



S. BURNETT
& ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Forest View Estates

Functional Servicing Report

Prepared for

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Prepared by

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1.0 Introduction

1.1 General Information

S. Burnett and Associates Limited have been retained by Jim Coffey to prepare a Functional Servicing Report and site grading for the proposed development in the Town of Arthur. The property is a 2.345 hectare (ha) parcel of land located at Park Lot 4, North of Domville Street, Township of Wellington North, as presented in **Figure 1a**. The drainage area for the site is approximately 2.37ha in size.

This Functional Servicing Report will support the Draft Plan of Subdivision and Zoning By-Law Amendment Applications for the proposed development of the site. Detailed engineering designs and drawings related to site servicing and grading will include water, wastewater and incorporate the functional concepts of the storm water management (SWM) measures as outlined in this report.

1.2 Objectives

The objectives of this Functional Servicing Report are:

- To evaluate the storm water management opportunities and constraints including:
 - review of any existing storm water controls for the site,
 - determine suitable methods for attenuation and treatment of storm water runoff,
 - demonstrate compliance of the proposed storm water control measures with the Township of Wellington North storm water management criteria.
- To evaluate the water supply opportunities and constraints including:
 - review of any existing water supply for the site,
 - determine the increase in water demand for the site,
 - determine if the current Township infrastructure can meet demands,
 - identify ideal locations to connect to the Township water supply.
- To evaluate the sewage discharge capacity opportunities and constraints including:
 - review of any existing wastewater infrastructure for the site,
 - determine the increase of wastewater generation for the site,
 - determine if the current Township of Wellington North infrastructure can meet flows generated,
 - identify ideal locations to connect to the Township wastewater infrastructure.

The above will be completed in accordance with accepted engineering practices and governing criteria from the approval agencies and the Township in support of the application for Draft Plan of Subdivision and Zoning By-Law Amendment.

1.3 Existing Conditions

The subject site has a total drainage area of 2.37 ha. The site is currently covered with a grassy surface area. There are potential 6” (200mm) water mains and 8” (250mm) sanitary service connections, both along Domville Street. The existing site does not currently have a defined outlet for storm water however, the majority of the 2.37 ha site drains south, toward a ditch along Domville Street and a drainage tile on the south west corner of the property and a small portion drains to the North edge of the property towards an old rail allowance. The profile of the Domville ditch is shown in Figure 1b, while Figure 1c shows the profile of the rail allowance with select cross sections to show available capacity. There is approximately a 1.28m grade differential from the highpoint near the north end of the property to the low point at the property boundary near Domville Street. The site is bound by:

- Residential to the East
- Domville Street and residential to the South
- Industrial Zoning to the North and West

A four month groundwater monitoring plan was undertaken for the months from June to September 2018, to determine the level of the groundwater at the site. Three piezometers were installed at the SE, NE and NW corners of the site. The high and low levels for each location are presented in **Table 1**.

Table 1 Existing Groundwater Levels

Monitoring Well Info	SE (BH5)	NE (BH8)	NW (BH4)
Tag ID	A227263	A227264	A227265
High Water Level [mbg]	0.89	1.16	1.14
Low Water Level [mbg]	1.66	2.32	2.47

The high water level has been observed at 0.89 meters below ground level at the SE monitoring well. The water levels will continue to be monitored monthly to record any seasonal variations to the groundwater table. The monitoring data can be found in appendix A with a map of the monitoring well locations.

1.4 Proposed Development

The proposed development will consist of the following building types and numbers:

- Building Type 1 – Ten (10) Single Detached Residential (Lots 1-5, 8-12)
- Building Type 2 – Eight (8) Semi-detached Residential (Lots 6, 7, 13, 14)
- Building Type 3 – Two (2) 4-Unit Townhouses (Blocks 15 and 16)
- Building Type 4 – One (1) Multiple Residential (Block 17)

The site will be used for new residential construction. A total of one (1) entrance will be constructed off of Domville Street to service the residential units.

The draft plan is illustrated in **Figure 2**.

A summary of the maximum proposed development coverage based on the Township of Wellington North’s maximum lot coverage, is outlined in **Table 2**.

Table 2 Site Statistics for Proposed Development

Location	Area (ha)
Total Building Area	0.625
Landscaped Area	1.223
Proposed Asphalt Area	0.512
Total	2.370

2.0 Stormwater Management Analysis

2.1 Design Criteria

The proposed site is located within the jurisdiction of the Township of Wellington North and the Grand River Conservation Authority (GRCA). Therefore storm water management design criteria from the Township of Wellington North complying with GRCA for this site are as follows:

- Post-development flows must match pre-development flow for events up to and including the 100-year storm.
- The proposed development must ensure no increase in erosion or downstream flooding.
- “Enhanced” level storm water quality treatment, 80% removal of the suspended solids

2.2 Method of Analysis

The Modified Rational Method was used to calculate storm water runoff flows from the site based on both pre- and post-development conditions. Intensity-Duration-Frequency curves were used with a 10-minute initial time of concentration to complete the required calculations. Detailed calculations are shown in Appendix A.

3.0 Stormwater Management Plan

3.1 Allowable Release Rates

In order to assess storm water characteristics of the site, the pre-development peak flow rates for the site were modeled using the Rational Method and the following equation:

$$Q_{PEAK} = CIA$$

Where C = the runoff coefficient

I = the average rainfall intensity

A = the size of the drainage area

The peak flow rates for post development are required to maintain the pre development flows. The pre development flows and hence the criteria release rates are presented in Table 3.

Table 3 Pre-development Flow Rates

Storm Frequency	Peak Flow (m ³ /s)
2 year	0.11
5 year	0.14
10 year	0.17
25 year	0.21
50 year	0.26
100 year	0.30

The Rational Method calculations are included in Appendix A.

3.2 Proposed Conditions

Drainage from the proposed development will be split drained via swales for treatment and retention and then eventually will drain into the storm water management facility located at the rear (north end) of the property and into two catchbasins at the property entrance (south end). The Stormwater accumulated in the Stormwater management facility will be discharged to the drainage ditch north of the property through a flow control structure. The catchbasins will be designed to release the stormwater from the south end of the site through a flow control structure into the ditch along Domville Street and will continue down the Preston Street ditch.

3.2.1 Quantity Control

A proposed model was established to evaluate the quantity controls required on site. As previously indicated, the storm water on site will be discharged to Domville Street through the CBs and the rear ditch from the storm water management facility.

Table 4 provides a summary of the controlled flows from the subject site.

Table 4 Summary of Controlled Flow Rates

Storm Event	Q _{post development flow - total}	Q _{controlled outflow - subcatchment 1}	Q _{controlled outflow - subcatchment 2}	Unit
2 Year	0.23	0.04	0.07	m ³ /s
5 Year	0.31	0.05	0.10	m ³ /s
10 Year	0.36	0.05	0.11	m ³ /s
25 Year	0.46	0.07	0.14	m ³ /s
50 Year	0.56	0.09	0.17	m ³ /s
100 Year	0.64	0.10	0.20	m ³ /s

Quantity control is necessary in order to limit the 2 to 100-year storm events for the proposed development to the allowable release rates. In order to accomplish this, a complimentary system of drainage area storage swales, and V-shaped gutters will be constructed throughout the site as shown in Figure 3b.

The proposed overland and swale system will connect to the storm water areas prior to entering into the municipal ditch systems along Domville Street and the north end of the property. Side slopes for the swales will be 3:1.

Under the post-development conditions, flows will be maximized in the stormwater management facility as indicated within subcatchment 2. The storm water management facility is designed as a dry pond (flat bottom swale) with a 4:1 side slope to maintain natural aesthetics whilst maintaining the minimum slope required in accordance with MOE guidelines. The facility is designed with 0.3 m of freeboard and is sized to provide approximately 181 m³ of storage volume.

A summary of storage volume provided and proposed ponding elevations are shown in Table 5 below.

Table 5 Summary of Controlled Flow Rates

Storm Event	Storage Required (m ³)	Height (m)	Elevation (m)
2	43.63	0.22	456.52
5	57.80	0.29	456.59
10	66.97	0.33	456.63
25	86.56	0.43	456.73
50	104.98	0.52	456.82
100	120.08	0.60	456.90
Free board	180.56	0.90	457.20

A 310 mm orifice plate is provided within the pond to limit the outflow rates to pre development rates and will be cut into the proposed 400mm diameter outlet pipe. The outlet pipe is designed at a 1.25% slope to the existing ditch north of the subject site and is sized to ensure free flow under peak controlled flow conditions. Orifice flow through the horizontal pipeline is calculated with the head taken from the centroid.

The proposed outlet pipes within the CBs south of the subject site are also designed as control structures to ensure the allowable release rates in subcatchment 1 per Table 3 are never exceeded.

Appendix A provides a summary of the pond and orifice size calculations.

3.2.2 Quality Control

Storm water quality is required to achieve an average of 80% removal of total suspended solids based on an annual loading basis from all runoff leaving the site. In order to determine the TSS removal, achieved by the development, an analysis was completed which is summarized in Table 6 below.

Table 6 – Overall TSS Removal Estimate of Water Quality Controls

Surface	Effective TSS Removal	Treated Area (ha)	% of Total Area	TSS Removal Over Total Site
Roof Top Area	100%	0.625	26%	26%
Landscaped Area	100%	1.223	52%	52%
Asphalt Area	0%	0.512	22%	0%
<i>Total</i>	<i>66.7%</i>	<i>2.370</i>	<i>100%</i>	<i>78%</i>

A large portion of the proposed development has rooftop and landscaped areas that are considered 'clean' and do not require additional quality control. As shown above, the TSS removal of the site is approximately 78% which doesn't meet the required treatment. The design of the pond and swale system will increase the removal of TSS and bring the site into compliance.

4.0 Water Supply and Wastewater Servicing

4.1 Water Supply

There are three water main locations available for connection to the site. The first is along the far side of Domville Street, the second is located at the North end of Andrew Street and the third is in the middle of the near lane of Andrew Street. The pipes on both of the streets near the proposed development are 150mm (6") diameter. Connecting at the terminal of Andrew Street through the railway easement and to one of the other locations will provide a looped watermain. Either of these two locations is ideal to connect with the Township's water supply. A full cost estimate should be done to determine which connection would be the most cost effective. The connection to the Domville Street main would have a larger effect on the local traffic flow. In order to accomplish a connection to the Andrew Street water main, the connection would be required to go through an easement on the East side of the property. There is an easement currently in the available location. The proposed water servicing location hook-ups are shown in Figure 4.

The apartment complex is proposed to have a water connection directly off of the proposed road's main line using a 150mm pipe. All other future housing will connect to the main line with 25mm pipes. The addition of two Fire Hydrants connecting to the 150mm pipe is proposed to ensure that the new development meets emergency fire regulations and hydrant distance requirements.

The anticipated average day demand on the municipal water supply is determined by the equation:

$$\text{Demand} = \text{Population} \times \text{people per dwelling} \times \text{per capita demand}$$

For the Township of Wellington North the person per dwelling is anticipated to be three (3) persons per dwelling and two (2) persons per unit. Also, the Township recommends a per unit average day usage of 1.35m³/day or 450L per person per day based on the three (3) people per unit.

Using this equation and a total of 18 dwellings and 32 units, the water demand is determined as follows:

$$\begin{aligned} \text{Average Day Demand} &= 18 \times 1.35\text{m}^3/\text{day} + 32 \times 0.90\text{m}^3/\text{day} \\ &= 53.10\text{m}^3/\text{day} \end{aligned}$$

The maximum day demand for the development is determined by the following equation:

$$\text{Max Day} = \text{Average Day} \times \text{Max Day Factor}$$

The Maximum day factor for the Township of Wellington North is approximately 4.9 and therefore the maximum day demand for the development is:

$$\begin{aligned} \text{Max Day Demand} &= 53.10\text{m}^3/\text{day} \times 4.9 \\ &= 260.19\text{m}^3/\text{day} \end{aligned}$$

Based on previous discussions with the Township's Public Works department, there appears to be sufficient capacity to provide domestic flows to the proposed development. Sizing of the mainline

connection into the development is proposed at 150mm diameter to ensure fire and emergency flow can also be provided.

4.2 Wastewater Servicing

There are two sanitary sewer lines available for connection to the site. The first is along the middle of Domville Street and the second is located in an easement to the east of the property to Andrew Street. The pipes on both of the streets near the proposed development are 200mm diameter. The Domville Street location is most ideal to connect with the Township's sanitary system. Service pipes of 125mm (5") and 150mm (6") pipes are proposed for the housing and townhouse/apartment connections, respectively. Both connections would require the addition of fill in order to allow service to basements. However, the development is proposing slab on grade construction. The Domville Street connection is the preferred connection as the shallow depth of the Andrew Street Connection would require significant fill or pumping. The proposed sanitary servicing plan is shown in Figure 5.

The manhole located on Domville Street has a depth of approximately 3.20 m. The second option of an easement connection to Andrew Street is possible, however it is costly due to the amount of fill required or pumping. In order to provide service to all of the homes using the Domville Street manhole the following conditions must be met:

- The slope of the sanitary pipes from the property line to the manhole is at the minimum slope of 2%.
- The slope of a sanitary line on the property is at the minimum slope of 1%.

