Appendix A WATER SUPPLY SERVICING

A.1 DOMESTIC WATER DEMAND ESTIMATE

Cope Drive Stage 1 - Domestic Water Demand Estimates

- Based on Venchiarutti Gagliardi Architect Inc. Site Plan (160401397)

Building ID	Area (m^2)	Population	Daily Rate of Demand [1]	Avg Day Demand		Max Day Demand [2]		Peak Hour Demand [2]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Retail A	3,248	-	28,000	6.3	0.11	9.5	0.16	17.1	0.28
Retail B	568	-	28,000	1.1	0.02	1.7	0.03	3.0	0.05
Retail C	743	-	28,000	1.4	0.02	2.2	0.04	3.9	0.07
Retail D	1,133	-	28,000	2.2	0.04	3.3	0.06	5.9	0.10
Retail E	1,412	-	28,000	2.7	0.05	4.1	0.07	7.4	0.12
Retail F	576	-	28,000	1.1	0.02	1.7	0.03	3.0	0.05
Retail G	372	-	28,000	0.7	0.01	1.1	0.02	2.0	0.03
Retail H	279	-	28,000	0.5	0.01	0.8	0.01	1.5	0.02
Total Site :				**16.2**	**0.27**	**24.3**	**0.40**	**43.7**	**0.73**

1. 28,000 L/gross ha/day is used to calculate water demand for Shopping Centres.
2. The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:
   maximum day demand rate = 1.5 x average day demand rate
   peak hour demand rate = 1.8 x maximum day demand rate

A.2 FIRE FLOW REQUIREMENTS PER FUS

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building A

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						3248	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	13000
5	Determine Occupancy Charge	Limited Combustible						-15%	11050
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	> 45	21	1	0-30	Wood Frame or Non-Combustible	0%	553
		East	> 45	23	1	0-30	Wood Frame or Non-Combustible	0%	
		South	> 45	51	1	31-60	Wood Frame or Non-Combustible	0%	
		West	30.1 to 45	70	2	> 120	Wood Frame or Non-Combustible	5%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							12000
		Total Required Fire Flow in L/s							200.0
		Required Duration of Fire Flow (hrs)							2.50
		Required Volume of Fire Flow (m^3)							1800

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 7/3/2018
Fire Flow Calculation #: 1
Description: Building B

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						568	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min						-	5000
5	Determine Occupancy Charge	Limited Combustible						-15%	4250
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	30.1 to 45	26	2	31-60	Wood Frame or Non-Combustible	5%	765
		East	10.1 to 20	20	2	31-60	Wood Frame or Non-Combustible	13%	
		South	> 45	20	1	0-30	Wood Frame or Non-Combustible	0%	
		West	> 45	20	1	0-30	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							5000
		Total Required Fire Flow in L/s							83.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							600

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building C

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						743	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	6000
5	Determine Occupancy Charge	Limited Combustible						-15%	5100
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	29	1	0-30	Wood Frame or Non-Combustible	12%	1479
		East	10.1 to 20	30	1	0-30	Wood Frame or Non-Combustible	12%	
		South	30.1 to 45	23	1	0-30	Wood Frame or Non-Combustible	5%	
		West	> 45	30	2	31-60	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	**Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min**							**7000**
		Total Required Fire Flow in L/s							**116.7**
		Required Duration of Fire Flow (hrs)							**2.00**
		Required Volume of Fire Flow (m^3)							**840**

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FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building D

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						1133	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	7000
5	Determine Occupancy Charge	Limited Combustible						-15%	5950
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	66	2	> 120	Wood Frame or Non-Combustible	15%	2916
		East	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
		South	> 45	66	1	61-90	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							9000
		Total Required Fire Flow in L/s							150.0
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							1080

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building E

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						1412	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	8000
5	Determine Occupancy Charge	Limited Combustible						-15%	6800
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	66	2	> 120	Wood Frame or Non-Combustible	15%	3332
		East	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
		South	> 45	66	1	61-90	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
8	Determine Final Required Fire Flow	**Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min**							**10000**
		Total Required Fire Flow in L/s							**166.7**
		Required Duration of Fire Flow (hrs)							**2.00**
		Required Volume of Fire Flow (m^3)							**1200**

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building F

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						576	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	5000
5	Determine Occupancy Charge	Limited Combustible						-15%	4250
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	66	2	> 120	Wood Frame or Non-Combustible	15%	2083
		East	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
		South	> 45	66	1	61-90	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							6000
		Total Required Fire Flow in L/s							100.0
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							720

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building G

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						372	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	4000
5	Determine Occupancy Charge	Limited Combustible						-15%	3400
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	66	2	> 120	Wood Frame or Non-Combustible	15%	1666
		East	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
		South	> 45	66	1	61-90	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							5000
		Total Required Fire Flow in L/s							83.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							600

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401397
Project Name: Cope Drive Stage 1 (5331 Fernbank Road)
Date: 6/25/2018
Fire Flow Calculation #: 1
Description: Building H

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						279	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	4000
5	Determine Occupancy Charge	Limited Combustible						-15%	3400
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	0
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	66	2	> 120	Wood Frame or Non-Combustible	15%	1666
		East	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
		South	> 45	66	1	61-90	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	21	1	0-30	Wood Frame or Non-Combustible	17%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							5000
		Total Required Fire Flow in L/s							83.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							600

A.3 BOUNDARY CONDITIONS

BOUNDARY CONDITIONS

Boundary Conditions For: 5331 Fernbank Rd

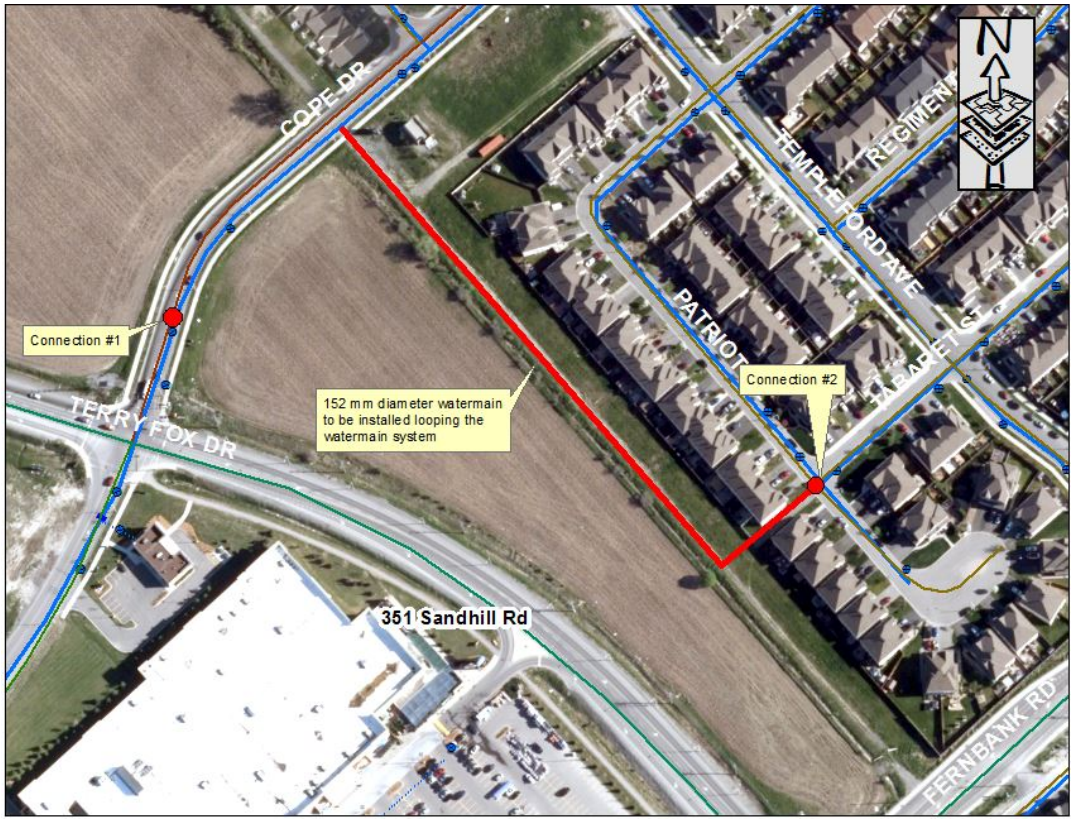
Date of Boundary Conditions: 2018-Jul-09

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	14.4	0.2
Maximum Daily Demand	21.6	0.4
Peak Hour	39.0	0.7
Fire Flow #1 Demand	12,000.0	200.0

Number Of Connections: 2

Location:



BOUNDARY CONDITIONS

Results:

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	92.1
Peak Hour	157.1	85.0
Max Day Plus Fire (12,000) L/min	147.6	71.5

[1]Elevation: **97.33**

Connection #: 2

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	91.4
Peak Hour	157.1	84.3
Max Day Plus Fire (12,000) L/min	128.5	43.7

[1]Elevation: **97.33**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

2) 152 mm Diameter main (minimum size) must be inserted (as shown in location image) in order to achieve minimum HGL and pressures set forth by the City of Ottawa.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

A.4 HYDRAULIC ANALYSIS RESULTS

Hydraulic Model Results - Average Day Analysis

Junction Results

ID	Demand	Elevation	Head	Pressure	
	(L/s)	(m)	(m)	(psi)	(Kpa)
1	0.02	96.97	162.10	92.59	638.39
2	0.11	96.95	162.10	92.62	638.60
3	0.00	97.46	162.10	91.89	633.56
4	0.06	97.55	162.10	91.76	632.67
5	0.00	97.55	162.10	91.76	632.67
6	0.01	97.8	162.10	91.41	630.25
7	0.00	97.39	162.10	91.99	634.25
8	0.07	97.42	162.10	91.95	633.98
9	0.01	97.33	162.10	92.08	634.87

Pipe Results

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	(mm)		(L/s)	(m/s)
10	7001	1	19.15	204	110	0.19	0.01
11	1	2	37.54	150	100	0.11	0.01
12	1	3	113.98	204	110	0.06	0.00
13	3	4	45.34	50	100	0.06	0.03
14	3	5	32.56	204	110	0.00	0.00
15	5	6	39.88	50	100	0.01	0.01
16	5	7	109.85	204	110	-0.01	0.00
17	7	8	31.88	150	100	-0.02	0.00
18	7	9	64.59	204	110	0.01	0.00
19	8	7002	20.95	150	100	-0.09	0.01

Hydraulic Model Results -Peak Hour Analysis

Junction Results

ID	Demand	Elevation	Head	Pressure	
	(L/s)	(m)	(m)	(psi)	(Kpa)
1	0.05	96.97	157.10	85.48	589.37
2	0.28	96.95	157.10	85.51	589.57
3	0.00	97.46	157.10	84.78	584.54
4	0.17	97.55	157.08	84.62	583.44
5	0.00	97.55	157.10	84.66	583.71
6	0.03	97.80	157.10	84.3	581.23
7	0.00	97.39	157.10	84.88	585.23
8	0.17	97.42	157.10	84.84	584.95
9	0.02	97.33	157.10	84.97	585.85

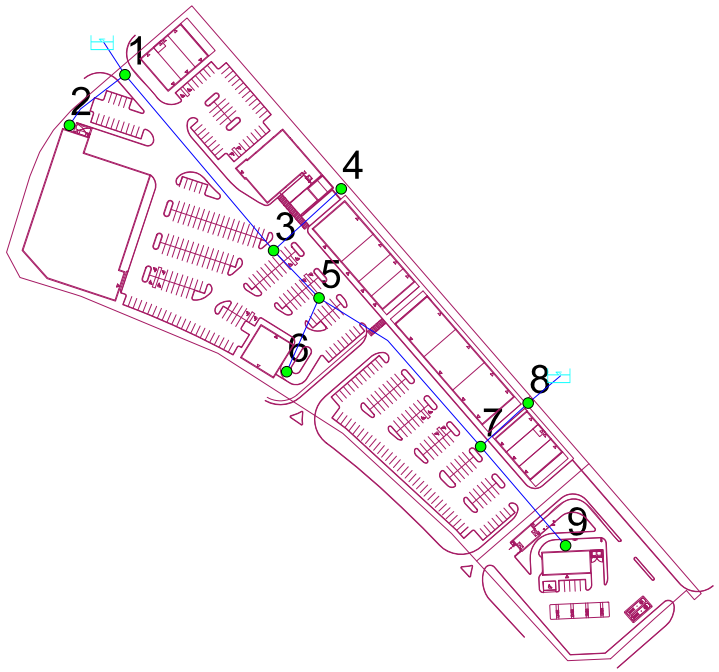
Pipe Results

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
10	7001	1	19.15	204	110	0.49	0.01
11	1	2	37.54	150	100	0.28	0.02
12	1	3	113.98	204	110	0.16	0.00
13	3	4	45.34	50	100	0.17	0.09
14	3	5	32.56	204	110	-0.01	0.00
15	5	6	39.88	50	100	0.03	0.02
16	5	7	109.85	204	110	-0.04	0.00
17	7	8	31.88	150	100	-0.06	0.00
18	7	9	64.59	204	110	0.02	0.00
19	8	7002	20.95	150	100	-0.23	0.01

Hydraulic Model Results -Fire Flow Analysis (167 L/s)

ID	Static Demand	Static Pressure		Static Head	Fire-Flow Demand	Residual Pressure		Available Flow at Hydrant	Available Flow Pressure	
	(L/s)	(psi)	(Kpa)	(m)	(L/s)	(psi)	(Kpa)	(L/s)	(psi)	(Kpa)
1	0.03	71.04	489.81	146.94	200.00	62.70	432.30	737.29	20	137.90
2	0.16	71.06	489.94	146.94	0.00	71.06	489.94	171.57	20	137.90
3	0.00	64.77	446.58	143.02	150.00	44.79	308.82	313.56	20	137.90
4	0.10	64.63	445.61	143.01	0.00	64.63	445.61	8.54	20	137.90
5	0.00	63.06	434.79	141.91	83.00	50.54	348.46	290.90	20	137.90
6	0.02	62.70	432.30	141.91	0.00	62.70	432.30	8.90	20	137.90
8	0.10	49.61	342.05	132.32	167.00	39.06	269.31	289.99	20	137.90
9	0.01	58.02	400.04	138.14	83.00	42.22	291.10	184.05	20	137.90

160401397 - JUNCTION ID'S



JUNCTION (MOTYPE)
- Active
- Domain

TANK (MOTYPE)
- Active Tank
- Domain Tank
- Active Reservoir
- Domain Reservoir

PIPE (MOTYPE)
- Active Pipe
- Domain Pipe
- Active Check Valve
- Domain Check Valve

PUMP (MOTYPE)
- Active
- Domain

VALVE (MOTYPE)
- Active
- Domain

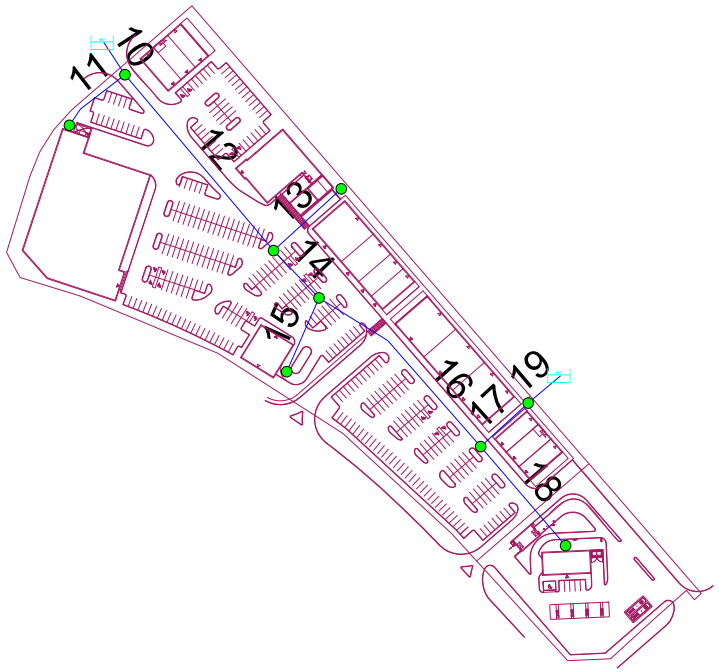
ACAD-160401397-SP.dxf

ANNO1

Prepared By:

Date: Monday, July 23, 2018

160401397 - PIPE ID'S



JUNCTION (MOTYPE)
- Active
- Domain

TANK (MOTYPE)
- Active Tank
- Domain Tank
- Active Reservoir
- Domain Reservoir

PIPE (MOTYPE)
- Active Pipe
- Domain Pipe
- Active Check Valve
- Domain Check Valve

PUMP (MOTYPE)
- Active
- Domain

VALVE (MOTYPE)
- Active
- Domain

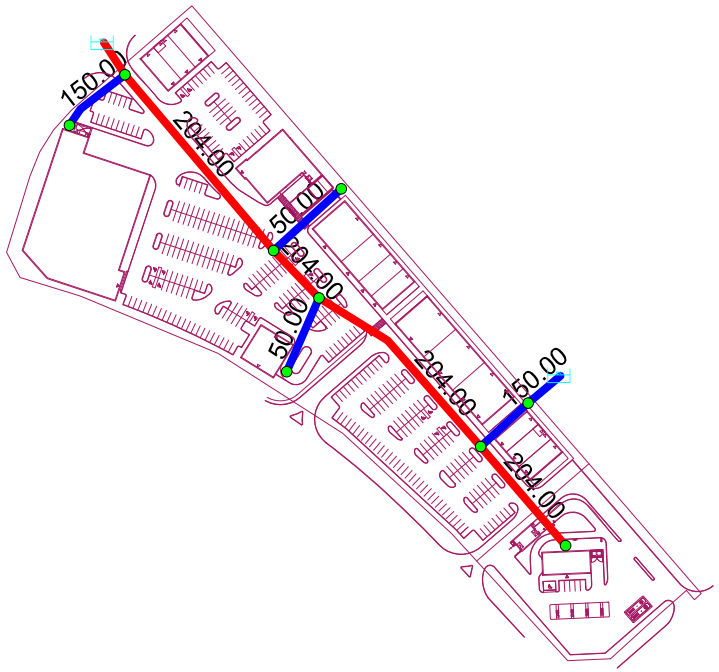
ACAD-160401397-SP.dxf

ANNO1

Prepared By:

Date: Monday, July 23, 2018

160401397 - PIPE DIAMETER



JUNCTION (MOTYPE)
- Active
- Domain

TANK (MOTYPE)
- Active Tank
- Domain Tank
- Active Reservoir
- Domain Reservoir

PIPE (VALUE)
- Less than 151
- Greater than 151

PUMP (MOTYPE)
- Active
- Domain

VALVE (MOTYPE)
- Active
- Domain

ACAD-160401397-SP.dxf

ANNO2

Prepared By:

Date: Monday, July 23, 2018

Appendix B WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET

Stantec

SUBDIVISION:

Terry Fox Drive and Cope Drive Commercial Shopping Development

DATE: 7/23/2018
REVISION: 1
DESIGNED BY: TKR
CHECKED BY: -

SANITARY SEWER DESIGN SHEET

(City of Ottawa)

FILE NUMBER: 160401397

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
C106B	38	106	0.00	0	0	0	0	0.00	0	4.00	0.0	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.03	0.0	0.0	14.6	100	PVC	DR 28	1.00	5.3	**0.43%**	0.67	0.14
C106A	39	106	0.00	0	0	0	0	0.00	0	4.00	0.0	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.01	0.01	0.0	0.0	6.2	150	PVC	DR 28	1.00	15.3	**0.05%**	0.86	0.07
G106A, G106B	106	105	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.65	0.0	0.65	0.69	0.2	0.2	23.4	250	PVC	SDR 35	0.50	42.9	**0.57%**	0.86	0.19
C105B	41	105	0.00	0	0	0	0	0.00	0	4.00	0.0	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.06	0.06	0.0	0.0	5.8	150	PVC	DR 28	1.00	15.3	**0.31%**	0.86	0.16
G105A	105	104	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.56	1.21	0.0	0.56	1.31	0.4	0.5	94.8	250	PVC	SDR 35	0.50	42.9	**1.11%**	0.86	0.25
C105A	42	104	0.00	0	0	0	0	0.00	0	4.00	0.0	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1	0.14	0.14	0.0	0.1	5.8	150	PVC	DR 28	1.00	15.3	**0.75%**	0.86	0.21
G104A	104	103	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.27	1.48	0.1	0.27	1.71	0.6	0.7	40.6	250	PVC	SDR 35	0.50	42.9	**1.59%**	0.86	0.27
C103A	43	103	0.00	0	0	0	0	0.00	0	4.00	0.0	0.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1	0.11	0.11	0.0	0.1	19.0	150	PVC	DR 28	1.00	15.3	**0.60%**	0.86	0.21
C103B	44	103	0.00	0	0	0	0	0.00	0	4.00	0.0	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.04	0.04	0.0	0.0	25.0	150	PVC	DR 28	1.00	15.3	**0.20%**	0.86	0.14
G103A	103	100	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.98	2.46	0.2	0.98	2.84	0.9	1.1	105.3	250	PVC	SDR 35	0.50	42.9	**2.62%**	0.86	0.31
	46	102	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0	0.0	7.2	150	PVC	DR 28	1.00	15.3	**0.00%**	0.86	0.00
C102A	102	100	0.00	0	0	0	0	0.00	0	4.00	0.0	0.32	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.2	0.32	0.32	0.1	0.3	23.8	250	PVC	SDR 35	7.45	165.5	**0.16%**	3.33	0.53
C101A	48	101	0.00	0	0	0	0	0.00	0	4.00	0.0	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.06	0.06	0.0	0.0	20.6	150	PVC	DR 28	1.00	15.3	**0.30%**	0.86	0.16
C101B	49	101	0.00	0	0	0	0	0.00	0	4.00	0.0	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.1	28.1	150	PVC	DR 28	1.00	15.3	**0.44%**	0.86	0.19
	101	100	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.14	0.0	0.0	13.5	250	PVC	SDR 35	0.50	42.9	**0.11%**	0.86	0.11
G100A	100	33	0.00	0	0	0	0	0.00	0	4.00	0.0	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.38	2.83	0.4	0.38	3.68	1.2	1.6	58.3	250	PVC	SDR 35	0.50	42.9	**3.80%**	0.86	0.34
																												250							

B.2 BACKGROUND REPORT EXCERPTS (SANITARY DRAINAGE)

Stantec

Cavanagh Construction

SOHO Development Phase 1 and 2

DATE: April 2007
REVISION: October 2007
DESIGNED BY: MJS
CHECKED BY: KK

SANITARY SEWER DESIGN SHEET

(City of Ottawa)

FILE NUMBER: 1604-00502

DESIGN PARAMETERS

AVG. DAILY FLOW / PERSON =	350	l/p/day	COMMERCIAL	50,000.00	l/Ha/day
MINIMUM VELOCITY =	0.60	m/s	LIGHT INDUSTRIAL	35,000.00	l/Ha/day
n =	0.013		INSTITUTIONAL	0.60	l/s/Ha
MAX PEAK FACTOR =	4.0		INFILTRATION	0.28	l/s/Ha
MIN PEAK FACTOR =	2.4		RESIDENTIAL HARMON PEAKING FACTOR PERSONS/UNIT =		4.0
			KANATA WEST REPORT PERSONS/UNIT =		3.0
Peaking Factor Industrial:	1.5		POPULATION DENSITY PER UNIT =	Single Family =	3.4
Peaking Factor Comm. / Inst.:	1.5			Townhouse =	2.7

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	UNITS* (KWR)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	**TOTAL FLOW (l/s)**	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	(FULL) (m/s)	VEL. (ACT.) (m/s)
Phase 1																												
PATRIOT PLACE	101	102	0.80		14	0	38	0.80	38	4.00	0.62							0.00	0.80	0.80	0.224	**0.84**	40.5	200	0.65	26.88	0.84	0.34
PATRIOT PLACE	102	104	0.55		16	0	43	1.35	81	4.00	1.31							0.00	0.55	1.35	0.378	**1.69**	76.9	200	0.45	22.40	0.70	0.36
PATRIOT PLACE	104	105	0.37		13	0	35	1.72	116	4.00	1.88							0.00	0.37	1.72	0.482	**2.36**	64.0	200	0.45	22.40	0.70	0.43
PATRIOT PLACE	105	106	0.60		21	0	57	2.32	173	4.00	2.80							0.00	0.60	2.32	0.650	**3.45**	98.0	200	0.45	22.40	0.70	0.48
PATRIOT PLACE	106	109	0.73		24	0	65	3.05	238	4.00	3.86							0.00	0.73	3.05	0.854	**4.71**	81.0	200	0.45	22.40	0.70	0.53
TABARET STREET	104	107	0.43		12	0	32	0.43	32	4.00	0.52							0.00	0.43	0.43	0.120	**0.64**	83.8	200	0.70	27.84	0.87	0.35
TEMPLEFORD AVENUE	107	108	0.48		6	0	16	0.91	48	4.00	0.78							0.00	0.48	0.91	0.255	**1.04**	81.0	200	0.45	22.40	0.70	0.33
TEMPLEFORD AVENUE	108	109	0.31		6	0	16	1.22	64	4.00	1.04							0.00	0.31	1.22	0.342	**1.38**	81.0	200	0.45	22.40	0.70	0.36
TEMPLEFORD AVENUE	109	110	0.11		0	0	0	4.38	302	4.00	4.89							0.00	0.11	4.38	1.226	**6.12**	53.6	200	0.84	30.72	0.96	0.71
BLOCK 1	110B	110	0.52		40	0	108	0.52	108	4.00	1.75							0.00	0.52	0.52	0.146	**1.90**	111.5	200	0.75	29.12	0.91	0.47
TEMPLEFORD AVENUE	110	147	0.08		0	0	0	4.98	410	4.00	6.64							0.00	0.08	4.98	1.394	**8.03**	46.5	200	1.18	36.48	1.14	0.89
NORTHGRAVES	129	130	0.20		3	0	8	0.20	8	4.00	0.13							0.00	0.20	0.20	0.056	**0.19**	13.0	200	0.65	26.88	0.84	0.00
NORTHGRAVES	130	131	0.59		13	0	35	0.79	43	4.00	0.70							0.00	0.59	0.79	0.221	**0.92**	105.2	200	0.45	22.40	0.70	0.33
NORTHGRAVES	131	132	0.35		6	0	16	1.14	59	4.00	0.96							0.00	0.35	1.14	0.319	**1.28**	78.0	200	0.45	22.40	0.70	0.33
NORTHGRAVES	132	133	0.42		9	0	24	1.56	83	4.00	1.34							0.00	0.42	1.56	0.437	**1.78**	78.0	200	0.45	22.40	0.70	0.36
NORTHGRAVES	133	133A	0.26		6	0	16	1.82	99	4.00	1.60							0.00	0.26	1.82	0.510	**2.11**	55.4	200	0.45	22.40	0.70	0.41
BLOCK 34 ****	133C	133B	0.24		20	0	54	0.24	54	4.00	0.88							0.00	0.24	0.24	0.067	**0.95**	42.5	200	0.65	26.88	0.84	0.34
BLOCK 34 ****	133B	133A	0.48		40	0	108	0.72	162	4.00	2.63							0.00	0.48	0.72	0.202	**2.83**	113.0	200	0.40	21.12	0.66	0.44
NORTHGRAVES	133A	146	0.16		4	0	11	2.70	272	4.00	4.41							0.00	0.16	2.70	0.756	**5.17**	43.2	200	1.09	34.88	1.09	0.75
COPE DR ***	STUB	145B	125.14		0	0	8075	125.14	8075	3.05	99.77			28.72	28.72			17.45	153.86	153.86	43.081	**160.30**	20.4	525	0.25	223.00	1.00	1.09
COPE DR	145B	145A	0.09		0	0	0	125.23	8075	3.05	99.77				28.72			17.45	0.09	153.95	43.106	**160.33**	34.4	525	0.25	223.00	1.00	1.09
COPE DR	145A	145	0.12		0	0	0	125.35	8075	3.05	99.77				28.72			17.45	0.12	154.07	43.140	**160.36**	46.4	525	0.25	223.00	1.00	1.09
COPE DR	145	146	23.14		0	0	2811	148.49	10886	2.92	128.77				28.72			17.45	23.14	177.21	49.619	**195.84**	78.0	525	0.25	223.00	1.00	1.14
HENBURY WAY	134A	134	0.43		9	0	24	0.43	24	4.00	0.39							0.00	0.43	0.43	0.120	**0.51**	58.3	200	0.65	26.88	0.84	0.00
HENBURY WAY	134	141	0.06		0	0	0	0.49	24	4.00	0.39							0.00	0.06	0.49	0.137	**0.53**	42.6	200	0.65	26.88	0.84	0.00
ALSON MILLS WAY	135	136	0.68		16	0	43	0.68	43	4.00	0.70							0.00	0.68	0.68	0.190	**0.89**	79.9	200	0.65	26.88	0.84	0.34
ALSON MILLS WAY	136	142	0.06		0	0	0	0.74	43	4.00	0.70							0.00	0.06	0.74	0.207	**0.91**	41.6	200	0.82	30.40	0.95	0.38
WHITEFORD WAY	137	138	0.81		22	0	59	0.81	59	4.00	0.96							0.00	0.81	0.81	0.227	**1.19**	101.1	200	0.78	29.44	0.92	0.43
WHITEFORD WAY	138	143	0.18		2	0	5	0.99	64	4.00	1.04							0.00	0.18	0.99	0.277	**1.32**	54.4	200	0.78	29.44	0.92	0.43
NORTHGRAVES	129	139	0.22		4	0	11	0.22	11	4.00	0.18							0.00	0.22	0.22	0.062	**0.24**	26.7	200	0.65	26.88	0.84	0.00
NORTHGRAVES	139	140	0.29		7	0	19	0.51	30	4.00	0.49							0.00	0.29	0.51	0.143	**0.63**	31.2	200	0.45	22.40	0.70	0.28
NORTHGRAVES	140	141	0.64		16	0	43	1.15	73	4.00	1.18							0.00	0.64	8.00	2.240	**3.42**	87.6	200	0.65	26.88	0.84	0.55
NORTHGRAVES	141	142	0.60		16	0	43	2.24	140	4.00	2.27							0.00	0.60	9.09	2.545	**4.82**	85.7	200	0.35	19.84	0.62	0.50
NORTHGRAVES	142	143	0.57		15	0	41	3.55	224	4.00	3.63							0.00	0.57	10.40	2.912	**6.54**	79.8	200	0.55	24.96	0.78	0.64
NORTHGRAVES	143	144	0.44		11	0	30	4.98	318	4.00	5.15							0.00	0.44	11.83	3.312	**8.46**	60.0	200	0.69	27.84	0.87	0.76
NORTHGRAVES	144	149	0.42		10	0	27	5.40	345	4.00	5.59							0.00	0.42	12.25	3.430	**9.02**	64.5	200	0.69	27.84	0.87	0.77

Stantec

Cavanagh Construction

SOHO Development Phase 1 and 2

DATE: April 2007
REVISION: October 2007
DESIGNED BY: MJS
CHECKED BY: KK

SANITARY SEWER DESIGN SHEET

(City of Ottawa)

FILE NUMBER: 1604-00502

DESIGN PARAMETERS

AVG. DAILY FLOW / PERSON =	350	l/p/day	COMMERCIAL	50,000.00	l/Ha/day
MINIMUM VELOCITY =	0.60	m/s	LIGHT INDUSTRIAL	35,000.00	l/Ha/day
n =	0.013		INSTITUTIONAL	0.60	l/s/Ha
MAX PEAK FACTOR =	4.0		INFILTRATION	0.28	l/s/Ha
MIN PEAK FACTOR =	2.4		RESIDENTIAL HARMON PEAKING FACTOR PERSONS/UNIT =		4.0
			KANATA WEST REPORT PERSONS/UNIT =		3.0
Peaking Factor Industrial:	1.5		POPULATION DENSITY PER UNIT =	Single Family =	3.4
Peaking Factor Comm. / Inst.:	1.5			Townhouse =	2.7

