1000

$M = 1 + 14 / (4 + P^{1/2})$

Q = (P x q x M) / 86.4

Uncertaintity Factor = 1.1

M (Min) = 2

M (Max) =4

1873 London Line Design Flow* (L/s) = 10.42

Notes/Comments:
Extran. Flow of 0.6 L/s/ha given by City of Sarnia to be used for modelling of existing sanitary sewers. Future growth factors based on previous sanitary modelling completed by City of Sarnia. Future growth factors only applied to Zone areas. See Drawing DAM-PS29 for drainage area map and zone layout (2020).

References:
All zoning information obtained from City of Sarnia Zoning By-Law 85 of 2002.

Design Calculations

Location					Individual Values							Cumulative Values						Cumulative Flow Data						
Area ID	From		To		Highway Commercial Area (ha)	Light Indsutrial Area (ha)	Commercial Area (ha)	Residential Area	Residential Units (Single+Semis)	Residential Population	Total Area (ha)	Highway Commercial Area (ha)	Light Industrial Area (ha)	Commercial Area (ha)	Residential Area (ha)	Residential Population	Total Area (ha)	Residential P.F.	Highway Commercial Flow (L/s)	Commercial Flow (L/s)	Light Industrial Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous** Flow (L/s)	Total Design Flow (L/s)
	MH #	Inv (m)	MH #	Inv (m)	A(hc)	A(Li)		A(p)	#	cap.		A(hc)	A(li)	A(c)	A(p)	P		M(p)	Q(hc)	Q(c)	Q(Li)	Q(p)	Q(i)	Q(d)
Zone 26	Zone 26	-	Zone 34	-	2.37	16.98					19.35	2.37	16.98				19.35		0.84		7.57		10.27	18.68
Zone 34	Zone 34	-	PS29	-	9.77			18.39	240	535	28.16	12.14	16.98		18.39	554	47.51	3.95	4.33		7.57	9.20	25.35	46.44
Zone 51	Zone 51	-	PS29	-	3.54						3.54	3.54					3.54		1.26				1.77	3.03
1873 London Line*	UPSTREAM	-	PS29	-			0.57	14.65	135	478	15.22			0.57	14.65	478	15.22	3.99		0.47		8.49	1.47	10.42
TOTAL FLOW	PS29	-	Outlet (TO PS 54)	-								15.67	16.98	0.57	33.04	1032	18.76	3.79	5.59	0.47	7.57	17.69	28.59	59.89

*For detailed 1873 London Line calculations see 18-569 Sanitary Design Sheet, proposed development residential population based on residential density of 3.5 cap/unit

**Existing developed areas are assumed to have an extran. flow of 0.6 L/s/ha.
Future developed areas are assumed to have an extran. flow of 0.1 L/s/ha

CITY OF SARNIA

FUTURE SANITARY SEWER MODELING FOR FLOW TO PS 29 (20 YEARS)

Greck

Project / Subdivision : 1873 London Line

Prepared by: Deven Verma

Consulting Engineer : Greck and Associates Limited

Checked by: Eric Greck P.Eng

Last Revised: March 20, 2020

Project No.: 18-569

Design Parameters (City)

Residential Density = 2.23 cap/unit

Residential = 330 L/cap/day

Light Industrial (LI) = 35 m^3/ha/day

Highway Commercial (HC) = 28 m^3/ha/day

Commercial(c)= 65 m^3/ha/day

Extran. Flow (i)= 0.6 L/s/ha

Future area Extran. Flow= 0.1 L/s/ha

Population Growth= 20%

Highway Commercial Growth = 50%

Light Industrial Growth= 30%

Design Equations

Q(p)= peak population flow (L/s)

$Q(i) = i \times A$ = peak extraneous flow (L/s)

$Q(hc) = \frac{HC \times A(hc)}{86.4}$ = peak highway commercial flow (L/s)

Q(d) = Q(hc) + Q(c) + Q(Li)+Q(p)+Q(i) = peak design flow (L/s)

$Q(c)^* = \frac{c \times A}{86.4}$ = peak commercial flow (L/s)

$Q(Li) = \frac{LI \times A(Li)}{86.4}$ = peak light industrial flow (L/s)

P = population

M = peaking factor (Harmon)

P = p x # units / 1000

$M = 1 + 14 / (4 + P^{1/2})$

Q = (P x q x M) / 86.4

Uncertaintity Factor = 1.1

M (Min) = 2

M (Max) =4

1873 London Line Design Flow* (L/s) = 10.42

Notes/Comments:
Extran. Flow of 0.6 L/s/ha given by City of Sarnia to be used for modelling of existing sanitary sewers. Future growth factors based on previous sanitary modelling completed by City of Sarnia. Future growth factors only applied to Zone areas. See Drawing DAM-PS29 for drainage area map and zone layout (2020).

References:
All zoning information obtained from City of Sarnia Zoning By-Law 85 of 2002.