There will be the need to install three (3) sanitary manholes to allow sanitary sewage service access on the proposed site.

The anticipated demand on the municipal sewage system is determined using average day sewage flow rates and peaking factors. It is anticipated that a sewage flow of approximately 450 litres/per person per day, or 1350 litres per dwelling, would be generated based on average Township of Wellington North flow rates. The Ontario Building Code stipulates a volume of 275 litres/per person per day in an apartment building, in this case with two bedrooms. Therefore, sewage flow based on the Township of Wellington North flow rates is approximately 48.3m³/day. Consultation with the Township has indicated that Public Works is moving towards an expansion to the Water Pollution Control Plant (WPCP) that will eventually allow this added flow rate. Current applications are being approved on an individual basis with some having a HOLD designation.

5.0 Erosion and Sediment Control

Given the generally flat topography, the subject lands are considered to have a low to moderate erosive potential. The construction phase for the project should be relatively short in terms of duration, whereas its activity level is expected to be relatively high. Effective environmental and sedimentation controls must be in place on a temporary basis both during the construction period, and post construction until the permanent features of the completed development are established.

To ensure storm water quality control during construction, it is imperative that effective environmental and sedimentation control be in place on a temporary basis throughout the entire area prior to construction activities. It is therefore recommended that during the construction phase the following practices be implemented and maintained throughout to mitigate the off-site transportation of eroded soils:

- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit;
- Provision of silt control fences for the duration of construction activities in all areas where surface drainage flows over disturbed areas and off the site. This will generally be along the south and east property boundaries;
- Installation of rip rap check dams and geotextile fences in key locations as deemed necessary; and,
- Designation of fuelling areas and fuel storage areas, and ensuring that these areas are properly treated to contain leaks and other surface spills. Further, a maintenance plan will be prepared to ensure the up-keep of these designated areas.

Prior to the commencement of construction activities, a proposed 1.2 m high siltation control fence should be installed along the entirety of the property boundary, so as to filter such surface runoff. This fence will delineate areas for construction activities.

To assist in minimizing the tracking of mud off-site, it is proposed that temporary mud mat systems be provided at the entrances to the site. The mud mats will consist of 50 mm diameter clear stone to a minimum depth of 250 mm. This mud mat will be installed only for a short term during the majority of the building construction period.

Through the implementation of the proposed construction practices discussed above and regular maintenance of these controls, it can be ensured that satisfactory protection of the surrounding areas will occur during the construction stage of the proposed development.

6.0 Conclusions and Recommendations

6.1 Stormwater Management

The storm water management analysis provided above is summarized as follows:

- The storm water management for the site has been designed to ensure that the post development 2 to 100-year release rate meets the pre development conditions from the site and is not exceeded for any event;
- Rear yard swales are proposed to facilitate discharge into the storm water management facility and CBs
- Stormwater management quality is provided through swales, CBs constructed with sumps and storm water management pond.
- The proposed SWM area and the CBs will discharge into the municipal ditch system.
- The total amount of storage provided is 181m³.

6.2 Water Supply

The water supply analysis is summarized as follows:

- The preferred municipal supply connection is located on Domville Street.
- A 150mm diameter PVC water main should be installed under the roadway to provide domestic and fire protection to the development.
- The average water demand for the proposed development is estimated to be 53.10m³/day with a maximum demand of 260.19m³/day.
- Consultation with the Township has indicated that satisfactory water supply capacity is available in the municipal system to allow allocation of the development.

6.3 Wastewater Servicing

The wastewater generated is summarized as follows:

- The preferred municipal system to connect to is the sanitary manhole located on Domville Street.
- The amount of wastewater generated for the proposed dwellings, at 50 dwellings, is anticipated to be 48.3m³/day.
- The Township's municipal collection system currently does not have sufficient capacity to accommodate the new flows generated. The Township is currently approving applications on an individual basis.

In summary, the site can be serviced with an on-site storm water management system capable of satisfying the applicable SWM criteria. The site is also serviceable for water supply and fire protection. Finally, sanitary sewage collection and disposal is possible for the site utilizing a gravity sanitary sewers. The groundwater level can be alleviated during the construction design phase by employing waterproofing techniques for basement construction or potentially the use of slab on grade construction for some of the residences if required.

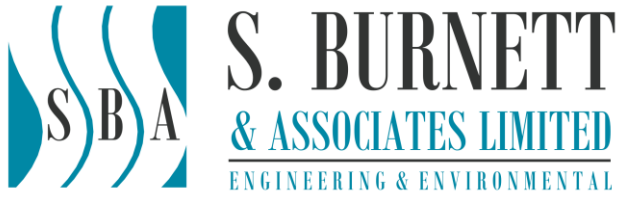
Accordingly, we hereby recommend the adoption of this report as it relates to the provision of SWM works, and for the purposes of servicing for the Draft Plan of Subdivision and Zoning By-Law Amendment Application.

Prepared by:

S. Burnett & Associates Limited



Terrance Gole, EP



Appendix A

Groundwater Monitoring and Stormwater Management Calculations



S. BURNETT
& ASSOCIATES LIMITED
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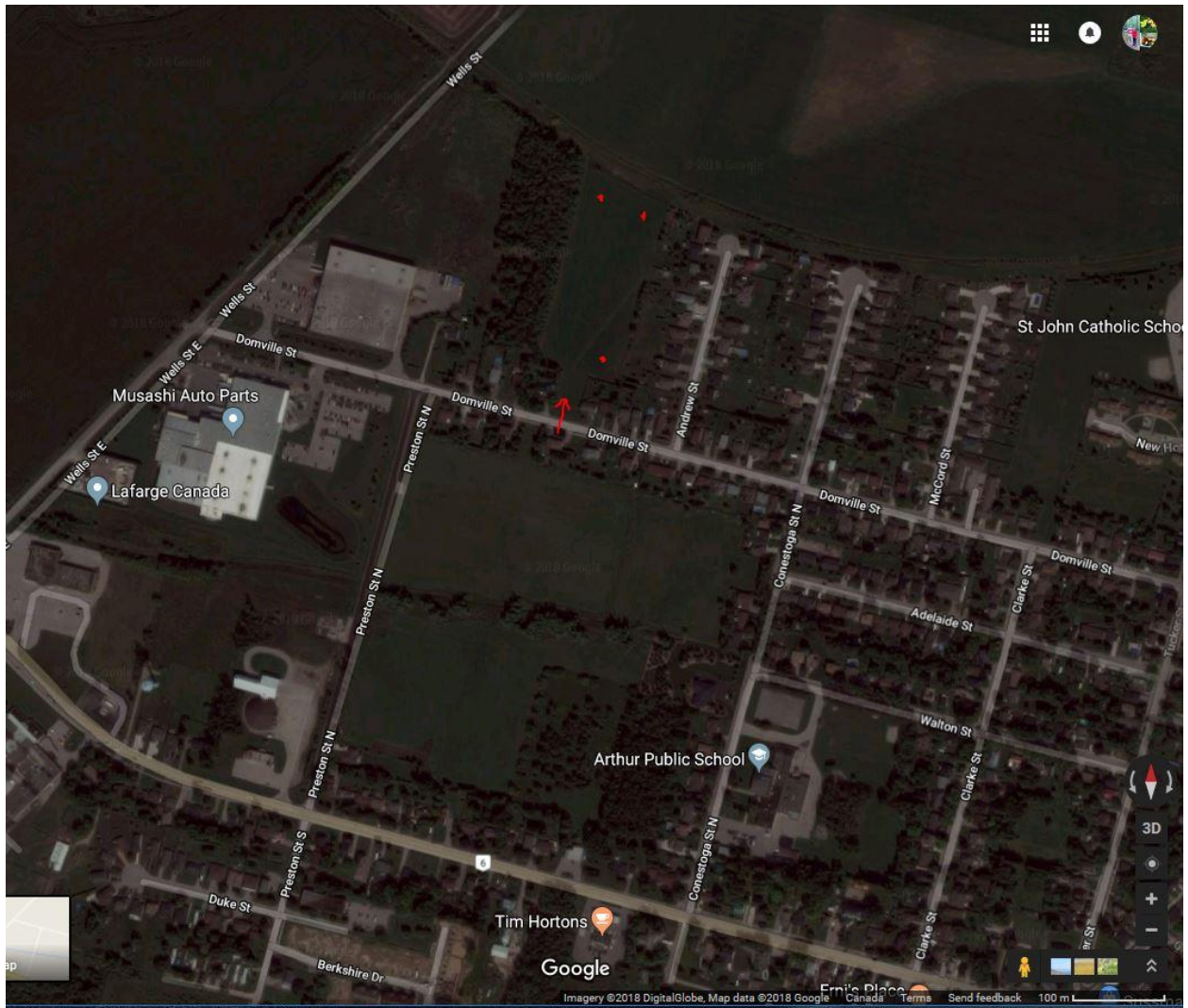
Appendix B

Figure 1 - 7

D13001 - Forest View (Arthur) Monitoring Well Raw Data

Well Info:	BH5 (SE)	BH8 (NE)	BH4 (NW)
Tag ID	A227263	A227264	A227265
Elevation	100.00	100.00	100.00
Length of Pipe			
Pipe Abv. Grade	0.770	1.060	0.725
21-Jun-18			
Manual Reading	1.661	2.216	1.867
Time	2:05 PM	2:12 PM	2:18 PM
GW depth b.g. (m)	0.891	1.156	1.142
GW Elevation	99.109	98.844	98.858
19-Jul-18			
Manual Reading	1.942	2.537	2.191
Time	1:18 PM	1:24 PM	1:30 PM
GW depth b.g. (m)	1.17	1.48	1.47
GW Elevation (m)	98.83	98.52	98.53
29-Aug-18			
Manual Reading	2.15	2.98	2.75
Time	11:21 AM	11:29 AM	11:33 AM
GW depth b.g. (m)	1.38	1.92	2.03
GW Elevation	98.62	98.08	97.98
27-Sep-18			
Manual Reading	2.43	3.38	3.19
Time	9:40 AM	9:47 AM	9:52 AM
GW depth b.g. (m)	1.66	2.32	2.47
GW Elevation	98.34	97.68	97.54

Monitoring Well locations at Forest View Estates



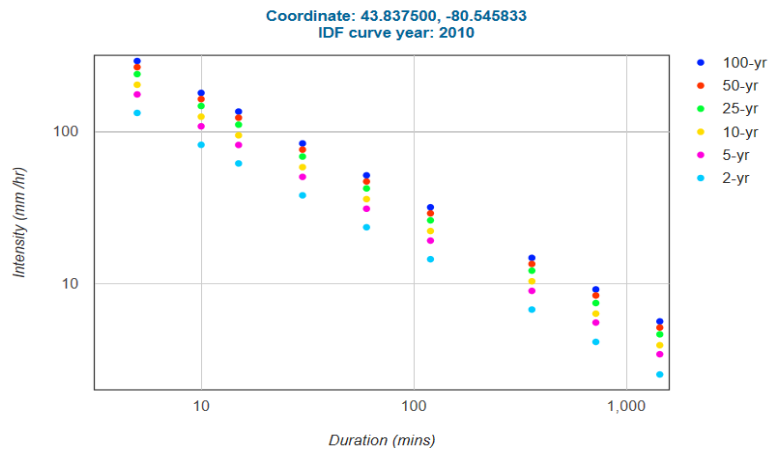
Satellite Imagery credit: Google Inc.