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	UNITS* (KWR)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	**TOTAL FLOW (l/s)**	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	(FULL) (m/s)	VEL. (ACT.) (m/s)
TABARET STREET	111A	111	0.67		24	0	65	0.67	65	4.00	1.05							0.00	0.67	0.67	0.188	**1.24**	84.5	200	0.45	22.40	0.70	0.33
TABARET STREET	111	119	0.70		22	0	59	0.70	59	2.40	0.57							0.00	0.70	0.70	0.196	**0.77**	116.0	200	0.45	22.40	0.70	
REGIMENT AVENUE	112A	112	0.57		20	0	54	0.57	54	4.00	0.88							0.00	0.57	0.57	0.160	**1.04**	68.8	200	0.65	26.88	0.84	0.34
REGIMENT AVENUE	112	113	0.65		21	0	57	1.22	111	4.00	1.80							0.00	0.65	1.22	0.342	**2.14**	91.8	200	0.70	27.84	0.87	0.45
REGIMENT AVENUE	113	121	0.02		0	0	0	1.24	111	2.40	1.08							0.00	0.02	1.24	0.347	**1.43**	21.8	200	0.70	27.84	0.87	
PEPPERVILLE CRESCENT	114	115	0.62		21	0	57	0.62	57	4.00	0.92							0.00	0.62	0.62	0.174	**1.09**	67.6	200	0.40	21.12	0.66	0.31
PEPPERVILLE CRESCENT	115	116	0.81		27	0	73	1.43	130	4.00	2.11							0.00	0.81	1.43	0.400	**2.51**	105.0	200	0.40	21.12	0.66	0.41
PEPPERVILLE CRESCENT	116	117	0.16		3	0	8	1.59	138	4.00	2.24							0.00	0.16	1.59	0.445	**2.69**	8.5	200	0.40	21.12	0.66	0.44
PEPPERVILLE CRESCENT	117	118	0.47		15	0	41	2.06	179	4.00	2.90							0.00	0.47	2.06	0.577	**3.48**	55.0	200	0.40	21.12	0.66	0.48
PEPPERVILLE CRESCENT	118	119	0.09		2	0	5	2.15	184	4.00	2.98							0.00	0.09	2.15	0.602	**3.58**	21.6	200	0.40	21.12	0.66	0.48
PEPPERVILLE CRESCENT	119	120	0.28		8	0	22	3.13	265	4.00	4.29							0.00	0.28	3.13	0.876	**5.17**	38.4	200	0.40	21.12	0.66	0.53
PEPPERVILLE CRESCENT	120	121	0.45		15	0	41	3.58	306	4.00	4.96							0.00	0.45	3.58	1.002	**5.96**	62.0	200	0.40	21.12	0.66	0.56
PEPPERVILLE CRESCENT	121	122	0.56		17	0	46	5.38	463	3.99	7.48							0.00	0.56	5.38	1.506	**8.99**	72.9	200	0.40	21.12	0.66	0.63
PEPPERVILLE CRESCENT	122	123	0.13		2	0	5	5.51	468	3.99	7.56							0.00	0.13	5.51	1.543	**9.10**	8.9	200	0.40	21.12	0.66	0.63
PEPPERVILLE CRESCENT	123	125	0.12		3	0	8	5.63	476	3.99	7.69							0.00	0.12	5.63	1.576	**9.27**	22.3	200	0.45	22.40	0.70	0.66
PEPPERVILLE CRESCENT	124A	124	0.53		19	0	51	0.53	51	4.00	0.83							0.00	0.53	0.53	0.148	**0.98**	64.6	200	0.50	23.68	0.74	0.35
PEPPERVILLE CRESCENT	124	125	0.48		17	0	46	1.01	97	4.00	1.57							0.00	0.48	1.01	0.283	**1.85**	63.9	200	1.50	40.96	1.28	0.60
EASEMENT	125	125A	0.04		0	0	0	6.68	573	3.94	9.15							0.00	0.04	6.68	1.870	**11.02**	52.1	200	0.40	21.12	0.66	0.67
BLOCK 84-A ****	125C	125B	0.27		20	0	54	0.27	54	4.00	0.88							0.00	0.27	0.27	0.076	**0.96**	50.6	200	0.65	26.88	0.84	0.34
BLOCK 84-A ****	125B	125A	0.30		24		65	0.57	119	4.00	1.93							0.00	0.30	0.57	0.160	**2.09**	66.5	200	0.40	21.12	0.66	0.38
EASEMENT	125A	149	0.04		0		0	7.29	692	3.90	10.93							0.00	0.04	7.29	2.041	**12.97**	47.9	200	0.40	21.12	0.66	0.69
COPE DR	146	147	0.21		0	0	0	151.40	11158	2.91	131.53						28.72	17.45	0.21	177.42	49.678	**198.66**	87.5	525	0.25	223.00	1.00	1.14
COPE DR	147	148	0.17		0	0	0	156.55	11568	2.89	135.43						28.72	17.45	0.17	182.57	51.120	**204.00**	70.9	525	0.25	223.00	1.00	1.15
COPE DR	148	149	0.13		0	0	0	156.68	11568	2.89	135.43						28.72	17.45	0.13	182.70	51.156	**204.04**	58.3	525	0.25	223.00	1.00	1.15
COPE DR ****	149	150	0.48		12	0	32	169.85	12637	2.85	145.90						28.72	17.45	0.48	202.72	56.762	**220.11**	111.9	525	0.25	223.00	1.00	1.16
COPE DR	150	151	0.13		0	0	0	169.98	12637	2.85	145.90						28.72	17.45	0.13	202.85	56.798	**220.15**	57.4	525	0.25	223.00	1.00	1.16

Stantec

Cavanagh Construction

SOHO Development Phase 1 and 2

DATE: April 2007
REVISION: October 2007
DESIGNED BY: MJS
CHECKED BY: KK

SANITARY SEWER DESIGN SHEET

(City of Ottawa)

FILE NUMBER: 1604-00502

DESIGN PARAMETERS

AVG. DAILY FLOW / PERSON =	350	l/p/day	COMMERCIAL	50,000.00	l/Ha/day
MINIMUM VELOCITY =	0.60	m/s	LIGHT INDUSTRIAL	35,000.00	l/Ha/day
n =	0.013		INSTITUTIONAL	0.60	l/s/Ha
MAX PEAK FACTOR =	4.0		INFILTRATION	0.28	l/s/Ha
MIN PEAK FACTOR =	2.4		RESIDENTIAL HARMON PEAKING FACTOR PERSONS/UNIT =		4.0
			KANATA WEST REPORT PERSONS/UNIT =		3.0
Peaking Factor Industrial:	1.5		POPULATION DENSITY PER UNIT =	Single Family =	3.4
Peaking Factor Comm. / Inst.:	1.5			Townhouse =	2.7

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	UNITS* (KWR)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	**TOTAL FLOW (l/s)**	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	(FULL) (m/s)	VEL. (ACT.) (m/s)
WESTHALL WAY	210	209	0.29		8	0	22	0.29	22	4.00	0.36							0.00	0.29	0.29	0.081	**0.44**	56.0	200	0.65	26.88	0.84	0.00
WESTHALL WAY	209	206	0.21		6	0	16	0.50	38	4.00	0.62							0.00	0.21	0.50	0.140	**0.76**	46.1	200	0.50	23.68	0.74	0.30
CARRONBRIDGE CIRCLE	202	201	0.13		3	0	8	0.13	8	4.00	0.13							0.00	0.13	0.13	0.036	**0.17**	8.3	200	0.65	26.88	0.84	0.00
CARRONBRIDGE CIRCLE	201	210	0.45		13	0	35	0.58	43	4.00	0.70							0.00	0.45	0.58	0.162	**0.86**	55.8	200	0.50	23.68	0.74	0.30
CARRONBRIDGE CIRCLE	210	211	0.43		12	0	32	1.01	75	4.00	1.22							0.00	0.43	1.01	0.283	**1.50**	70.2	200	0.50	23.68	0.74	0.38
CARRONBRIDGE CIRCLE	211	212	0.21		4	0	11	1.22	86	4.00	1.39							0.00	0.21	1.22	0.342	**1.73**	11.0	200	0.50	23.68	0.74	0.38
CARRONBRIDGE CIRCLE	212	213	0.45		14	0	38	1.67	124	4.00	2.01							0.00	0.45	1.67	0.468	**2.48**	54.2	200	0.50	23.68	0.74	0.46
CARRONBRIDGE CIRCLE	213	214	0.33		9	0	24	2.00	148	4.00	2.40							0.00	0.33	2.00	0.560	**2.96**	54.8	200	0.50	23.68	0.74	0.49
CARRONBRIDGE CIRCLE	202	203	0.56		17	0	46	0.56	46	4.00	0.75							0.00	0.56	0.56	0.157	**0.91**	72.3	200	0.40	21.12	0.66	0.31
CARRONBRIDGE CIRCLE	203	204	0.24		4	0	11	0.80	57	4.00	0.92							0.00	0.24	0.80	0.224	**1.14**	14.1	200	0.45	22.40	0.70	0.33
CARRONBRIDGE CIRCLE	204	205	0.18		5	0	14	0.98	71	4.00	1.15							0.00	0.18	0.98	0.274	**1.42**	34.0	200	0.45	22.40	0.70	0.36
CARRONBRIDGE CIRCLE	205	206	0.15		3	0	8	1.13	79	4.00	1.28							0.00	0.15	1.13	0.316	**1.60**	32.7	200	0.45	22.40	0.70	0.36
CARRONBRIDGE CIRCLE	206	207	0.23		6	0	16	1.86	133	4.00	2.16							0.00	0.23	1.86	0.521	**2.68**	33.4	200	0.45	22.40	0.70	0.43
CARRONBRIDGE CIRCLE	207	208	0.24		7	0	19	2.10	152	4.00	2.46							0.00	0.24	2.10	0.588	**3.05**	34.3	200	0.45	22.40	0.70	0.46
CARRONBRIDGE CIRCLE	208	214	0.45		11	0	30	2.55	182	4.00	2.95							0.00	0.45	2.55	0.714	**3.66**	50.6	200	1.00	33.60	1.05	0.65
CARRONBRIDGE CIRCLE	214	215	0.17		4	0	11	4.72	341	4.00	5.53							0.00	0.17	4.72	1.322	**6.85**	32.1	200	0.50	23.68	0.74	0.63
CARRONBRIDGE CIRCLE	215	216	0.34		8	0	22	5.06	363	4.00	5.88							0.00	0.34	5.06	1.417	**7.30**	37.6	200	0.50	23.68	0.74	0.64
CARRONBRIDGE CIRCLE	216	217	0.23		6	0	16	5.29	379	4.00	6.14							0.00	0.23	5.29	1.481	**7.62**	39.3	200	0.50	23.68	0.74	0.65
CARRONBRIDGE CIRCLE	217	218	0.16		3	0	8	5.45	387	4.00	6.27							0.00	0.16	5.45	1.526	**7.80**	10.5	200	0.50	23.68	0.74	0.65
CARRONBRIDGE CIRCLE	218	219	0.33		9	0	24	5.78	411	4.00	6.66							0.00	0.33	5.78	1.618	**8.28**	42.7	200	0.50	23.68	0.74	0.67
CARRONBRIDGE CIRCLE **	219	151A	0.14		0	0	0	5.92	411	4.00	6.66							0.00	0.14	5.92	1.658	**63.32**	45.9	450	0.16	118.08	0.72	0.73
BLOCK 85 ****	151B	151A	0.36		24	0	65	0.36	65	4.00	1.05							0.00	0.36	0.36	0.101	**1.15**	68.0	200	0.65	26.88	0.84	0.39
AKERSON **	151A	151	0.12		0	0	0	6.40	476	3.99	7.69							0.00	0.12	6.40	1.792	**64.48**	50.2	450	0.16	118.08	0.72	0.73
COPE / AKERSON **	151	EX.	0.01		0	0	0	176.39	13113	2.84	150.86			28.72				17.45	0.01	209.26	58.593	**281.90**	3.4	600	0.25	321.20	1.10	1.25
* Population Derived from average of High Density and M			122.5	persons/gross ha																								

** Added flow of 55l/s generated from Bridelwood Trails

*** Added future residential area = 125ha, population 8075 and Industrial area of 28.72ha (See OMM/Trow Drawing MP 14589-SA1 Rev 5)

**** Assume that these units are stacked towns and multiply the number of units by 4

Appendix C STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET AND ROOF STORAGE CALCULATIONS

Stantec

Terry Fox Drive and Cope Drive
Commercial Shopping Development

DATE: 2018-07-24
REVISION: 1
DESIGNED BY: TRK
CHECKED BY: -

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401397

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min
BEDDING CLASS = B

LOCATION			DRAINAGE AREA																						PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
R1006A	9	1006	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.3	0.3	0.3	14.3	200	200	CIRCULAR	PVC	-	1.00	33.3	**0.96%**	1.05	0.28	0.86
																				10.86																			
	10	1006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	7.7	200	200	CIRCULAR	PVC	-	1.00	33.3	**0.00%**	1.05	0.00	0.00
																				10.00																			
L1006B	506	1006	0.34	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.220	0.220	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	46.9	38.4	250	250	CIRCULAR	PVC	-	1.00	60.4	**77.71%**	1.22	1.18	0.54
																				10.54																			
L1006C, L1006A	1006	1005	0.32	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.235	0.455	0.000	0.000	0.000	0.000	0.000	0.000	10.86	73.67	99.88	117.06	171.10	0.0	0.3	93.4	23.4	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	**46.54%**	0.90	0.75	0.52
																				11.37																			
R1005B	14	1005	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.6	0.6	0.6	4.3	200	200	CIRCULAR	PVC	-	1.00	33.3	**1.89%**	1.05	0.34	0.21
																				10.21																			
L1005A	1005	1004	0.56	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.447	0.902	0.000	0.000	0.000	0.000	0.000	0.000	11.37	71.90	97.45	114.21	166.90	0.0	1.0	181.1	98.3	750	750	CIRCULAR	CONCRETE	-	0.10	367.3	**49.31%**	0.81	0.69	2.38
																				13.75																			
R1005A	15	1004	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	1.6	1.6	1.6	4.3	200	200	CIRCULAR	PVC	-	1.00	33.3	**4.74%**	1.05	0.45	0.16
																				10.16																			
L1003B	1004	1003	0.56	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.468	1.370	0.000	0.000	0.000	0.000	0.000	0.000	13.75	64.87	87.81	102.86	150.24	0.0	2.5	249.4	40.6	750	750	CIRCULAR	CONCRETE	-	0.10	367.3	**67.90%**	0.81	0.75	0.90
																				14.65																			
R1003A	16	1003	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	17.5	200	200	CIRCULAR	PVC	-	1.00	33.3	**0.00%**	1.05	0.00	0.00
																				10.00																			
R1003B	17	1003	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.6	0.6	0.6	27.0	200	200	CIRCULAR	PVC	-	1.00	33.3	**1.89%**	1.05	0.34	1.31
																				11.31																			
L1003A	1003	1000	0.30	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.250	1.620	0.000	0.000	0.000	0.000	0.000	0.000	14.65	62.60	84.70	99.19	144.86	1.3	4.4	286.1	101.7	825	825	CIRCULAR	CONCRETE	-	0.10	473.6	**60.42%**	0.86	0.78	2.18
																				16.83																			
	500	1001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	17.7	300	300	CIRCULAR	PVC	-	1.00	96.2	**0.00%**	1.37	0.00	0.00
																				10.00																			
R1001A	20	1001	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.6	0.6	0.6	22.1	200	200	CIRCULAR	PVC	-	1.00	33.3	**1.89%**	1.05	0.34	1.07
																				11.07																			
R1001B	21	1001	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	1.0	1.0	1.0	26.6	200	200	CIRCULAR	PVC	-	1.00	33.3	**2.85%**	1.05	0.38	1.16
																				11.16																			
L1001A	1001	1000	0.29	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.198	0.198	0.000	0.000	0.000	0.000	0.000	0.000	11.16	72.61	98.42	115.34	168.57	0.0	1.6	41.4	13.5	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**31.14%**	0.81	0.60	0.37
																				11.54																			
R1002A	24	1002	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	3.8	3.8	3.8	9.3	200	200	CIRCULAR	PVC	-	1.00	33.3	**11.38%**	1.05	0.57	0.27
	1002	1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.27	75.78	102.79	120.49	176.13	0.0	3.8	3.8	25.8	300	300	CIRCULAR	PVC	-	1.00	96.2	**3.94%**	1.37	0.56	0.77
																				11.04																			
L1000A	1000	3	0.34	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.291	2.108	0.000	0.000	0.000	0.000	0.000	0.000	16.83	57.77	78.08	91.42	133.45	0.0	9.8	348.1	61.3	825	825	CIRCULAR	CONCRETE	-	0.10	473.6	**73.51%**	0.86	0.83	1.24
																				18.07									825	825									

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFA
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0038	1	0.025	72	1	1	0.025
0.050	0.0003	0.0038	5	0.050	289	5	5	0.050
0.075	0.0003	0.0038	22	0.075	650	16	22	0.075
0.100	0.0003	0.0038	60	0.100	1156	38	60	0.100
0.125	0.0003	0.0038	135	0.125	1806	75	135	0.125
0.150	0.0003	0.0038	265	0.150	2600	130	265	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
4.8	1265.3	4.8	0.35148
21.0	4279.6	16.2	1.54026
59.4	10155.7	38.4	4.36128
134.6	19847.6	75.1	9.87452
264.4	34309.3	129.9	19.4049

Rooftop Storage Summary

Total Building Area (sq.m)		3250
Assume Available Roof Area (sq.	80%	2600
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		12
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		265
Estimated 100 Year Drawdown Time (h)		14.2

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.004	0.004	-
Depth (m)	0.093	0.136	0.150
Volume (cu.m)	49.1	193.0	265.0
Draintime (hrs)	3.6	14.2	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFB
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0006	0	0.025	13	0	0	0.025
0.050	0.0003	0.0006	1	0.050	51	1	1	0.050
0.075	0.0003	0.0006	4	0.075	114	3	4	0.075
0.100	0.0003	0.0006	10	0.100	203	7	10	0.100
0.125	0.0003	0.0006	24	0.125	317	13	24	0.125
0.150	0.0003	0.0006	46	0.150	456	23	46	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.8	1298.8	0.8	0.36079
3.6	4438.1	2.8	1.59359
10.3	10588.9	6.7	4.53495
23.4	20755.1	13.1	10.3003
46.1	35940.6	22.7	20.2838

Rooftop Storage Summary

Total Building Area (sq.m)		570
Assume Available Roof Area (sq.	80%	456
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		2
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		46
Estimated 100 Year Drawdown Time (h)		15.1

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	Closed
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.094	0.137	0.150
Volume (cu.m)	8.7	34.3	46.2
Draintime (hrs)	3.8	15.1	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFC
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0009	0	0.025	18	0	0	0.025
0.050	0.0003	0.0009	1	0.050	74	1	1	0.050
0.075	0.0003	0.0009	5	0.075	166	4	5	0.075
0.100	0.0003	0.0009	15	0.100	295	10	15	0.100
0.125	0.0003	0.0009	34	0.125	461	19	34	0.125
0.150	0.0003	0.0009	67	0.150	664	33	67	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
1.2	1272.9	1.2	0.35359
5.3	4332.4	4.1	1.55704
15.1	10315.4	9.8	4.42244
34.2	20196.4	19.1	10.0326
67.3	34950.0	33.1	19.7409

Rooftop Storage Summary

Total Building Area (sq.m)		830
Assume Available Roof Area (sq.	80%	664
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		3
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		67
Estimated 100 Year Drawdown Time (h)		14.5

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	Closed
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.093	0.137	0.150
Volume (cu.m)	12.5	49.6	67.4
Draintime (hrs)	3.7	14.5	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFD
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0013	0	0.025	25	0	0	0.025
0.050	0.0003	0.0013	2	0.050	100	2	2	0.050
0.075	0.0003	0.0013	7	0.075	226	6	7	0.075
0.100	0.0003	0.0013	21	0.100	402	13	21	0.100
0.125	0.0003	0.0013	47	0.125	628	26	47	0.125
0.150	0.0003	0.0013	92	0.150	904	45	92	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
1.6	1306.9	1.6	0.36303
7.2	4438.1	5.6	1.59584
20.6	10554.4	13.3	4.52762
46.6	20650.9	26.1	10.264
91.7	35722.7	45.1	20.1869

Rooftop Storage Summary

Total Building Area (sq.m)		1130
Assume Available Roof Area (sq.	80%	904
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		4
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		92
Estimated 100 Year Drawdown Time (h)		14.9

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min	L/s	Notch Rating			
	Open	75%	50%	25%	**Closed**	
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**	
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**	
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**	
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**	
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**	
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**	

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.093	0.137	0.150
Volume (cu.m)	17.2	67.8	91.9
Draintime (hrs)	3.8	14.9	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFE
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0016	0	0.025	31	0	0	0.025
0.050	0.0003	0.0016	2	0.050	125	2	2	0.050
0.075	0.0003	0.0016	9	0.075	282	7	9	0.075
0.100	0.0003	0.0016	26	0.100	501	17	26	0.100
0.125	0.0003	0.0016	59	0.125	783	33	59	0.125
0.150	0.0003	0.0016	115	0.150	1128	56	115	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.1	1308.5	2.1	0.36348
9.1	4438.1	7.0	1.59628
25.7	10547.5	16.6	4.52615
58.2	20630.1	32.5	10.2567
114.5	35679.1	56.3	20.1676

Rooftop Storage Summary

Total Building Area (sq.m)		1410
Assume Available Roof Area (sq.	80%	1128
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		5
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		115
Estimated 100 Year Drawdown Time (h)		14.9

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	Closed
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.002	0.002	-
Depth (m)	0.093	0.137	0.150
Volume (cu.m)	21.5	84.6	114.8
Draintime (hrs)	3.8	14.9	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFF
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0006	0	0.025	13	0	0	0.025
0.050	0.0003	0.0006	1	0.050	52	1	1	0.050
0.075	0.0003	0.0006	4	0.075	116	3	4	0.075
0.100	0.0003	0.0006	11	0.100	206	7	11	0.100
0.125	0.0003	0.0006	24	0.125	322	13	24	0.125
0.150	0.0003	0.0006	47	0.150	464	23	47	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.8	1322.3	0.8	0.36731
3.7	4517.3	2.9	1.62213
10.5	10776.8	6.8	4.61567
23.8	21122.0	13.3	10.4829
46.9	36574.6	23.1	20.6425

Rooftop Storage Summary

Total Building Area (sq.m)		580
Assume Available Roof Area (sq.	80%	464
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		2
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		47
Estimated 100 Year Drawdown Time (h)		15.4

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	Closed
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.094	0.137	0.150
Volume (cu.m)	8.9	35.0	47.0
Draintime (hrs)	3.9	15.4	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFG
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0006	0	0.025	8	0	0	0.025
0.050	0.0003	0.0006	1	0.050	33	1	1	0.050
0.075	0.0003	0.0006	2	0.075	74	2	2	0.075
0.100	0.0003	0.0006	7	0.100	132	4	7	0.100
0.125	0.0003	0.0006	15	0.125	206	8	15	0.125
0.150	0.0003	0.0006	30	0.150	296	15	30	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.5	829.2	0.5	0.23034
2.3	2853.1	1.8	1.02285
6.6	6831.8	4.3	2.92057
15.1	13417.0	8.5	6.64751
29.8	23260.3	14.7	13.1087

Rooftop Storage Summary

Total Building Area (sq.m)		370
Assume Available Roof Area (sq.	80%	296
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		2
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		30
Estimated 100 Year Drawdown Time (h)		8.8

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.088	0.133	0.150
Volume (cu.m)	4.6	19.9	29.8
Draintime (hrs)	2.0	8.8	

Project #PROJECT #, PROJECT DESCRIPTION
Roof Drain Design Sheet, Area ROOFG
Standard Zurn Model Z-105-5 Control-Flo Single Notch Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0003	0	0.025	6	0	0	0.025
0.050	0.0003	0.0003	0	0.050	25	0	0	0.050
0.075	0.0003	0.0003	2	0.075	56	1	2	0.075
0.100	0.0003	0.0003	5	0.100	100	3	5	0.100
0.125	0.0003	0.0003	11	0.125	156	6	11	0.125
0.150	0.0003	0.0003	22	0.150	224	11	22	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.4	1235.7	0.4	0.34326
1.7	4279.6	1.4	1.53203
5.0	10282.2	3.2	4.38819
11.4	20229.7	6.4	10.0076
22.4	35108.5	11.1	19.7599

Rooftop Storage Summary

Total Building Area (sq.m)		280
Assume Available Roof Area (sq.	80%	224
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		1
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		22
Estimated 100 Year Drawdown Time (h)		14.8

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Zurn Drain Catalogue

Head (m)	L/min Open	L/s 75%	Notch Rating 50%	25%	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.3155**
0.075	0.9464	0.8675	0.7886	0.7098	**0.3155**
0.100	1.2618	1.1041	0.9464	0.7886	**0.3155**
0.125	1.5773	1.3407	1.1041	0.8675	**0.3155**
0.150	1.8927	1.5773	1.2618	0.9464	**0.3155**

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	**5yr**	**100yr**	**Available**
Qresult (cu.m/s)	0.000	0.000	-
Depth (m)	0.083	0.137	0.150
Volume (cu.m)	2.8	16.8	22.5
Draintime (hrs)	2.5	14.8	

C.2 SAMPLE PCSWMM MODEL INPUT (100YR 3HR CHICAGO)

```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
START_DATE           09/14/2011
START_TIME           00:00:00
REPORT_START_DATE    09/14/2011
REPORT_START_TIME    00:00:00
END_DATE             09/15/2011
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:00:20
WET_STEP             00:00:20
DRY_STEP             00:05:00
ROUTING_STEP         1
ALLOW_PONDING        YES
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  D-W
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              6

[EVAPORATION]
;;Type           Parameters
;;-------------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
```



```
;;-------------- --------- ------ ------ ----------
RG1              INTENSITY 0:10   1.0    TIMESERIES 100yr3hrChicago

[SUBCATCHMENTS]
;;                                                    Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet              Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ------------------ -------- -------- -------- -------- -------- --------
L100A            RG1              L100A-S            0.341945 92.857   76.94    2        0
L101A            RG1              L101A-S            0.290502 68.571   65.36    2        0
L103A            RG1              L103A-S            0.29782  91.429   67.01    2        0
L103B            RG1              L103B-S            0.557091 91.429   125.35   2        0
L105A            RG1              L105A-S            0.559028 85.714   125.78   2        0
L106A            RG1              106-MH             0.071578 100      16.11    2        0
L106B            RG1              L106B-S            0.338465 64.286   76.15    2        0
L106C            RG1              L106B-S            0.2488   72.857   55.98    2        0
R101A            RG1              R101A-S            0.05689  100      12.8     2        0
R101B            RG1              R101B-S            0.082874 100      18.65    2        0
R102A            RG1              R102A-S            0.324836 100      73.09    2        0
R103A            RG1              R103A-S            0.113338 100      25.5     2        0
R103B            RG1              R103B-S            0.037165 100      8.36     2        0
R105A            RG1              R105A-S            0.141198 100      31.77    2        0
R105B            RG1              R105B-S            0.057598 100      12.96    2        0
R106B            RG1              R106B-S            0.027871 100      6.27     2        0
U100A            RG1              U100A-OF           0.100156 8.571    22.54    2        0
U100B            RG1              U100B-OF           0.010342 100      2.33     2        0
U100C            RG1              U100C-OF           0.009976 100      2.24     2        0
U100D            RG1              U100D-OF           0.014594 100      3.28     2        0
```

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
L1000A	0.013	0.25	1.57	4.67	0	OUTLET	
L1001A	0.013	0.25	1.57	4.67	0	OUTLET	
L1003A	0.013	0.25	1.57	4.67	0	OUTLET	
L1003B	0.013	0.25	1.57	4.67	0	OUTLET	
L1005A	0.013	0.25	1.57	4.67	0	OUTLET	
L1006A	0.013	0.25	1.57	4.67	0	OUTLET	
L1006B	0.013	0.25	1.57	4.67	0	OUTLET	
L1006C	0.013	0.25	1.57	4.67	0	OUTLET	
R1001A	0.013	0.25	1.57	4.67	0	OUTLET	
R1001B	0.013	0.25	1.57	4.67	0	OUTLET	
R1002A	0.013	0.25	1.57	4.67	0	OUTLET	
R1003A	0.013	0.25	1.57	4.67	0	OUTLET	
R1003B	0.013	0.25	1.57	4.67	0	OUTLET	
R1005A	0.013	0.25	1.57	4.67	0	OUTLET	
R1005B	0.013	0.25	1.57	4.67	0	OUTLET	
R1006B	0.013	0.25	1.57	4.67	0	OUTLET	
U100A	0.013	0.25	1.57	4.67	0	PERVIOUS	100
U100B	0.013	0.25	1.57	4.67	0	OUTLET	
U100C	0.013	0.25	1.57	4.67	0	OUTLET	
U100D	0.013	0.25	1.57	4.67	0	OUTLET	

[INFILTRATION]

;;Subcatchment	MaxRate	MinRate	Decay	DryTime	MaxInfil
L1000A	76.2	13.2	4.14	7	0
L1001A	76.2	13.2	4.14	7	0
L1003A	76.2	13.2	4.14	7	0
L1003B	76.2	13.2	4.14	7	0
L1005A	76.2	13.2	4.14	7	0
L1006A	76.2	13.2	4.14	7	0
L1006B	76.2	13.2	4.14	7	0
L1006C	76.2	13.2	4.14	7	0
R1001A	76.2	13.2	4.14	7	0
R1001B	76.2	13.2	4.14	7	0
R1002A	76.2	13.2	4.14	7	0
R1003A	76.2	13.2	4.14	7	0
R1003B	76.2	13.2	4.14	7	0
R1005A	76.2	13.2	4.14	7	0
R1005B	76.2	13.2	4.14	7	0
R1006B	76.2	13.2	4.14	7	0
U100A	76.2	13.2	4.14	7	0
U100B	76.2	13.2	4.14	7	0
U100C	76.2	13.2	4.14	7	0
U100D	76.2	13.2	4.14	7	0

[OUTFALLS]

;;Name	Invert Elev.	Outfall Type	Stage/Table Time Series	Tide Gate	Route To
OF2	97	FREE		NO	
OF-MJ	96	FREE		NO	
OF-MN	93.61	FREE		NO	
U100A-OF	0	FREE		NO	
U100B-OF	98.2	FREE		NO	
U100C-OF	98.2	FREE		NO	
U100D-OF	98.2	FREE		NO	

[STORAGE]

;;Name	Invert Elev.	Max. Depth	Init. Depth	Storage Curve	Curve Params			Ponded Area	Evap. Frac.	Infiltration parameters
1000-MH	93.846	3.223	0	FUNCTIONAL	0	0	0	0	0	
1001-MH	94.248	2.705	0	FUNCTIONAL	0	0	0	0	0	
1002-MH	94.629	2.884	0	FUNCTIONAL	0	0	0	0	0	
1003-MH	93.978	3.605	0	FUNCTIONAL	0	0	0	0	0	
1004-MH	94.094	3.41	0	FUNCTIONAL	0	0	0	0	0	
1005-MH	94.222	3.123	0	FUNCTIONAL	0	0	0	0	0	
1006-MH	94.494	2.8	0	FUNCTIONAL	0	0	0	0	0	
L1000A-S	94.92	2.33	0	TABULAR	L1000A-S			0	0	
L1000A-S(1)	96.97	0.35	0	FUNCTIONAL	0	0	0	0	0	
L1001A-S	94.82	2.33	0	TABULAR	L1001A-S			0	0	
L1003A-S	95.02	2.33	0	TABULAR	L1003A-S			0	0	
L1003B-S	95.9	1.73	0	TABULAR	L1003B-S			0	0	
L1003B-S(1)	97.5	0.35	0	FUNCTIONAL	0	0	0	0	0	
L1005A-S	94.13	3.33	0	TABULAR	L1005A-S			0	0	
L1006B-S	95.02	2.76	0	TABULAR	L1006B-S			0	0	
L1006B-S(1)	97.14	0.35	0	FUNCTIONAL	0	0	0	0	0	
R1001A-S	105	0.3	0	TABULAR	BLDG_B			0	0	
R1001B-S	105	0.3	0	TABULAR	BLDG_C			0	0	
R1002A-S	105	0.3	0	TABULAR	BLDG_A			0	0	
R1003A-S	105	0.3	0	TABULAR	BLDG_D			0	0	
R1003B-S	105	0.3	0	TABULAR	BLDG_G			0	0	
R1005A-S	105	0.3	0	TABULAR	BLDG_E			0	0	
R1005B-S	105	0.3	0	TABULAR	BLDG_F			0	0	
R1006B-S	105	0.3	0	TABULAR	BLDG_H			0	0	