Design Calculations

Location					Individual Values							Cumulative Values						Cumulative Flow Data						
Area ID	From		To		Highway Commercial Area (ha)	Light Indsutrial Area (ha)	Commercial Area (ha)	Residential Area	Residential Units (Single+Semis)	Residential Population	Total Area (ha)	Highway Commercial Area (ha)	Light Industrial Area (ha)	Commercial Area (ha)	Residential Area (ha)	Residential Population	Total Area (ha)	Residential P.F.	Highway Commercial Flow (L/s)	Commercial Flow (L/s)	Light Industrial Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous** Flow (L/s)	Total Design Flow (L/s)
	MH #	Inv (m)	MH #	Inv (m)	A(hc)	A(Li)		A(p)	#	cap.		A(hc)	A(li)	A(c)	A(p)	P		M(p)	Q(hc)	Q(c)	Q(Li)	Q(p)	Q(i)	Q(d)
Zone 26	Zone 26	-	Zone 34	-	2.84	19.20					22.04	2.84	19.20				22.04		1.01		8.55		10.53	20.10
Zone 34	Zone 34	-	PS29	-	11.72			20.06	262	584	31.78	14.57	19.20		20.06	606	53.82	3.93	5.19		8.55	10.01	25.98	49.73
Zone 51	Zone 51	-	PS29	-	4.24						4.24	4.24					4.24		1.51				1.84	3.35
1873 London Line*	UPSTREAM	-	PS29	-			0.57	14.65	135	478	15.22			0.57	14.65	478	15.22	3.99		0.47		8.49	1.47	10.42
TOTAL FLOW	PS29	-	Outlet (TO PS 54)	-								18.81	19.20	0.57	34.71	1084	19.46	3.78	6.71	0.47	8.55	18.50	29.29	63.50

*For detailed 1873 London Line calculations see 18-569 Sanitary Design Sheet, proposed development residential population based on residential density of 3.5 cap/unit

**Existing developed areas are assumed to have an extran. flow of 0.6 L/s/ha.
Future developed areas are assumed to have an extran. flow of 0.1 L/s/ha

CITY OF SARNIA
FUTURE SANITARY SEWER MODELING FOR FLOW TO PS 29 (40 YEARS)

Greck

Project / Subdivision : 1873 London Line

Prepared by: Deven Verma

Consulting Engineer : Greck and Associates Limited

Checked by: Eric Greck P.Eng

Last Revised: March 20, 2020

Project No.: 18-569

Design Parameters (City)

Residential Density =	2.23	cap/unit	Population Growth=	20%
Residential =	330	L/cap/day	Highway Commercial Growth =	100%
Light Industrial (LI) =	35	m^3/ha/day	Light Industrial Growth=	100%
Highway Commercial (HC) =	28	m^3/ha/day		
Commercial(c)=	65	m^3/ha/day		
Extran. Flow (i)=	0.6	L/s/ha		
Future area Extran. Flow=	0.1	L/s/ha		

Design Equations

Q(p)= peak population flow (L/s)

$Q(i) = \frac{i \times A}{}$ = peak extraneous flow (L/s)

$Q(hc) = \frac{HC \times A(hc)}{86.4}$ = peak highway commercial flow (L/s)

Q(d) = Q(hc) + Q(c) + Q(Li)+Q(p)+Q(i) = peak design flow (L/s)

$Q(c)^* = \frac{c \times A}{86.4}$ = peak commercial flow (L/s)

$Q(Li) = \frac{LI \times A(Li)}{86.4}$ = peak light industrial flow (L/s)

P = population

M = peaking factor (Harmon)

P = p x # units / 1000

$M = 1 + 14 / (4 + P^{1/2})$

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Uncertaintity Factor = 1.1

M (Min) = 2

M (Max) =4

1873 London Line Design Flow* (L/s) = 10.42

Notes/Comments:
Extran. Flow of 0.6 L/s/ha given by City of Sarnia to be used for modelling of existing sanitary sewers. Future growth factors based on previous sanitary modelling completed by City of Sarnia. Future growth factors only applied to Zone areas. See Drawing DAM-PS29 for drainage area map and zone layout (2020).

References:
All zoning information obtained from City of Sarnia Zoning By-Law 85 of 2002.

Design Calculations

Location					Individual Values							Cumulative Values						Cumulative Flow Data						
Area ID	From		To		Highway Commercial Area (ha)	Light Indsutrial Area (ha)	Commercial Area (ha)	Residential Area	Residential Units (Single+Semis)	Residential Population	Total Area (ha)	Highway Commercial Area (ha)	Light Industrial Area (ha)	Commercial Area (ha)	Residential Area (ha)	Residential Population	Total Area (ha)	Residential P.F.	Highway Commercial Flow (L/s)	Commercial Flow (L/s)	Light Industrial Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous** Flow (L/s)	Total Design Flow (L/s)
	MH #	Inv (m)	MH #	Inv (m)	A(hc)	A(Li)		A(p)	#	cap.		A(hc)	A(li)	A(c)	A(p)	P		M(p)	Q(hc)	Q(c)	Q(Li)	Q(p)	Q(i)	Q(d)
Zone 26	Zone 26	-	Zone 34	-	3.79	29.53					33.32	3.79	29.53				33.32		1.35		13.16		11.66	26.17
Zone 34	Zone 34	-	PS29	-	15.63			20.06	262	584	35.69	19.42	29.53		20.06	617	69.01	3.93	6.92		13.16	10.18	27.50	57.76
Zone 51	Zone 51	-	PS29	-	5.66						5.66	5.66					5.66		2.02				1.98	4.00
1873 London Line*	UPSTREAM	-	PS29	-			0.57	14.65	135	478	15.22			0.57	14.65	478	15.22	3.99		0.47		8.49	1.47	10.42
TOTAL FLOW	PS29	-	Outlet (TO PS 54)	-								25.08	29.53	0.57	34.71	1095	20.88	3.77	8.94	0.47	13.16	18.67	30.95	72.18

*For detailed 1873 London Line calculations see 18-569 Sanitary Design Sheet, proposed development residential population based on residential density of 3.5 cap/unit

**Existing developed areas are assumed to have an extran. flow of 0.6 L/s/ha. Future developed areas are assumed to have an extran. flow of 0.1 L/s/ha