Project Name: Forest View Estate
 Project #: D13001
 Rainfall Intensities

Prepared by: D. Creary
 Reviewed by:

Time of Concentration (mins)	
Pre-Development	10.00
Post-Development	10.00

Storm Event (yr)	IDF Coefficients		Intensity (mm/hr)
	A	B	
2	23.400	-0.699	81.9
5	31.000	-0.699	108.50
10	35.900	-0.699	125.60
25	42.200	-0.699	147.70
50	46.900	-0.699	164.10
100	51.500	-0.699	180.20



Notes - IDF Curve Link:

http://www.mto.gov.on.ca/IDF_Curves/results_out.shtml?coords=43.83948,-80.54436

Project Name: Forest View Estate

Project #: D13001

Calculations for Pre Internal Flows

Method: Rational Formula

*Applicable for Drainage Basins less than 200acres (80 ha)

*Refer to stormwater collection systems and desin handbook - Larry W. Mays

Prepared by: D. Creary

Reviewed by:

Storm Event (yr)	C Adjusment			I (mm/hr)	A (ha)	Peak Discharge - Q (m ³ /s)
	C	Factor	Adjusted C			
2.00	0.20	1.00	0.20	81.90	2.37	0.11
5.00	0.20	1.00	0.20	108.50	2.37	0.14
10.00	0.20	1.00	0.20	125.60	2.37	0.17
25.00	0.20	1.10	0.22	147.70	2.37	0.21
50.00	0.20	1.20	0.24	164.10	2.37	0.26
100.00	0.20	1.25	0.25	180.20	2.37	0.30

Project Name: Forest View Estate

Project #: D13001

Calculations for Post Development Flows (SWA-B)

*Refer to stormwater collection systems and desin handbook - Larry W. Mays

Prepared by: D. Creary

Reviewed by:

2 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.00	0.45	81.90	1.41	0.14
		0.45		1.41	0.14

5 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.00	0.45	108.50	1.41	0.19
		0.45		1.41	0.19

10 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.00	0.45	125.60	1.41	0.22
		0.45		1.41	0.22

25 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.10	0.50	147.70	1.41	0.29
		0.50		1.41	0.29

50 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.20	0.54	164.10	1.41	0.35
		0.54		1.41	0.35

100 Year

C	C Adjusment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.45	1.25	0.56	180.20	1.41	0.40
		0.56		1.41	0.40

Project Name: Forest View Estate

Project #: D13001

Calculations for Post Development Flows (SWA-A)

*Refer to stormwater collection systems and design handbook - Larry W. Mays

Prepared by: D. Creary

Reviewed by:

2 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.00	0.40	81.90	0.96	0.09
		0.40			

5 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.00	0.40	108.50	0.96	0.12
		0.40			

10 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.00	0.40	125.60	0.96	0.13
		0.40			

25 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.10	0.44	147.70	0.96	0.17
		0.44			

50 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.20	0.48	164.10	0.96	0.21
		0.48			

100 Year

C	C Adjustment		I (mm/hr)	A Controlled(ha)	Q Controlled (m3/s)
	Factor	Adjusted C			
0.40	1.25	0.50	180.20	0.96	0.24
		0.50			

Project Name: Forest View Estate
 Project #: D13001
 Flow Summary

Prepared by: D. Creary
 Reviewed by:

Storm Event	Q _{peak pre flow}	Q _{post development flow - subcatchment 2}	Q _{post development flow - subcatchment 1}	Q _{post development flow - total}	Q _{controlled outflow - subcatchment 2}	Q _{controlled outflow - subcatchment 1}	Unit
2 Year	0.11	0.14	0.09	0.23	0.07	0.04	m3/s
5 Year	0.14	0.19	0.12	0.31	0.10	0.05	m3/s
10 Year	0.17	0.22	0.13	0.36	0.11	0.05	m3/s
25 Year	0.21	0.29	0.17	0.46	0.14	0.07	m3/s
50 Year	0.26	0.35	0.21	0.56	0.17	0.09	m3/s
100 Year	0.30	0.40	0.24	0.64	0.20	0.10	m3/s

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Drainage Area	1.41	ha
Composite Run-off Coefficient	0.45	
Allowable outflow, Q_p	0.07	m^3/s
Post Time of Concentration	10.00	minutes

2 Year IDF Coefficients	
A	23.4
B	-0.699

2 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	132.912	300	3.69E-05	0.23426	37.76
10	81.874	600	2.27E-05	0.14430	43.23
15	61.667	900	1.71E-05	0.10869	43.63
20	50.434	1200	1.40E-05	0.08889	41.64
25	43.150	1500	1.20E-05	0.07605	38.22
30	37.987	1800	1.06E-05	0.06695	33.81
35	34.107	2100	9.47E-06	0.06011	28.70
40	31.067	2400	8.63E-06	0.05476	23.04
45	28.612	2700	7.95E-06	0.05043	16.95
50	26.581	3000	7.38E-06	0.04685	10.50
55	24.867	3300	6.91E-06	0.04383	3.75
60	23.400	3600	6.50E-06	0.04124	(3.25)
65	22.127	3900	6.15E-06	0.03900	(10.47)
70	21.010	4200	5.84E-06	0.03703	(17.87)
75	20.021	4500	5.56E-06	0.03529	(25.45)
80	19.137	4800	5.32E-06	0.03373	(33.17)
85	18.343	5100	5.10E-06	0.03233	(41.03)
90	17.625	5400	4.90E-06	0.03106	(49.00)
Required Storage					43.63

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Area of watershed, A	1.41	ha
Composite Run-off Coefficient	0.45	
Allowable outflow, Q_p	0.10	m^3/s
Post Time of Concentration	10.00	minutes

5 Year IDF Coefficients	
A	31
B	-0.699

5 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	176.080	300	4.89E-05	0.31034	50.03
10	108.465	600	3.01E-05	0.19117	57.27
15	81.696	900	2.27E-05	0.14399	57.80
20	66.814	1200	1.86E-05	0.11776	55.17
25	57.165	1500	1.59E-05	0.10075	50.63
30	50.325	1800	1.40E-05	0.08870	44.80
35	45.184	2100	1.26E-05	0.07964	38.02
40	41.158	2400	1.14E-05	0.07254	30.52
45	37.905	2700	1.05E-05	0.06681	22.45
50	35.214	3000	9.78E-06	0.06206	13.90
55	32.944	3300	9.15E-06	0.05806	4.97
60	31.000	3600	8.61E-06	0.05464	(4.31)
65	29.313	3900	8.14E-06	0.05166	(13.87)
70	27.833	4200	7.73E-06	0.04906	(23.68)
75	26.523	4500	7.37E-06	0.04675	(33.71)
80	25.353	4800	7.04E-06	0.04468	(43.94)
85	24.301	5100	6.75E-06	0.04283	(54.35)
90	23.349	5400	6.49E-06	0.04115	(64.92)
Required Storage					57.80

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Area of watershed, A	1.41	ha
Composite Run-off Coefficient	0.45	
Allowable outflow, Q_p	0.11	m^3/s
Post Time of Concentration	10.00	minutes

10 Year IDF Coefficients	
A	35.9
B	-0.699

10 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	203.912	300	5.66E-05	0.35939	57.96
10	125.609	600	3.49E-05	0.22139	66.35
15	94.609	900	2.63E-05	0.16675	66.97
20	77.375	1200	2.15E-05	0.13637	63.93
25	66.201	1500	1.84E-05	0.11668	58.68
30	58.279	1800	1.62E-05	0.10272	51.93
35	52.326	2100	1.45E-05	0.09222	44.09
40	47.663	2400	1.32E-05	0.08401	35.41
45	43.896	2700	1.22E-05	0.07737	26.07
50	40.780	3000	1.13E-05	0.07187	16.18
55	38.151	3300	1.06E-05	0.06724	5.84
60	35.900	3600	9.97E-06	0.06327	(4.89)
65	33.947	3900	9.43E-06	0.05983	(15.96)
70	32.233	4200	8.95E-06	0.05681	(27.32)
75	30.715	4500	8.53E-06	0.05414	(38.93)
80	29.360	4800	8.16E-06	0.05175	(50.77)
85	28.142	5100	7.82E-06	0.04960	(62.82)
90	27.040	5400	7.51E-06	0.04766	(75.05)
Required Storage					66.97

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Area of watershed, A	1.41	ha
Composite Run-off Coefficient	0.50	
Allowable outflow, Q_p	0.14	m^3/s
Post Time of Concentration	10.00	minutes

25 Year IDF Coefficients	
A	42.2
B	-0.699

25 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	239.696	300	6.66E-05	0.46471	74.92
10	147.652	600	4.10E-05	0.28626	85.76
15	111.212	900	3.09E-05	0.21561	86.56
20	90.954	1200	2.53E-05	0.17634	82.61
25	77.818	1500	2.16E-05	0.15087	75.81
30	68.507	1800	1.90E-05	0.13282	67.08
35	61.509	2100	1.71E-05	0.11925	56.94
40	56.027	2400	1.56E-05	0.10862	45.71
45	51.599	2700	1.43E-05	0.10004	33.62
50	47.936	3000	1.33E-05	0.09294	20.82
55	44.846	3300	1.25E-05	0.08695	7.44
60	42.200	3600	1.17E-05	0.08182	(6.45)
65	39.904	3900	1.11E-05	0.07736	(20.77)
70	37.889	4200	1.05E-05	0.07346	(35.46)
75	36.105	4500	1.00E-05	0.07000	(50.48)
80	34.513	4800	9.59E-06	0.06691	(65.80)
85	33.081	5100	9.19E-06	0.06414	(81.39)
90	31.785	5400	8.83E-06	0.06162	(97.21)
Required Storage					86.56

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Area of watershed, A	1.41	ha
Composite Run-off Coefficient	0.54	
Allowable outflow, Q_p	0.17	m^3/s
Post Time of Concentration	10.00	minutes

50 Year IDF Coefficients	
A	46.9
B	-0.699

50 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	266.392	300	7.40E-05	0.56342	90.85
10	164.097	600	4.56E-05	0.34707	104.01
15	123.598	900	3.43E-05	0.26141	104.98
20	101.084	1200	2.81E-05	0.21379	100.21
25	86.485	1500	2.40E-05	0.18292	91.97
30	76.136	1800	2.11E-05	0.16103	81.39
35	68.359	2100	1.90E-05	0.14458	69.10
40	62.267	2400	1.73E-05	0.13170	55.49
45	57.346	2700	1.59E-05	0.12129	40.84
50	53.275	3000	1.48E-05	0.11268	25.34
55	49.841	3300	1.38E-05	0.10541	9.12
60	46.900	3600	1.30E-05	0.09919	(7.71)
65	44.348	3900	1.23E-05	0.09380	(25.06)
70	42.109	4200	1.17E-05	0.08906	(42.86)
75	40.127	4500	1.11E-05	0.08487	(61.07)
80	38.357	4800	1.07E-05	0.08112	(79.64)
85	36.765	5100	1.02E-05	0.07776	(98.52)
90	35.325	5400	9.81E-06	0.07471	(117.70)
Required Storage					104.98

Project Name: Forest View Estate
 Project #: D13001
 Calculations for Detention Pond Storage

Prepared by: D. Creary
 Reviewed by:

Area of watershed, A	1.41	ha
Composite Run-off Coefficient	0.56	
Allowable outflow, Q_p	0.1987	m^3/s
Post Time of Concentration	10.00	minutes

100 Year IDF Coefficients	
A	51.5
B	-0.699

100 Year Storm					Storage
t_d (min)	i (mm/hr)	t_d (sec)	i (m/sec)	I_p (m^3/s)	S_d (m^3)
5	292.520	300	8.13E-05	0.64446	103.92
10	180.192	600	5.01E-05	0.39698	118.97
15	135.721	900	3.77E-05	0.29901	120.08
20	110.998	1200	3.08E-05	0.24454	114.61
25	94.967	1500	2.64E-05	0.20923	105.19
30	83.604	1800	2.32E-05	0.18419	93.09
35	75.064	2100	2.09E-05	0.16538	79.03
40	68.375	2400	1.90E-05	0.15064	63.47
45	62.971	2700	1.75E-05	0.13873	46.71
50	58.500	3000	1.62E-05	0.12888	28.97
55	54.729	3300	1.52E-05	0.12058	10.42
60	51.500	3600	1.43E-05	0.11346	(8.83)
65	48.698	3900	1.35E-05	0.10729	(28.67)
70	46.239	4200	1.28E-05	0.10187	(49.04)
75	44.062	4500	1.22E-05	0.09707	(69.87)
80	42.119	4800	1.17E-05	0.09279	(91.11)
85	40.371	5100	1.12E-05	0.08894	(112.71)
90	38.790	5400	1.08E-05	0.08546	(134.64)

Required Storage 120.08

Project Name: Forest View Estate
Project No.: D13001
Task: Pond Depth Calculations
Method:
Type: Flat Bottom Swale

Prepared by: D. Creary
Reviewed by:

Equation $H = 2 * V / ((B + T) * L)$

Side Slope 1 4
Length 24 m
Top Width 10.8 m
Bottom Width 6 m

Pond Base Elevation 456.3 m

Storm Event	Storage Required (m3)	Height (m)	Elevation (m)
2	43.63	0.22	456.52
5	57.80	0.29	456.59
10	66.97	0.33	456.63
25	86.56	0.43	456.73
50	104.98	0.52	456.82
100	120.08	0.60	456.90
Free board	180.56	0.90	457.20

Project Name: Forest View Estate
 Project No.: D13001
 Calculations for Orifice Outlet Structure(s)

Prepared by: D. Creary
 Reviewed by:

K _o Value	
Plate	0.80

Description	2-year Storm	5-year Storm	10-year Storm	25-year Storm	50-year Storm	100-year Storm	Units
	Horizontal Plate						
Ponding Height	0.22	0.29	0.33	0.43	0.52	0.60	m
Orifice Invert (Pond Bottom)	456.3	456.3	456.3	456.3	456.3	456.3	m
Orifice Diameter	310.0	310.0	310.0	310.0	310.0	310.0	mm
Orifice Area, a _o	0.31	0.31	0.31	0.31	0.31	0.31	m
Centroid	0.075	0.075	0.075	0.075	0.075	0.075	m ²
Discharge Coefficient, k _o	456.46	456.46	456.46	456.46	456.46	456.46	m
Orifice Head (taken from centroid)	0.80	0.80	0.80	0.80	0.80	0.80	
Orifice Flow, Q	0.06	0.13	0.18	0.27	0.37	0.44	m
Allowable Flow, Q _p	0.07	0.10	0.11	0.14	0.16	0.18	m ³ /s
Difference	0.07	0.10	0.11	0.14	0.17	0.20	m ³ /s
	-0.01	0.00	0.00	0.00	-0.01	-0.02	m ³ /s

Project Name: Forest View Estate
 Project No.: D13001
 Task: Storm Sewer Hydraulic Calculations
 Method: Manning's Equations