[CONDUITS]

;;Name	Inlet Node	Outlet Node	Length	Manning N	Inlet Offset	Outlet Offset	Init. Flow	Max. Flow

;;----------	----------	----------	----------	----------	----------	----------	----------	----------
C1	L1000A-S	L1000A-S(1)	30.554	0.01	96.9	96.97	0	0
C10	L1005A-S	L1006B-S	134.169	0.013	97.11	97.43	0	0
C11	L1006B-S	L1006B-S(1)	29.472	0.013	97.43	97.14	0	0
C12	L1006B-S(1)	OF2	17.844	0.013	97.14	97	0	0
C2	L1001A-S	L1000A-S	37.468	0.013	96.8	96.9	0	0
C3	L1000A-S(1)	OF-MJ	62.343	0.013	96.97	96	0	0
C4	L1003B-S(1)	L1003B-S	54.781	0.013	97.5	97.28	0	0
C5	L1003B-S	L1003A-S	57.647	0.013	97.28	97	0	0
C6	L1003A-S	L1000A-S	35.479	0.013	97	96.9	0	0
C7	L1003B-S(1)	L1005A-S	31.42	0.013	97.5	97.11	0	0
Pipe_15	1001-MH	1000-mh	13.604	0.013	94.548	94.521	0	0
Pipe_2	1000-mh	OF-MN	61.102	0.013	94.146	94.085	0	0
Pipe_20	1002-MH	1000-mh	26.281	0.013	94.929	94.671	0	0
Pipe_3	1003-MH	1000-mh	101.814	0.013	94.278	94.176	0	0
Pipe_4	1004-MH	1003-MH	40.488	0.013	94.394	94.353	0	0
Pipe_5	1005-MH	1004-MH	98.797	0.013	94.522	94.424	0	0
Pipe_6	1006-MH	1005-MH	22.94	0.013	94.794	94.747	0	0

[ORIFICES]

;;	Inlet	Outlet	Orifice	Crest	Disch.	Flap	Open/Close
;;Name	Node	Node	Type	Height	Coeff.	Gate	Time
;;----------	----------	----------	----------	----------	----------	----	----------
L1000A-IC	L1000A-S	1000-mh	SIDE	94.92	0.572	NO	0
L1001A-IC	L1001A-S	1001-MH	SIDE	95.42	0.61	NO	0
L1003A-IC	L1003A-S	1003-MH	SIDE	95.62	0.572	NO	0
L1003B-IC	L1003B-S	1003-MH	SIDE	95.9	0.61	NO	0
L1005A-IC	L1005A-S	1005-MH	SIDE	94.87	0.572	NO	0
L1005A-IC(1)	L1005A-S	1005-MH	SIDE	94.91	0.572	NO	0
L1005A-IC(2)	L1005A-S	1005-MH	SIDE	95.21	0.572	NO	0

L1006B-IC	L1006B-S	1006-MH	SIDE	95.62	0.61	NO	0

[OUTLETS]

;;	Inlet	Outlet	Outflow	Outlet	Qcoeff/	Flap
;;Name	Node	Node	Height	Type	QTable	Qexpon Gate
;;----------	----------	----------	----------	----------	----------	---------- ----
R1001A-O	R1001A-S	1001-MH	105	TABULAR/HEAD	BLDG_B_O	NO
R1001B-O	R1001B-S	1001-MH	105	TABULAR/HEAD	BLDG_C_O	NO
R1002A-O	R1002A-S	1002-MH	105	TABULAR/HEAD	BLDG_A_O	NO
R1003A-O	R1003A-S	1003-MH	105	TABULAR/HEAD	BLDG_D_O	NO
R1003B-O	R1003B-S	1003-MH	105	TABULAR/HEAD	BLDG_G_O	NO
R1005A-O	R1005A-S	1004-MH	105	TABULAR/HEAD	BLDG_E_O	NO
R1005B-O	R1005B-S	1005-MH	105	TABULAR/HEAD	BLDG_F_O	NO
R1006B-O	R1006B-S	1006-MH	105	TABULAR/HEAD	BLDG_H_O	NO

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels
C1	TRAPEZOIDAL	0.15	8	20	20	1
C10	TRAPEZOIDAL	0.15	8	20	20	1
C11	TRAPEZOIDAL	0.15	8	20	20	1
C12	TRAPEZOIDAL	0.15	8	20	20	1
C2	TRAPEZOIDAL	0.15	8	20	20	1
C3	IRREGULAR	8.5mROW	0	0	0	1
C4	TRAPEZOIDAL	0.15	8	20	20	1
C5	TRAPEZOIDAL	0.15	8	20	20	1
C6	TRAPEZOIDAL	0.15	8	20	20	1
C7	TRAPEZOIDAL	0.15	8	20	20	1
Pipe_15	CIRCULAR	0.45	0	0	0	1
Pipe_2	CIRCULAR	0.825	0	0	0	1
Pipe_20	CIRCULAR	0.3	0	0	0	1
Pipe_3	CIRCULAR	0.825	0	0	0	1
Pipe_4	CIRCULAR	0.75	0	0	0	1
Pipe_5	CIRCULAR	0.75	0	0	0	1
Pipe_6	CIRCULAR	0.525	0	0	0	1
L1000A-IC	CIRCULAR	0.083	0	0	0	
L1001A-IC	CIRCULAR	0.083	0	0	0	

```
L1003A-IC         CIRCULAR     0.083            0          0          0
L1003B-IC         CIRCULAR     0.083            0          0          0
L1005A-IC         CIRCULAR     0.108            0          0          0
L1005A-IC(1)      CIRCULAR     0.108            0          0          0
L1005A-IC(2)      CIRCULAR     0.108            0          0          0
L1006B-IC         CIRCULAR     0.2              0          0          0

[TRANSECTS]

;Full street, width = 10m, curb = 0.15m , cross-slope = 0.02m/m, bank-slope = 0.02m/m, bank-height = 0.23m.
NC 0.02     0.02     0.014
X1 10mROW           7        4        14       0.0       0.0       0.0      0.0      0.0
GR 0.23     0        0.15     4        0        4         0.1       9        0        14
GR 0.15     14       0.23     18

;Full street, width = 8.5m, curb = 0.15m , cross-slope = 0.02m/m, bank-slope = 0.02m/m, bank-height = 0.23m.
NC 0.02     0.02     0.013
X1 16.5mROW         7        4        12.5     0.0       0.0       0.0      0.0      0.0
GR 0.23     0        0.15     4        0        4         0.13      8.25     0        12.5
GR 0.15     12.5     0.23     16.5

;Half street, width = 4.25m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height =
0.23m.
NC 0.02     0.02     0.013
X1 16.5mROW_half    4        0.0      4.25     0.0       0.0       0.0      0.0      0.0
GR 0.13     0        0        4.25     0.15     4.25      0.23      8.25

;Full street, width = 8.5m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height =
0.245m.
NC 0.02     0.02     0.013
X1 18mROW           7        4.75     13.25    0.0       0.0       0.0      0.0      0.0
GR 0.25     0        0.15     4.75     0        4.75      0.13      9        0        13.25
GR 0.15     13.25    0.25     18

;Half street, width = 4.25m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height =
0.245m.
NC 0.02     0.02     0.013
X1 18mROW_half      4        0.0      4.25     0.0       0.0       0.0      0.0      0.0
GR 0.13     0        0        4.25     0.15     4.25      0.25      9

;Full street, width = 8.5m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height = 0.27m.
NC 0.02     0.02     0.013
X1 20mROW           7        5.75     14.25    0.0       0.0       0.0      0.0      0.0
GR 0.27     0        0.15     5.75     0        5.75      0.13      10       0        14.25
GR 0.15     14.25    0.27     20.5

;Half street, width = 4.25m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height =
0.27m.
```



```
NC 0.02     0.02     0.013
X1 20mROW_half      4        0.0      4.25     0.0       0.0       0.0      0.0      0.0
GR 0.13     0        0        4.25     0.15     4.25      0.27      10

;Full street, width = 24m, curb = 0.15m , cross-slope = 0.016m/m, bank-slope = 0.02m/m, bank-height = 0.23m.
NC 0.02     0.02     0.014
X1 24mROW           7        4        28       0.0       0.0       0.0      0.0      0.0
GR 0.23     0        0.15     4        0        4         0.19      16       0        28
GR 0.15     28       0.23     32

;Half street, width = 5.5m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height = 0.28m.
NC 0.02     0.02     0.013
X1 24mROW_half      4        0.0      5.5      0.0       0.0       0.0      0.0      0.0
GR 0.17     0        0        5.5      0.15     5.5       0.28      12

;Full street, width = 5.5m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height = 0.23m.
NC 0.02     0.02     0.013
X1 8.5mROW          7        1.5      7        0.0       0.0       0.0      0.0      0.0
GR 0.18     0        0.15     1.5      0        1.5       0.08      4.25     0        7
GR 0.15     7        0.18     8.5

;Half street, width = 2.75m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.02m/m, bank-height =
0.18m.
NC 0.02     0.02     0.013
X1 8.5mROW_half     4        0.0      2.75     0.0       0.0       0.0      0.0      0.0
GR 0.08     0        0        2.75     0.15     2.75      0.18      4.25

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------
Pipe_15          0          0.02       0          NO         0
Pipe_2           0          1.32       0          NO         0
Pipe_20          0          0.64       0          NO         0
Pipe_3           0          0.06       0          NO         0
Pipe_4           0          0.14       0          NO         0
Pipe_5           0          0.14       0          NO         0
Pipe_6           0          0.06       0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
1013             Rating     0          0
1013                        1.8        563
1013                        2.15       563
1013                        2.5        563

BLDG_A_O         Rating     0.000      0
BLDG_A_O                    0.025      3.8
```

BLDG_A_O		0.050	3.8
BLDG_A_O		0.075	3.8
BLDG_A_O		0.100	3.8
BLDG_A_O		0.125	3.8
BLDG_A_O		0.150	3.8
BLDG_B_O	Rating	0.000	0
BLDG_B_O		0.025	0.6
BLDG_B_O		0.050	0.6
BLDG_B_O		0.075	0.6
BLDG_B_O		0.100	0.6
BLDG_B_O		0.125	0.6
BLDG_B_O		0.150	0.6
BLDG_C_O	Rating	0.000	0
BLDG_C_O		0.025	0.9
BLDG_C_O		0.050	0.9
BLDG_C_O		0.075	0.9
BLDG_C_O		0.100	0.9
BLDG_C_O		0.125	0.9
BLDG_C_O		0.150	0.9
BLDG_D_O	Rating	0.000	0
BLDG_D_O		0.025	1.3
BLDG_D_O		0.050	1.3
BLDG_D_O		0.075	1.3
BLDG_D_O		0.100	1.3
BLDG_D_O		0.125	1.3
BLDG_D_O		0.150	1.3
BLDG_E_O	Rating	0.000	0
BLDG_E_O		0.025	1.6
BLDG_E_O		0.050	1.6
BLDG_E_O		0.075	1.6
BLDG_E_O		0.100	1.6
BLDG_E_O		0.125	1.6
BLDG_E_O		0.150	1.6
BLDG_F_O	Rating	0.000	0
BLDG_F_O		0.025	0.6
BLDG_F_O		0.050	0.6
BLDG_F_O		0.075	0.6
BLDG_F_O		0.100	0.6
BLDG_F_O		0.125	0.6
BLDG_F_O		0.150	0.6
BLDG_G_O	Rating	0.000	0
BLDG_G_O		0.025	0.6

BLDG_G_O		0.050	0.6
BLDG_G_O		0.075	0.6
BLDG_G_O		0.100	0.6
BLDG_G_O		0.125	0.6
BLDG_G_O		0.150	0.6
BLDG_H_O	Rating	0.000	0
BLDG_H_O		0.025	0.3
BLDG_H_O		0.050	0.3
BLDG_H_O		0.075	0.3
BLDG_H_O		0.100	0.3
BLDG_H_O		0.125	0.3
BLDG_H_O		0.150	0.3
IPEX_A	Rating	0	0
IPEX_A		0.2	8.2
IPEX_A		0.26	10
IPEX_A		0.41	12
IPEX_A		0.58	14
IPEX_A		0.76	16
IPEX_A		0.95	18
IPEX_A		1.31	20
IPEX_A		1.8	21.5
IPEX_A		3	25.17
IPEX_B	Rating	0	0
IPEX_B		0.2	12.5
IPEX_B		0.25	14
IPEX_B		0.34	16
IPEX_B		0.43	18
IPEX_B		0.55	20
IPEX_B		0.68	22
IPEX_B		0.84	24
IPEX_B		1	26
IPEX_B		1.19	28
IPEX_B		1.41	30
IPEX_B		1.69	32
IPEX_B		1.79	32.5
IPEX_B		3	38.55
IPEX_C	Rating	0	0
IPEX_C		0.2	16
IPEX_C		0.26	18
IPEX_C		0.32	20
IPEX_C		0.4	22
IPEX_C		0.49	24
IPEX_C		0.58	26
IPEX_C		0.69	28

IPEX_C		0.8	30
IPEX_C		0.91	32
IPEX_C		1.02	34
IPEX_C		1.14	36
IPEX_C		1.3	38
IPEX_C		1.53	40
IPEX_C		1.78	41.5
IPEX_C		3	48.82
IPEX_D	Rating	0	0
IPEX_D		0.2	21
IPEX_D		0.38	30
IPEX_D		0.65	40
IPEX_D		1	50
IPEX_D		1.43	60
IPEX_D		2	70
IPEX_D		2.65	80
IPEX_D		3.45	90
IPEX_D		4.25	95
IPEX_F	Rating	0	0
IPEX_F		0.2	32
IPEX_F		0.35	40
IPEX_F		0.5	50
IPEX_F		0.75	60
IPEX_F		1	70
IPEX_F		1.35	80
IPEX_F		1.75	90
IPEX_F		2.3	100
IPEX_F		2.95	110
IPEX_F		3.9	120
IPEX_F		4.02	121
Model105	Rating	0	0
Model105		0.22	4.49
Model105		0.25	4.58
Model105		0.37	5.5
Model105		0.5	6.2
Model105		0.67	7
Model105		0.75	7.55
Model105		1.01	8.78
Model105		1.26	9.92
Model105		1.5	10.91
Model105		1.75	11.9
Model105		2	12.86
Model105		2.25	13.55
Model105		2.5	14.47
Model105		3	16.31

Model45	Rating	0	0
Model45		0.19	1.77
Model45		0.25	1.95
Model45		0.37	2.1
Model45		0.52	2.25
Model45		0.7	2.5
Model45		0.75	2.55
Model45		1	2.78
Model45		1.25	3
Model45		1.5	3.2
Model45		2	3.55
Model45		2.5	3.83
Model45		2.58	3.9
Model45		3	4.27
Model55	Rating	0	0
Model55		0.2	2.42
Model55		0.25	2.54
Model55		0.38	3
Model55		0.5	3.12
Model55		0.75	3.52
Model55		1.01	3.8
Model55		1.26	4.1
Model55		1.5	4.42
Model55		1.75	4.55
Model55		2	4.85
Model55		2.25	4.98
Model55		2.5	5.15
Model55		3	5.49
Model65	Rating	0	0
Model65		0.22	2.78
Model65		0.25	3.01
Model65		0.37	3.5
Model65		0.5	3.85
Model65		0.75	4.52
Model65		1.01	5.02
Model65		1.26	5.46
Model65		1.5	5.8
Model65		1.75	6.2
Model65		2	6.5
Model65		2.25	6.8
Model65		2.5	7.15
Model65		3	7.85
Model75	Rating	0	0
Model75		0.22	3.27

Model75		0.25	3.41
Model75		0.37	4
Model75		0.5	4.5
Model75		0.62	4.99
Model75		0.75	5.42
Model75		1.01	6.15
Model75		1.26	6.77
Model75		1.5	7.4
Model75		1.75	7.93
Model75		2	8.42
Model75		2.25	8.9
Model75		2.5	9.4
Model75		3	10.1
Model85	Rating	0	0
Model85		0.25	3.45
Model85		0.35	4
Model85		0.4	4.5
Model85		0.5	4.8
Model85		0.62	5.5
Model85		0.75	5.88
Model85		1.01	6.8
Model85		1.26	7.62
Model85		1.5	8.35
Model85		1.75	8.97
Model85		2	9.55
Model85		2.25	10.10
Model85		2.5	10.6
Model85		3	11.6
Model95	Rating	0	0
Model95		0.25	3.58
Model95		0.28	4
Model95		0.38	5
Model95		0.5	5.44
Model95		0.6	6
Model95		0.75	6.75
Model95		1.01	7.82
Model95		1.26	8.77
Model95		1.5	9.6
Model95		1.75	10.46
Model95		2	11.12
Model95		2.25	11.78
Model95		2.5	12.48
Model95		3	13.88
BLDG_A	Storage	0.000	0
BLDG_A		0.025	72

BLDG_A		0.050	289
BLDG_A		0.075	650
BLDG_A		0.100	1156
BLDG_A		0.125	1806
BLDG_A		0.150	2600
BLDG_B	Storage	0.000	0
BLDG_B		0.025	12.66666667
BLDG_B		0.050	50.66666667
BLDG_B		0.075	114
BLDG_B		0.100	202.6666667
BLDG_B		0.125	316.6666667
BLDG_B		0.150	456
BLDG_C	Storage	0.000	0
BLDG_C		0.025	18.44444444
BLDG_C		0.050	73.77777778
BLDG_C		0.075	166
BLDG_C		0.100	295.1111111
BLDG_C		0.125	461.1111111
BLDG_C		0.150	664
BLDG_D	Storage	0.000	0
BLDG_D		0.025	25.11111111
BLDG_D		0.050	100.4444444
BLDG_D		0.075	226
BLDG_D		0.100	401.7777778
BLDG_D		0.125	627.7777778
BLDG_D		0.150	904
BLDG_E	Storage	0.000	0
BLDG_E		0.025	31.33333333
BLDG_E		0.050	125.3333333
BLDG_E		0.075	282
BLDG_E		0.100	501.3333333
BLDG_E		0.125	783.3333333
BLDG_E		0.150	1128
BLDG_F	Storage	0.000	0
BLDG_F		0.025	12.88888889
BLDG_F		0.050	51.55555556
BLDG_F		0.075	116
BLDG_F		0.100	206.2222222
BLDG_F		0.125	322.2222222
BLDG_F		0.150	464
BLDG_G	Storage	0.000	0
BLDG_G		0.025	8.222222222

```
BLDG_G                     0.050      32.88888889
BLDG_G                     0.075      74
BLDG_G                     0.100      131.5555556
BLDG_G                     0.125      205.5555556
BLDG_G                     0.150      296

BLDG_H           Storage   0.000      0
BLDG_H                     0.025      6.222222222
BLDG_H                     0.050      24.88888889
BLDG_H                     0.075      56
BLDG_H                     0.100      99.55555556
BLDG_H                     0.125      155.5555556
BLDG_H                     0.150      224

L1000A-S         Storage   0          0
L1000A-S                   1.63       0
L1000A-S                   1.98       571
L1000A-S                   1.981      0
L1000A-S                   2.34       0

L1001A-S         Storage   0          0
L1001A-S                   1.63       0
L1001A-S                   1.98       571
L1001A-S                   1.981      0
L1001A-S                   2.34       0

L1003A-S         Storage   0          0
L1003A-S                   1.63       0
L1003A-S                   1.98       571
L1003A-S                   1.981      0
L1003A-S                   2.34       0

L1003B-S         Storage   0          0
L1003B-S                   1.03       0
L1003B-S                   1.38       571
L1003B-S                   1.381      0
L1003B-S                   1.73       0

L1005A-S         Storage   0          0
L1005A-S                   2.63       0
L1005A-S                   2.98       571
L1005A-S                   2.981      0
L1005A-S                   3.34       0

L1005A-S(1)      Storage   0          0
L1005A-S(1)                1.63       0
L1005A-S(1)                1.98       571
L1005A-S(1)                1.981      0
```



```
L1005A-S(1)                2.34       0

L1005A-S(2)      Storage   0          0
L1005A-S(2)                1.63       0
L1005A-S(2)                1.98       571
L1005A-S(2)                1.981      0
L1005A-S(2)                2.34       0

L1006B-S         Storage   0          0
L1006B-S                   1.63       0
L1006B-S                   1.98       571
L1006B-S                   1.981      0
L1006B-S                   2.34       0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100yr12hrChicago           0:20       1.59416
100yr12hrChicago           0:40       1.7318
100yr12hrChicago           1:00       1.89884
100yr12hrChicago           1:20       2.10633
100yr12hrChicago           1:40       2.37172
100yr12hrChicago           2:00       2.72448
100yr12hrChicago           2:20       3.21883
100yr12hrChicago           2:40       3.96717
100yr12hrChicago           3:00       5.2493
100yr12hrChicago           3:20       8.02715
100yr12hrChicago           3:40       19.9951
100yr12hrChicago           4:00       119.9504
100yr12hrChicago           4:20       26.62797
100yr12hrChicago           4:40       13.39022
100yr12hrChicago           5:00       9.10339
100yr12hrChicago           5:20       6.96965
100yr12hrChicago           5:40       5.68604
100yr12hrChicago           6:00       4.82536
100yr12hrChicago           6:20       4.20613
100yr12hrChicago           6:40       3.73799
100yr12hrChicago           7:00       3.37088
100yr12hrChicago           7:20       3.07476
100yr12hrChicago           7:40       2.83047
100yr12hrChicago           8:00       2.62526
100yr12hrChicago           8:20       2.45025
100yr12hrChicago           8:40       2.29908
100yr12hrChicago           9:00       2.16711
100yr12hrChicago           9:20       2.05079
100yr12hrChicago           9:40       1.94745
100yr12hrChicago           10:00      1.85496
100yr12hrChicago           10:20      1.77167
```

100yr12hrChicago	10:40	1.69622
100yr12hrChicago	11:00	1.62754
100yr12hrChicago	11:20	1.56474
100yr12hrChicago	11:40	1.50706
100yr12hrChicago	12:00	1.45389
100yr12hrSCS	0:30	2.88
100yr12hrSCS	1:00	1.344
100yr12hrSCS	1:30	2.496
100yr12hrSCS	2:00	2.496
100yr12hrSCS	2:30	3.264
100yr12hrSCS	3:00	2.88
100yr12hrSCS	3:30	3.84
100yr12hrSCS	4:00	3.84
100yr12hrSCS	4:30	5.184
100yr12hrSCS	5:00	6.528
100yr12hrSCS	5:30	10.368
100yr12hrSCS	6:00	82.176
100yr12hrSCS	6:30	20.928
100yr12hrSCS	7:00	9.216
100yr12hrSCS	7:30	6.144
100yr12hrSCS	8:00	5.376
100yr12hrSCS	8:30	4.224
100yr12hrSCS	9:00	4.416
100yr12hrSCS	9:30	2.88
100yr12hrSCS	10:00	2.304
100yr12hrSCS	10:30	3.264
100yr12hrSCS	11:00	2.112
100yr12hrSCS	11:30	1.92
100yr12hrSCS	12:00	1.92
100yr24hrSCS	0:10	0.97
100yr24hrSCS	0:20	0.97
100yr24hrSCS	0:30	0.97
100yr24hrSCS	0:40	0.97
100yr24hrSCS	0:50	0.97
100yr24hrSCS	1:00	0.97
100yr24hrSCS	1:10	0.97
100yr24hrSCS	1:20	0.97
100yr24hrSCS	1:30	0.97
100yr24hrSCS	1:40	0.97
100yr24hrSCS	1:50	0.97
100yr24hrSCS	2:00	0.97
100yr24hrSCS	2:10	1.15
100yr24hrSCS	2:20	1.15
100yr24hrSCS	2:30	1.15
100yr24hrSCS	2:40	1.15
100yr24hrSCS	2:50	1.15

100yr24hrSCS	3:00	1.15
100yr24hrSCS	3:10	1.15
100yr24hrSCS	3:20	1.15
100yr24hrSCS	3:30	1.15
100yr24hrSCS	3:40	1.15
100yr24hrSCS	3:50	1.15
100yr24hrSCS	4:00	1.15
100yr24hrSCS	4:10	1.42
100yr24hrSCS	4:20	1.42
100yr24hrSCS	4:30	1.42
100yr24hrSCS	4:40	1.42
100yr24hrSCS	4:50	1.42
100yr24hrSCS	5:00	1.42
100yr24hrSCS	5:10	1.42
100yr24hrSCS	5:20	1.42
100yr24hrSCS	5:30	1.42
100yr24hrSCS	5:40	1.42
100yr24hrSCS	5:50	1.42
100yr24hrSCS	6:00	1.42
100yr24hrSCS	6:10	1.59
100yr24hrSCS	6:20	1.59
100yr24hrSCS	6:30	1.59
100yr24hrSCS	6:40	1.59
100yr24hrSCS	6:50	1.59
100yr24hrSCS	7:00	1.59
100yr24hrSCS	7:10	1.95
100yr24hrSCS	7:20	1.95
100yr24hrSCS	7:30	1.95
100yr24hrSCS	7:40	1.95
100yr24hrSCS	7:50	1.95
100yr24hrSCS	8:00	1.95
100yr24hrSCS	8:10	2.3
100yr24hrSCS	8:20	2.3
100yr24hrSCS	8:30	2.3
100yr24hrSCS	8:40	2.48
100yr24hrSCS	8:50	2.48
100yr24hrSCS	9:00	2.48
100yr24hrSCS	9:10	2.84
100yr24hrSCS	9:20	2.84
100yr24hrSCS	9:30	2.84
100yr24hrSCS	9:40	3.19
100yr24hrSCS	9:50	3.19
100yr24hrSCS	10:00	3.19
100yr24hrSCS	10:10	4.08
100yr24hrSCS	10:20	4.08
100yr24hrSCS	10:30	4.08
100yr24hrSCS	10:40	5.49
100yr24hrSCS	10:50	5.49

100yr24hrSCS	11:00	5.49
100yr24hrSCS	11:10	8.51
100yr24hrSCS	11:20	8.51
100yr24hrSCS	11:30	8.51
100yr24hrSCS	11:40	26.23
100yr24hrSCS	11:50	67.34
100yr24hrSCS	12:00	108.45
100yr24hrSCS	12:10	12.76
100yr24hrSCS	12:20	12.76
100yr24hrSCS	12:30	12.76
100yr24hrSCS	12:40	6.56
100yr24hrSCS	12:50	6.56
100yr24hrSCS	13:00	6.56
100yr24hrSCS	13:10	4.78
100yr24hrSCS	13:20	4.78
100yr24hrSCS	13:30	4.78
100yr24hrSCS	13:40	3.72
100yr24hrSCS	13:50	3.72
100yr24hrSCS	14:00	3.72
100yr24hrSCS	14:10	2.66
100yr24hrSCS	14:20	2.66
100yr24hrSCS	14:30	2.66
100yr24hrSCS	14:40	2.66
100yr24hrSCS	14:50	2.66
100yr24hrSCS	15:00	2.66
100yr24hrSCS	15:10	2.66
100yr24hrSCS	15:20	2.66
100yr24hrSCS	15:30	2.66
100yr24hrSCS	15:40	2.66
100yr24hrSCS	15:50	2.66
100yr24hrSCS	16:00	2.66
100yr24hrSCS	16:10	1.59
100yr24hrSCS	16:20	1.59
100yr24hrSCS	16:30	1.59
100yr24hrSCS	16:40	1.59
100yr24hrSCS	16:50	1.59
100yr24hrSCS	17:00	1.59
100yr24hrSCS	17:10	1.59
100yr24hrSCS	17:20	1.59
100yr24hrSCS	17:30	1.59
100yr24hrSCS	17:40	1.59
100yr24hrSCS	17:50	1.59
100yr24hrSCS	18:00	1.59
100yr24hrSCS	18:10	1.59
100yr24hrSCS	18:20	1.59
100yr24hrSCS	18:30	1.59
100yr24hrSCS	18:40	1.59
100yr24hrSCS	18:50	1.59

100yr24hrSCS	19:00	1.59
100yr24hrSCS	19:10	1.59
100yr24hrSCS	19:20	1.59
100yr24hrSCS	19:30	1.59
100yr24hrSCS	19:40	1.59
100yr24hrSCS	19:50	1.59
100yr24hrSCS	20:00	1.59
100yr24hrSCS	20:10	1.06
100yr24hrSCS	20:20	1.06
100yr24hrSCS	20:30	1.06
100yr24hrSCS	20:40	1.06
100yr24hrSCS	20:50	1.06
100yr24hrSCS	21:00	1.06
100yr24hrSCS	21:10	1.06
100yr24hrSCS	21:20	1.06
100yr24hrSCS	21:30	1.06
100yr24hrSCS	21:40	1.06
100yr24hrSCS	21:50	1.06
100yr24hrSCS	22:00	1.06
100yr24hrSCS	22:10	1.06
100yr24hrSCS	22:20	1.06
100yr24hrSCS	22:30	1.06
100yr24hrSCS	22:40	1.06
100yr24hrSCS	22:50	1.06
100yr24hrSCS	23:00	1.06
100yr24hrSCS	23:10	1.06
100yr24hrSCS	23:20	1.06
100yr24hrSCS	23:30	1.06
100yr24hrSCS	23:40	1.06
100yr24hrSCS	23:50	1.06
100yr24hrSCS	24:00	1.06
100yr3hrChicago	0:10	6.04573
100yr3hrChicago	0:20	7.54219
100yr3hrChicago	0:30	10.1588
100yr3hrChicago	0:40	15.96889
100yr3hrChicago	0:50	40.65497
100yr3hrChicago	1:00	178.559
100yr3hrChicago	1:10	54.04853
100yr3hrChicago	1:20	27.3187
100yr3hrChicago	1:30	18.24039
100yr3hrChicago	1:40	13.73692
100yr3hrChicago	1:50	11.05876
100yr3hrChicago	2:00	9.28521
100yr3hrChicago	2:10	8.02389
100yr3hrChicago	2:20	7.08022
100yr3hrChicago	2:30	6.34698
100yr3hrChicago	2:40	5.76029

100yr3hrChicago	2:50	5.27978
100yr3hrChicago	3:00	4.87871
100yr6hrChicago	0:20	3.21883
100yr6hrChicago	0:40	3.96717
100yr6hrChicago	1:00	5.2493
100yr6hrChicago	1:20	8.02715
100yr6hrChicago	1:40	19.9951
100yr6hrChicago	2:00	119.9504
100yr6hrChicago	2:20	26.62797
100yr6hrChicago	2:40	13.39022
100yr6hrChicago	3:00	9.10339
100yr6hrChicago	3:20	6.96965
100yr6hrChicago	3:40	5.68604
100yr6hrChicago	4:00	4.82536
100yr6hrChicago	4:20	4.20613
100yr6hrChicago	4:40	3.73799
100yr6hrChicago	5:00	3.37088
100yr6hrChicago	5:20	3.07476
100yr6hrChicago	5:40	2.83047
100yr6hrChicago	6:00	2.62526
100yr6hrSCS	0:05	6.509
100yr6hrSCS	0:10	6.509
100yr6hrSCS	0:15	6.509
100yr6hrSCS	0:20	6.509
100yr6hrSCS	0:25	6.509
100yr6hrSCS	0:30	6.509
100yr6hrSCS	0:35	6.509
100yr6hrSCS	0:40	9.757
100yr6hrSCS	0:45	9.757
100yr6hrSCS	0:50	9.757
100yr6hrSCS	0:55	9.757
100yr6hrSCS	1:00	9.757
100yr6hrSCS	1:05	9.757
100yr6hrSCS	1:10	9.757
100yr6hrSCS	1:15	13.006
100yr6hrSCS	1:20	13.006
100yr6hrSCS	1:25	13.006
100yr6hrSCS	1:30	13.006
100yr6hrSCS	1:35	16.255
100yr6hrSCS	1:40	16.255
100yr6hrSCS	1:45	16.255
100yr6hrSCS	1:50	16.255
100yr6hrSCS	1:55	39.018
100yr6hrSCS	2:00	39.018
100yr6hrSCS	2:05	39.018
100yr6hrSCS	2:10	70.445