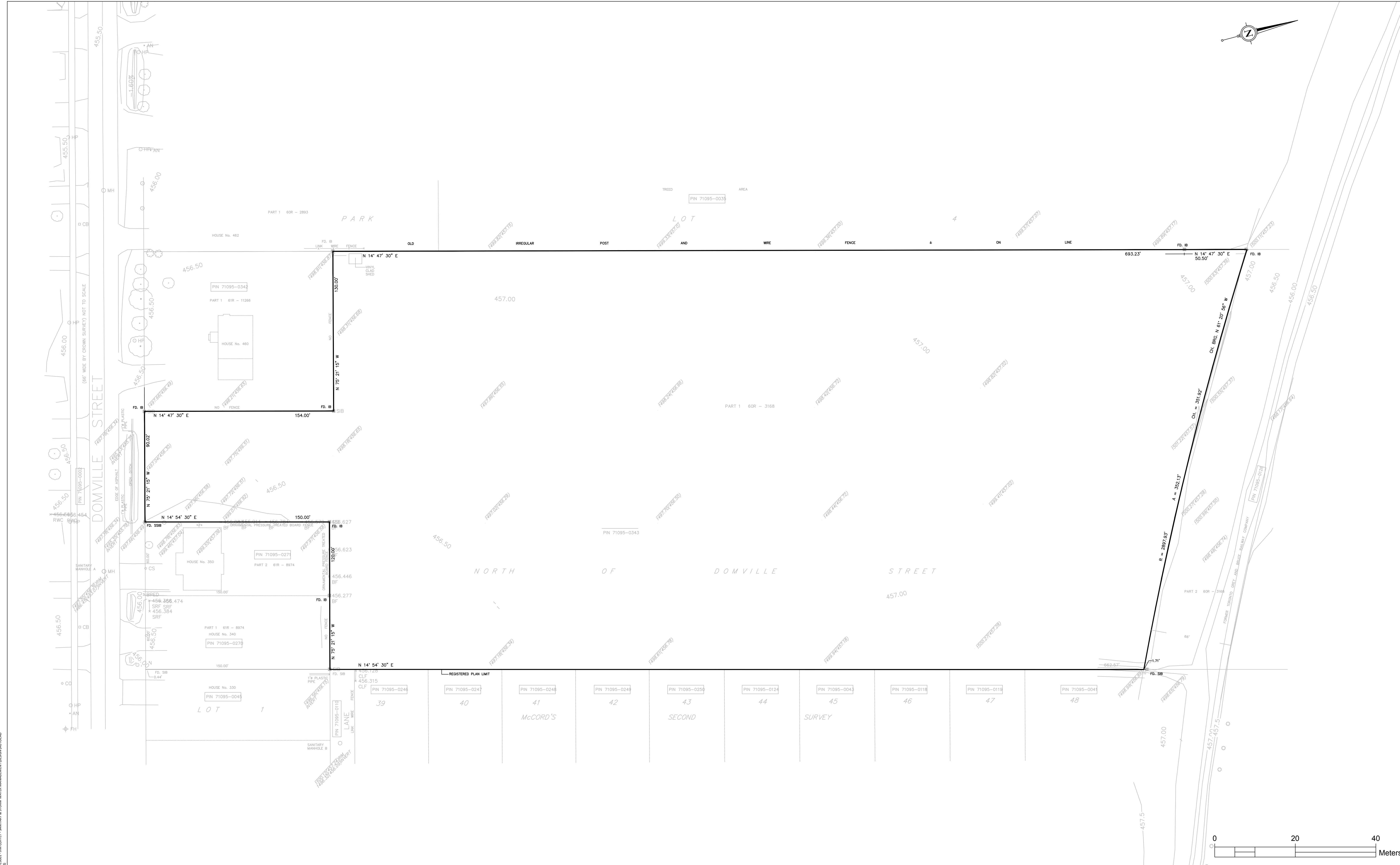
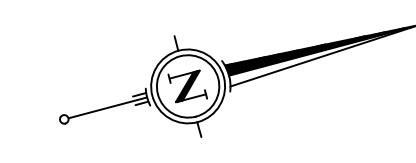
Prepared by: D. Creary
 Reviewed by:

Storm Event (yr)	IDF Coefficients	
	A	B
Major (100 yr)	51.500	-0.699

*10min entry time

Storm Sewer Hydraulic Design Sheet

Description	Sub-catchment Area Acc. (m2)	Runoff Coefficient, C	Initial Time of Concentration (mins)	Time of Concentration (mins)	Acc. Time of Concentration (mins)	Intensity (mm/hr)	Design Flow (l/s)	Diameter (mm)	d/D	Flow Depth, y (mm)	Flow Area, A (mm2)	Wetted Perimeter, P (mm)	Hydraulic Radius, R (mm)	Start Elev. (m)	End Elev. (m)	Length (m)	Slope (%)	Mannings no., n	Velocity (m/s)	Capacity (l/s)	Design Flow (l/s)	Travel Time (s)	Flow Test	Velocity Test	Q/Qcap
CB 1 to Ditch	4800	0.50	10.00	0.03	10.03	180.02	120.0	350	85%	297.5	87162	821	106.14	455.80	455.77	3	1.00%	0.013	1.72	150	120.0	1.7	OK	OK	0.80
CB 2 to Ditch	4800	0.50	10.00	0.03	10.03	180.02	120.0	350	85%	297.5	87162	821	106.14	455.74	455.71	3	1.00%	0.013	1.72	150	120.0	1.7	OK	OK	0.80
Outlet Pipe	-	-	10.00	0.19	10.19	177.35	198.71	400	85%	340.0	113844	938	121.31	456.30	456.00	24.00	1.25%	0.013	2.11	240	198.7	11.4	OK	OK	0.83



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1.	01-JUNE-2018	ISSUED FOR REVIEW			
2.	22-JUNE-2018	ISSUED FOR REVIEW			
3.	24-AUG-2018	ISSUED FOR REVIEW			
4.	07-NOV-2018	ISSUED FOR DRAFT PLAN OF SUBDIVISION APP.			

CLIENT
JIM COFFEY
940749 ONTARIO LIMITED

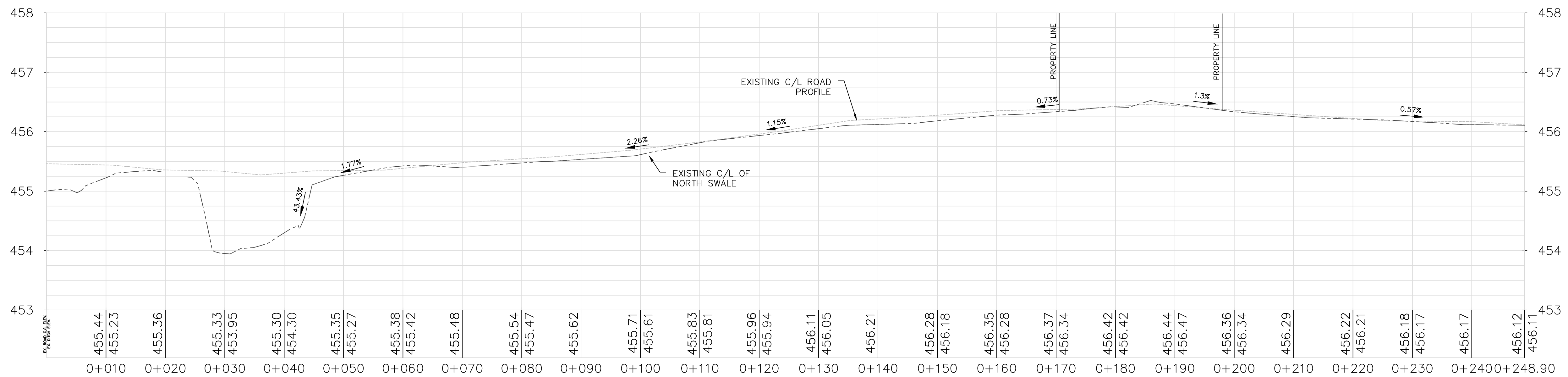
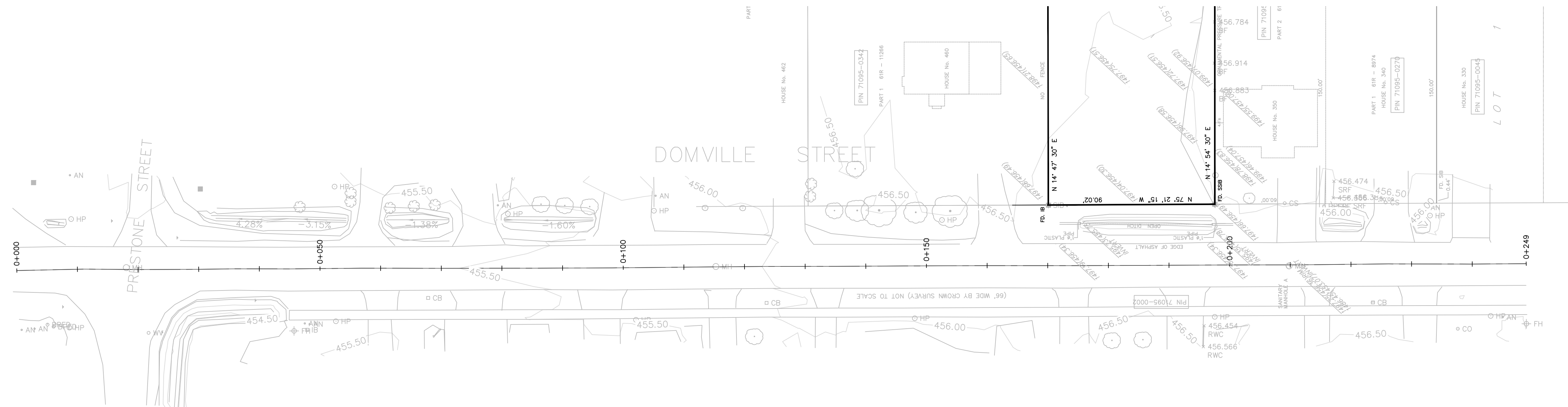
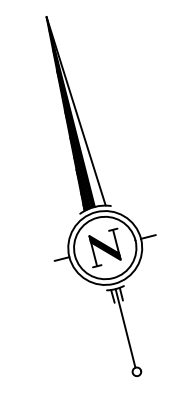
PROJECT
FOREST VIEW ESTATE

DRAWING TITLE
EXISTING PROPERTY GRADING

S. BURNETT & ASSOCIATES LIMITED
 ENGINEERING AND ENVIRONMENTAL SERVICES
 210 BROADWAY, UNIT 203
 ORANGEVILLE, ONTARIO L9W 5G4
 TELEPHONE: 519-941-2949 FAX: 519-941-2036

DESIGNED BY: T.G. DRAWN BY: D.S./H.S. VERIFIED BY: S.B. DRAWING NO.:
 SCALE: 1:400 PROJECT NO.: D13001

FIG. 1a



DOMVILLE STREET EXISTING PROFILE

M:\BROADVIEW\DEVELOPMENT\2018\01\DOMVILLE\DOMVILLE\DWG\EXISTING DOMVILLE STREET DRAINAGE.DWG
 2018-11-07 10:53 AM
 S. BURNETT & ASSOCIATES LIMITED

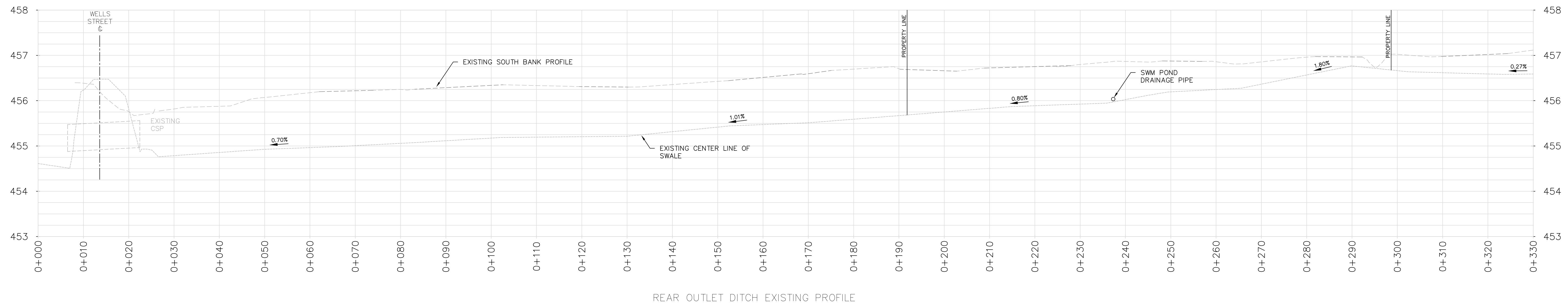
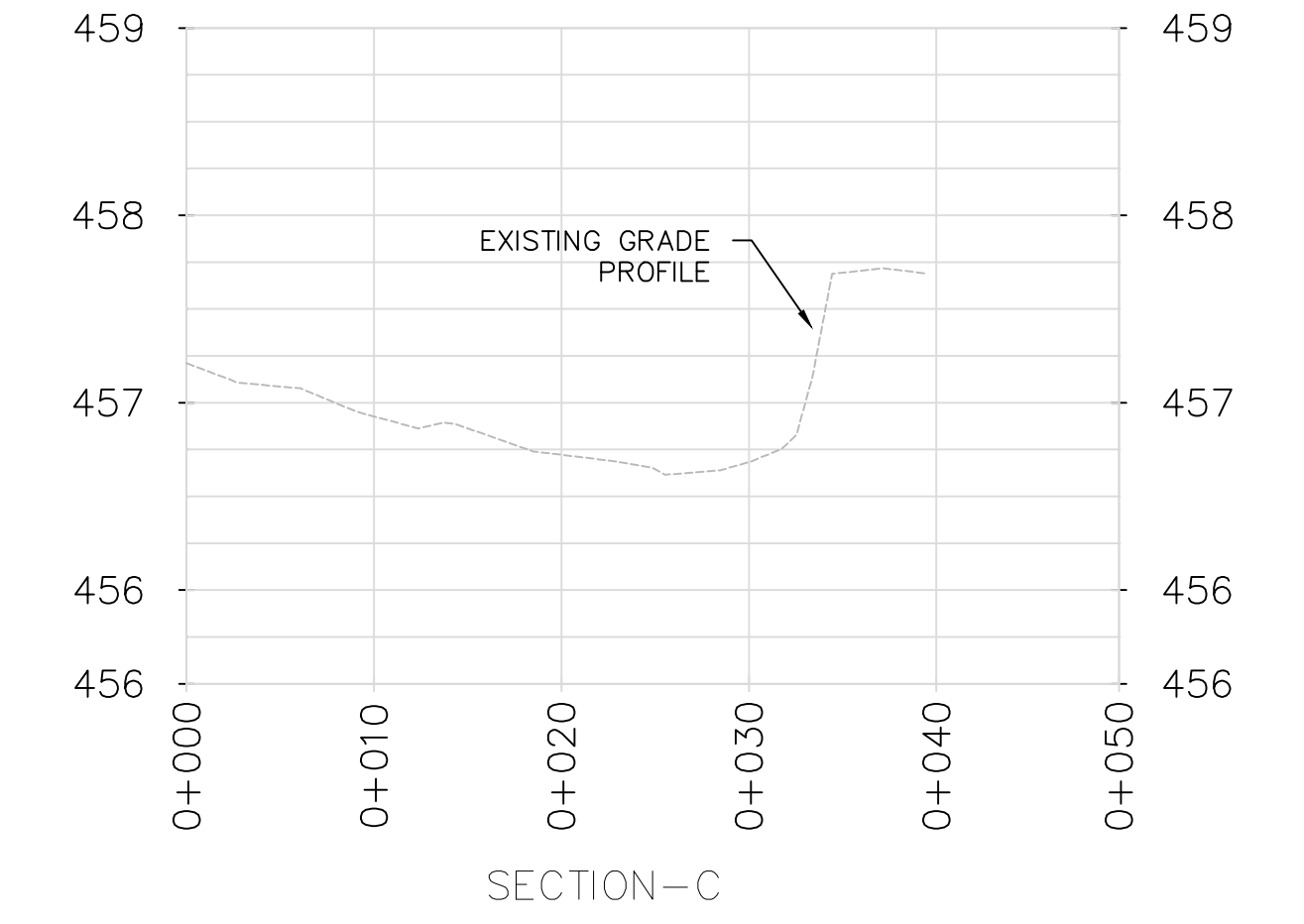
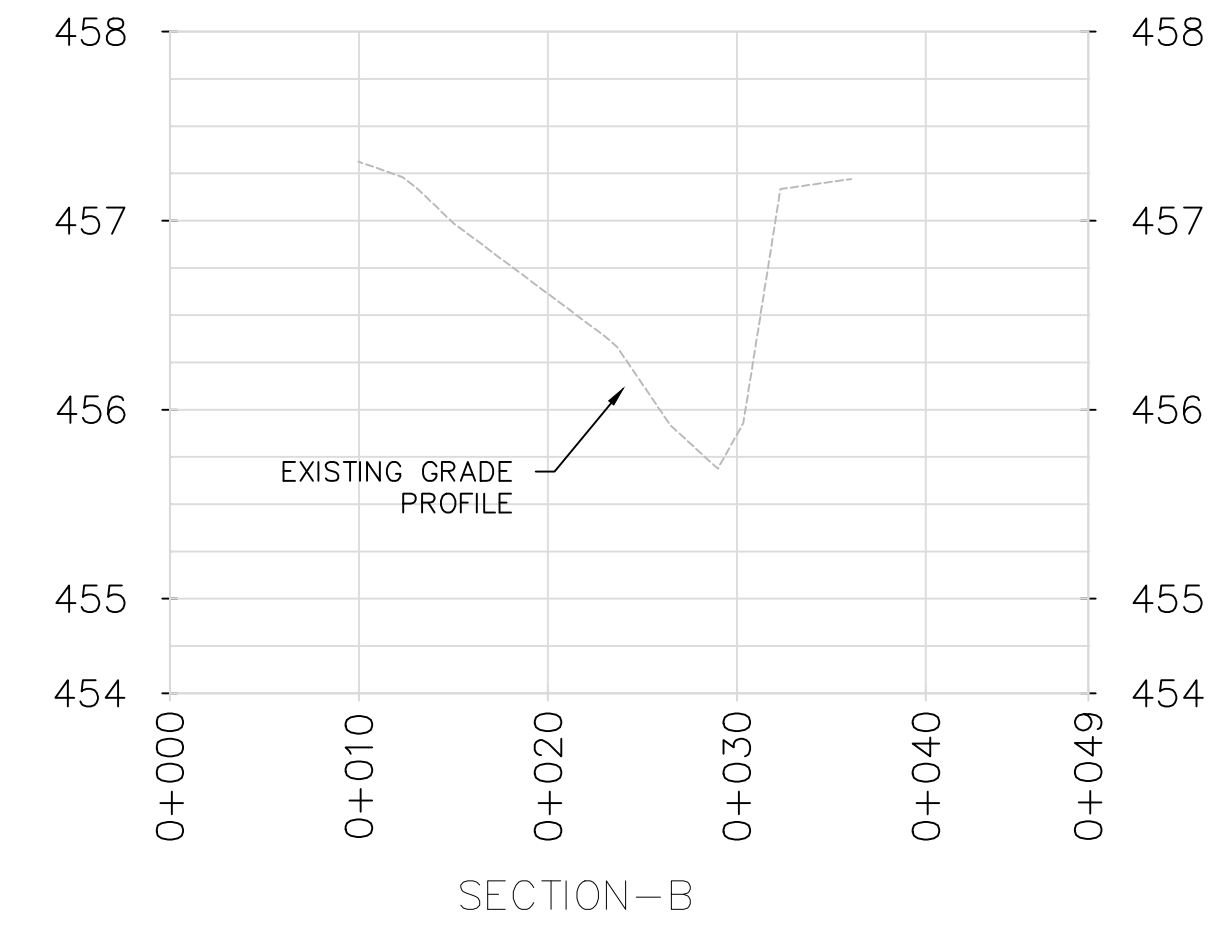
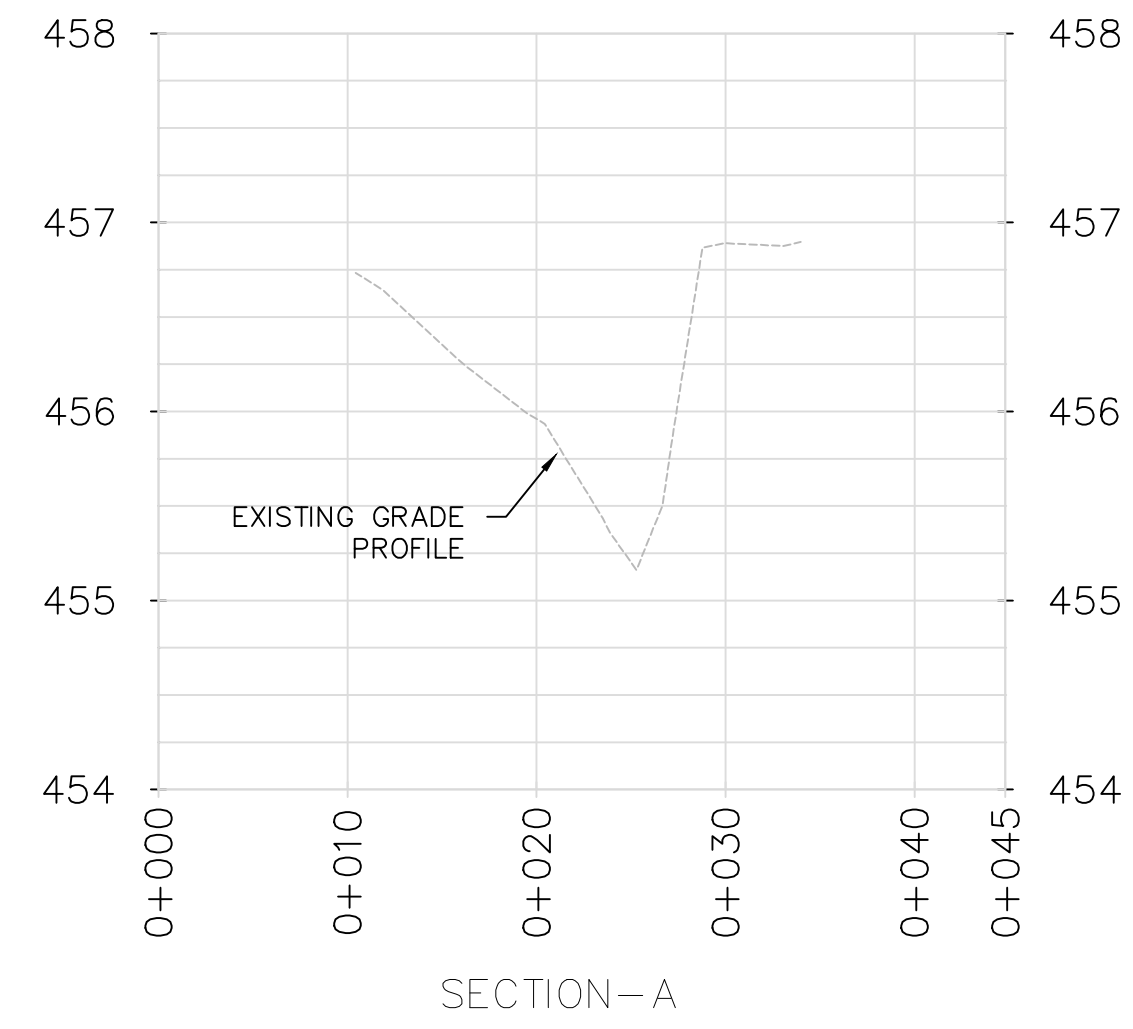
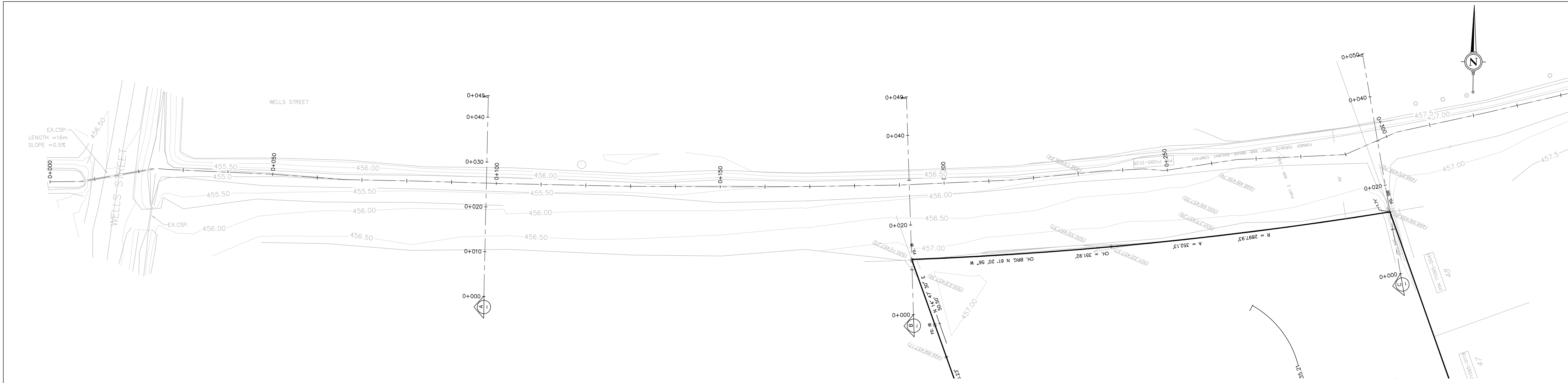
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4.	07-NOV-2018	ISSUED FOR DRAFT PLAN OF SUBDIVISION APP.			

CLIENT	JIM COFFEY 940749 ONTARIO LIMITED
PROJECT	FOREST VIEW ESTATE
DRAWING TITLE	EXISTING DOMVILLE STREET DRAINAGE

S. BURNETT & ASSOCIATES LIMITED ENGINEERING AND ENVIRONMENTAL SERVICES 210 BROADWAY, UNIT 203 ORANGEVILLE, ONTARIO L9W 5G4 TELEPHONE: 519-941-2949 FAX: 519-941-2036							
DESIGNED BY	T.G.	DRAWN BY	D.S./H.S.	VERIFIED BY	S.B.	DRAWING No.	FIG. 1b
SCALE	1:400	PROJECT No.	D13001				

PROF. STAMP



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4.	07-NOV-2018	ISSUED FOR DRAFT PLAN OF SUBDIVISION APP.			