100yr6hrSCS	2:15	70.445
100yr6hrSCS	2:20	73.152
100yr6hrSCS	2:25	73.152
100yr6hrSCS	2:30	56.897
100yr6hrSCS	2:35	24.388
100yr6hrSCS	2:40	24.388
100yr6hrSCS	2:45	24.388
100yr6hrSCS	2:50	16.255
100yr6hrSCS	2:55	16.255
100yr6hrSCS	3:00	16.255
100yr6hrSCS	3:05	16.255
100yr6hrSCS	3:10	16.255
100yr6hrSCS	3:15	16.255
100yr6hrSCS	3:20	16.255
100yr6hrSCS	3:25	13.006
100yr6hrSCS	3:30	13.006
100yr6hrSCS	3:35	13.006
100yr6hrSCS	3:40	13.006
100yr6hrSCS	3:45	13.006
100yr6hrSCS	3:50	13.006
100yr6hrSCS	3:55	13.006
100yr6hrSCS	4:00	9.757
100yr6hrSCS	4:05	9.757
100yr6hrSCS	4:10	9.757
100yr6hrSCS	4:15	9.757
100yr6hrSCS	4:20	9.757
100yr6hrSCS	4:25	9.757
100yr6hrSCS	4:30	9.757
100yr6hrSCS	4:35	7.592
100yr6hrSCS	4:40	7.592
100yr6hrSCS	4:45	7.592
100yr6hrSCS	4:50	7.592
100yr6hrSCS	4:55	7.592
100yr6hrSCS	5:00	7.592
100yr6hrSCS	5:05	7.592
100yr6hrSCS	5:10	7.592
100yr6hrSCS	5:15	7.592
100yr6hrSCS	5:20	7.592
100yr6hrSCS	5:25	7.592
100yr6hrSCS	5:30	4.332
100yr6hrSCS	5:35	4.332
100yr6hrSCS	5:40	4.332
100yr6hrSCS	5:45	4.332
100yr6hrSCS	5:50	4.332
100yr6hrSCS	5:55	4.332
100yr6hrSCS	6:00	4.332
10yr12hrChicago	0:20	1.13018

10yr12hrChicago	0:40	1.22716
10yr12hrChicago	1:00	1.34479
10yr12hrChicago	1:20	1.4908
10yr12hrChicago	1:40	1.67739
10yr12hrChicago	2:00	1.92517
10yr12hrChicago	2:20	2.27198
10yr12hrChicago	2:40	2.79615
10yr12hrChicago	3:00	3.69227
10yr12hrChicago	3:20	5.62717
10yr12hrChicago	3:40	13.90114
10yr12hrChicago	4:00	82.21047
10yr12hrChicago	4:20	18.4745
10yr12hrChicago	4:40	9.34711
10yr12hrChicago	5:00	6.37557
10yr12hrChicago	5:20	4.8918
10yr12hrChicago	5:40	3.99718
10yr12hrChicago	6:00	3.3963
10yr12hrChicago	6:20	2.9634
10yr12hrChicago	6:40	2.63576
10yr12hrChicago	7:00	2.37859
10yr12hrChicago	7:20	2.17097
10yr12hrChicago	7:40	1.99957
10yr12hrChicago	8:00	1.85551
10yr12hrChicago	8:20	1.73257
10yr12hrChicago	8:40	1.62634
10yr12hrChicago	9:00	1.53354
10yr12hrChicago	9:20	1.45173
10yr12hrChicago	9:40	1.379
10yr12hrChicago	10:00	1.3139
10yr12hrChicago	10:20	1.25524
10yr12hrChicago	10:40	1.2021
10yr12hrChicago	11:00	1.15371
10yr12hrChicago	11:20	1.10945
10yr12hrChicago	11:40	1.06879
10yr12hrChicago	12:00	1.03129
10yr12hrSCS	0:30	1.9566
10yr12hrSCS	1:00	0.91308
10yr12hrSCS	1:30	1.69572
10yr12hrSCS	2:00	1.69572
10yr12hrSCS	2:30	2.21748
10yr12hrSCS	3:00	1.9566
10yr12hrSCS	3:30	2.6088
10yr12hrSCS	4:00	2.6088
10yr12hrSCS	4:30	3.52188
10yr12hrSCS	5:00	4.43496
10yr12hrSCS	5:30	7.04376
10yr12hrSCS	6:00	55.82832

10yr12hrSCS	6:30	14.21796
10yr12hrSCS	7:00	6.26112
10yr12hrSCS	7:30	4.17408
10yr12hrSCS	8:00	3.65232
10yr12hrSCS	8:30	2.86968
10yr12hrSCS	9:00	3.00012
10yr12hrSCS	9:30	1.9566
10yr12hrSCS	10:00	1.56528
10yr12hrSCS	10:30	2.21748
10yr12hrSCS	11:00	1.43484
10yr12hrSCS	11:30	1.3044
10yr12hrSCS	12:00	1.3044
10yr24hrSCS	0:10	0.71
10yr24hrSCS	0:20	0.71
10yr24hrSCS	0:30	0.71
10yr24hrSCS	0:40	0.71
10yr24hrSCS	0:50	0.71
10yr24hrSCS	1:00	0.71
10yr24hrSCS	1:10	0.71
10yr24hrSCS	1:20	0.71
10yr24hrSCS	1:30	0.71
10yr24hrSCS	1:40	0.71
10yr24hrSCS	1:50	0.71
10yr24hrSCS	2:00	0.71
10yr24hrSCS	2:10	0.84
10yr24hrSCS	2:20	0.84
10yr24hrSCS	2:30	0.84
10yr24hrSCS	2:40	0.84
10yr24hrSCS	2:50	0.84
10yr24hrSCS	3:00	0.84
10yr24hrSCS	3:10	0.84
10yr24hrSCS	3:20	0.84
10yr24hrSCS	3:30	0.84
10yr24hrSCS	3:40	0.84
10yr24hrSCS	3:50	0.84
10yr24hrSCS	4:00	0.84
10yr24hrSCS	4:10	1.04
10yr24hrSCS	4:20	1.04
10yr24hrSCS	4:30	1.04
10yr24hrSCS	4:40	1.04
10yr24hrSCS	4:50	1.04
10yr24hrSCS	5:00	1.04
10yr24hrSCS	5:10	1.04
10yr24hrSCS	5:20	1.04
10yr24hrSCS	5:30	1.04
10yr24hrSCS	5:40	1.04
10yr24hrSCS	5:50	1.04

10yr24hrSCS	6:00	1.04
10yr24hrSCS	6:10	1.16
10yr24hrSCS	6:20	1.16
10yr24hrSCS	6:30	1.16
10yr24hrSCS	6:40	1.16
10yr24hrSCS	6:50	1.16
10yr24hrSCS	7:00	1.16
10yr24hrSCS	7:10	1.42
10yr24hrSCS	7:20	1.42
10yr24hrSCS	7:30	1.42
10yr24hrSCS	7:40	1.42
10yr24hrSCS	7:50	1.42
10yr24hrSCS	8:00	1.42
10yr24hrSCS	8:10	1.68
10yr24hrSCS	8:20	1.68
10yr24hrSCS	8:30	1.68
10yr24hrSCS	8:40	1.81
10yr24hrSCS	8:50	1.81
10yr24hrSCS	9:00	1.81
10yr24hrSCS	9:10	2.07
10yr24hrSCS	9:20	2.07
10yr24hrSCS	9:30	2.07
10yr24hrSCS	9:40	2.33
10yr24hrSCS	9:50	2.33
10yr24hrSCS	10:00	2.33
10yr24hrSCS	10:10	2.98
10yr24hrSCS	10:20	2.98
10yr24hrSCS	10:30	2.98
10yr24hrSCS	10:40	4.01
10yr24hrSCS	10:50	4.01
10yr24hrSCS	11:00	4.01
10yr24hrSCS	11:10	6.21
10yr24hrSCS	11:20	6.21
10yr24hrSCS	11:30	6.21
10yr24hrSCS	11:40	19.15
10yr24hrSCS	11:50	49.17
10yr24hrSCS	12:00	79.19
10yr24hrSCS	12:10	9.32
10yr24hrSCS	12:20	9.32
10yr24hrSCS	12:30	9.32
10yr24hrSCS	12:40	4.79
10yr24hrSCS	12:50	4.79
10yr24hrSCS	13:00	4.79
10yr24hrSCS	13:10	3.49
10yr24hrSCS	13:20	3.49
10yr24hrSCS	13:30	3.49
10yr24hrSCS	13:40	2.72
10yr24hrSCS	13:50	2.72

10yr24hrSCS	14:00	2.72
10yr24hrSCS	14:10	1.94
10yr24hrSCS	14:20	1.94
10yr24hrSCS	14:30	1.94
10yr24hrSCS	14:40	1.94
10yr24hrSCS	14:50	1.94
10yr24hrSCS	15:00	1.94
10yr24hrSCS	15:10	1.94
10yr24hrSCS	15:20	1.94
10yr24hrSCS	15:30	1.94
10yr24hrSCS	15:40	1.94
10yr24hrSCS	15:50	1.94
10yr24hrSCS	16:00	1.94
10yr24hrSCS	16:10	1.16
10yr24hrSCS	16:20	1.16
10yr24hrSCS	16:30	1.16
10yr24hrSCS	16:40	1.16
10yr24hrSCS	16:50	1.16
10yr24hrSCS	17:00	1.16
10yr24hrSCS	17:10	1.16
10yr24hrSCS	17:20	1.16
10yr24hrSCS	17:30	1.16
10yr24hrSCS	17:40	1.16
10yr24hrSCS	17:50	1.16
10yr24hrSCS	18:00	1.16
10yr24hrSCS	18:10	1.16
10yr24hrSCS	18:20	1.16
10yr24hrSCS	18:30	1.16
10yr24hrSCS	18:40	1.16
10yr24hrSCS	18:50	1.16
10yr24hrSCS	19:00	1.16
10yr24hrSCS	19:10	1.16
10yr24hrSCS	19:20	1.16
10yr24hrSCS	19:30	1.16
10yr24hrSCS	19:40	1.16
10yr24hrSCS	19:50	1.16
10yr24hrSCS	20:00	1.16
10yr24hrSCS	20:10	0.78
10yr24hrSCS	20:20	0.78
10yr24hrSCS	20:30	0.78
10yr24hrSCS	20:40	0.78
10yr24hrSCS	20:50	0.78
10yr24hrSCS	21:00	0.78
10yr24hrSCS	21:10	0.78
10yr24hrSCS	21:20	0.78
10yr24hrSCS	21:30	0.78
10yr24hrSCS	21:40	0.78
10yr24hrSCS	21:50	0.78

10yr24hrSCS	22:00	0.78
10yr24hrSCS	22:10	0.78
10yr24hrSCS	22:20	0.78
10yr24hrSCS	22:30	0.78
10yr24hrSCS	22:40	0.78
10yr24hrSCS	22:50	0.78
10yr24hrSCS	23:00	0.78
10yr24hrSCS	23:10	0.78
10yr24hrSCS	23:20	0.78
10yr24hrSCS	23:30	0.78
10yr24hrSCS	23:40	0.78
10yr24hrSCS	23:50	0.78
10yr24hrSCS	24:00	0.78
10yr3hrChicago	0:10	4.24804
10yr3hrChicago	0:20	5.29032
10yr3hrChicago	0:30	7.10821
10yr3hrChicago	0:40	11.12994
10yr3hrChicago	0:50	28.09961
10yr3hrChicago	1:00	122.1418
10yr3hrChicago	1:10	37.28489
10yr3hrChicago	1:20	18.95368
10yr3hrChicago	1:30	12.69959
10yr3hrChicago	1:40	9.58762
10yr3hrChicago	1:50	7.7327
10yr3hrChicago	2:00	6.50203
10yr3hrChicago	2:10	5.6255
10yr3hrChicago	2:20	4.96886
10yr3hrChicago	2:30	4.45808
10yr3hrChicago	2:40	4.04902
10yr3hrChicago	2:50	3.71371
10yr3hrChicago	3:00	3.4336
10yr6hrChicago	0:20	2.27198
10yr6hrChicago	0:40	2.79615
10yr6hrChicago	1:00	3.69227
10yr6hrChicago	1:20	5.62717
10yr6hrChicago	1:40	13.90114
10yr6hrChicago	2:00	82.21047
10yr6hrChicago	2:20	18.4745
10yr6hrChicago	2:40	9.34711
10yr6hrChicago	3:00	6.37557
10yr6hrChicago	3:20	4.8918
10yr6hrChicago	3:40	3.99718
10yr6hrChicago	4:00	3.3963
10yr6hrChicago	4:20	2.9634
10yr6hrChicago	4:40	2.63576
10yr6hrChicago	5:00	2.37859

10yr6hrChicago	5:20	2.17097
10yr6hrChicago	5:40	1.99957
10yr6hrChicago	6:00	1.85551
15mmChicago,4hr	0:10	0.91
15mmChicago,4hr	0:20	1.05
15mmChicago,4hr	0:30	1.25
15mmChicago,4hr	0:40	1.55
15mmChicago,4hr	0:50	2.07
15mmChicago,4hr	1:00	3.23
15mmChicago,4hr	1:10	8.06
15mmChicago,4hr	1:20	33.99
15mmChicago,4hr	1:30	10.65
15mmChicago,4hr	1:40	5.47
15mmChicago,4hr	1:50	3.68
15mmChicago,4hr	2:00	2.79
15mmChicago,4hr	2:10	2.25
15mmChicago,4hr	2:20	1.9
15mmChicago,4hr	2:30	1.65
15mmChicago,4hr	2:40	1.45
15mmChicago,4hr	2:50	1.31
15mmChicago,4hr	3:00	1.19
15mmChicago,4hr	3:10	1.09
15mmChicago,4hr	3:20	1.01
15mmChicago,4hr	3:30	0.94
15mmChicago,4hr	3:40	0.88
15mmChicago,4hr	3:50	0.83
15mmChicago,4hr	4:00	0.78
25mmChicago,4hr,T=10min	0:10	1.516088055
25mmChicago,4hr,T=10min	0:20	1.749115351
25mmChicago,4hr,T=10min	0:30	2.078715445
25mmChicago,4hr,T=10min	0:40	2.583625152
25mmChicago,4hr,T=10min	0:50	3.461716789
25mmChicago,4hr,T=10min	1:00	5.394996968
25mmChicago,4hr,T=10min	1:10	13.44811663
25mmChicago,4hr,T=10min	1:20	56.72433275
25mmChicago,4hr,T=10min	1:30	17.78358976
25mmChicago,4hr,T=10min	1:40	9.131254948
25mmChicago,4hr,T=10min	1:50	6.147712357
25mmChicago,4hr,T=10min	2:00	4.655383456
25mmChicago,4hr,T=10min	2:10	3.762897479
25mmChicago,4hr,T=10min	2:20	3.169361772
25mmChicago,4hr,T=10min	2:30	2.745825503
25mmChicago,4hr,T=10min	2:40	2.428071751
25mmChicago,4hr,T=10min	2:50	2.180598417
25mmChicago,4hr,T=10min	3:00	1.982179574
25mmChicago,4hr,T=10min	3:10	1.819403154

25mmChicago,4hr,T=10min	3:20	1.683310546
25mmChicago,4hr,T=10min	3:30	1.567742242
25mmChicago,4hr,T=10min	3:40	1.468311255
25mmChicago,4hr,T=10min	3:50	1.381797508
25mmChicago,4hr,T=10min	4:00	1.305793328
25mmChicago,4hr,T=20min	0:20	1.808915744
25mmChicago,4hr,T=20min	0:40	2.746305561
25mmChicago,4hr,T=20min	1:00	6.714741505
25mmChicago,4hr,T=20min	1:20	38.42768707
25mmChicago,4hr,T=20min	1:40	8.899335477
25mmChicago,4hr,T=20min	2:00	4.539401564
25mmChicago,4hr,T=20min	2:20	3.108195061
25mmChicago,4hr,T=20min	2:40	2.390715892
25mmChicago,4hr,T=20min	3:00	1.95700979
25mmChicago,4hr,T=20min	3:20	1.665164372
25mmChicago,4hr,T=20min	3:40	1.454596382
25mmChicago,4hr,T=20min	4:00	1.295032654
25yr12hrChicago	0:20	1.30376
25yr12hrChicago	0:40	1.41615
25yr12hrChicago	1:00	1.55254
25yr12hrChicago	1:20	1.72192
25yr12hrChicago	1:40	1.93852
25yr12hrChicago	2:00	2.22636
25yr12hrChicago	2:20	2.62962
25yr12hrChicago	2:40	3.23983
25yr12hrChicago	3:00	4.28477
25yr12hrChicago	3:20	6.54681
25yr12hrChicago	3:40	16.27437
25yr12hrChicago	4:00	97.25511
25yr12hrChicago	4:20	21.66195
25yr12hrChicago	4:40	10.90953
25yr12hrChicago	5:00	7.42285
25yr12hrChicago	5:20	5.68603
25yr12hrChicago	5:40	4.64061
25yr12hrChicago	6:00	3.93935
25yr12hrChicago	6:20	3.43465
25yr12hrChicago	6:40	3.053
25yr12hrChicago	7:00	2.75364
25yr12hrChicago	7:20	2.51212
25yr12hrChicago	7:40	2.31284
25yr12hrChicago	8:00	2.1454
25yr12hrChicago	8:20	2.0026
25yr12hrChicago	8:40	1.87924
25yr12hrChicago	9:00	1.77153
25yr12hrChicago	9:20	1.67658
25yr12hrChicago	9:40	1.59222

25yr12hrChicago	10:00	1.51671
25yr12hrChicago	10:20	1.4487
25yr12hrChicago	10:40	1.3871
25yr12hrChicago	11:00	1.33102
25yr12hrChicago	11:20	1.27974
25yr12hrChicago	11:40	1.23262
25yr12hrChicago	12:00	1.18921
25yr12hrSCS	0:30	2.292
25yr12hrSCS	1:00	1.0696
25yr12hrSCS	1:30	1.9864
25yr12hrSCS	2:00	1.9864
25yr12hrSCS	2:30	2.5976
25yr12hrSCS	3:00	2.292
25yr12hrSCS	3:30	3.056
25yr12hrSCS	4:00	3.056
25yr12hrSCS	4:30	4.1256
25yr12hrSCS	5:00	5.1952
25yr12hrSCS	5:30	8.2512
25yr12hrSCS	6:00	65.3984
25yr12hrSCS	6:30	16.6552
25yr12hrSCS	7:00	7.3344
25yr12hrSCS	7:30	4.8896
25yr12hrSCS	8:00	4.2784
25yr12hrSCS	8:30	3.3616
25yr12hrSCS	9:00	3.5144
25yr12hrSCS	9:30	2.292
25yr12hrSCS	10:00	1.8336
25yr12hrSCS	10:30	2.5976
25yr12hrSCS	11:00	1.6808
25yr12hrSCS	11:30	1.528
25yr12hrSCS	12:00	1.528
25yr24hrSCS	0:10	0.82
25yr24hrSCS	0:20	0.82
25yr24hrSCS	0:30	0.82
25yr24hrSCS	0:40	0.82
25yr24hrSCS	0:50	0.82
25yr24hrSCS	1:00	0.82
25yr24hrSCS	1:10	0.82
25yr24hrSCS	1:20	0.82
25yr24hrSCS	1:30	0.82
25yr24hrSCS	1:40	0.82
25yr24hrSCS	1:50	0.82
25yr24hrSCS	2:00	0.82
25yr24hrSCS	2:10	0.97
25yr24hrSCS	2:20	0.97
25yr24hrSCS	2:30	0.97

25yr24hrSCS	2:40	0.97
25yr24hrSCS	2:50	0.97
25yr24hrSCS	3:00	0.97
25yr24hrSCS	3:10	0.97
25yr24hrSCS	3:20	0.97
25yr24hrSCS	3:30	0.97
25yr24hrSCS	3:40	0.97
25yr24hrSCS	3:50	0.97
25yr24hrSCS	4:00	0.97
25yr24hrSCS	4:10	1.19
25yr24hrSCS	4:20	1.19
25yr24hrSCS	4:30	1.19
25yr24hrSCS	4:40	1.19
25yr24hrSCS	4:50	1.19
25yr24hrSCS	5:00	1.19
25yr24hrSCS	5:10	1.19
25yr24hrSCS	5:20	1.19
25yr24hrSCS	5:30	1.19
25yr24hrSCS	5:40	1.19
25yr24hrSCS	5:50	1.19
25yr24hrSCS	6:00	1.19
25yr24hrSCS	6:10	1.34
25yr24hrSCS	6:20	1.34
25yr24hrSCS	6:30	1.34
25yr24hrSCS	6:40	1.34
25yr24hrSCS	6:50	1.34
25yr24hrSCS	7:00	1.34
25yr24hrSCS	7:10	1.64
25yr24hrSCS	7:20	1.64
25yr24hrSCS	7:30	1.64
25yr24hrSCS	7:40	1.64
25yr24hrSCS	7:50	1.64
25yr24hrSCS	8:00	1.64
25yr24hrSCS	8:10	1.93
25yr24hrSCS	8:20	1.93
25yr24hrSCS	8:30	1.93
25yr24hrSCS	8:40	2.08
25yr24hrSCS	8:50	2.08
25yr24hrSCS	9:00	2.08
25yr24hrSCS	9:10	2.38
25yr24hrSCS	9:20	2.38
25yr24hrSCS	9:30	2.38
25yr24hrSCS	9:40	2.68
25yr24hrSCS	9:50	2.68
25yr24hrSCS	10:00	2.68
25yr24hrSCS	10:10	3.42
25yr24hrSCS	10:20	3.42
25yr24hrSCS	10:30	3.42

25yr24hrSCS	10:40	4.61
25yr24hrSCS	10:50	4.61
25yr24hrSCS	11:00	4.61
25yr24hrSCS	11:10	7.14
25yr24hrSCS	11:20	7.14
25yr24hrSCS	11:30	7.14
25yr24hrSCS	11:40	22.02
25yr24hrSCS	11:50	56.54
25yr24hrSCS	12:00	91.07
25yr24hrSCS	12:10	10.71
25yr24hrSCS	12:20	10.71
25yr24hrSCS	12:30	10.71
25yr24hrSCS	12:40	5.51
25yr24hrSCS	12:50	5.51
25yr24hrSCS	13:00	5.51
25yr24hrSCS	13:10	4.02
25yr24hrSCS	13:20	4.02
25yr24hrSCS	13:30	4.02
25yr24hrSCS	13:40	3.12
25yr24hrSCS	13:50	3.12
25yr24hrSCS	14:00	3.12
25yr24hrSCS	14:10	2.23
25yr24hrSCS	14:20	2.23
25yr24hrSCS	14:30	2.23
25yr24hrSCS	14:40	2.23
25yr24hrSCS	14:50	2.23
25yr24hrSCS	15:00	2.23
25yr24hrSCS	15:10	2.23
25yr24hrSCS	15:20	2.23
25yr24hrSCS	15:30	2.23
25yr24hrSCS	15:40	2.23
25yr24hrSCS	15:50	2.23
25yr24hrSCS	16:00	2.23
25yr24hrSCS	16:10	1.34
25yr24hrSCS	16:20	1.34
25yr24hrSCS	16:30	1.34
25yr24hrSCS	16:40	1.34
25yr24hrSCS	16:50	1.34
25yr24hrSCS	17:00	1.34
25yr24hrSCS	17:10	1.34
25yr24hrSCS	17:20	1.34
25yr24hrSCS	17:30	1.34
25yr24hrSCS	17:40	1.34
25yr24hrSCS	17:50	1.34
25yr24hrSCS	18:00	1.34
25yr24hrSCS	18:10	1.34
25yr24hrSCS	18:20	1.34
25yr24hrSCS	18:30	1.34

25yr24hrSCS	18:40	1.34
25yr24hrSCS	18:50	1.34
25yr24hrSCS	19:00	1.34
25yr24hrSCS	19:10	1.34
25yr24hrSCS	19:20	1.34
25yr24hrSCS	19:30	1.34
25yr24hrSCS	19:40	1.34
25yr24hrSCS	19:50	1.34
25yr24hrSCS	20:00	1.34
25yr24hrSCS	20:10	0.89
25yr24hrSCS	20:20	0.89
25yr24hrSCS	20:30	0.89
25yr24hrSCS	20:40	0.89
25yr24hrSCS	20:50	0.89
25yr24hrSCS	21:00	0.89
25yr24hrSCS	21:10	0.89
25yr24hrSCS	21:20	0.89
25yr24hrSCS	21:30	0.89
25yr24hrSCS	21:40	0.89
25yr24hrSCS	21:50	0.89
25yr24hrSCS	22:00	0.89
25yr24hrSCS	22:10	0.89
25yr24hrSCS	22:20	0.89
25yr24hrSCS	22:30	0.89
25yr24hrSCS	22:40	0.89
25yr24hrSCS	22:50	0.89
25yr24hrSCS	23:00	0.89
25yr24hrSCS	23:10	0.89
25yr24hrSCS	23:20	0.89
25yr24hrSCS	23:30	0.89
25yr24hrSCS	23:40	0.89
25yr24hrSCS	23:50	0.89
25yr24hrSCS	24:00	0.89
25yr3hrChicago	0:10	4.9336
25yr3hrChicago	0:20	6.15217
25yr3hrChicago	0:30	8.28157
25yr3hrChicago	0:40	13.00553
25yr3hrChicago	0:50	33.04079
25yr3hrChicago	1:00	144.693
25yr3hrChicago	1:10	43.90416
25yr3hrChicago	1:20	22.22391
25yr3hrChicago	1:30	14.85162
25yr3hrChicago	1:40	11.19158
25yr3hrChicago	1:50	9.01374
25yr3hrChicago	2:00	7.57085
25yr3hrChicago	2:10	6.54433
25yr3hrChicago	2:20	5.77608

25yr3hrChicago	2:30	5.17898
25yr3hrChicago	2:40	4.7011
25yr3hrChicago	2:50	4.30965
25yr3hrChicago	3:00	3.98283
25yr6hrChicago	0:20	2.62962
25yr6hrChicago	0:40	3.23983
25yr6hrChicago	1:00	4.28477
25yr6hrChicago	1:20	6.54681
25yr6hrChicago	1:40	16.27437
25yr6hrChicago	2:00	97.25511
25yr6hrChicago	2:20	21.66195
25yr6hrChicago	2:40	10.90953
25yr6hrChicago	3:00	7.42285
25yr6hrChicago	3:20	5.68603
25yr6hrChicago	3:40	4.64061
25yr6hrChicago	4:00	3.93935
25yr6hrChicago	4:20	3.43465
25yr6hrChicago	4:40	3.053
25yr6hrChicago	5:00	2.75364
25yr6hrChicago	5:20	2.51212
25yr6hrChicago	5:40	2.31284
25yr6hrChicago	6:00	2.1454
2yr12hrChicago	0:20	0.75695
2yr12hrChicago	0:40	0.82137
2yr12hrChicago	1:00	0.89947
2yr12hrChicago	1:20	0.99632
2yr12hrChicago	1:40	1.11998
2yr12hrChicago	2:00	1.28402
2yr12hrChicago	2:20	1.5133
2yr12hrChicago	2:40	1.85924
2yr12hrChicago	3:00	2.44928
2yr12hrChicago	3:20	3.71851
2yr12hrChicago	3:40	9.09179
2yr12hrChicago	4:00	52.03126
2yr12hrChicago	4:20	12.04974
2yr12hrChicago	4:40	6.14637
2yr12hrChicago	5:00	4.20851
2yr12hrChicago	5:20	3.23704
2yr12hrChicago	5:40	2.6498
2yr12hrChicago	6:00	2.25464
2yr12hrChicago	6:20	1.96953
2yr12hrChicago	6:40	1.75348
2yr12hrChicago	7:00	1.58373
2yr12hrChicago	7:20	1.44656
2yr12hrChicago	7:40	1.33324
2yr12hrChicago	8:00	1.23793

2yr12hrChicago	8:20	1.15654
2yr12hrChicago	8:40	1.08616
2yr12hrChicago	9:00	1.02466
2yr12hrChicago	9:20	0.97041
2yr12hrChicago	9:40	0.92217
2yr12hrChicago	10:00	0.87897
2yr12hrChicago	10:20	0.84003
2yr12hrChicago	10:40	0.80473
2yr12hrChicago	11:00	0.77259
2yr12hrChicago	11:20	0.74317
2yr12hrChicago	11:40	0.71613
2yr12hrChicago	12:00	0.6912
2yr12hrSCS	0:30	1.2702
2yr12hrSCS	1:00	0.59276
2yr12hrSCS	1:30	1.10084
2yr12hrSCS	2:00	1.10084
2yr12hrSCS	2:30	1.43956
2yr12hrSCS	3:00	1.2702
2yr12hrSCS	3:30	1.6936
2yr12hrSCS	4:00	1.6936
2yr12hrSCS	4:30	2.28636
2yr12hrSCS	5:00	2.87912
2yr12hrSCS	5:30	4.57272
2yr12hrSCS	6:00	36.24304
2yr12hrSCS	6:30	9.23012
2yr12hrSCS	7:00	4.06464
2yr12hrSCS	7:30	2.70976
2yr12hrSCS	8:00	2.37104
2yr12hrSCS	8:30	1.86296
2yr12hrSCS	9:00	1.94764
2yr12hrSCS	9:30	1.2702
2yr12hrSCS	10:00	1.01616
2yr12hrSCS	10:30	1.43956
2yr12hrSCS	11:00	0.93148
2yr12hrSCS	11:30	0.8468
2yr12hrSCS	12:00	0.8468
2yr24hrSCS	0:10	0.5
2yr24hrSCS	0:20	0.5
2yr24hrSCS	0:30	0.5
2yr24hrSCS	0:40	0.5
2yr24hrSCS	0:50	0.5
2yr24hrSCS	1:00	0.5
2yr24hrSCS	1:10	0.5
2yr24hrSCS	1:20	0.5
2yr24hrSCS	1:30	0.5
2yr24hrSCS	1:40	0.5

2yr24hrSCS	1:50	0.5
2yr24hrSCS	2:00	0.5
2yr24hrSCS	2:10	0.59
2yr24hrSCS	2:20	0.59
2yr24hrSCS	2:30	0.59
2yr24hrSCS	2:40	0.59
2yr24hrSCS	2:50	0.59
2yr24hrSCS	3:00	0.59
2yr24hrSCS	3:10	0.59
2yr24hrSCS	3:20	0.59
2yr24hrSCS	3:30	0.59
2yr24hrSCS	3:40	0.59
2yr24hrSCS	3:50	0.59
2yr24hrSCS	4:00	0.59
2yr24hrSCS	4:10	0.73
2yr24hrSCS	4:20	0.73
2yr24hrSCS	4:30	0.73
2yr24hrSCS	4:40	0.73
2yr24hrSCS	4:50	0.73
2yr24hrSCS	5:00	0.73
2yr24hrSCS	5:10	0.73
2yr24hrSCS	5:20	0.73
2yr24hrSCS	5:30	0.73
2yr24hrSCS	5:40	0.73
2yr24hrSCS	5:50	0.73
2yr24hrSCS	6:00	0.73
2yr24hrSCS	6:10	0.82
2yr24hrSCS	6:20	0.82
2yr24hrSCS	6:30	0.82
2yr24hrSCS	6:40	0.82
2yr24hrSCS	6:50	0.82
2yr24hrSCS	7:00	0.82
2yr24hrSCS	7:10	1
2yr24hrSCS	7:20	1
2yr24hrSCS	7:30	1
2yr24hrSCS	7:40	1
2yr24hrSCS	7:50	1
2yr24hrSCS	8:00	1
2yr24hrSCS	8:10	1.18
2yr24hrSCS	8:20	1.18
2yr24hrSCS	8:30	1.18
2yr24hrSCS	8:40	1.27
2yr24hrSCS	8:50	1.27
2yr24hrSCS	9:00	1.27
2yr24hrSCS	9:10	1.46
2yr24hrSCS	9:20	1.46
2yr24hrSCS	9:30	1.46
2yr24hrSCS	9:40	1.64

2yr24hrSCS	9:50	1.64
2yr24hrSCS	10:00	1.64
2yr24hrSCS	10:10	2.09
2yr24hrSCS	10:20	2.09
2yr24hrSCS	10:30	2.09
2yr24hrSCS	10:40	2.82
2yr24hrSCS	10:50	2.82
2yr24hrSCS	11:00	2.82
2yr24hrSCS	11:10	4.37
2yr24hrSCS	11:20	4.37
2yr24hrSCS	11:30	4.37
2yr24hrSCS	11:40	13.47
2yr24hrSCS	11:50	34.58
2yr24hrSCS	12:00	55.69
2yr24hrSCS	12:10	6.55
2yr24hrSCS	12:20	6.55
2yr24hrSCS	12:30	6.55
2yr24hrSCS	12:40	3.37
2yr24hrSCS	12:50	3.37
2yr24hrSCS	13:00	3.37
2yr24hrSCS	13:10	2.46
2yr24hrSCS	13:20	2.46
2yr24hrSCS	13:30	2.46
2yr24hrSCS	13:40	1.91
2yr24hrSCS	13:50	1.91
2yr24hrSCS	14:00	1.91
2yr24hrSCS	14:10	1.36
2yr24hrSCS	14:20	1.36
2yr24hrSCS	14:30	1.36
2yr24hrSCS	14:40	1.36
2yr24hrSCS	14:50	1.36
2yr24hrSCS	15:00	1.37
2yr24hrSCS	15:10	1.36
2yr24hrSCS	15:20	1.36
2yr24hrSCS	15:30	1.36
2yr24hrSCS	15:40	1.36
2yr24hrSCS	15:50	1.36
2yr24hrSCS	16:00	1.36
2yr24hrSCS	16:10	0.82
2yr24hrSCS	16:20	0.82
2yr24hrSCS	16:30	0.82
2yr24hrSCS	16:40	0.82
2yr24hrSCS	16:50	0.82
2yr24hrSCS	17:00	0.82
2yr24hrSCS	17:10	0.82
2yr24hrSCS	17:20	0.82
2yr24hrSCS	17:30	0.82
2yr24hrSCS	17:40	0.82

2yr24hrSCS	17:50	0.82
2yr24hrSCS	18:00	0.82
2yr24hrSCS	18:10	0.82
2yr24hrSCS	18:20	0.82
2yr24hrSCS	18:30	0.82
2yr24hrSCS	18:40	0.82
2yr24hrSCS	18:50	0.82
2yr24hrSCS	19:00	0.82
2yr24hrSCS	19:10	0.82
2yr24hrSCS	19:20	0.82
2yr24hrSCS	19:30	0.82
2yr24hrSCS	19:40	0.82
2yr24hrSCS	19:50	0.82
2yr24hrSCS	20:00	0.82
2yr24hrSCS	20:10	0.55
2yr24hrSCS	20:20	0.55
2yr24hrSCS	20:30	0.55
2yr24hrSCS	20:40	0.55
2yr24hrSCS	20:50	0.55
2yr24hrSCS	21:00	0.55
2yr24hrSCS	21:10	0.55
2yr24hrSCS	21:20	0.55
2yr24hrSCS	21:30	0.55
2yr24hrSCS	21:40	0.55
2yr24hrSCS	21:50	0.55
2yr24hrSCS	22:00	0.55
2yr24hrSCS	22:10	0.55
2yr24hrSCS	22:20	0.55
2yr24hrSCS	22:30	0.55
2yr24hrSCS	22:40	0.55
2yr24hrSCS	22:50	0.55
2yr24hrSCS	23:00	0.55
2yr24hrSCS	23:10	0.55
2yr24hrSCS	23:20	0.55
2yr24hrSCS	23:30	0.55
2yr24hrSCS	23:40	0.55
2yr24hrSCS	23:50	0.55
2yr24hrSCS	24:00	0.55
2yr3hrChicago	0:10	2.81459
2yr3hrChicago	0:20	3.49824
2yr3hrChicago	0:30	4.68718
2yr3hrChicago	0:40	7.30485
2yr3hrChicago	0:50	18.20881
2yr3hrChicago	1:00	76.805
2yr3hrChicago	1:10	24.07906
2yr3hrChicago	1:20	12.36376
2yr3hrChicago	1:30	8.32403

2yr3hrChicago	1:40	6.30341
2yr3hrChicago	1:50	5.09498
2yr3hrChicago	2:00	4.29133
2yr3hrChicago	2:10	3.71786
2yr3hrChicago	2:20	3.28762
2yr3hrChicago	2:30	2.95254
2yr3hrChicago	2:40	2.68388
2yr3hrChicago	2:50	2.46348
2yr3hrChicago	3:00	2.27921
2yr6hrChicago	0:20	1.5133
2yr6hrChicago	0:40	1.85924
2yr6hrChicago	1:00	2.44928
2yr6hrChicago	1:20	3.71851
2yr6hrChicago	1:40	9.09179
2yr6hrChicago	2:00	52.03126
2yr6hrChicago	2:20	12.04974
2yr6hrChicago	2:40	6.14637
2yr6hrChicago	3:00	4.20851
2yr6hrChicago	3:20	3.23704
2yr6hrChicago	3:40	2.6498
2yr6hrChicago	4:00	2.25464
2yr6hrChicago	4:20	1.96953
2yr6hrChicago	4:40	1.75348
2yr6hrChicago	5:00	1.58373
2yr6hrChicago	5:20	1.44656
2yr6hrChicago	5:40	1.33324
2yr6hrChicago	6:00	1.23793
50yr12hrChicago	0:20	1.4416
50yr12hrChicago	0:40	1.56606
50yr12hrChicago	1:00	1.71712
50yr12hrChicago	1:20	1.90475
50yr12hrChicago	1:40	2.14474
50yr12hrChicago	2:00	2.46375
50yr12hrChicago	2:20	2.91078
50yr12hrChicago	2:40	3.5875
50yr12hrChicago	3:00	4.74693
50yr12hrChicago	3:20	7.25894
50yr12hrChicago	3:40	18.08154
50yr12hrChicago	4:00	108.471
50yr12hrChicago	4:20	24.07963
50yr12hrChicago	4:40	12.10875
50yr12hrChicago	5:00	8.23218
50yr12hrChicago	5:20	6.30265
50yr12hrChicago	5:40	5.14188
50yr12hrChicago	6:00	4.36357
50yr12hrChicago	6:20	3.80359

50yr12hrChicago	6:40	3.38026
50yr12hrChicago	7:00	3.04828
50yr12hrChicago	7:20	2.7805
50yr12hrChicago	7:40	2.55959
50yr12hrChicago	8:00	2.37402
50yr12hrChicago	8:20	2.21575
50yr12hrChicago	8:40	2.07905
50yr12hrChicago	9:00	1.95971
50yr12hrChicago	9:20	1.85453
50yr12hrChicago	9:40	1.76107
50yr12hrChicago	10:00	1.67743
50yr12hrChicago	10:20	1.60211
50yr12hrChicago	10:40	1.5339
50yr12hrChicago	11:00	1.47179
50yr12hrChicago	11:20	1.415
50yr12hrChicago	11:40	1.36283
50yr12hrChicago	12:00	1.31475
50yr12hrSCS	0:30	2.5473
50yr12hrSCS	1:00	1.18874
50yr12hrSCS	1:30	2.20766
50yr12hrSCS	2:00	2.20766
50yr12hrSCS	2:30	2.88694
50yr12hrSCS	3:00	2.5473
50yr12hrSCS	3:30	3.3964
50yr12hrSCS	4:00	3.3964
50yr12hrSCS	4:30	4.58514
50yr12hrSCS	5:00	5.77388
50yr12hrSCS	5:30	9.17028
50yr12hrSCS	6:00	72.68296
50yr12hrSCS	6:30	18.51038
50yr12hrSCS	7:00	8.15136
50yr12hrSCS	7:30	5.43424
50yr12hrSCS	8:00	4.75496
50yr12hrSCS	8:30	3.73604
50yr12hrSCS	9:00	3.90586
50yr12hrSCS	9:30	2.5473
50yr12hrSCS	10:00	2.03784
50yr12hrSCS	10:30	2.88694
50yr12hrSCS	11:00	1.86802
50yr12hrSCS	11:30	1.6982
50yr12hrSCS	12:00	1.6982
50yr24hrSCS	0:10	0.9
50yr24hrSCS	0:20	0.9
50yr24hrSCS	0:30	0.9
50yr24hrSCS	0:40	0.9
50yr24hrSCS	0:50	0.9

50yr24hrSCS	1:00	0.9
50yr24hrSCS	1:10	0.9
50yr24hrSCS	1:20	0.9
50yr24hrSCS	1:30	0.9
50yr24hrSCS	1:40	0.9
50yr24hrSCS	1:50	0.9
50yr24hrSCS	2:00	0.9
50yr24hrSCS	2:10	1.06
50yr24hrSCS	2:20	1.06
50yr24hrSCS	2:30	1.06
50yr24hrSCS	2:40	1.06
50yr24hrSCS	2:50	1.06
50yr24hrSCS	3:00	1.06
50yr24hrSCS	3:10	1.06
50yr24hrSCS	3:20	1.06
50yr24hrSCS	3:30	1.06
50yr24hrSCS	3:40	1.06
50yr24hrSCS	3:50	1.06
50yr24hrSCS	4:00	1.06
50yr24hrSCS	4:10	1.3
50yr24hrSCS	4:20	1.3
50yr24hrSCS	4:30	1.3
50yr24hrSCS	4:40	1.3
50yr24hrSCS	4:50	1.3
50yr24hrSCS	5:00	1.3
50yr24hrSCS	5:10	1.3
50yr24hrSCS	5:20	1.3
50yr24hrSCS	5:30	1.3
50yr24hrSCS	5:40	1.3
50yr24hrSCS	5:50	1.3
50yr24hrSCS	6:00	1.3
50yr24hrSCS	6:10	1.47
50yr24hrSCS	6:20	1.47
50yr24hrSCS	6:30	1.47
50yr24hrSCS	6:40	1.47
50yr24hrSCS	6:50	1.47
50yr24hrSCS	7:00	1.47
50yr24hrSCS	7:10	1.79
50yr24hrSCS	7:20	1.79
50yr24hrSCS	7:30	1.79
50yr24hrSCS	7:40	1.79
50yr24hrSCS	7:50	1.79
50yr24hrSCS	8:00	1.79
50yr24hrSCS	8:10	2.12
50yr24hrSCS	8:20	2.12
50yr24hrSCS	8:30	2.12
50yr24hrSCS	8:40	2.28
50yr24hrSCS	8:50	2.28

50yr24hrSCS	9:00	2.28
50yr24hrSCS	9:10	2.61
50yr24hrSCS	9:20	2.61
50yr24hrSCS	9:30	2.61
50yr24hrSCS	9:40	2.93
50yr24hrSCS	9:50	2.93
50yr24hrSCS	10:00	2.93
50yr24hrSCS	10:10	3.75
50yr24hrSCS	10:20	3.75
50yr24hrSCS	10:30	3.75
50yr24hrSCS	10:40	5.05
50yr24hrSCS	10:50	5.05
50yr24hrSCS	11:00	5.05
50yr24hrSCS	11:10	7.82
50yr24hrSCS	11:20	7.82
50yr24hrSCS	11:30	7.82
50yr24hrSCS	11:40	24.12
50yr24hrSCS	11:50	61.94
50yr24hrSCS	12:00	99.76
50yr24hrSCS	12:10	11.74
50yr24hrSCS	12:20	11.74
50yr24hrSCS	12:30	11.74
50yr24hrSCS	12:40	6.03
50yr24hrSCS	12:50	6.03
50yr24hrSCS	13:00	6.03
50yr24hrSCS	13:10	4.4
50yr24hrSCS	13:20	4.4
50yr24hrSCS	13:30	4.4
50yr24hrSCS	13:40	3.42
50yr24hrSCS	13:50	3.42
50yr24hrSCS	14:00	3.42
50yr24hrSCS	14:10	2.44
50yr24hrSCS	14:20	2.44
50yr24hrSCS	14:30	2.44
50yr24hrSCS	14:40	2.44
50yr24hrSCS	14:50	2.44
50yr24hrSCS	15:00	2.45
50yr24hrSCS	15:10	2.44
50yr24hrSCS	15:20	2.44
50yr24hrSCS	15:30	2.44
50yr24hrSCS	15:40	2.44
50yr24hrSCS	15:50	2.44
50yr24hrSCS	16:00	2.44
50yr24hrSCS	16:10	1.47
50yr24hrSCS	16:20	1.47
50yr24hrSCS	16:30	1.47
50yr24hrSCS	16:40	1.47
50yr24hrSCS	16:50	1.47

50yr24hrSCS	17:00	1.47
50yr24hrSCS	17:10	1.47
50yr24hrSCS	17:20	1.47
50yr24hrSCS	17:30	1.47
50yr24hrSCS	17:40	1.47
50yr24hrSCS	17:50	1.47
50yr24hrSCS	18:00	1.47
50yr24hrSCS	18:10	1.47
50yr24hrSCS	18:20	1.47
50yr24hrSCS	18:30	1.47
50yr24hrSCS	18:40	1.47
50yr24hrSCS	18:50	1.47
50yr24hrSCS	19:00	1.47
50yr24hrSCS	19:10	1.47
50yr24hrSCS	19:20	1.47
50yr24hrSCS	19:30	1.47
50yr24hrSCS	19:40	1.47
50yr24hrSCS	19:50	1.47
50yr24hrSCS	20:00	1.47
50yr24hrSCS	20:10	0.98
50yr24hrSCS	20:20	0.98
50yr24hrSCS	20:30	0.98
50yr24hrSCS	20:40	0.98
50yr24hrSCS	20:50	0.98
50yr24hrSCS	21:00	0.98
50yr24hrSCS	21:10	0.98
50yr24hrSCS	21:20	0.98
50yr24hrSCS	21:30	0.98
50yr24hrSCS	21:40	0.98
50yr24hrSCS	21:50	0.98
50yr24hrSCS	22:00	0.98
50yr24hrSCS	22:10	0.98
50yr24hrSCS	22:20	0.98
50yr24hrSCS	22:30	0.98
50yr24hrSCS	22:40	0.98
50yr24hrSCS	22:50	0.98
50yr24hrSCS	23:00	0.98
50yr24hrSCS	23:10	0.98
50yr24hrSCS	23:20	0.98
50yr24hrSCS	23:30	0.98
50yr24hrSCS	23:40	0.98
50yr24hrSCS	23:50	0.98
50yr24hrSCS	24:00	0.98
50yr3hrChicago	0:10	5.46715
50yr3hrChicago	0:20	6.8204
50yr3hrChicago	0:30	9.18659
50yr3hrChicago	0:40	14.44064

50yr3hrChicago	0:50	36.76423
50yr3hrChicago	1:00	161.4707
50yr3hrChicago	1:10	48.876
50yr3hrChicago	1:20	24.70426
50yr3hrChicago	1:30	16.49475
50yr3hrChicago	1:40	12.42227
50yr3hrChicago	1:50	10.00043
50yr3hrChicago	2:00	8.39661
50yr3hrChicago	2:10	7.256
50yr3hrChicago	2:20	6.40264
50yr3hrChicago	2:30	5.73956
50yr3hrChicago	2:40	5.20903
50yr3hrChicago	2:50	4.7745
50yr3hrChicago	3:00	4.41182
50yr6hrChicago	0:20	2.91078
50yr6hrChicago	0:40	3.5875
50yr6hrChicago	1:00	4.74693
50yr6hrChicago	1:20	7.25894
50yr6hrChicago	1:40	18.08154
50yr6hrChicago	2:00	108.471
50yr6hrChicago	2:20	24.07963
50yr6hrChicago	2:40	12.10875
50yr6hrChicago	3:00	8.23218
50yr6hrChicago	3:20	6.30265
50yr6hrChicago	3:40	5.14188
50yr6hrChicago	4:00	4.36357
50yr6hrChicago	4:20	3.80359
50yr6hrChicago	4:40	3.38026
50yr6hrChicago	5:00	3.04828
50yr6hrChicago	5:20	2.7805
50yr6hrChicago	5:40	2.55959
50yr6hrChicago	6:00	2.37402
5yr12hrChicago	0:20	0.98348
5yr12hrChicago	0:40	1.06763
5yr12hrChicago	1:00	1.16968
5yr12hrChicago	1:20	1.2963
5yr12hrChicago	1:40	1.45807
5yr12hrChicago	2:00	1.67279
5yr12hrChicago	2:20	1.97319
5yr12hrChicago	2:40	2.42691
5yr12hrChicago	3:00	3.2019
5yr12hrChicago	3:20	4.87289
5yr12hrChicago	3:40	11.99351
5yr12hrChicago	4:00	70.25111
5yr12hrChicago	4:20	15.92407
5yr12hrChicago	4:40	8.07957

5yr12hrChicago	5:00	5.51877
5yr12hrChicago	5:20	4.23826
5yr12hrChicago	5:40	3.46547
5yr12hrChicago	6:00	2.94605
5yr12hrChicago	6:20	2.57163
5yr12hrChicago	6:40	2.28812
5yr12hrChicago	7:00	2.0655
5yr12hrChicago	7:20	1.88572
5yr12hrChicago	7:40	1.73726
5yr12hrChicago	8:00	1.61243
5yr12hrChicago	8:20	1.5059
5yr12hrChicago	8:40	1.41382
5yr12hrChicago	9:00	1.33337
5yr12hrChicago	9:20	1.26242
5yr12hrChicago	9:40	1.19935
5yr12hrChicago	10:00	1.14288
5yr12hrChicago	10:20	1.09199
5yr12hrChicago	10:40	1.04589
5yr12hrChicago	11:00	1.0039
5yr12hrChicago	11:20	0.96549
5yr12hrChicago	11:40	0.93019
5yr12hrChicago	12:00	0.89765
5yr12hrSCS	0:30	1.6851
5yr12hrSCS	1:00	0.78638
5yr12hrSCS	1:30	1.46042
5yr12hrSCS	2:00	1.46042
5yr12hrSCS	2:30	1.90978
5yr12hrSCS	3:00	1.6851
5yr12hrSCS	3:30	2.2468
5yr12hrSCS	4:00	2.2468
5yr12hrSCS	4:30	3.03318
5yr12hrSCS	5:00	3.81956
5yr12hrSCS	5:30	6.06636
5yr12hrSCS	6:00	48.08152
5yr12hrSCS	6:30	12.24506
5yr12hrSCS	7:00	5.39232
5yr12hrSCS	7:30	3.59488
5yr12hrSCS	8:00	3.14552
5yr12hrSCS	8:30	2.47148
5yr12hrSCS	9:00	2.58382
5yr12hrSCS	9:30	1.6851
5yr12hrSCS	10:00	1.34808
5yr12hrSCS	10:30	1.90978
5yr12hrSCS	11:00	1.23574
5yr12hrSCS	11:30	1.1234
5yr12hrSCS	12:00	1.1234

5yr24hrSCS	0:10	0.63
5yr24hrSCS	0:20	0.63
5yr24hrSCS	0:30	0.63
5yr24hrSCS	0:40	0.63
5yr24hrSCS	0:50	0.63
5yr24hrSCS	1:00	0.63
5yr24hrSCS	1:10	0.63
5yr24hrSCS	1:20	0.63
5yr24hrSCS	1:30	0.63
5yr24hrSCS	1:40	0.63
5yr24hrSCS	1:50	0.63
5yr24hrSCS	2:00	0.63
5yr24hrSCS	2:10	0.74
5yr24hrSCS	2:20	0.74
5yr24hrSCS	2:30	0.74
5yr24hrSCS	2:40	0.74
5yr24hrSCS	2:50	0.74
5yr24hrSCS	3:00	0.74
5yr24hrSCS	3:10	0.74
5yr24hrSCS	3:20	0.74
5yr24hrSCS	3:30	0.74
5yr24hrSCS	3:40	0.74
5yr24hrSCS	3:50	0.74
5yr24hrSCS	4:00	0.74
5yr24hrSCS	4:10	0.91
5yr24hrSCS	4:20	0.91
5yr24hrSCS	4:30	0.91
5yr24hrSCS	4:40	0.91
5yr24hrSCS	4:50	0.91
5yr24hrSCS	5:00	0.91
5yr24hrSCS	5:10	0.91
5yr24hrSCS	5:20	0.91
5yr24hrSCS	5:30	0.91
5yr24hrSCS	5:40	0.91
5yr24hrSCS	5:50	0.91
5yr24hrSCS	6:00	0.91
5yr24hrSCS	6:10	1.03
5yr24hrSCS	6:20	1.03
5yr24hrSCS	6:30	1.03
5yr24hrSCS	6:40	1.03
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5yr24hrSCS	7:10	1.26
5yr24hrSCS	7:20	1.26
5yr24hrSCS	7:30	1.26
5yr24hrSCS	7:40	1.26
5yr24hrSCS	7:50	1.26
5yr24hrSCS	8:00	1.26

5yr24hrSCS	8:10	1.48
5yr24hrSCS	8:20	1.48
5yr24hrSCS	8:30	1.48
5yr24hrSCS	8:40	1.6
5yr24hrSCS	8:50	1.6
5yr24hrSCS	9:00	1.6
5yr24hrSCS	9:10	1.83
5yr24hrSCS	9:20	1.83
5yr24hrSCS	9:30	1.83
5yr24hrSCS	9:40	2.06
5yr24hrSCS	9:50	2.06
5yr24hrSCS	10:00	2.06
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5yr24hrSCS	10:30	2.63
5yr24hrSCS	10:40	3.54
5yr24hrSCS	10:50	3.54
5yr24hrSCS	11:00	3.54
5yr24hrSCS	11:10	5.48
5yr24hrSCS	11:20	5.48
5yr24hrSCS	11:30	5.48
5yr24hrSCS	11:40	16.9
5yr24hrSCS	11:50	43.4
5yr24hrSCS	12:00	69.89
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5yr24hrSCS	12:30	8.22
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5yr24hrSCS	12:50	4.23
5yr24hrSCS	13:00	4.23
5yr24hrSCS	13:10	3.08
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5yr24hrSCS	13:30	3.08
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5yr24hrSCS	13:50	2.4
5yr24hrSCS	14:00	2.4
5yr24hrSCS	14:10	1.71
5yr24hrSCS	14:20	1.71
5yr24hrSCS	14:30	1.71
5yr24hrSCS	14:40	1.71
5yr24hrSCS	14:50	1.71
5yr24hrSCS	15:00	1.71
5yr24hrSCS	15:10	1.71
5yr24hrSCS	15:20	1.71
5yr24hrSCS	15:30	1.71
5yr24hrSCS	15:40	1.71
5yr24hrSCS	15:50	1.71
5yr24hrSCS	16:00	1.71

5yr24hrSCS	16:10	1.03
5yr24hrSCS	16:20	1.03
5yr24hrSCS	16:30	1.03
5yr24hrSCS	16:40	1.03
5yr24hrSCS	16:50	1.03
5yr24hrSCS	17:00	1.03
5yr24hrSCS	17:10	1.03
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5yr24hrSCS	17:50	1.03
5yr24hrSCS	18:00	1.03
5yr24hrSCS	18:10	1.03
5yr24hrSCS	18:20	1.03
5yr24hrSCS	18:30	1.03
5yr24hrSCS	18:40	1.03
5yr24hrSCS	18:50	1.03
5yr24hrSCS	19:00	1.03
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5yr24hrSCS	19:30	1.03
5yr24hrSCS	19:40	1.03
5yr24hrSCS	19:50	1.03
5yr24hrSCS	20:00	1.03
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5yr24hrSCS	20:20	0.69
5yr24hrSCS	20:30	0.69
5yr24hrSCS	20:40	0.69
5yr24hrSCS	20:50	0.69
5yr24hrSCS	21:00	0.69
5yr24hrSCS	21:10	0.69
5yr24hrSCS	21:20	0.69
5yr24hrSCS	21:30	0.69
5yr24hrSCS	21:40	0.69
5yr24hrSCS	21:50	0.69
5yr24hrSCS	22:00	0.69
5yr24hrSCS	22:10	0.69
5yr24hrSCS	22:20	0.69
5yr24hrSCS	22:30	0.69
5yr24hrSCS	22:40	0.69
5yr24hrSCS	22:50	0.69
5yr24hrSCS	23:00	0.69
5yr24hrSCS	23:10	0.69
5yr24hrSCS	23:20	0.69
5yr24hrSCS	23:30	0.69
5yr24hrSCS	23:40	0.69
5yr24hrSCS	23:50	0.69
5yr24hrSCS	24:00	0.69

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5yr3hrChicago              0:10       3.68223
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5yr3hrChicago              0:30       6.15055
5yr3hrChicago              0:40       9.6141
5yr3hrChicago              0:50       24.17035
5yr3hrChicago              1:00       104.193
5yr3hrChicago              1:10       32.03692
5yr3hrChicago              1:20       16.3375
5yr3hrChicago              1:30       10.96479
5yr3hrChicago              1:40       8.28693
5yr3hrChicago              1:50       6.68897
5yr3hrChicago              2:00       5.6279
5yr3hrChicago              2:10       4.87167
5yr3hrChicago              2:20       4.30483
5yr3hrChicago              2:30       3.8637
5yr3hrChicago              2:40       3.51028
5yr3hrChicago              2:50       3.22046
5yr3hrChicago              3:00       2.97831

5yr6hrChicago              0:20       1.97319
5yr6hrChicago              0:40       2.42691
5yr6hrChicago              1:00       3.2019
5yr6hrChicago              1:20       4.87289
5yr6hrChicago              1:40       11.99351
5yr6hrChicago              2:00       70.25111
5yr6hrChicago              2:20       15.92407
5yr6hrChicago              2:40       8.07957
5yr6hrChicago              3:00       5.51877
5yr6hrChicago              3:20       4.23826
5yr6hrChicago              3:40       3.46547
5yr6hrChicago              4:00       2.94605
5yr6hrChicago              4:20       2.57163
5yr6hrChicago              4:40       2.28812
5yr6hrChicago              5:00       2.0655
5yr6hrChicago              5:20       1.88572
5yr6hrChicago              5:40       1.73726
5yr6hrChicago              6:00       1.61243