CLIENT
JIM COFFEY
 940749 ONTARIO LIMITED

PROJECT
FOREST VIEW ESTATE

DRAWING TITLE
EXISTING NORTH SIDE DRAINAGE

S. BURNETT & ASSOCIATES LIMITED
 ENGINEERING AND ENVIRONMENTAL SERVICES
 210 BROADWAY, UNIT 203
 ORANGEVILLE, ONTARIO L9W 5G4
 TELEPHONE: 519-941-2949 FAX: 519-941-2036

DESIGNED BY: T.G. DRAWN BY: D.S./H.S. VERIFIED BY: S.B. DRAWING No.:
 SCALE: 1:400 PROJECT No.: D13001

FIG. 1c

DOMVILLE STREET

NORTH OF
DOMVILLE
PARK

EXISTING EMPLOYMENT

EXISTING RESIDENTIAL

PART 3
60R-2693

PART 2
60R-2693

PART 1
60R-2693

HOUSE No. 462
PART 1 60R-2883
PARK

HOUSE No. 460
PART 1 61R-11266

Blk 19 SWM 0.03ha.

Blk 20 SWM 0.03ha.

HOUSE No. 350
PART 1 61R-8974

PART 2
61R-8974

EXISTING RESIDENTIAL

LOT 1

LOT 2

LOT 3

LOT 4

N14°54'30"E

39

40

41

42

43

44

45

46

47

48

LOT 49

LOT 50

LOT 51

ANDREW STREET

EXISTING RESIDENTIAL

MCCORD'S

SECOND

SURVEY

Block 17
Multiple Residential
0.38ha.

Blk 18
SWM
0.06ha.

Block 15
Townhouse
0.16ha.

Block 16
Townhouse
0.15ha.

CUL-DE-SAC
20.0m
RADIUS

A=35.21
CH=30.84

A=39.02
CH=33.12

A=30.49
CH=27.02

A=83.23

201.95m

104.69

226.69m

36.74

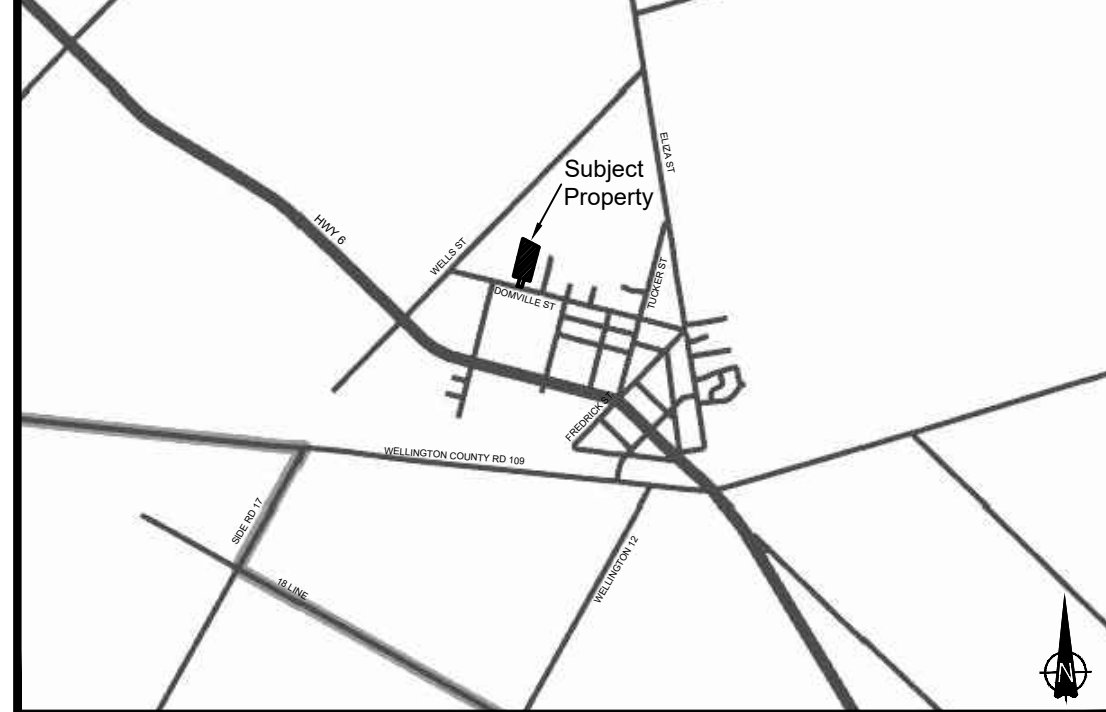
23.63

21.94

41.86

201.95m

KEY PLAN
N.T.S.



DRAFT PLAN OF SUBDIVISION

Part of Park Lot 4
North of Domville Street
Crown Survey
Township of Wellington North
(Formerly Village of Arthur)
County of Wellington

LAND USE SCHEDULE

DESCRIPTION	LOTS/BLKS.	UNITS	AREA (ha.)
Single Detached Residential	Lots 1-5, 8-12	10	0.66
Semi-Detached Residential	Lots 6-7, 13-14	8	0.36
Townhouse	Block 15	4	0.16
	Block 16	4	0.15
Multiple Residential	Block 17	24	0.38
Stormwater Management Blocks	Blocks 18-20		0.12
Roads			0.51
Total			2.34ha.

ADDITIONAL INFORMATION

(UNDER SECTION 51(17) OF THE PLANNING ACT)
INFORMATION REQUIRED BY CLAUSES a,b,c,d,e,f,g,j and l ARE AS SHOWN ON THE DRAFT PLAN.
h) Municipal water supply
i) Perth Silt Loam
k) All sanitary and storm sewers as required

OWNER'S CERTIFICATE

I AUTHORIZE THE GSP GROUP INC. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO

OWNER _____ DATE _____

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE CORRECTLY SHOWN.

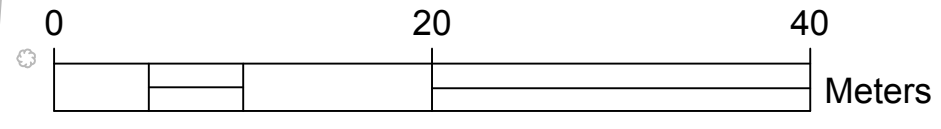
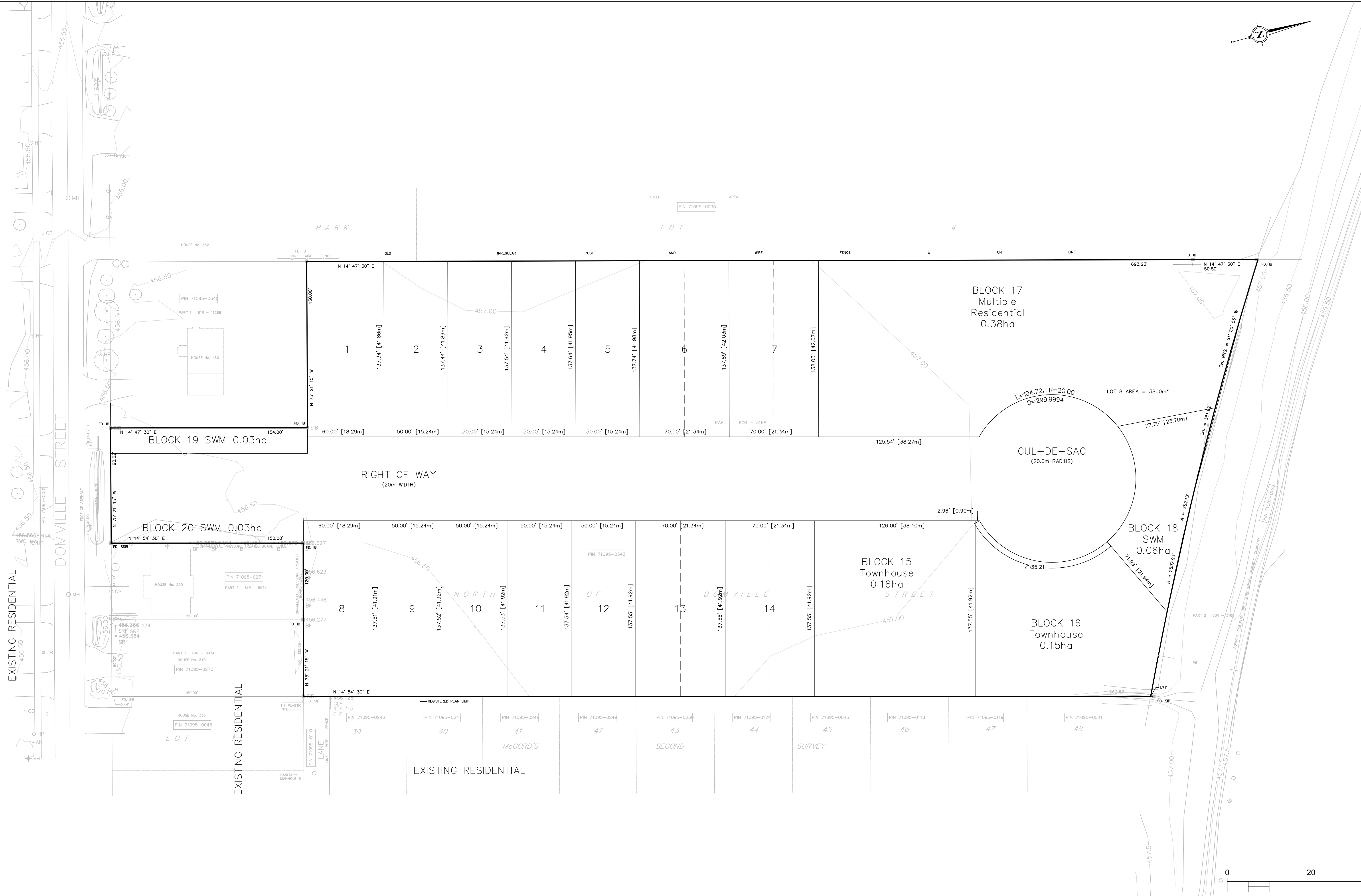
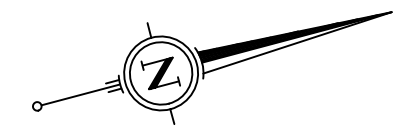
SURVEYOR _____ DATE _____

GSP group

PLANNING | URBAN DESIGN | LANDSCAPE ARCHITECTURE

gspgroup.ca

REVISIONS



M:\B\A\B\DEVELOPMENT\DEVELOPMENT-2018\03\001 - JIM COFFEY - SANITARY & STORM WATER MANAGEMENT\DESIGN\AUTOCAD DRAWING\0301_01_18_18.DWG