historical,Aug4/1988           0:05       0.1
historical,Aug4/1988           0:10       0.1
historical,Aug4/1988           0:15       0
historical,Aug4/1988           0:20       3.7
historical,Aug4/1988           0:25       6.2
historical,Aug4/1988           0:30       101.5
historical,Aug4/1988           0:35       15.5
historical,Aug4/1988           0:40       29.3
historical,Aug4/1988           0:45       19.8
```



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historical,Aug4/1988           0:50       1.5
historical,Aug4/1988           0:55       1.7
historical,Aug4/1988           1:00       5.4
historical,Aug4/1988           1:05       24.6
historical,Aug4/1988           1:10       26.5
historical,Aug4/1988           1:15       34.9
historical,Aug4/1988           1:20       10.2
historical,Aug4/1988           1:25       27.1
historical,Aug4/1988           1:30       104.4
historical,Aug4/1988           1:35       27.5
historical,Aug4/1988           1:40       62.5
historical,Aug4/1988           1:45       31.8
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historical,Aug4/1988           2:00       156.2
historical,Aug4/1988           2:05       5.1
historical,Aug4/1988           2:10       0.2
historical,Aug4/1988           2:15       0.2
historical,Aug4/1988           2:20       0.2
historical,Aug4/1988           2:25       0.2
historical,Aug4/1988           2:30       0.2
historical,Aug4/1988           2:35       0.2
historical,Aug4/1988           2:40       0.2
historical,Aug4/1988           2:45       0.2
historical,Aug4/1988           2:50       0.2
historical,Aug4/1988           2:55       0.2
historical,Aug4/1988           3:00       12.8
historical,Aug4/1988           3:05       14
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historical,Aug4/1988           3:15       21.8
historical,Aug4/1988           3:20       1.4
historical,Aug4/1988           3:25       0.2
historical,Aug4/1988           3:30       0.2
historical,Aug4/1988           3:35       0.2
historical,Aug4/1988           3:40       0.2
historical,Aug4/1988           3:45       0.2
historical,Aug4/1988           3:50       0.2
historical,Aug4/1988           3:55       0.2
historical,Aug4/1988           4:00       0.2
historical,Aug4/1988           4:05       0.2
historical,Aug4/1988           4:10       0.2
historical,Aug4/1988           4:15       0.2
historical,Aug4/1988           4:20       0.2
historical,Aug4/1988           4:25       0.2
historical,Aug4/1988           4:30       0.2
historical,Aug4/1988           4:35       0.2
historical,Aug4/1988           4:40       0.2
historical,Aug4/1988           4:45       0.2
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historical,Aug4/1988	4:50	0.2
historical,Aug4/1988	4:55	0.2
historical,Aug4/1988	5:00	2.9
historical,Aug4/1988	5:05	7.8
historical,Aug4/1988	5:10	10
historical,Aug4/1988	5:15	6.3
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historical,Aug4/1988	5:30	2.6
historical,Aug4/1988	5:35	1.7
historical,Aug4/1988	5:40	0
historical,Aug4/1988	5:45	0
historical,Aug8/1996	0:05	4
historical,Aug8/1996	0:10	11.9
historical,Aug8/1996	0:15	26.5
historical,Aug8/1996	0:20	13.3
historical,Aug8/1996	0:25	0
historical,Aug8/1996	0:30	2.7
historical,Aug8/1996	0:35	0
historical,Aug8/1996	0:40	8
historical,Aug8/1996	0:45	18.6
historical,Aug8/1996	0:50	10.6
historical,Aug8/1996	0:55	21.2
historical,Aug8/1996	1:00	2.7
historical,Aug8/1996	1:05	2.7
historical,Aug8/1996	1:10	15.9
historical,Aug8/1996	1:15	66.3
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historical,Aug8/1996	1:25	122
historical,Aug8/1996	1:30	88.9
historical,Aug8/1996	1:35	9.3
historical,Aug8/1996	1:40	8
historical,Aug8/1996	1:45	4
historical,Aug8/1996	1:50	0
historical,Aug8/1996	1:55	2.7
historical,Aug8/1996	2:00	0
historical,Aug8/1996	2:05	0
historical,Aug8/1996	2:10	0
historical,Aug8/1996	2:15	5.3
historical,Aug8/1996	2:20	0
historical,Aug8/1996	2:25	0
historical,Aug8/1996	2:30	0
historical,Aug8/1996	2:35	0
historical,Aug8/1996	2:40	0
historical,Aug8/1996	2:45	0
historical,Aug8/1996	2:50	4
historical,Aug8/1996	2:55	53.1

historical,Aug8/1996	3:00	69
historical,Aug8/1996	3:05	63.7
historical,Aug8/1996	3:10	58.4
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historical,Aug8/1996	3:20	15.9
historical,Aug8/1996	3:25	13.3
historical,Aug8/1996	3:30	8
historical,Aug8/1996	3:35	5.3
historical,Aug8/1996	3:40	6.6
historical,Aug8/1996	3:45	2.7
historical,Aug8/1996	3:50	4
historical,Aug8/1996	3:55	2.7
historical,Aug8/1996	4:00	4
historical,Aug8/1996	4:05	2.7
historical,Aug8/1996	4:10	5.3
historical,Aug8/1996	4:15	4
historical,Aug8/1996	4:20	2.7
historical,Aug8/1996	4:25	4
historical,Aug8/1996	4:30	2.7
historical,Aug8/1996	4:35	1.3
historical,Aug8/1996	4:40	1.3
historical,Aug8/1996	4:45	0
historical,Aug8/1996	4:50	0
historical,Aug8/1996	4:55	0
historical,Aug8/1996	5:00	0
historical,Aug8/1996	5:05	2.7
historical,Aug8/1996	5:10	0
historical,Aug8/1996	5:15	0
historical,Aug8/1996	5:20	0
historical,Aug8/1996	5:25	0
historical,Aug8/1996	5:30	0
historical,Aug8/1996	5:35	0
historical,Aug8/1996	5:40	0
historical,Aug8/1996	5:45	1.3
historical,Jul1/1979	0:05	2.3
historical,Jul1/1979	0:10	2.3
historical,Jul1/1979	0:15	8.89
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historical,Jul1/1979	0:25	8.89
historical,Jul1/1979	0:30	8.89
historical,Jul1/1979	0:35	38.1
historical,Jul1/1979	0:40	38.1
historical,Jul1/1979	0:45	38.1
historical,Jul1/1979	0:50	38.1
historical,Jul1/1979	0:55	38.1
historical,Jul1/1979	1:00	38.1
historical,Jul1/1979	1:05	38.1

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historical,Jul1/1979            1:10       50.8
historical,Jul1/1979            1:15       50.8
historical,Jul1/1979            1:20       76.2
historical,Jul1/1979            1:25       106.7
historical,Jul1/1979            1:30       106.7
historical,Jul1/1979            1:35       71.1
historical,Jul1/1979            1:40       71.1
historical,Jul1/1979            1:45       30.5
historical,Jul1/1979            1:50       30.5
historical,Jul1/1979            1:55       30.5
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historical,Jul1/1979            2:05       3.8
historical,Jul1/1979            2:10       3.8
historical,Jul1/1979            2:15       3.8
historical,Jul1/1979            2:20       3.8
historical,Jul1/1979            2:25       3.8
historical,Jul1/1979            2:30       3.8
historical,Jul1/1979            2:35       3.8
historical,Jul1/1979            2:40       3.8
historical,Jul1/1979            2:45       3.8
historical,Jul1/1979            2:50       3.8
historical,Jul1/1979            2:55       3.8
historical,Jul1/1979            3:00       3.8

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Node       OF-MN            MinorSystem
Node       U100B-OF         MJ
Node       U100C-OF         MJ
Node       U100D-OF         MJ
Node       1000-MH          MinorSystem
Node       1001-MH          MinorSystem
Node       1002-MH          MinorSystem
Node       1003-MH          MinorSystem
Node       1004-MH          MinorSystem
Node       1005-MH          MinorSystem
Node       1006-MH          MinorSystem
Node       L1000A-S         MJ
Node       L1000A-S(1)      MJ
Node       L1001A-S         MJ
Node       L1003A-S         MJ
Node       L1003B-S         MJ
```



```
Node       L1003B-S(1)      MJ
Node       L1005A-S         MJ
Node       L1006B-S         MJ
Node       L1006B-S(1)      MJ
Link       C1               MJ
Link       C10              MJ
Link       C11              MJ
Link       C12              MJ
Link       C2               MJ
Link       C3               MJ
Link       C4               MJ
Link       C5               MJ
Link       C6               MJ
Link       C7               MJ

[MAP]
DIMENSIONS       354001.0846      5015149.9789     354380.4394      5015507.6571
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
OF2              354353.792       5015186.214
OF-MJ            354018.601       5015469.469
OF-MN            354068.7         5015474
U100A-OF         354018.635       5015410.511
U100B-OF         354161.191       5015288.532
U100C-OF         354248.521       5015212.697
U100D-OF         354363.196       5015205.8
1000-MH          354106.5         5015426
1001-MH          354116.7         5015435
1002-MH          354098.4         5015401
1003-MH          354173.1         5015349
1004-MH          354208.3         5015329
1005-MH          354272.6         5015254
1006-MH          354288           5015237
L1000A-S         354097.382       5015427.717
L1000A-S(1)      354078.322       5015451.595
L1001A-S         354130           5015446
L1003A-S         354117.101       5015398.226
L1003B-S         354164.25        5015365.066
L1003B-S(1)      354202.265       5015325.627
L1005A-S         354217.311       5015298.048
L1006B-S         354322.8         5015220
L1006B-S(1)      354346.516       5015202.506
R1001A-S         354102.2         5015451
R1001B-S         354134           5015415
R1002A-S         354089.6         5015404
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R1003A-S	354186.3	5015360
R1003B-S	354158.9	5015326
R1005A-S	354211.5	5015331
R1005B-S	354275.9	5015257
R1006B-S	354288.6	5015222

[VERTICES]

;;Link	X-Coord	Y-Coord
C10	354235.005	5015275.547
C10	354268.413	5015246.273
C10	354290.313	5015240.686
C2	354106.21	5015433.88
L1005A-IC(1)	354242.714	5015271.748
L1005A-IC(2)	354246.737	5015279.234

[POLYGONS]

;;Subcatchment	X-Coord	Y-Coord
L1000A	354089.719	5015407.666
L1000A	354056.693	5015418.598
L1000A	354056.693	5015418.598
L1000A	354059.247	5015426.315
L1000A	354059.247	5015426.315
L1000A	354051.431	5015428.903
L1000A	354051.431	5015428.903
L1000A	354053.009	5015433.67
L1000A	354053.009	5015433.67
L1000A	354059.589	5015439.289
L1000A	354059.589	5015439.289
L1000A	354061.82	5015446.029
L1000A	354061.82	5015446.029
L1000A	354067.821	5015449.52
L1000A	354067.821	5015449.52
L1000A	354073.435	5015447.662
L1000A	354073.435	5015447.662
L1000A	354088.336	5015460.576
L1000A	354088.336	5015460.576
L1000A	354098.315	5015449.061
L1000A	354098.315	5015449.061
L1000A	354104.702	5015445.231
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R1001A	354118.465	5015466.524
R1001A	354098.315	5015449.061
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R1001A	354088.336	5015460.576
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R1001B	354155.037	5015430.432
R1001B	354155.037	5015430.432
R1001B	354180.252	5015401.337
R1001B	354180.252	5015401.337
R1001B	354172.568	5015394.678
R1001B	354172.568	5015394.678
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R1001B	354153.559	5015398.9
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R1003A	354220.573	5015354.812
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U100A	354032.214	5015363.232
U100A	354032.214	5015363.232
U100A	354024.961	5015356.773
U100B	354171.136	5015289.862
U100B	354166.574	5015293.044
U100B	354166.574	5015293.044
U100B	354160.216	5015297.332
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U100B	354168.457	5015304.473
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U100C             354259.889       5015213.277
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U100C             354256.807       5015210.46
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U100D             354346.747       5015192.941
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U100D             354346.661       5015205.037
U100D             354346.661       5015205.037
U100D             354353.317       5015210.805

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
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C.3 SAMPLE PCSWMM MODEL OUTPUT (100YR 3HR CHICAGO)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date 09/14/2011 00:00:00
Ending Date 09/15/2011 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:00:20
Wet Time Step 00:00:20
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... NO
Maximum Trials 8
Number of Threads 6
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.264	71.665
Evaporation Loss	0.000	0.000
Infiltration Loss	0.025	6.756
Surface Runoff	0.234	63.581
Final Storage	0.005	1.336
Continuity Error (%)	-0.012	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.234	2.341
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.235	2.348
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000

Continuity Error (%) ..... -0.283

****
Highest Continuity Errors
****
Node L1001A-S (-7.12%)
Node L1003B-S (2.39%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 1.00 sec
Average Time Step : 1.00 sec
Maximum Time Step : 1.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
L1000A	71.66	0.00	0.00	3.14	67.07	0.23	167.67	0.936
L1001A	71.66	0.00	0.00	14.15	56.44	0.16	126.45	0.788
L1003A	71.66	0.00	0.00	3.78	66.46	0.20	145.58	0.927
L1003B	71.66	0.00	0.00	3.78	66.46	0.37	272.32	0.927
L1005A	71.66	0.00	0.00	6.33	64.00	0.36	268.53	0.893
L1006A	71.66	0.00	0.00	0.00	70.10	0.05	35.49	0.978
L1006B	71.66	0.00	0.00	16.15	54.52	0.18	142.44	0.761
L1006C	71.66	0.00	0.00	12.18	58.35	0.15	111.64	0.814
R1001A	71.66	0.00	0.00	0.00	70.10	0.04	28.21	0.978
R1001B	71.66	0.00	0.00	0.00	70.10	0.06	41.09	0.978

R1002A		71.66	0.00	0.00	0.00	70.10
0.23	161.06	0.978				
R1003A		71.66	0.00	0.00	0.00	70.10
0.08	56.20	0.978				
R1003B		71.66	0.00	0.00	0.00	70.10
0.03	18.43	0.978				
R1005A		71.66	0.00	0.00	0.00	70.10
0.10	70.01	0.978				
R1005B		71.66	0.00	0.00	0.00	70.10
0.04	28.56	0.978				
R1006B		71.66	0.00	0.00	0.00	70.10
0.02	13.82	0.978				
U100A		71.66	0.00	0.00	44.20	27.33
0.03	18.05	0.381				
U100B		71.66	0.00	0.00	0.00	70.10
0.01	5.13	0.978				
U100C		71.66	0.00	0.00	0.00	70.10
0.01	4.95	0.978				
U100D		71.66	0.00	0.00	0.00	70.10
0.01	7.24	0.978				

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF2	OUTFALL	0.00	0.00	97.00	0 00:00	0.00
OF-MJ	OUTFALL	0.00	0.04	96.04	0 01:28	0.04
OF-MN	OUTFALL	0.00	0.00	93.61	0 00:00	0.00
U100A-OF	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
U100B-OF	OUTFALL	0.00	0.00	98.20	0 00:00	0.00
U100C-OF	OUTFALL	0.00	0.00	98.20	0 00:00	0.00
U100D-OF	OUTFALL	0.00	0.00	98.20	0 00:00	0.00
1000-MH	STORAGE	0.41	0.81	94.66	0 01:12	0.81
1001-MH	STORAGE	0.33	0.42	94.67	0 01:12	0.42
1002-MH	STORAGE	0.32	0.34	94.97	0 00:49	0.34
1003-MH	STORAGE	0.37	0.77	94.74	0 01:11	0.77
1004-MH	STORAGE	0.35	0.72	94.81	0 01:10	0.72
1005-MH	STORAGE	0.34	0.73	94.95	0 01:10	0.73
1006-MH	STORAGE	0.32	0.58	95.08	0 01:10	0.58
L1000A-S	STORAGE	0.29	2.09	97.01	0 01:29	2.09
L1000A-S(1)	STORAGE	0.00	0.04	97.01	0 01:28	0.04
L1001A-S	STORAGE	0.81	2.20	97.02	0 01:28	2.20
L1003A-S	STORAGE	0.78	2.03	97.05	0 01:12	2.03
L1003B-S	STORAGE	0.21	1.42	97.32	0 01:10	1.42
L1003B-S(1)	STORAGE	0.00	0.00	97.50	0 00:00	0.00
L1005A-S	STORAGE	0.81	2.96	97.09	0 01:13	2.96
L1006B-S	STORAGE	0.64	1.94	96.96	0 01:15	1.94
L1006B-S(1)	STORAGE	0.00	0.00	97.14	0 00:00	0.00
R1001A-S	STORAGE	0.10	0.17	105.17	0 03:11	0.17
R1001B-S	STORAGE	0.10	0.17	105.17	0 03:11	0.17
R1002A-S	STORAGE	0.09	0.17	105.17	0 03:10	0.17
R1003A-S	STORAGE	0.09	0.17	105.17	0 03:10	0.17
R1003B-S	STORAGE	0.06	0.17	105.17	0 02:50	0.17
R1005A-S	STORAGE	0.09	0.17	105.17	0 03:11	0.17
R1005B-S	STORAGE	0.10	0.17	105.17	0 03:11	0.17
R1006B-S	STORAGE	0.10	0.17	105.17	0 03:11	0.17

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF2	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
OF-MJ	OUTFALL	0.00	46.27	0 01:28	0	0.0486	0.000
OF-MN	OUTFALL	0.00	300.40	0 01:12	0	2.25	0.000
U100A-OF	OUTFALL	18.05	18.05	0 01:10	0.0274	0.0274	0.000
U100B-OF	OUTFALL	5.13	5.13	0 01:10	0.00725	0.00725	0.000
U100C-OF	OUTFALL	4.95	4.95	0 01:10	0.00699	0.00699	0.000
U100D-OF	OUTFALL	7.24	7.24	0 01:10	0.0102	0.0102	0.000
1000-MH	STORAGE	0.00	302.95	0 01:11	0	2.25	-0.089
1001-MH	STORAGE	0.00	19.73	0 01:28	0	0.343	0.095
1002-MH	STORAGE	0.00	3.80	0 00:34	0	0.228	0.154
1003-MH	STORAGE	0.00	263.68	0 01:10	0	1.43	-0.013
1004-MH	STORAGE	0.00	229.36	0 01:10	0	0.892	0.135
1005-MH	STORAGE	0.00	228.59	0 01:10	0	0.796	0.256
1006-MH	STORAGE	35.49	129.48	0 01:10	0.0502	0.399	0.083
L1000A-S	STORAGE	167.67	273.86	0 01:17	0.229	0.391	0.181
L1000A-S(1)	STORAGE	0.00	72.72	0 01:23	0	0.0508	0.054
L1001A-S	STORAGE	126.45	238.12	0 01:15	0.164	0.254	-6.649
L1003A-S	STORAGE	145.58	357.13	0 01:10	0.198	0.326	-0.561
L1003B-S	STORAGE	272.32	272.32	0 01:10	0.37	0.37	2.444
L1003B-S(1)	STORAGE	0.00	0.00	0 00:00	0	0	0.000 ltr
L1005A-S	STORAGE	268.53	268.53	0 01:10	0.358	0.358	0.273
L1006B-S	STORAGE	254.08	254.08	0 01:10	0.33	0.33	0.223

L1006B-S(1)	STORAGE	0.00	0.00	0	00:00	0	0
0.000 ltr							
R1001A-S	STORAGE	28.21	28.21	0	01:10	0.0399	0.0399
0.000							
R1001B-S	STORAGE	41.09	41.09	0	01:10	0.0581	0.0581
0.000							
R1002A-S	STORAGE	161.06	161.06	0	01:10	0.228	0.228
-0.000							
R1003A-S	STORAGE	56.20	56.20	0	01:10	0.0795	0.0795
-0.000							
R1003B-S	STORAGE	18.43	18.43	0	01:10	0.0261	0.0261
-0.000							
R1005A-S	STORAGE	70.01	70.01	0	01:10	0.099	0.099
-0.000							
R1005B-S	STORAGE	28.56	28.56	0	01:10	0.0404	0.0404
0.000							
R1006B-S	STORAGE	13.82	13.82	0	01:10	0.0195	0.0195
0.000							

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
1000-MH	0.000	0	0	0	0.000	0	0 00:00	300.40
1001-MH	0.000	0	0	0	0.000	0	0 00:00	20.00
1002-MH	0.000	0	0	0	0.000	0	0 00:00	3.80
1003-MH	0.000	0	0	0	0.000	0	0 00:00	262.30
1004-MH	0.000	0	0	0	0.000	0	0 00:00	228.57
1005-MH	0.000	0	0	0	0.000	0	0 00:00	227.76
1006-MH	0.000	0	0	0	0.000	0	0	

00:00 129.30							
L1000A-S	0.010	10	0	0	0.100	100	0
01:11 211.92							
L1000A-S(1)	0.000	0	0	0	0.000	0	0
00:00 46.27							
L1001A-S	0.011	11	0	0	0.100	100	0
01:15 131.83							
L1003A-S	0.009	9	0	0	0.100	100	0
01:10 214.61							
L1003B-S	0.010	10	0	0	0.100	100	0
01:06 235.96							
L1003B-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
L1005A-S	0.002	2	0	0	0.089	89	0
01:13 99.33							
L1006B-S	0.001	1	0	0	0.079	79	0
01:15 94.60							
L1006B-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
R1001A-S	0.014	9	0	0	0.034	22	0
03:11 0.60							
R1001B-S	0.020	9	0	0	0.049	22	0
03:11 0.90							
R1002A-S	0.071	8	0	0	0.189	22	0
03:10 3.80							
R1003A-S	0.025	8	0	0	0.066	22	0
03:10 1.30							
R1003B-S	0.006	6	0	0	0.020	20	0
02:50 0.60							
R1005A-S	0.032	8	0	0	0.083	22	0
03:11 1.60							
R1005B-S	0.014	9	0	0	0.034	22	0
03:11 0.60							
R1006B-S	0.007	9	0	0	0.016	22	0
03:11 0.30							

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF2	0.00	0.00	0.00	0.000
OF-MJ	3.12	18.03	46.27	0.049
OF-MN	89.83	28.95	300.40	2.247
U100A-OF	6.53	4.85	18.05	0.027
U100B-OF	12.15	0.69	5.13	0.007
U100C-OF	12.12	0.67	4.95	0.007
U100D-OF	12.43	0.95	7.24	0.010
System	19.45	54.14	336.53	2.348

****
Link Flow Summary
****

	Maximum	Time of Max	Maximum	Max/	Max/

Link	Type	|Flow| LPS	Occurrence days	hr:min	|Veloc| m/sec	Full Flow	Full Depth
C1	CONDUIT	72.72	0	01:23	0.12	0.04	0.52
C10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C2	CONDUIT	192.60	0	01:15	0.51	0.12	0.88
C3	CHANNEL	46.27	0	01:28	0.73	0.02	0.24
C4	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
C5	CONDUIT	218.79	0	01:10	0.60	0.10	0.27
C6	CONDUIT	198.47	0	01:12	0.53	0.12	0.44
C7	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
Pipe_15	CONDUIT	20.00	0	01:45	0.71	0.16	0.29
Pipe_2	CONDUIT	300.40	0	01:12	1.10	0.66	0.51
Pipe_20	CONDUIT	3.80	0	00:49	0.65	0.04	0.14
Pipe_3	CONDUIT	262.30	0	01:11	0.85	0.58	0.57
Pipe_4	CONDUIT	228.57	0	01:10	1.01	0.65	0.54
Pipe_5	CONDUIT	227.76	0	01:10	0.97	0.65	0.54
Pipe_6	CONDUIT	129.30	0	01:10	1.21	0.66	0.50
L1000A-IC	ORIFICE	19.65	0	01:29			1.00
L1001A-IC	ORIFICE	18.23	0	01:28			1.00
L1003A-IC	ORIFICE	16.14	0	01:12			1.00
L1003B-IC	ORIFICE	17.18	0	01:10			1.00
L1005A-IC	ORIFICE	34.11	0	01:15			1.00
L1005A-IC(1)	ORIFICE	33.85	0	01:13			1.00
L1005A-IC(2)	ORIFICE	31.37	0	01:13			1.00
L1006B-IC	ORIFICE	94.60	0	01:15			1.00
R1001A-O	DUMMY	0.60	0	00:34			
R1001B-O	DUMMY	0.90	0	00:34			
R1002A-O	DUMMY	3.80	0	00:34			
R1003A-O	DUMMY	1.30	0	00:34			
R1003B-O	DUMMY	0.60	0	00:36			
R1005A-O	DUMMY	1.60	0	00:34			
R1005B-O	DUMMY	0.60	0	00:34			
R1006B-O	DUMMY	0.30	0	00:34			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.84	0.00	0.00	0.06	0.00	0.00	0.10	0.02	0.00
C10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.93	0.01	0.00	0.06	0.00	0.00	0.00	0.89	

0.00									
C3	1.00	0.85	0.00	0.00	0.12	0.04	0.00	0.00	0.93
0.00									
C4	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
C5	1.00	0.96	0.00	0.00	0.03	0.00	0.00	0.02	0.03
0.00									
C6	1.00	0.94	0.03	0.00	0.03	0.00	0.00	0.00	0.95
0.00									
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
Pipe_15	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.00
0.00									
Pipe_2	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									
Pipe_20	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									
Pipe_3	1.00	0.02	0.00	0.00	0.79	0.00	0.00	0.19	0.56
0.00									
Pipe_4	1.00	0.02	0.00	0.00	0.16	0.00	0.00	0.81	0.00
0.00									
Pipe_5	1.00	0.02	0.00	0.00	0.73	0.00	0.00	0.25	0.00
0.00									
Pipe_6	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C2	0.01	0.01	1.00	0.01	0.01

Analysis begun on: Thu Jul 26 09:34:25 2018
Analysis ended on: Thu Jul 26 09:34:28 2018
Total elapsed time: 00:00:03

C.4 BACKGROUND REPORT EXCERPTS (STORM DRAINAGE)

Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Legend

- 2-11A (0.31 | 0.68) — DRAINAGE AREA NO. / RUNOFF COEFFICIENT / STORM DRAINAGE AREA (ha)
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN (ALL ROAD CB'S TO INCLUDE PERFORATED STUB DRAINS EXTENDING OUT FROM THE CB IN TWO DIRECTIONS PARALLEL TO THE ROADWAY. THESE DRAINS ARE TO BE INSTALLED AT THE BOTTOM OF THE SUBBASE LAYER.)
- PROPOSED SUBDRAIN CATCH BASIN
- PROPOSED 250ø PERFORATED PIPE
- (IC) — STREET CATCHBASINS TO BE INTERCONNECTED WITH ONLY ONE CONNECTION TO STORM SEWER PER PAIR WHERE NOTED.
- (A) — IPEX TYPE 'A' TO BE INSTALLED IN STREET AND REAR YARD CATCHBASINS WHERE NOTED.
- (1) — PROPOSED CATCH BASIN / MANHOLE c/w IPEX INLET-CONTROL DEVICE TYPE 'A' OR APPROVED EQUIVALENT
- PONDING AREA LIMITS
- DEPTH=0.20m — MAXIMUM PONDING DEPTH
- DIRECTION OF OVERLAND FLOW
- FUTURE PHASE OF STORM DRAINAGE WORKS

Notes

1. IPEX TYPE 'A' TO RESTRICT FLOWS TO THE STORM SEWER TO 22L/s AT 1.8m HEAD.

3	REVISED AS PER CITY COMMENTS AND FINAL APPROVAL	KJK	JBL	07.10.29
2	REVISED AS PER CITY COMMENTS	KJK	JBL	07.08.17
1	ISSUED FOR CITY COMMENTS	KJK	JBL	07.07.12
Revision		By	Appd.	YY.MM.DD
File Name: 160400502C-SD		KJK	JBL	KJK 07.03.14
		Dwn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

Client/Project
CAVANAGH CONSTRUCTION LTD.

SOHO - KANATA SOUTH

Ottawa ON Canada

Title
OVERALL
STORM DRAINAGE PLAN

Project No.	Scale	
160400502C	1:2000	0 20 60 100m
Drawing No.	Sheet	Revision
OSD	49 of 58	3

V:\01-ATA\active\160400502 (SOHO)\design\drawing\Submissions\2007-10-29 Rev3\160400502c-SD-rev3.dwg
2007-11-01 04:16PM By: rlochlo

ORIGINAL SHEET – ISO A1

160400502
7/24/2018

HGL Summary Phase 1

Date: 20-Jul-18

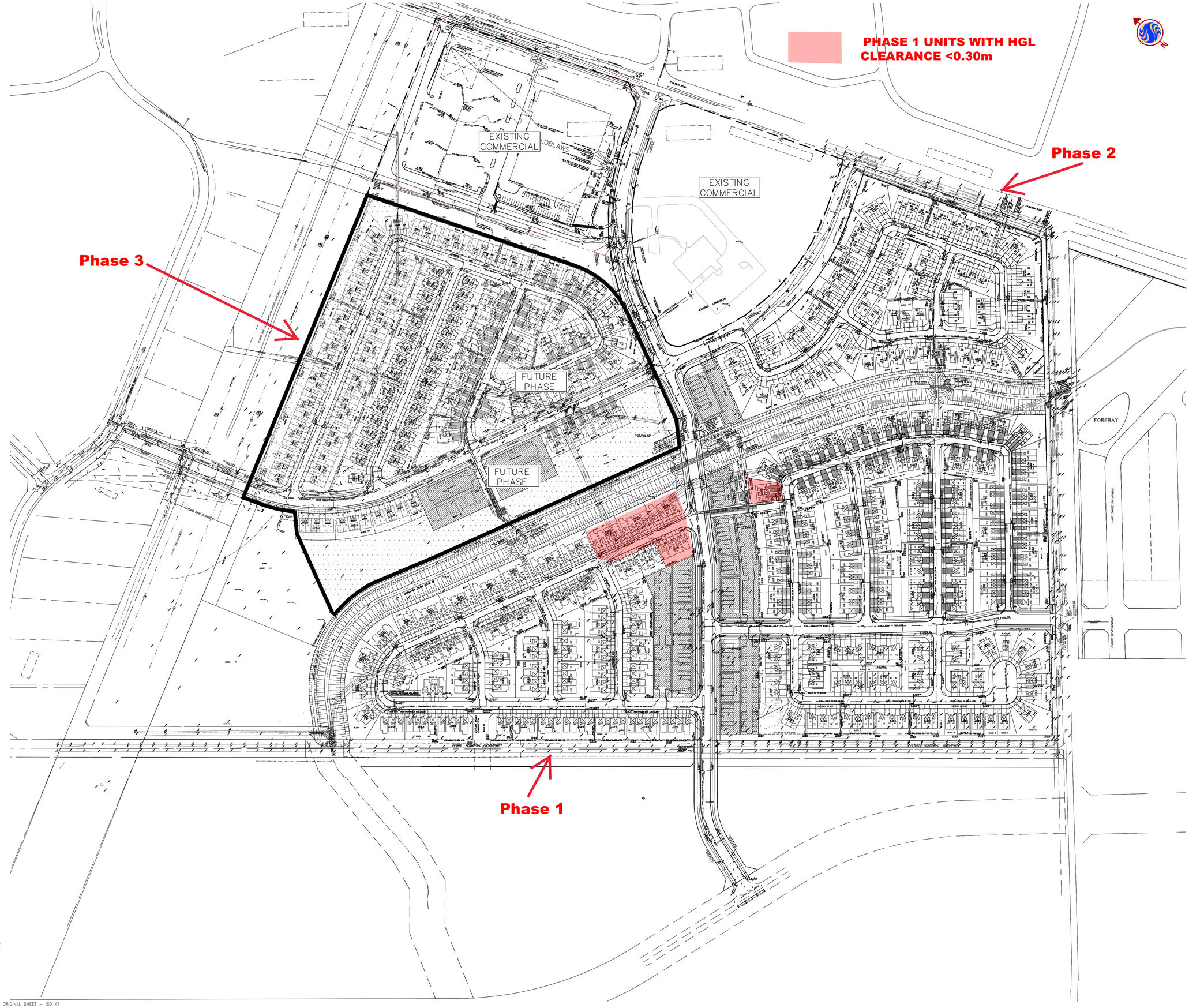
HGL Results copied from PCSWMM

Note:
1) both 24hr SCS and 3hr CHI storm HGL uses 24hr SCS dynamic BC from the existing conditions JFSA Monahan Drain model (January 2014).

Name	Ground (m)	**USF (m)**					Invert (m)
			24hr SCS	3hr CHI	24hr SCS	3hr CHI	
1001	98.17	96.15	95.32	95.32	0.83	0.83	95.32
1002	97.85	96.08	95.28	95.28	0.80	0.80	95.07
1004E	97.91	95.84	95.17	95.17	0.67	0.67	95.43
1004N	97.91	95.84	95.53	95.53	0.31	0.31	-
1005	97.91	95.70	94.97	94.97	0.73	0.73	94.91
1006	97.70	95.50	94.74	94.74	0.76	0.76	94.35
1007	98.02	N/A	95.16	95.16	-	-	95.16
1008	97.95	N/A	95.1	95.1	-	-	94.89
1009	97.74	95.88	94.99	95	0.89	0.88	94.69
1010	97.67	95.77	94.78	94.78	0.99	0.99	94.44
1011	97.35	95.23	94.72	94.72	0.51	0.51	94.11
1012	97.02	N/A	94.72	94.72	-	-	93.91
1013	96.92	N/A	94.72	94.72	-	-	93.61
1014	97.00	N/A	94.72	94.72	-	-	93.53
1015	97.49	N/A	94.72	94.72	-	-	93.43
1016	96.79	N/A	94.72	94.72	-	-	93.33
1017	97.86	96.00	95.14	95.14	0.86	0.86	95.14
1018	97.78	95.60	95.05	95.05	0.55	0.55	94.85
1019	97.44	95.67	94.77	94.77	0.90	0.90	94.59
1020	97.40	95.32	94.73	94.74	0.59	0.58	94.49
1021	97.25	95.32	94.72	94.74	0.60	0.58	94.38
1022	97.53	95.70	95.12	95.12	0.58	0.58	94.88
1023	97.34	95.29	94.92	94.92	0.37	0.37	94.57
1024	97.19	95.27	94.72	94.73	0.55	0.54	94.18
1025	97.17	95.27	94.72	94.73	0.55	0.54	94.04
1026	97.55	95.47	94.89	94.89	0.58	0.58	94.76
1027	97.31	95.39	94.76	94.76	0.63	0.63	94.44
1028	97.09	95.31	94.72	94.73	0.59	0.58	94.18
1029	96.95	95.09	94.72	94.73	0.37	0.36	93.91

160400502
7/24/2018

Name	Ground (m)	USF (m)					Invert (m)
			24hr SCS	3hr CHI	24hr SCS	3hr CHI	
1030	98.00	95.23	94.73	94.76	0.50	0.47	94.39
1031	98.00	95.10	94.73	94.73	0.37	0.37	94.01
1033N	97.50	95.85	95.23	95.23	0.62	0.62	95.23
1033S	97.50	95.85	95.32	95.32	0.53	0.53	-
1034	97.43	95.75	95.32	95.32	0.43	0.43	95.11
1035	97.20	95.65	95.18	95.18	0.47	0.47	94.99
1035N	97.20	95.65	95.03	95.03	0.62	0.62	-
1036	97.34	95.51	94.89	94.89	0.62	0.62	94.60
1037	97.50	95.73	95.13	95.13	0.60	0.60	95.13
1038	97.33	95.58	95.12	95.12	0.46	0.46	94.94
1039	97.26	95.27	94.78	94.78	0.49	0.49	94.46
1040	97.15	95.40	94.89	94.89	0.51	0.51	94.76
1041	97.14	95.28	94.73	94.73	0.55	0.55	94.48
1042	97.19	95.14	94.72	94.73	0.42	0.41	94.09
1043	97.07	95.42	94.82	94.82	0.60	0.60	94.45
1044	97.02	95.32	94.79	94.79	0.53	0.53	94.65
1045	97.00	95.09	94.72	94.73	0.37	0.36	94.25
1046	96.70	95.00	94.72	94.72	**0.28**	**0.28**	93.86
1047	96.63	94.90	94.72	94.72	**0.18**	**0.18**	93.74
1048	96.50	N/A	94.72	94.72	-	-	-
1048A	96.07	N/A	94.73	94.72	-	-	-
1049	96.86	95.05	94.73	94.72	0.32	0.33	93.72
1050	96.83	95.02	94.73	94.72	**0.29**	**0.30**	93.70
1051	96.75	95.02	94.73	94.72	**0.29**	**0.30**	93.58
1052	97.04	N/A	94.75	94.73	-	-	93.13
1053	97.22	95.42	95.06	95.06	0.36	0.36	94.72
1053B	97.20	N/A	94.8	94.8	-	-	93.09
DIVERSION	95.65	N/A	94.77	94.75	-	-	93.09
Monahan	95.05	N/A	94.69	94.69	-	-	92.88
N138	95.65	N/A	94.72	94.72	-	-	93.08



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Stantec

Legend

- DRAINAGE AREA NO. / RUNOFF COEFFICIENT / STORM DRAINAGE AREA (ha)
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN (ALL ROAD CB'S TO INCLUDE PERFORATED STUB DRAINS EXTENDING OUT FROM THE CB IN TWO DIRECTIONS PARALLEL TO THE ROADWAY. THESE DRAINS ARE TO BE INSTALLED AT THE BOTTOM OF THE SUBBASE LAYER.)
- PROPOSED SUBDRAIN CATCH BASIN
- PROPOSED 250ø PERFORATED PIPE
- (IC) STREET CATCHBASINS TO BE INTERCONNECTED WITH ONLY ONE CONNECTION TO STORM SEWER PER PAIR WHERE NOTED.
- (A) IPEX TYPE 'A' TO BE INSTALLED IN STREET AND REAR YARD CATCHBASINS WHERE NOTED.
- (1) PROPOSED CATCH BASIN / MANHOLE c/w IPEX INLET-CONTROL DEVICE TYPE 'A' OR APPROVED EQUIVALENT
- DEPTH=0.20m PONDING AREA LIMITS / MAXIMUM PONDING DEPTH
- DIRECTION OF OVERLAND FLOW
- FUTURE PHASE OF STORM DRAINAGE WORKS

Notes

1. IPEX TYPE 'A' TO RESTRICT FLOWS TO THE STORM SEWER TO 22L/s AT 1.8m HEAD.

7	REVISED DRIVEWAY & SIDEWALK LOCATIONS, ISSUED FOR FINAL APPROVAL	KJK	JBL	09.02.25
5	REVISED LOT GRADING AND SERVICING	KJK	JBL	08.11.03
4	ISSUED FOR CONSTRUCTION	KJK	JBL	08.01.21
3	REVISED AS PER CITY COMMENTS AND FINAL APPROVAL	KJK	JBL	07.10.29
2	REVISED AS PER CITY COMMENTS	KJK	JBL	07.08.17
1	ISSUED FOR CITY COMMENTS	KJK	JBL	07.07.12
Revision		By	Appd.	YY.MM.DD
File Name: 160400502C-SD		KJK Dwn.	JBL Chkd.	KJK 07.03.14 Dsgn. YY.MM.DD

Permit-Seal

Client/Project
CAVANAGH CONSTRUCTION LTD.

SOHO - KANATA SOUTH

Ottawa ON Canada

Title
OVERALL
STORM DRAINAGE PLAN

Project No.	Scale	Revision
160400502C	1:2000 (0 20 60 100m)	7
Drawing No.	Sheet	
OSD	49 of 58	

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2009-02-26 09:05AM By: gusik

ORIGINAL SHEET – ISO A1

Appendix D GEOTECHNICAL INVESTIGATION

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

patersongroup

Geotechnical Investigation

Proposed Commercial Development
Terry Fox Drive at Cope Drive - Ottawa

Prepared For

Street Properties

February 20, 2018

Report: PG4411-1

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Street Properties to conduct a geotechnical investigation for the proposed commercial development to be located at Terry Fox Drive, between Cope Drive and Fernbank Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the investigation was to:

- ❏ determine the subsurface soil and groundwater conditions based on test hole information completed within the subject site.
- ❏ Provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. The report contains our findings and includes geotechnical recommendations pertaining to the design and construction of the proposed development as understood at the time of this report.

Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

It is our understanding that the proposed development will consist of commercial slab-on-grade buildings with the associated parking areas, access lanes and landscaped areas. It is further anticipated that the development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

The field program for our investigation was carried out on January 15, 16 and 17, 2018. At that time, eight (8) boreholes were drilled to a maximum depth of 9.4 m below existing ground surface. The borehole locations were placed in a manner to provide general coverage of the subject site. The locations of the boreholes are presented on Drawing PG4411-1 - Test Hole Location Plan included in Appendix 2.

Boreholes were put down using a track-mounted auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from our geotechnical department. The drilling procedures consisted of augering to the required depths at the selected locations, sampling and testing the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler, using 73 mm diameter thin walled (TW) Shelby tubes in conjunction with a piston sampler, or from the auger flights. The depths at which the auger, split spoon, Shelby tube and grab samples were recovered from the test holes are shown as AU, SS, TW and G, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was carried out at regular depth intervals in cohesive soils.

Overburden thickness was evaluated during the course of the investigation by a dynamic cone penetration testing (DCPT) completed at BH 8-18. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

All soil samples were classified on site, placed in sealed plastic bags and were transported to our laboratory for visual inspection.

Subsurface conditions observed in the test holes were recorded in detail in the field. Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for specific details of the soil profile encountered at the test hole locations.

Groundwater

The groundwater observations are discussed in Subsection 4.3 and presented in the Soil Profile and Test Data sheets presented in Appendix 1.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of the report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test hole locations were laid out by Paterson personnel. The location of the test holes are presented in Drawing PG4411-1 - Test Hole Location Plan in Appendix 2. The ground surface elevations at the test hole locations were provided by Stantec Geomatics and are referenced to a geodetic datum.

3.3 Laboratory Testing

The soil samples recovered from the field investigation were examined in our laboratory. Two (2) Shelby tube samples were submitted for unidimensional consolidation. The results of the consolidation testing are presented on the Unidimensional Consolidation Test Results sheets presented in Appendix 1 and are further discussed in Subsection 5.3.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity and the pH of the sample. The results are presented in Appendix 1 and are discussed further in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The ground surface across the majority of the subject site is occupied by agricultural lands. A former roadway runs along the east portion os the site in a north-south direction. The subject site was noted to be relatively flat with a gentle downslope towards the south. Also, the site is at slightly lower elevation than Terry Fox Drive.

The subject site is bordered to the north by Cope Drive, to the east by Hazeldean Sideroad, to the south by Fernbank Road and to the west and southwest by Terry Fox Drive.

4.2 Subsurface Profile

Overburden

Generally, the soil conditions encountered at the test hole locations consist of a cultivated topsoil/organic layer or crushed stone fill material underlain by an interlayered loose silty sand and grey silty clay to clayey silt. Underlying the above noted layers is a firm to very stiff brown silty clay crust and/or a firm grey silty clay deposit with interbedded silt seams.

A dynamic cone penetration test was completed at BH 8-18 to a maximum depth of 30 m. Practical refusal was not encountered within the depth of the test. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Bedrock

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and dolomite of the Gull River Formation with an overburden drift thickness of 15 to 50 m depth.

4.3 Groundwater

Based on our field observations during our field program, which include moisture levels and colour of the recovered soil samples, the long-term groundwater level is anticipated to range between 2.5 to 3.5 m depth below ground surface. Groundwater levels are subject to seasonal fluctuations and therefore, the groundwater levels could vary at the time of construction. The groundwater level readings are presented in the Soil Profile and Test Data sheets in Appendix 1.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is adequate for a proposed commercial development. It is expected that the proposed commercial buildings will be founded by conventional shallow footings placed on an undisturbed, compact silty sand or a stiff brown silty clay bearing surface.

Due to the presence of the sensitive silty clay layer, the subject site will be subjected to a permissible grade raise restriction. If the grade raise restrictions are exceeded, several options are available, such as a preload/surcharge program or the placement of light weight fill below the proposed buildings.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of the standard proctor maximum dry density (SPMDD)

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. Site excavated, stiff brown silty clay under dry conditions and approved by the geotechnical consultant at the time of placement can be used to build up the subgrade level for areas to be paved. The stiff, brown silty clay should be placed in maximum 300 mm loose lifts and compacted to a minimum density of 95% of its SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**.

Footings placed on an undisturbed, compact silty sand and/or sandy silt bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **75 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **125 kPa**. Any loose or poor performing silty sand or sandy silt material should be proof-rolled and approved by the geotechnical consultant prior to placement of the footings.

A geotechnical resistance factor of 0.5 was applied to the above-noted bearing resistance value at ULS.

Footings designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Settlement/Grade Raise

Undrained shear strength testing was completed using a vane apparatus at each borehole location. In addition to the shear strength testing, undisturbed silty clay samples were collected using 73 mm diameter thin walled (TW) Shelby tube in conjunction with a piston sampler. The Shelby tube sample was sealed at both ends and transported to our laboratory for unidimensional consolidation testing.

Consideration must be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For buildings, a minimum value of 50% of the live load is recommended by Paterson.

Generally, the potential long term settlement is evaluated based on the compressibility characteristics of the silty clay. These characteristics are estimated in the laboratory by conducting unidimensional consolidation tests on undisturbed soil samples collected using Shelby tubes in conjunction with a piston sampler. Two (2) site specific consolidation tests were conducted. The results of the consolidation tests from our investigation is presented in Table 1 and in Appendix 1.

The value for p'_c is the preconsolidation pressure and p'_o is the effective overburden pressure of the test sample. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided.