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PROF. STAMP

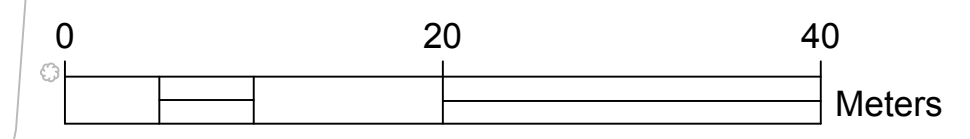
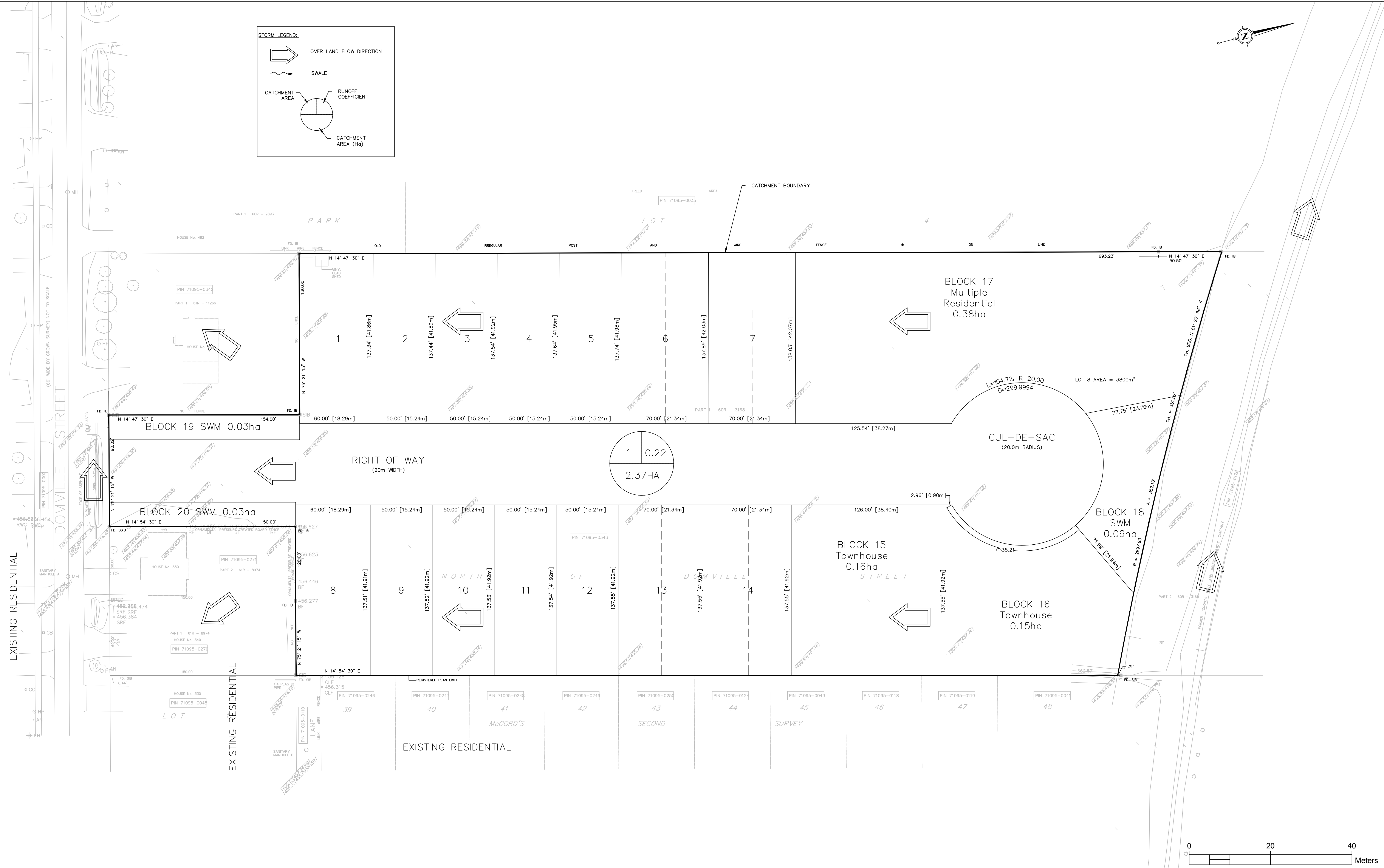
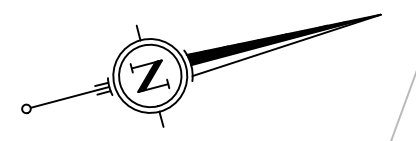
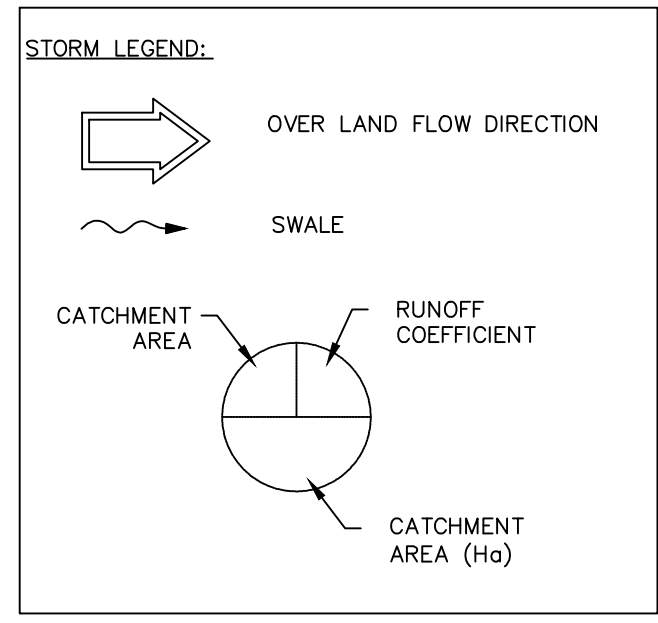
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2.	22-JUNE-2018	ISSUED FOR REVIEW			
3.	24-AUG-2018	ISSUED FOR REVIEW			
4.	07-NOV-2018	ISSUED FOR DRAFT PLAN OF SUBDIVISION APP.			

CLIENT
**JIM COFFEY
940749 ONTARIO LIMITED**

PROJECT
FOREST VIEW ESTATE

DRAWING TITLE
PROPOSED SITE PLAN

<p>S. BURNETT & ASSOCIATES LIMITED ENGINEERING AND ENVIRONMENTAL SERVICES 210 BROADWAY, UNIT 203 ORANGEVILLE, ONTARIO L9W 5G4 TELEPHONE: 519-941-2949 FAX: 519-941-2036</p>			DRAWING No.
DESIGNED BY T.G.	DRAWN BY D.S./H.S.	VERIFIED BY S.B.	FIG. 3
SCALE 1:400	PROJECT No. D13001		



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CLIENT
JIM COFFEY
940749 ONTARIO LIMITED

PROJECT
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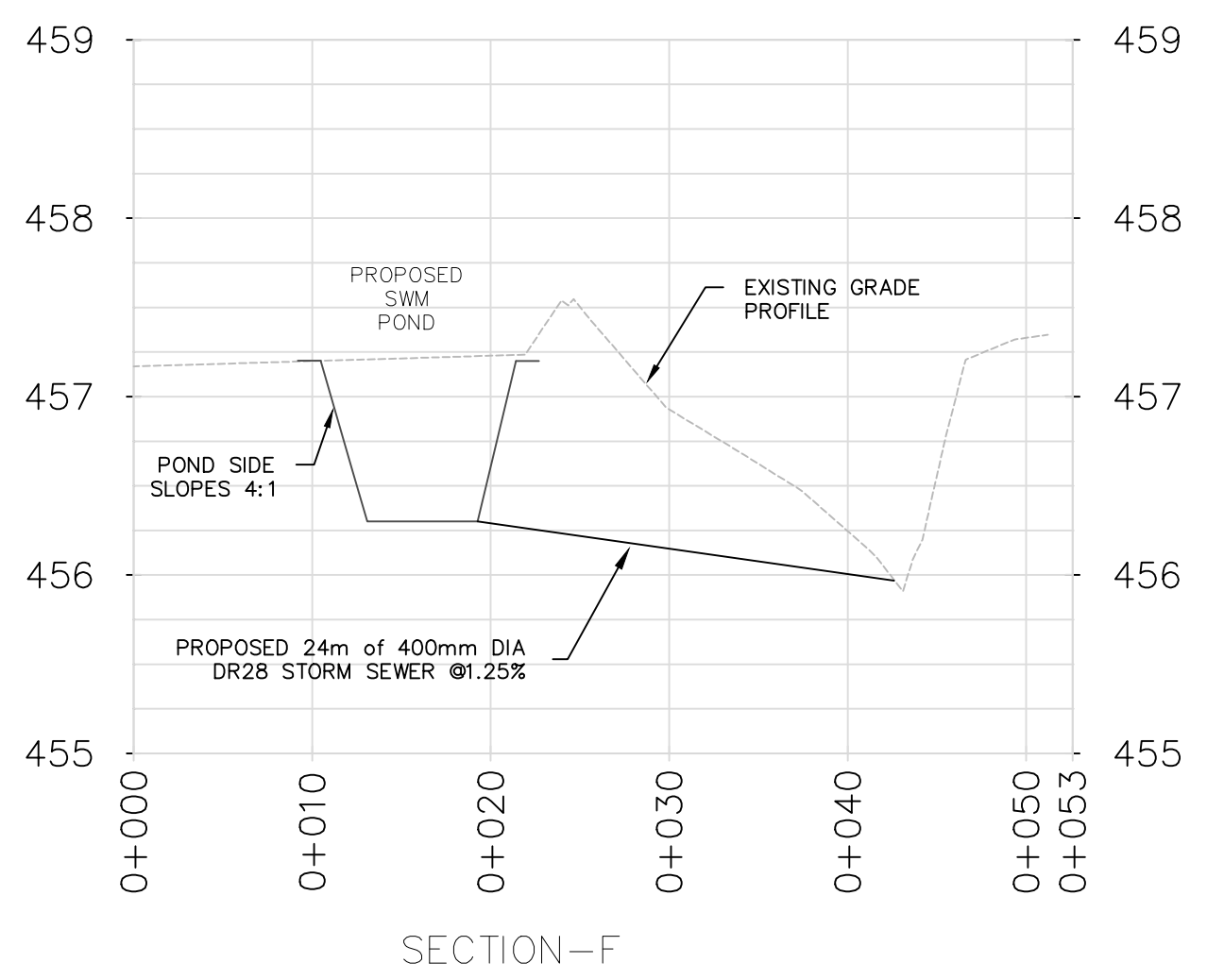
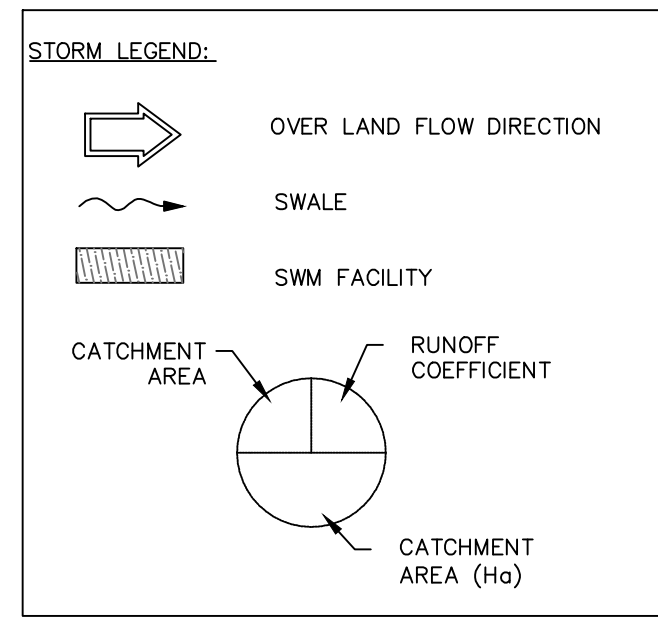
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PRE-DEVELOPMENT STORMWATER MANAGEMENT PLAN

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210 BROADWAY, UNIT 203
ORANGEVILLE, ONTARIO L9W 5G4
TELEPHONE: 519-941-2949 FAX: 519-941-2036

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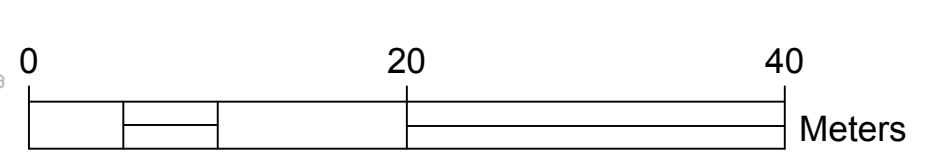
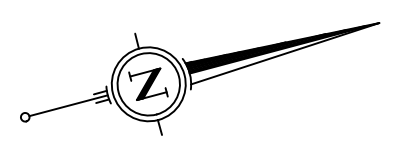
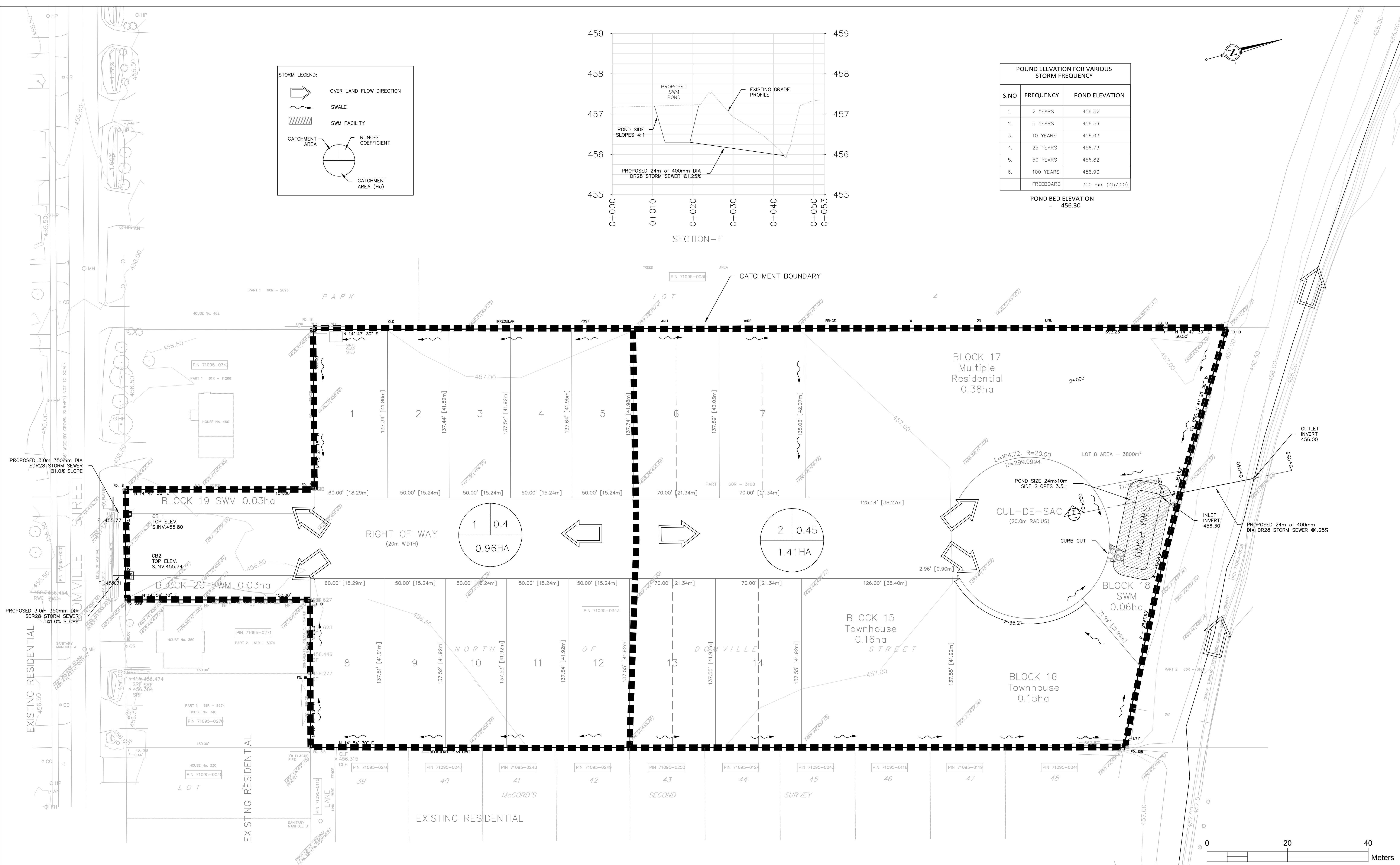
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FIG. 4