The values for C_{cr} and C_c are the recompression and compression indices, respectively. These soil parameters are a measure of the compressibility due to stress increases below and above the preconsolidation pressures. The higher values for the C_c, as compared to the C_{cr}, illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 1 - Summary of Consolidation Test Results

Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q (*)
BH 3-18	TW 3	4.04	111	42	0.013	0.898	A
BH 7-18	TW 3	3.89	78	41	0.021	1.190	A

* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

The values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering testing procedures and are estimates only. Natural variations within the soil deposit will affect the results. The p'_o parameter is directly influenced by the groundwater level. Groundwater levels were measured during the site investigation. Groundwater levels vary seasonally which has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The p'_o values for the consolidation tests during the investigation are based on the long term groundwater level being at 0.5 m below the existing groundwater table. The groundwater level is based on the colour and undrained shear strength profile of the silty clay.

The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when building are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

To reduce potential long term liabilities, consideration should be given to accounting for a larger groundwater lowering and to provide means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the buildings, etc). Buildings on silty clay deposits increases the likelihood of movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking compared to unreinforced foundations. Based on the consolidation testing results and undrained shear strength values, a permissible grade raise of **1.5 m** above existing ground surface is recommended for the grading within 6 m of the proposed building footprints. Finished grading beyond 6 m of the proposed building footprints are subject to a **2.0 m** grade raise restriction.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class E** for this area and the foundations being considered at this site. However, a higher site class for seismic site response such as a Class D may be possible for the proposed foundations provided a site specific shear wave velocity test be completed to confirm the higher site class. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code (OBC) 2012 for a full discussion of the earthquake design requirements.

5.5 Slab-on-Grade Construction

With the removal of all topsoil and deleterious fill, containing organic matter, within the footprints of the proposed buildings, undisturbed native soil surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of OPSS Granular A crushed stone for slab on grade construction. All backfill material within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD.

5.6 Pavement Structure

As a general guideline, the pavement structure shown in Table 2 and 3 can be used for car only parking areas and access lanes at this site, respectively.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE -** OPSS Granular A Crushed Stone
300	**SUBBASE -** OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 3 - Recommended Pavement Structure - Access Lanes and Heavy Truck Loading Areas	
Thickness (mm)	**Material Description**
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

Where silty clay is anticipated at subgrade level, consideration should be given to installing subdrains during the pavement construction. The sub-drain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for proposed structures. The system should consist of a 150 mm diameter, geotextile-wrapped, perforated, corrugated, plastic pipe, surrounded on all sides by 150 mm of 10 or 19 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage layer connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

Concrete Sidewalks Adjacent to Building(s)

To avoid differential settlements within the proposed sidewalks adjacent to the proposed buildings, it is recommended that the upper 300 mm of backfill placed below the concrete sidewalks to consist of free draining, non-frost susceptible material such as, Granular A or Granular B Type II, instead of site excavated material which is considered frost susceptible. The granular material should be placed in maximum 300 mm loose lifts and compacted to 95% of the material's SPMDD using suitable compaction equipment. The subgrade material should be shaped to promote positive drainage towards the building's perimeter drainage pipe. Consideration could be given to placing rigid insulation below the granular layer of the building(s) entrances to limit frost heave issues.

6.2 Protection Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

Excavations will be mostly through silty sand and sensitive grey silty clay. Above the groundwater level, for excavations to depths of approximately 3 m, the excavation side slopes should be stable in the short term at 1H:1V. Flatter slopes could be required for deeper excavations or for excavation below the groundwater level. Where such side slopes are not permissible or practical, temporary shoring should be used. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

The slope cross-sections recommended above are for temporary slopes. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the City of Ottawa.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within the firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extent at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD.

Generally, it should be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, as the high water contents make compacting impractical without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

Due to the relatively impervious nature of the silty clay materials, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

Permit to Take Water

A temporary Ministry of the Environment and Climate Change (MOECC) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MOECC.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MOECC review of the PTTW application.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

6.6 Winter Construction

The subsurface conditions at this site mostly consist of frost susceptible materials. In presence of water and freezing conditions ice could form within the soil mass. Heaving and settlement upon thawing could occur. Precautions should be taken if winter construction is considered for this project.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters, tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

The trench excavations should be constructed in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a non-aggressive corrosive environment.

6.8 Landscaping Considerations

The proposed development is located in a moderate sensitivity area with respect to tree plantings over a silty clay deposit. It is recommended that trees placed within 7.5 m of the foundation wall should consist of low water demanding trees with shallow roots systems that extend less than 1.5 m below ground surface. The trees should be reviewed and approved by the geotechnical consultant prior to placement. Trees placed greater than 7.5 m from the foundation wall may consist of typical street trees, which are typically moderate water demand species with roots extending to a maximum depth of 2 m below ground surface.

It is well documented in the literature, and is our experience, that fast-growing trees located near buildings founded on cohesive soils that shrink on drying can result in long-term differential settlements of the structures. Tree varieties that have the most pronounced effect on foundations are seen to consist of poplars, willows and some maples (i.e. Manitoba Maples) and, as such, they should not be considered in the landscaping design.

7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials used.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and the test hole log are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests to be notified immediately in order to permit reassessment of the recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Street Properties or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Faisal I. Abou-Seido, P.Eng.

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ Street Properties (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEET

SYMBOLS AND TERMS

UNIDIMENSIONAL CONSOLIDATION TEST SHEETS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

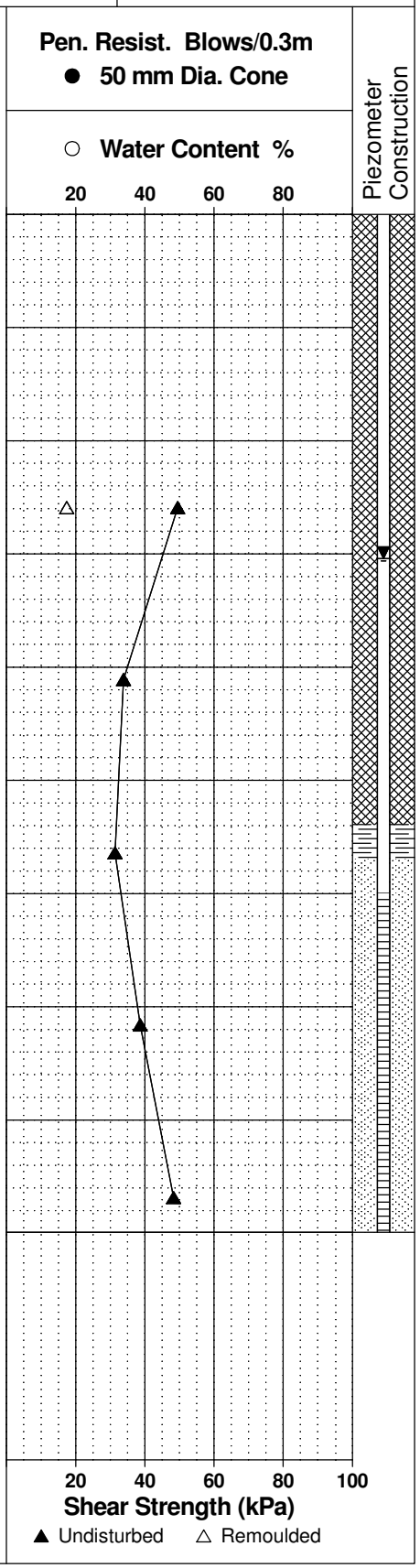
FILE NO. PG4411

REMARKS

HOLE NO. BH 1-18

BORINGS BY CME 55 Power Auger **DATE** January 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.97
FILL: Crushed stone with silt and sand, trace organics, topsoil		AU	1				
0.53							
Loose, brown **SILTY SAND,** trace clay		SS	2	54	9	1	95.97
1.83						2	94.97
		SS	3	46	P	3	93.97
Stiff to firm, grey **SILTY CLAY,** some sand						4	92.97
						5	91.97
						6	90.97
						7	89.97
						8	88.97
		SS	4	71	P		
8.99							
End of Borehole							
(GWL @ 3.04m - Feb. 13, 2018)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

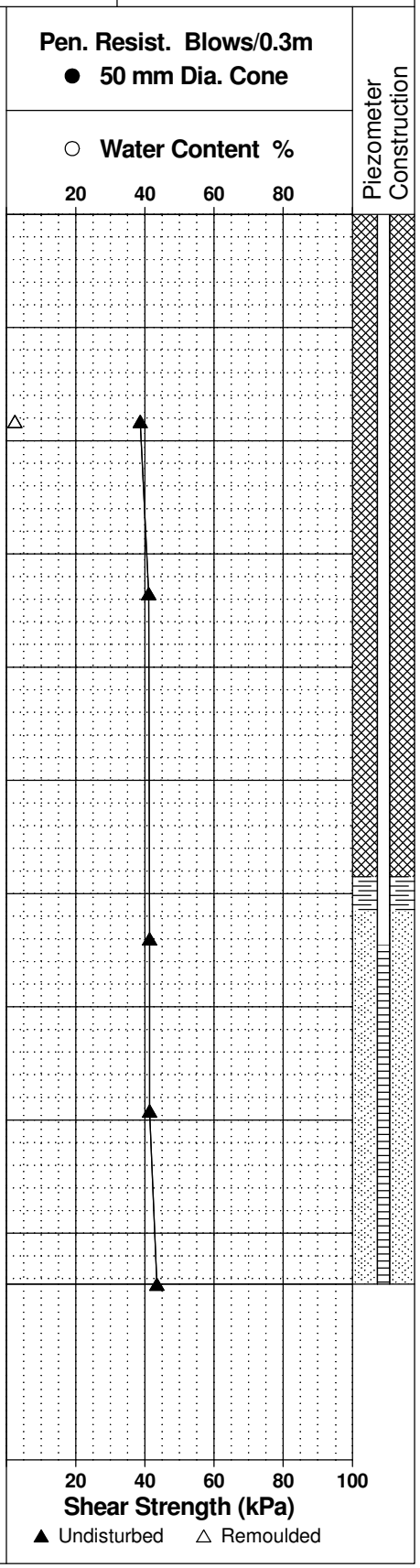
FILE NO. PG4411

REMARKS

HOLE NO. BH 2-18

BORINGS BY CME 55 Power Auger **DATE** January 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.79
TOPSOIL 0.28		AU	1				
Interlayered grey **SILTY SAND** and firm **CLAYEY SILT/SILTY CLAY** 1.07						1	95.79
						2	94.79
Grey **SANDY SILT,** trace clay 3.96						3	93.79
						4	92.79
						5	91.79
		TW	2	88		6	90.79
Firm, grey **SILTY CLAY,** some sand						7	89.79
						8	88.79
						9	87.79
9.45							
End of Borehole							
(Piezometer dry to 5.39m depth - Feb. 13, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

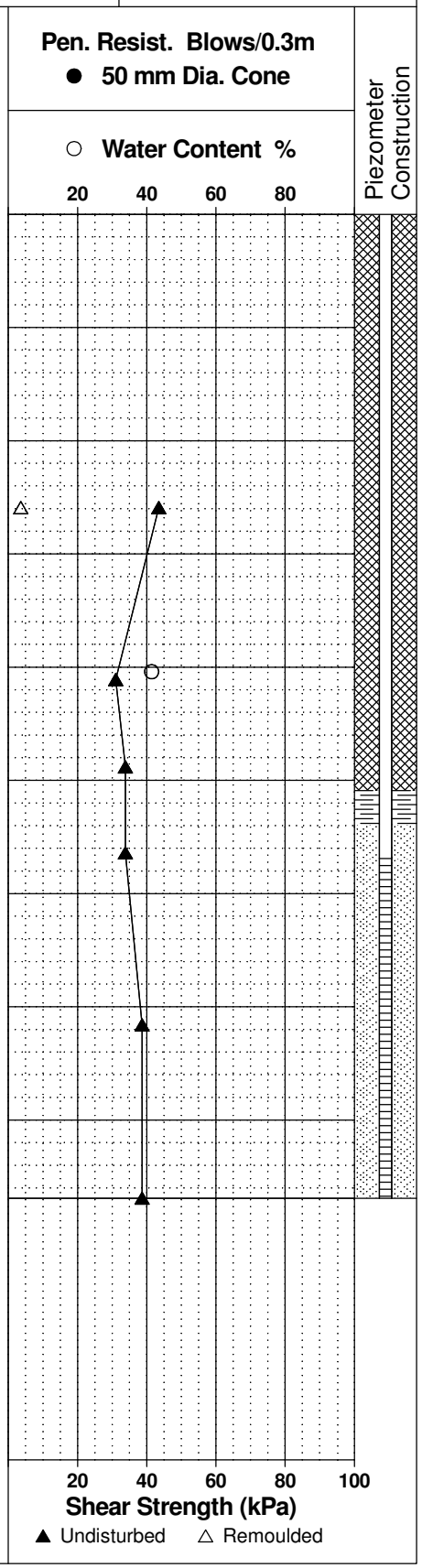
FILE NO. PG4411

REMARKS

HOLE NO. BH 3-18

BORINGS BY CME 55 Power Auger **DATE** January 15, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.68
TOPSOIL 0.28		AU	1				
Loose, brown **SILTY SAND,** trace clay		SS	2	58	8	1	95.68
1.83						2	94.68
						3	93.68
		TW	3	88		4	92.68
Firm, grey **SILTY CLAY,** some sand						5	91.68
						6	90.68
						7	89.68
						8	88.68
8.69							
End of Borehole							
(Piezometer damaged - Feb. 13, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

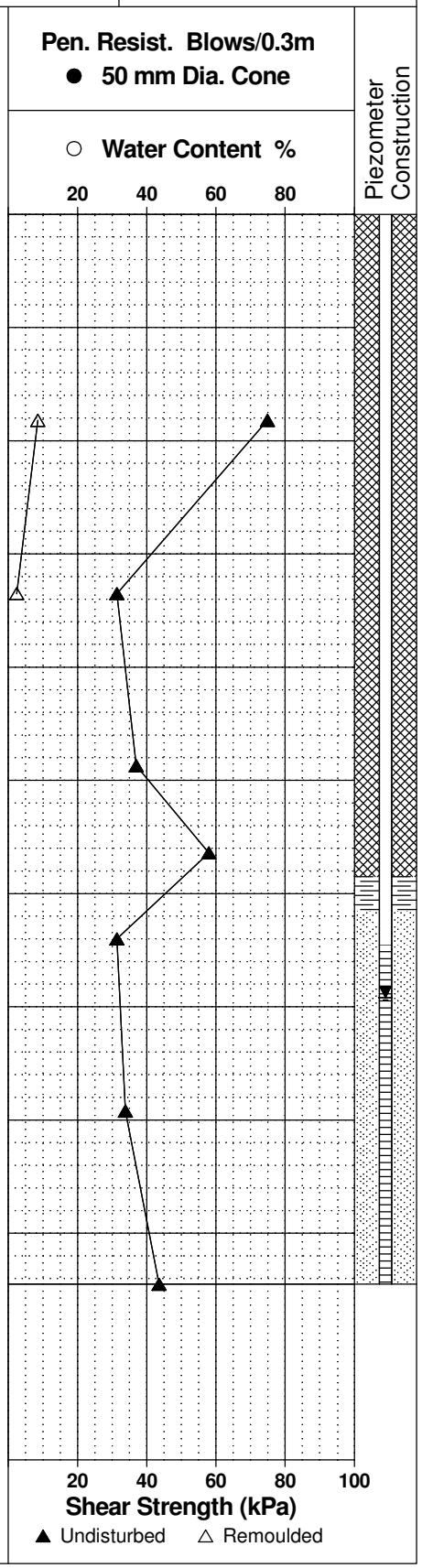
FILE NO. PG4411

REMARKS

HOLE NO. BH 4-18

BORINGS BY CME 55 Power Auger **DATE** January 16, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.68
TOPSOIL 0.33		AU	1				
Interlayered stiff, brown **CLAYEY SILT** to **SILTY CLAY,** some sand 0.91						1	95.68
Brown **SILTY SAND,** trace clay		SS	2	46	P	2	94.68
2.59							
Grey **SANDY SILT,** trace clay						3	93.68
3.96						4	92.68
		TW	3	96		5	91.68
Stiff to firm, grey **SILTY CLAY,** trace sand						6	90.68
						7	89.68
						8	88.68
						9	87.68
9.45							
End of Borehole							
(GWL @ 6.92m - Feb. 13, 2018)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

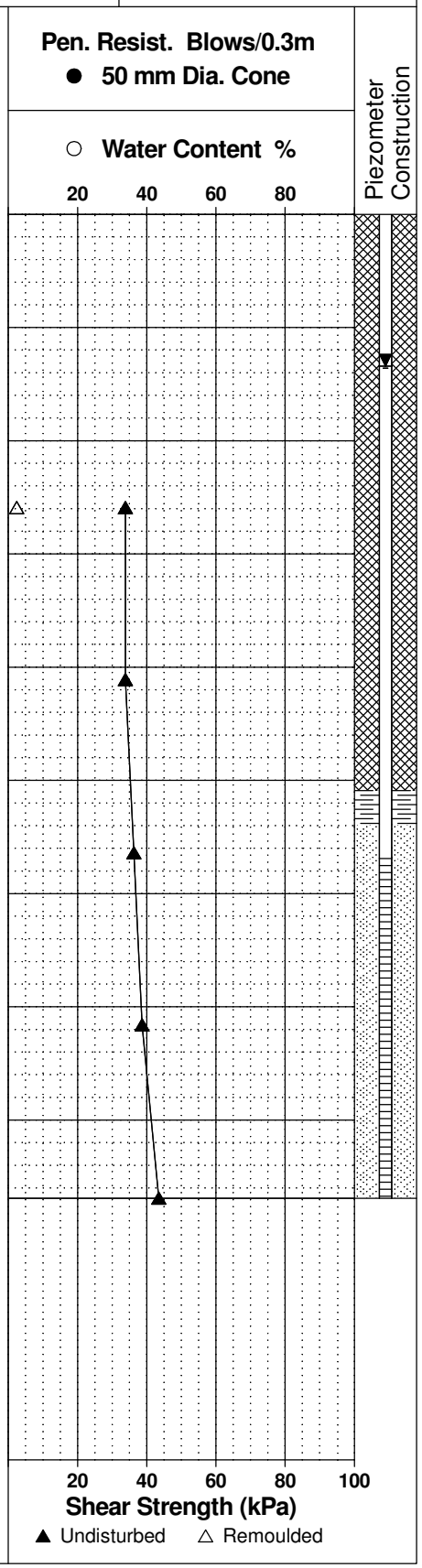
FILE NO. PG4411

REMARKS

HOLE NO. BH 5-18

BORINGS BY CME 55 Power Auger **DATE** January 16, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.76
TOPSOIL 0.23		AU	1				
Interlayered loose, grey **SILTY SAND** and **CLAYEY SILT/SILTY CLAY** 0.69						1	95.76
Loose, brown **SILTY SAND,** trace clay		SS	2	75	8		
1.83						2	94.76
Loose, grey **SANDY SILT,** trace clay						3	93.76
3.20						4	92.76
Firm, grey **SILTY CLAY,** trace sand						5	91.76
						6	90.76
						7	89.76
						8	88.76
8.69							
End of Borehole							
(GWL @ 1.34m - Feb. 13, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

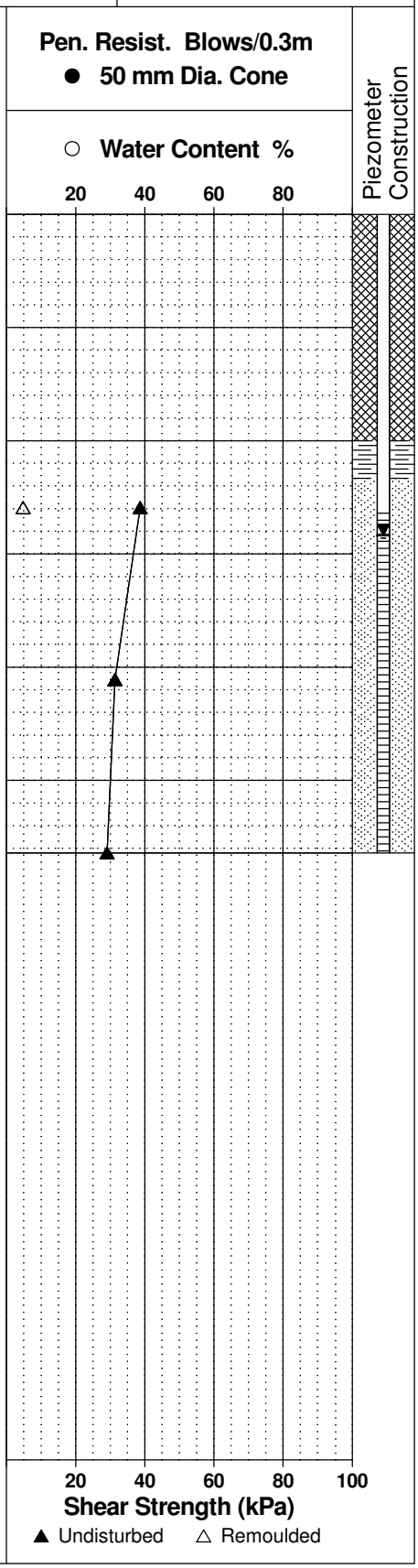
FILE NO. PG4411

REMARKS

HOLE NO. BH 6-18

BORINGS BY CME 55 Power Auger **DATE** January 16, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.72
TOPSOIL 0.30		AU	1				
Very loose, brown **SILTY SAND,** trace clay		SS	2	67	1	1	95.72
1.83						2	94.72
Firm, brown **SILTY CLAY,** trace sand						3	93.72
- grey by 3.8m depth						4	92.72
5.64						5	91.72
End of Borehole							
(GWL @ 2.84m - Feb. 13, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

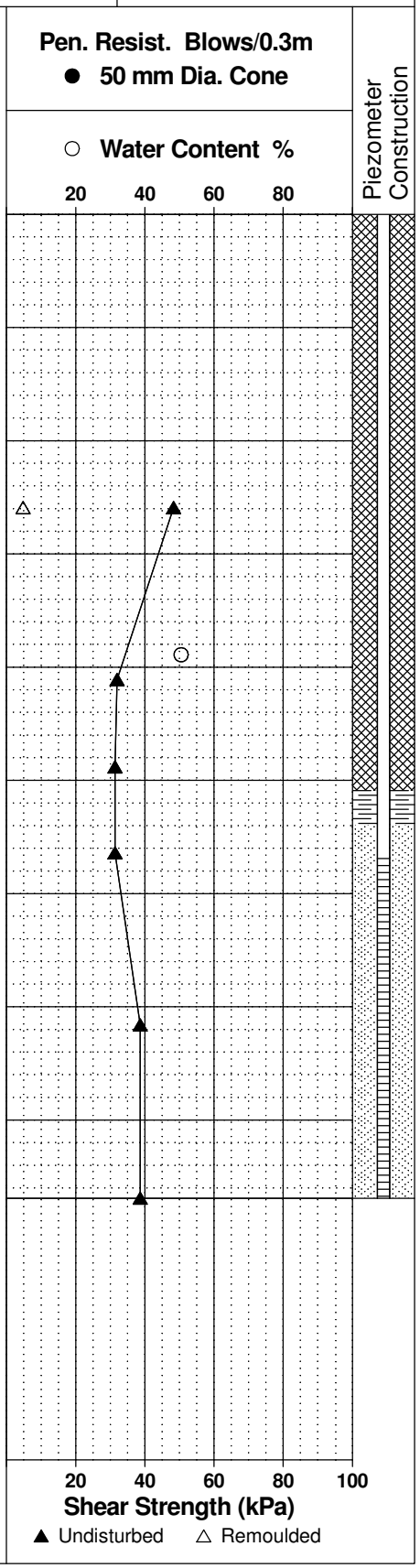
FILE NO. PG4411

REMARKS

HOLE NO. BH 7-18

BORINGS BY CME 55 Power Auger **DATE** January 16, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.13
FILL: Crushed stone with silt and sand		AU	1				
0.48							
Loose, brown **SILTY SAND,** trace clay		SS	2	50	9	1	96.13
1.83						2	95.13
						3	94.13
		TW	3	90		4	93.13
Firm, grey **SILTY CLAY,** trace sand						5	92.13
						6	91.13
						7	90.13
						8	89.13
8.69							
End of Borehole							
(Piezometer blocked at 0.51m depth - Feb. 13, 2018)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Commercial Development - Terry Fox Dr. @ Cope Dr.
Ottawa, Ontario

DATUM Geodetic elevations provided by Stantec Geomatics Limited.

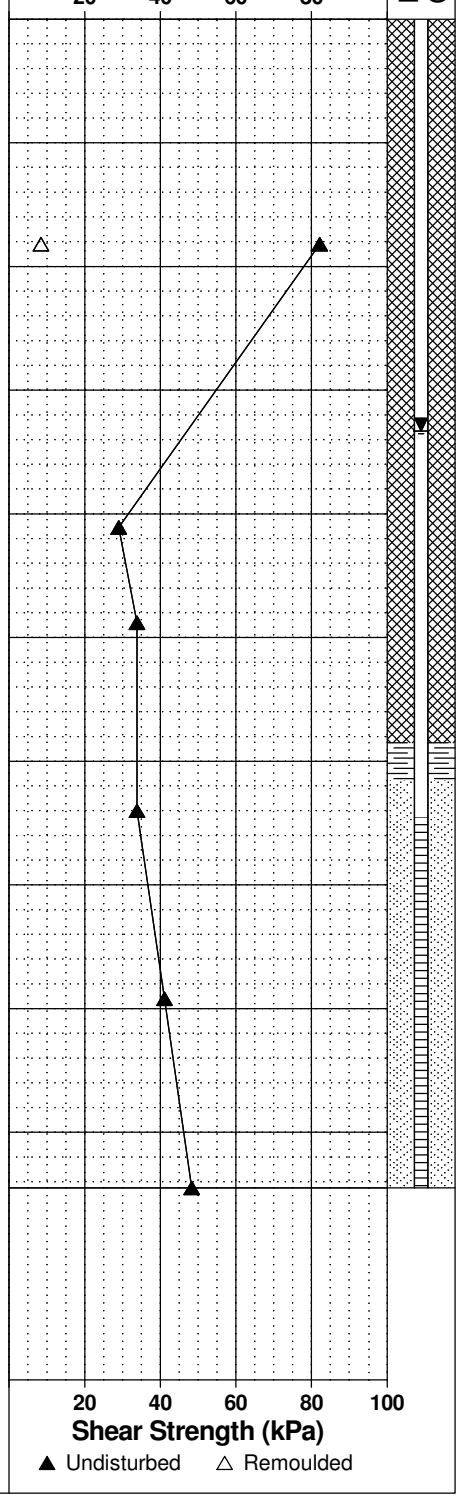
FILE NO. PG4411

REMARKS

HOLE NO. BH 8-18

BORINGS BY CME 55 Power Auger **DATE** January 17, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.10
FILL: Crushed stone with silt and sand 0.33		AU	1				
						1	96.10
		SS	2	54	P	2	95.10
Very stiff to firm, brown **SILTY CLAY,** some sand		TW	3	92		3	94.10
- grey by 3.8m depth						4	93.10
						5	92.10
						6	91.10
						7	90.10
						8	89.10
						9	88.10
9.45							
Dynamic Cone Penetration Test commenced at 9.45m depth. Cone pushed to 30.48m depth, no refusal encountered.							
(GWL @ 3.33m - Feb. 13, 2018)							



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Preliminary Geotechnical Investigation
Terry Fox Drive at Fernbank Road
Ottawa, Ontario

DATUM

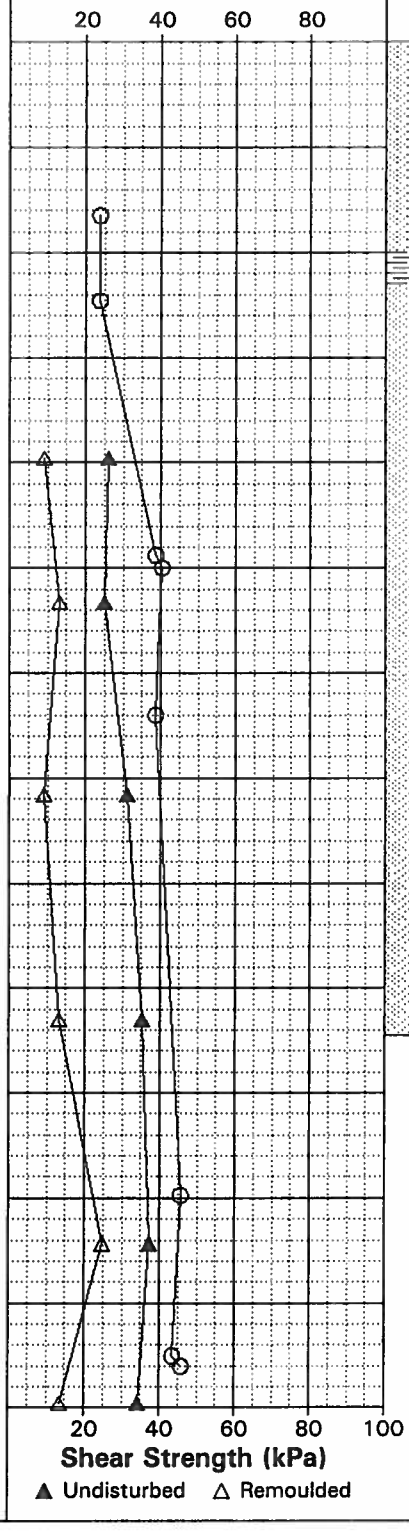
REMARKS

FILE NO. PG0812

HOLE NO. BH 2

BORINGS BY CME 75 Power Auger DATE 1 MAY 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.19									
Compact, brown SILTY SAND, trace clay		SS	1	0	12	1			
		SS	2	17	8	2			
- grey by 1.8m depth		SS	3	25	5				
2.74		SS	4	0	2	3			
		TW	5	100		4			
		SS	6	100	1	5			
Firm, grey SILTY CLAY/CLAYEY SILT, trace silty sand seams		TW	7	100		6			
		SS	8	100	1	7			
		TW	9	100		8			
						9			
						10			
						11			
						12			
						13			



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Preliminary Geotechnical Investigation
Terry Fox Drive at Fernbank Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 75 Power Auger DATE 1 MAY 06

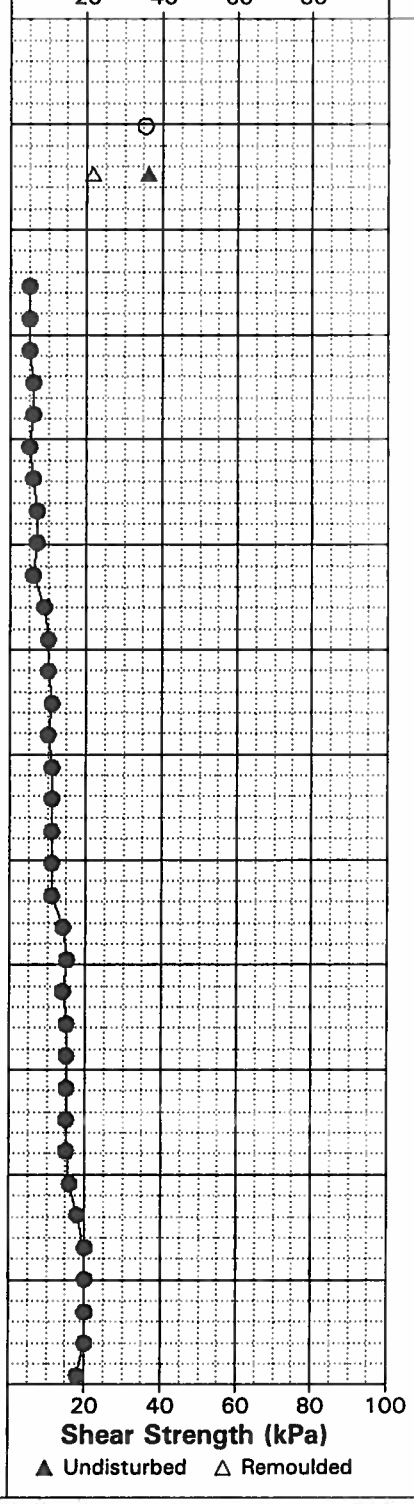
FILE NO. PG0812

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Firm, grey SILTY CLAY/CLAYEY SILT		SS	10	100	1		
14.63							
Dynamic Cone Penetration Test commenced @ 14.63m depth							
Inferred SILTY CLAY/CLAYEY SILT							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

Piezometer Construction



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE & TEST DATA

Preliminary Geotechnical Investigation
Terry Fox Drive at Fernbank Road
Ottawa, Ontario

DATUM

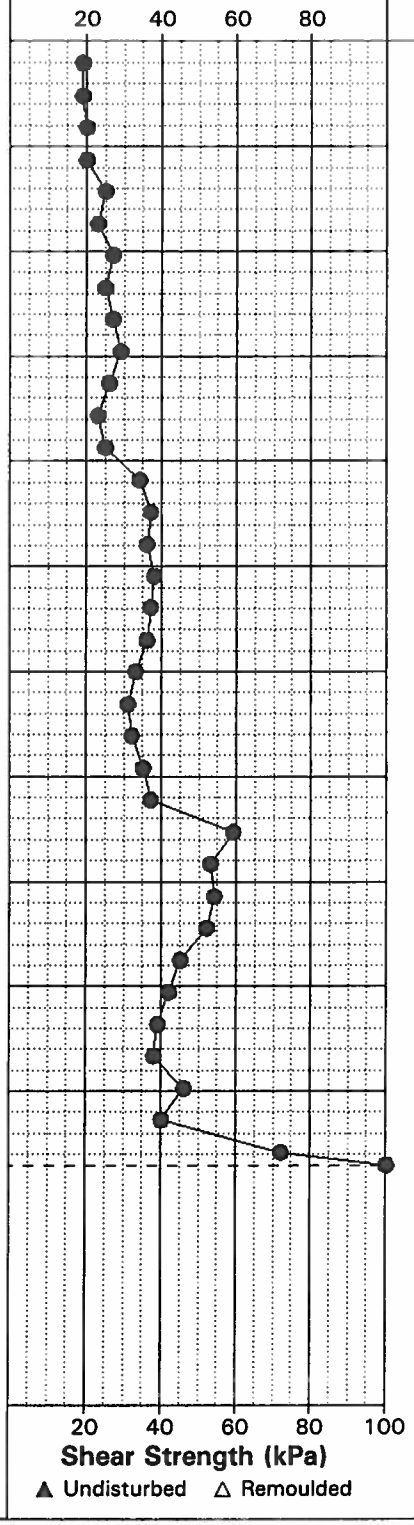
REMARKS

BORINGS BY CME 75 Power Auger DATE 1 MAY 06

FILE NO. PG0812

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
Inferred SILTY CLAY/CLAYEY SILT						26			
						27			
						28			
						29			
30.00						30			
Inferred GLACIAL TILL						31			
						32			
						33			
						34			
						35			
						36			
36.70 End of Borehole DCPT refusal @ 36.70m depth (GWL @ 0.77m-May 11/06)									



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

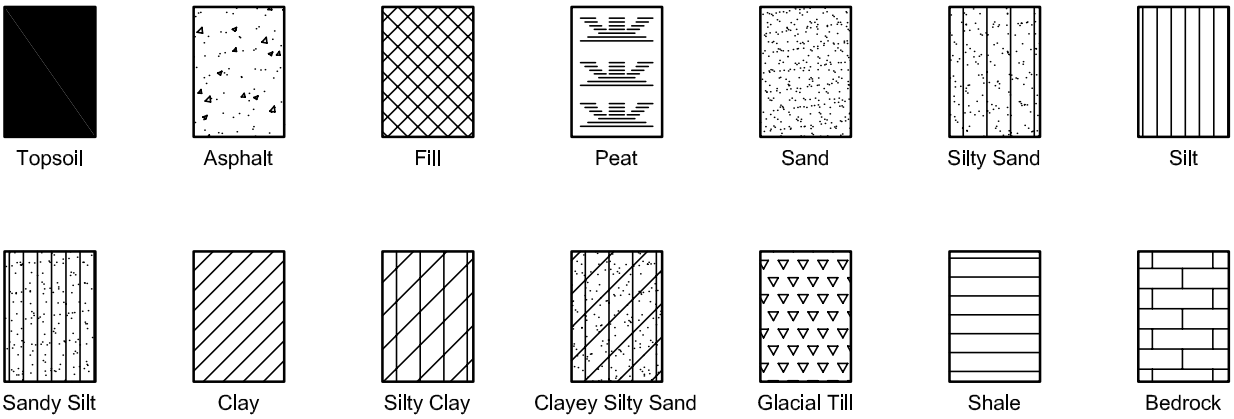
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

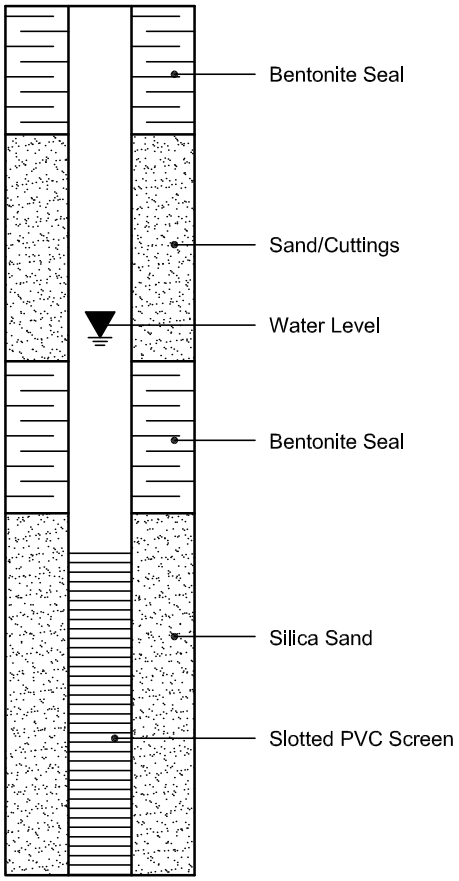
SYMBOLS AND TERMS (continued)

STRATA PLOT

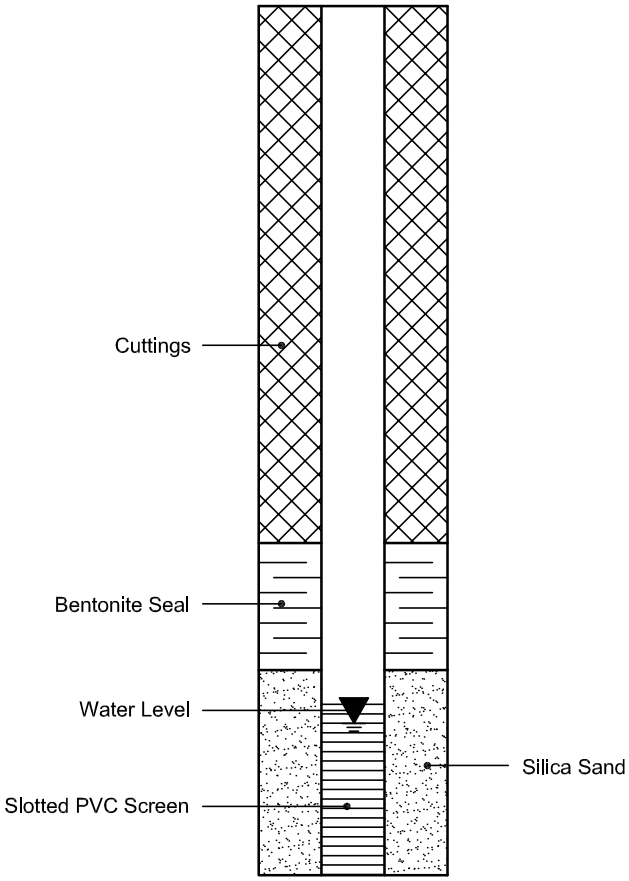


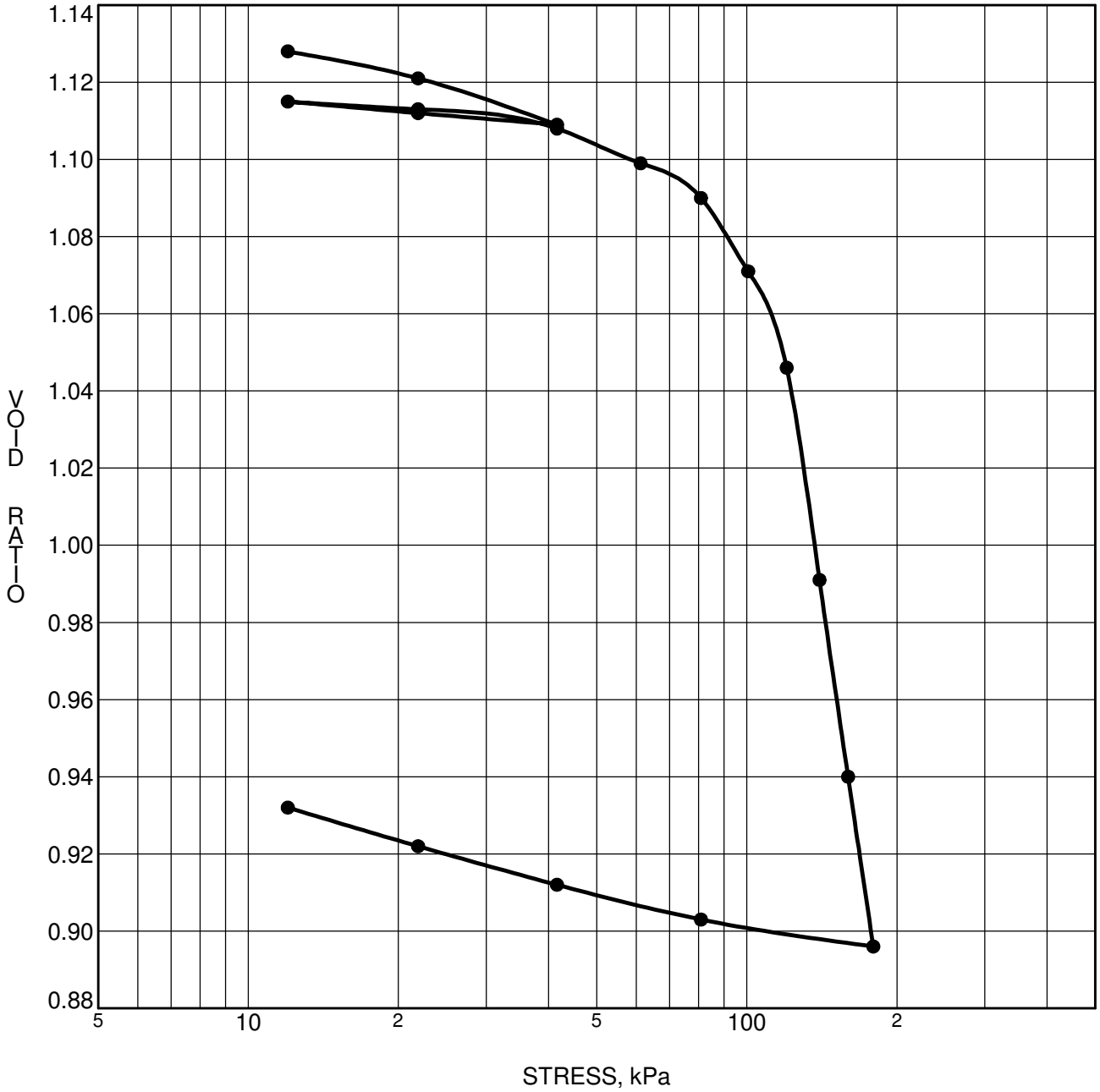
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





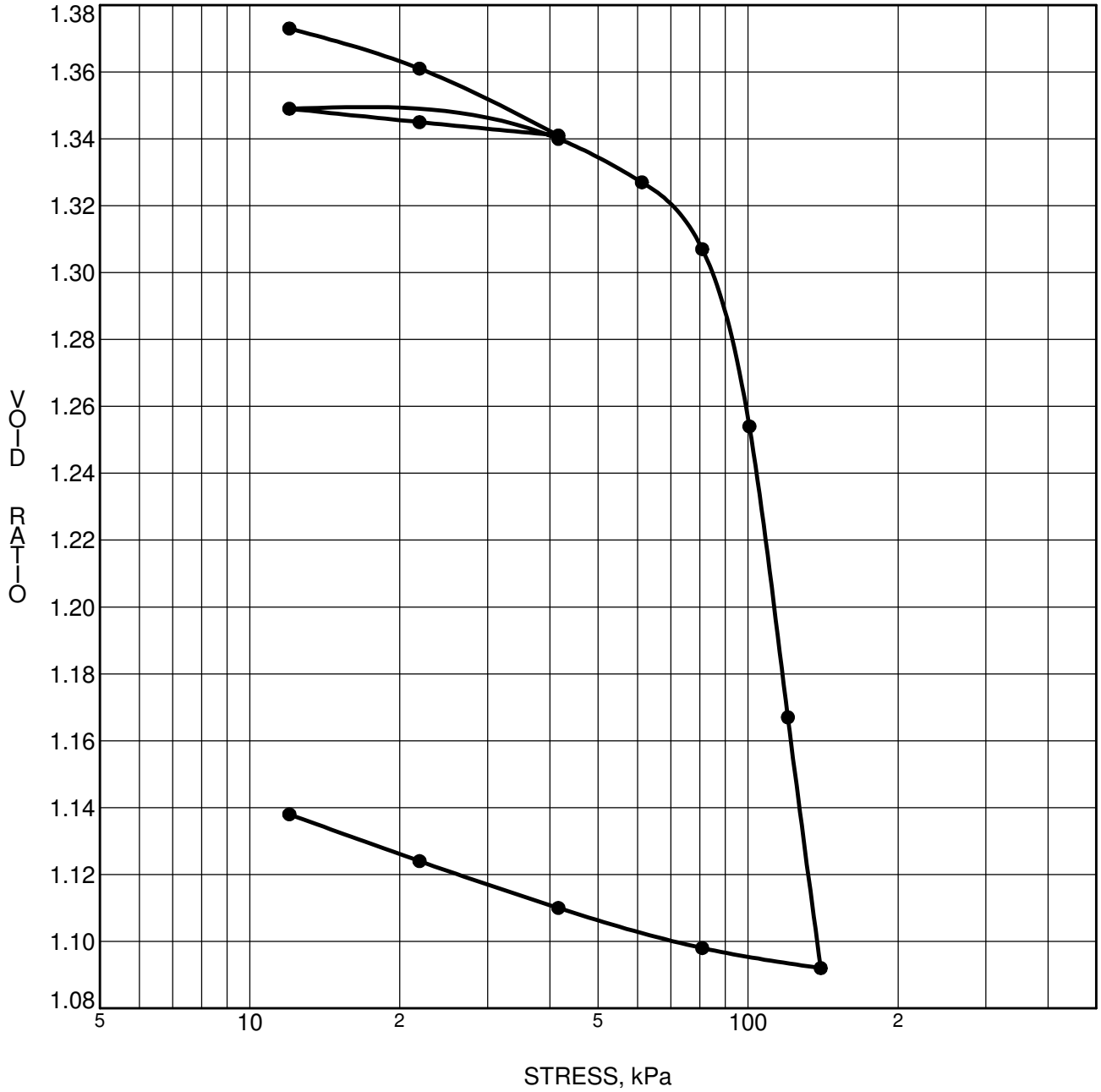
CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 3-18**	p'o	**41.54** kPa	Ccr	**0.013**
Sample No.	**TW 3**	p'c	**110.66** kPa	Cc	**0.898**
Sample Depth	**4.04** m	OC Ratio	**2.7**	Wo	**41.4** %
Sample Elev.	**92.64** m	Void Ratio	**1.139**	Unit Wt.	**17.8** kN/m ^{3}

CLIENT **Street Properties** FILE NO. **PG4411**

PROJECT **Geotechnical Investigation - Prop. Commercial Development - Terry Fox Drive** DATE **03/02/2018**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 7-18**	p'_o	**40.6** kPa	Ccr	**0.021**
Sample No.	**TW 3**	p'_c	**90** kPa	Cc	**1.190**
Sample Depth	**3.89** m	OC Ratio	**2.2**	Wo	**50.5** %
Sample Elev.	**93.24** m	Void Ratio	**1.389**	Unit Wt.	**17.0** kN/m ^{3}

CLIENT **Street Properties** FILE NO. **PG4411**

PROJECT **Geotechnical Investigation - Prop. Commercial Development - Terry Fox Drive** DATE **05/02/2018**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23169

Report Date: 12-Feb-2018

Order Date: 6-Feb-2018

Project Description: PG4411

	Client ID:	BH3-18-SS2	-	-	-
	Sample Date:	06-Feb-18	-	-	-
	Sample ID:	1806239-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	81.1	-	-	-
General Inorganics					
pH	0.05 pH Units	7.65	-	-	-
Resistivity	0.10 Ohm.m	62.6	-	-	-
Anions					
Chloride	5 ug/g dry	17	-	-	-
Sulphate	5 ug/g dry	41	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG4411-1 - TEST HOLE LOCATION PLAN

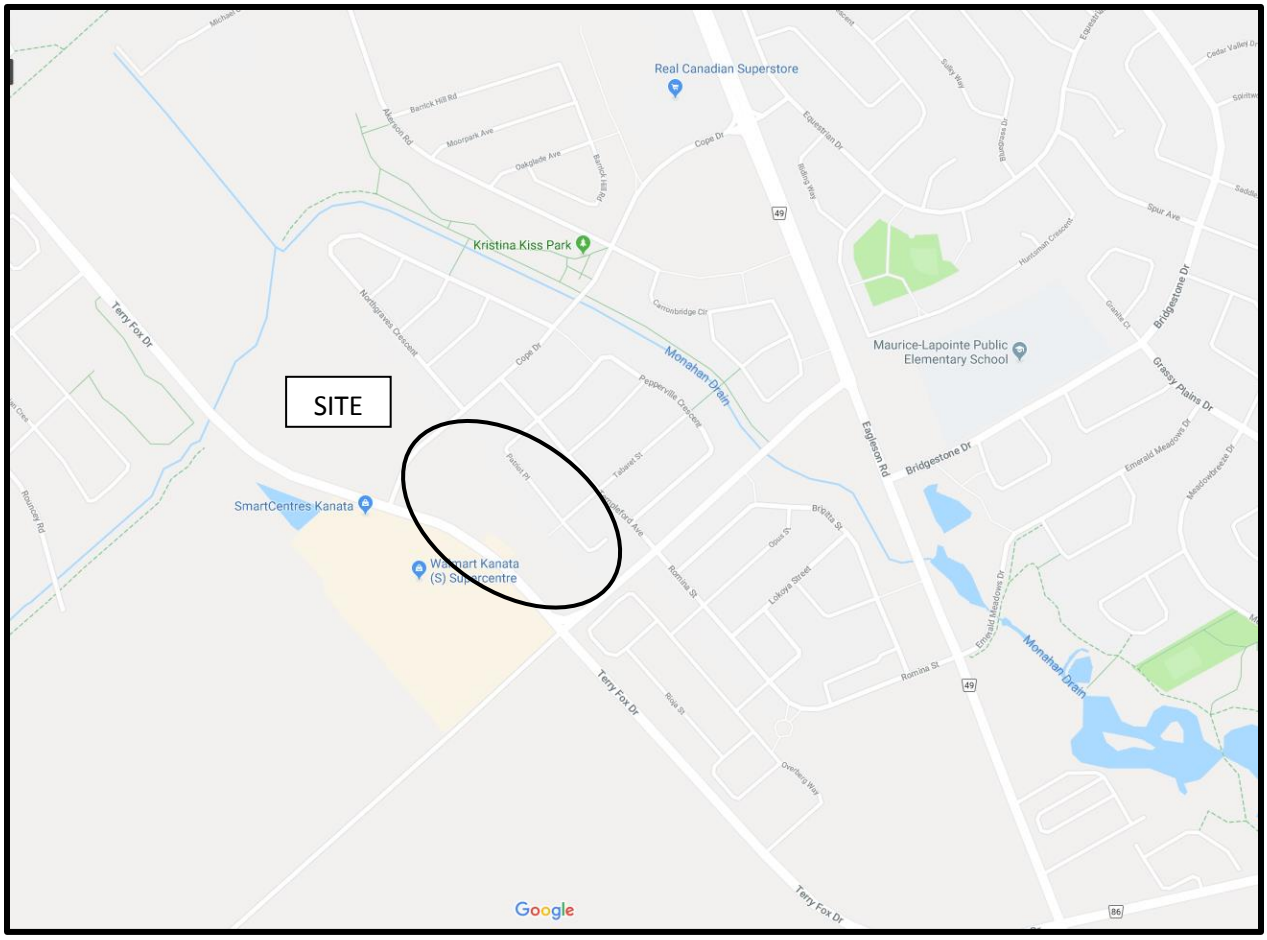
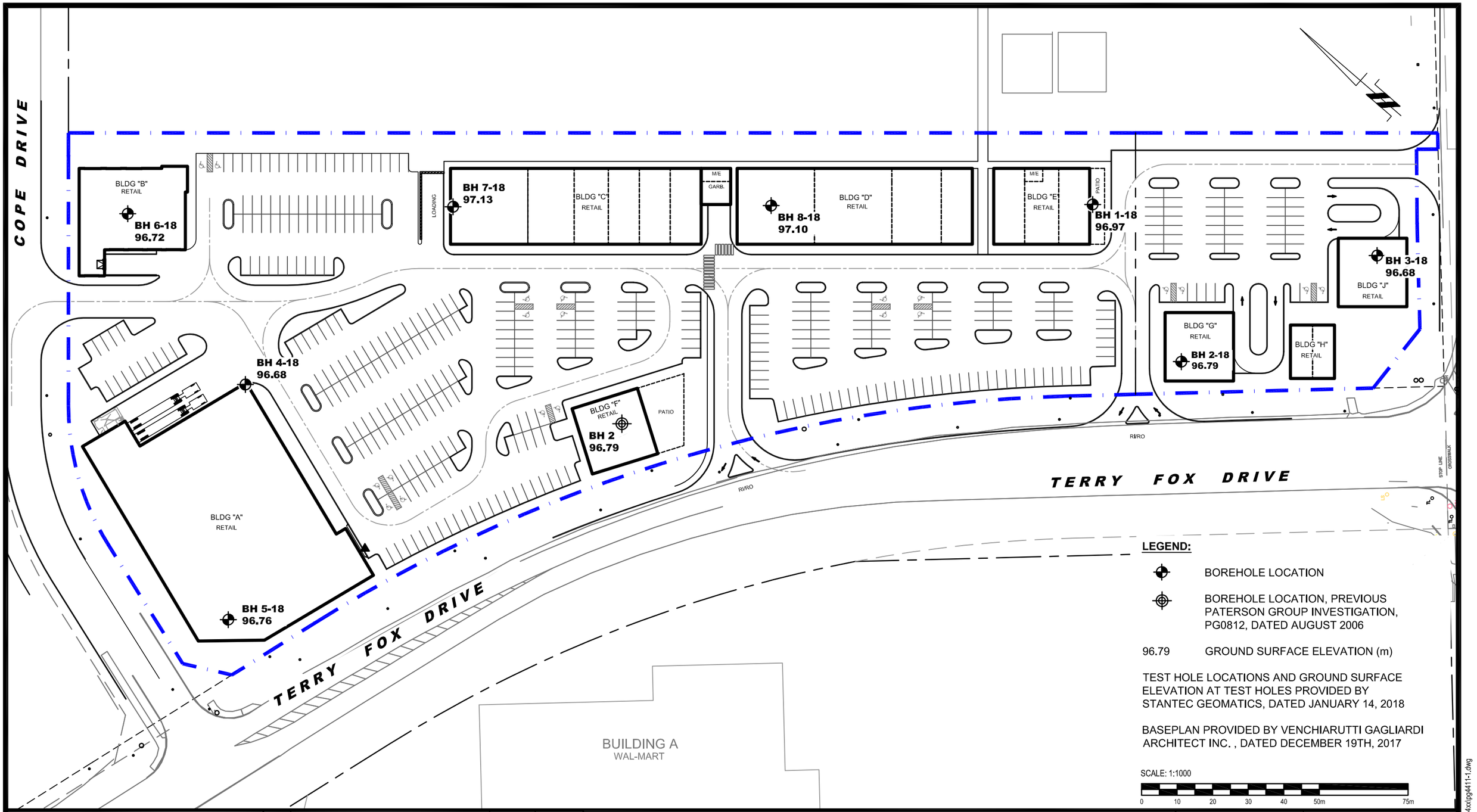


FIGURE 1

KEY PLAN

patersongroup



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE LOCATION, PREVIOUS PATERSON GROUP INVESTIGATION, PG0812, DATED AUGUST 2006
- 96.79 GROUND SURFACE ELEVATION (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATION AT TEST HOLES PROVIDED BY STANTEC GEOMATICS, DATED JANUARY 14, 2018

BASEPLAN PROVIDED BY VENCHIARUTTI GAGLIARDI ARCHITECT INC. , DATED DECEMBER 19TH, 2017

SCALE: 1:1000

0 10 20 30 40 50m 75m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
0			

STREET PROPERTIES

GEOTECHNICAL INESTIGATION - PROPOSED COMMERCIAL DEVELOPMENT
TERRY FOX DRIVE AT COPE DRIVE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 02/2018
Drawn by: RCG	Report No.: PG4411-1
Checked by: NZ	Dwg. No.: PG4411-1
Approved by: DJG	Revision No.: 0

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Appendix E DRAWINGS