POUND ELEVATION FOR VARIOUS STORM FREQUENCY

S.NO	FREQUENCY	POUND ELEVATION
1.	2 YEARS	456.52
2.	5 YEARS	456.59
3.	10 YEARS	456.63
4.	25 YEARS	456.73
5.	50 YEARS	456.82
6.	100 YEARS	456.90
	FREEBOARD	300 mm (457.20)
		POUND BED ELEVATION = 456.30



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JIM COFFEY
940749 ONTARIO LIMITED

PROJECT
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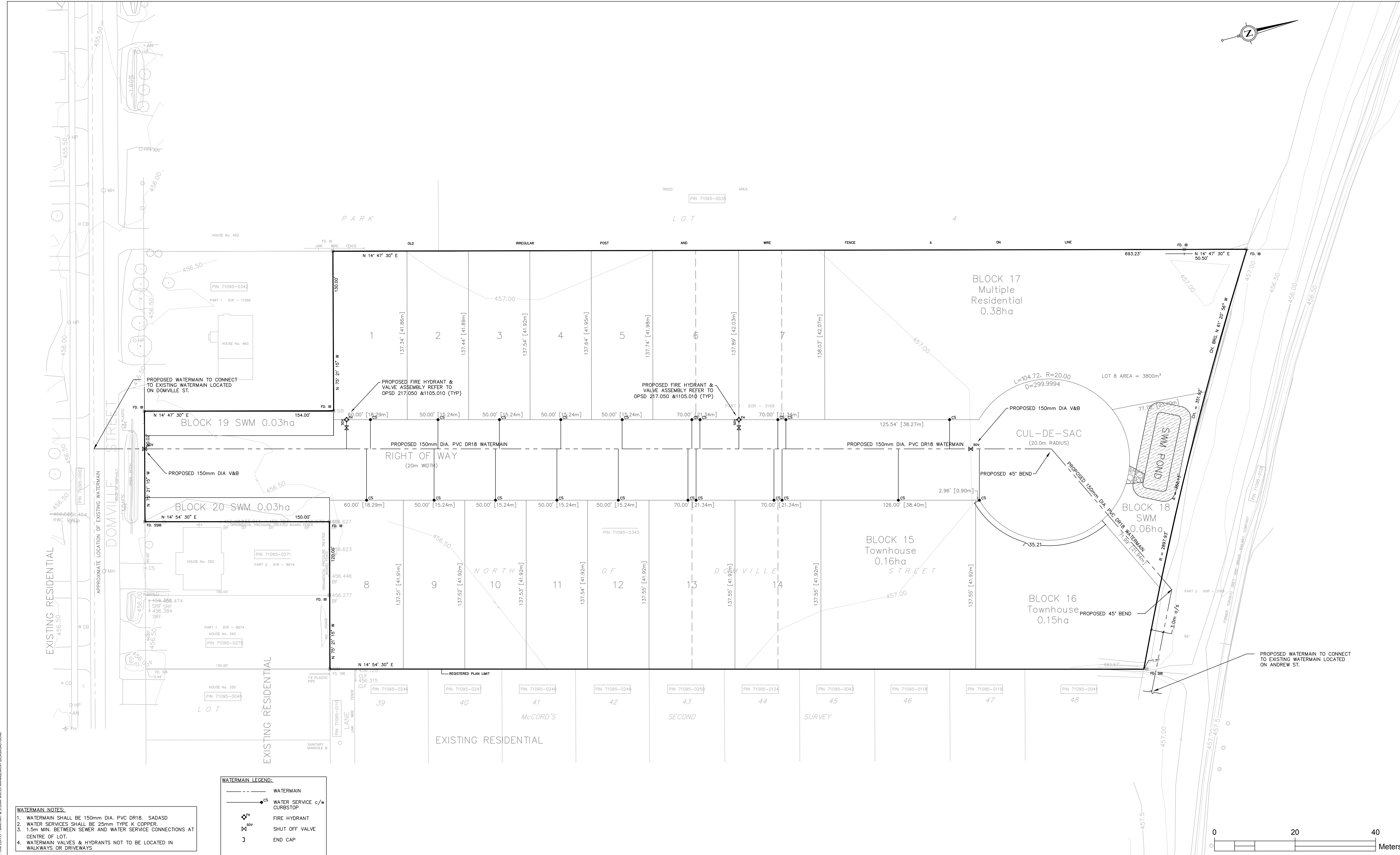
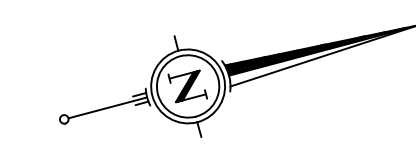
DRAWING TITLE
POST DEV. STORMWATER MANAGEMENT PLAN

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ENGINEERING AND ENVIRONMENTAL SERVICES
210 BROADWAY, UNIT 203
ORANGEVILLE, ONTARIO L9W 5G4
TELEPHONE: 519-941-2949 FAX: 519-941-2036

DESIGNED BY: T.G. DRAWN BY: D.S./H.S. VERIFIED BY: S.B. DRAWING NO.: D13001

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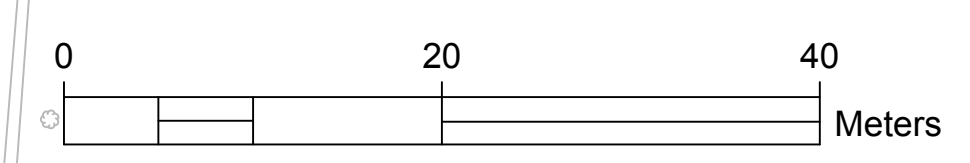
FIG. 5



WATERMAIN LEGEND:

	WATERMAIN
	WATER SERVICE c/w CURBSTOP
	FIRE HYDRANT
	SHUT OFF VALVE
	END CAP

- WATERMAIN NOTES:**
1. WATERMAIN SHALL BE 150mm DIA. PVC DR18. SADSAD
 2. WATER SERVICES SHALL BE 25mm TYPE K COPPER.
 3. 1.5m MIN. BETWEEN SEWER AND WATER SERVICE CONNECTIONS AT CENTRE OF LOT.
 4. WATERMAIN VALVES & HYDRANTS NOT TO BE LOCATED IN WALKWAYS OR DRIVEWAYS.



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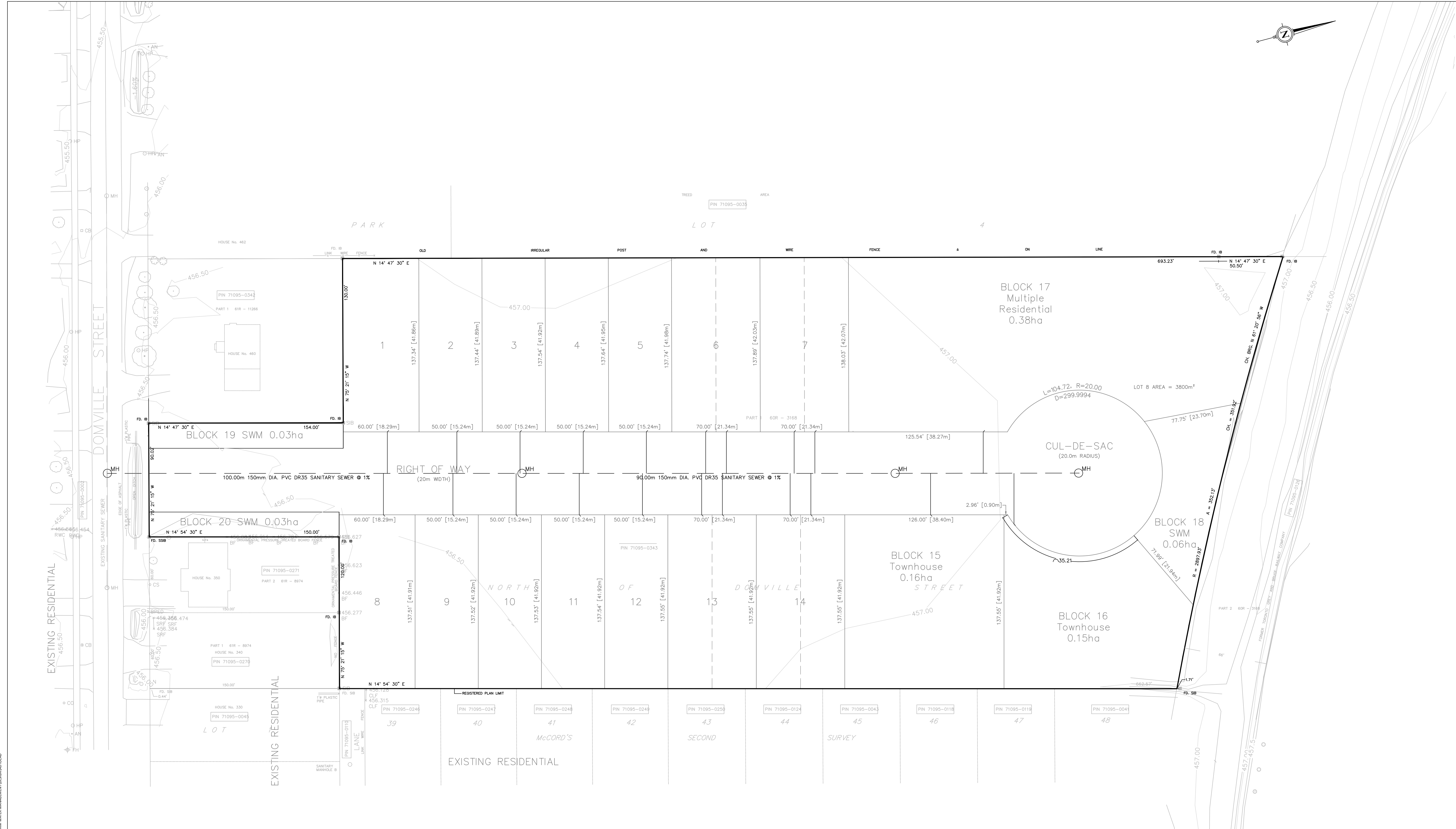
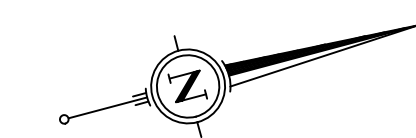
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PROPOSED WATER SERVICING PLAN

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ENGINEERING AND ENVIRONMENTAL SERVICES
210 BROADWAY, UNIT 203
ORANGEVILLE, ONTARIO L9W 5G4
TELEPHONE: 519-941-2949 FAX: 519-941-2036

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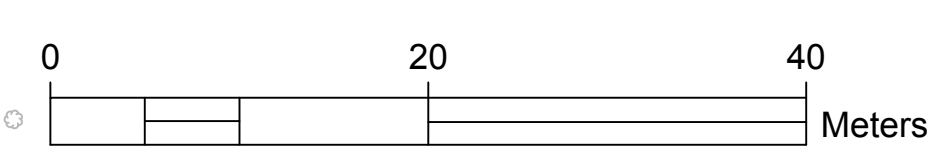
SCALE: 1:400 PROJECT NO.: D13001

FIG. 6



SANITARY NOTES:
 1. SANITARY SEWER MAIN LINES SHALL BE 150mm DIA. PVC DR35.
 2. SINGLE FAMILY RESIDENTIAL SANITARY SERVICES SHALL BE 125mm PVC DR 28.
 3. MULTI-UNIT RESIDENTIAL SANITARY SERVICES SHALL BE 150mm PVC DR 35.
 4. 1.5m MIN. BETWEEN SEWER AND WATER SERVICE CONNECTIONS AT CENTRE OF LOT.

SANITARY LEGEND:
 — SANITARY SEWER
 — SANITARY SERVICE
 ○ MH SANITARY MANHOLE



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**JIM COFFEY
 940749 ONTARIO LIMITED**

PROJECT
FOREST VIEW ESTATE

DRAWING TITLE
PROPOSED SANITARY SEWER PLAN

DESIGNED BY
 T.G.

DRAWN BY
 D.S./H.S.

VERIFIED BY
 S.B.

SCALE
 1:400

PROJECT No.
 D13001

DRAWING No.
FIG. 7

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