MAPLE AVENUE SUITES
HALIBURTON
STORM WATER MANAGEMENT REPORT

Prepared by:

Pinestone Engineering Ltd.
Muskoka Office
110 Kimberley Avenue
Bracebridge, Ontario P1L 1Z8

Phone: 705-645-8853
Fax: 705-645-7262
Email: pinestone@pel.ca
Web: www.pel.ca

Feburary 2022
21-11623M – rev. 0

Table of Contents

APPENDICES

1.0 INTRODUCTION

1.1 General

The developer is proposing to construct three (3) residential apartment buildings at 48 Maple Ave, in the Village of Haliburton. The property is approximately 0.29 ha in size and is legally described as Part of Lots 6 and 12, Block T, in the Village of Haliburton, Township of Dysart et al, County of Haliburton. The property is bounded by residential dwellings to the north and west, Victoria St to the south, and Maple Ave to the east (see Figure 1).

Associated outdoor surface parking facilities and landscape amenity areas are also proposed for the development. Access to the property will be provided via an asphalt driveway which will extend from Victoria Street.

Pinestone Engineering Ltd. has been retained by the owner to prepare a storm water management report and construction mitigation plan for the proposed development in support of the site plan and building permit approvals.

1.2 Purpose and Scope

This report has been prepared in order to outline the storm water management requirements of the proposed development and provide the design details of the required quantity and quality control facilities necessary to address the SWM criteria.

This report has been prepared to satisfy the requirements of the County of Haliburton, the Ministry of Transportation (MTO), and the Ministry of the Environment, Conservation and Parks (MECP).

The following objectives have been identified in the preparation of this report:

- Determine the appropriate storm water management criteria for the subject property.
- Determine if a reduction of peak runoff flows through structural controls are required to control potential flooding downstream from the development.
- Outline an appropriate set of quality control techniques that can be implemented to meet current MECP standards for this type of development.
- Provide design details of the proposed storm water management and conveyance facilities.
- Identify methods to control sedimentation and erosion during construction and in the long term.

PINESTONE ENGINEERING LIMITED | www.pel.ca

MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

LOCATION PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
FEB. 2022	N.T.S.	21-11623-M	FIGURE 1

1.3 Reference Reports

The following reports and studies have been used for reference in the preparation of this Storm Water Management Plan:

i) *Ministry of the Environment and Energy's Storm Water Management Planning and Design Manual, March 2003.*

ii) *Inter Agency Storm Water Management Working Committee "Design Criteria for Storm Water Management in Muskoka" November 1991.*

iii) *Storm Water Management Guidelines for District of Muskoka, prepared by Aquafor Beech Limited, December 2008.*

iv) *Sediment Control Planning Central Region Group, prepared by the Ministry of Natural Resources.*

v) *Drainage Management Manual, prepared by the Ministry of Transportation, 1997.*

vi) *Highway Drainage Design Standards, prepared by the Ministry of Transportation, January 2008.*

2.0 EXISTING SITE CONDITIONS

2.1 General

The subject development area is approximately 0.29 hectares in size. Currently, the site is occupied by a 1-storey dwelling and associated sheds which are to be removed prior to construction. A gravel driveway from Maple Ave provides access to the dwelling. The remainder of the site mainly consists of vegetated area, trees and shrubs.

2.2 Topography

A topographic survey was completed by Greg Bishop Surveying and Consulting Ltd., in 2021. The topography across the site is very mild, sloping toward Victoria street to the south at an average slope of approximately 1%. Elevations across the site range from 321.05 ASL along the north property limit to 318.90 ASL at the south property limit.

2.3 Drainage Conditions

Drainage from the property flows overland in the form of sheet flow towards Victoria St and migrates to adjacent lands to the west. All drainage ultimately outlets to Head Lake.

2.4 Site Geology

Based on our site reconnaissance and review of the topographic survey and Quaternary Geology of the Haliburton area published by the Canada Department of Agriculture 1960, the geology in the area of the lot is described as:

Sandy Loam Soils Overlying Shallow Precambrian Bedrock

Based on our review of the soil descriptions outlined in the MTO Drainage Manual on Chart 1.09, we have classified the site material as a Type B under the Soil Conservation Service, hydrologic soil group.

Adjustment of the curve numbers for the pervious component of the lands have been carried out in the computer model to represent Type B soils.

A copy of the soils mapping and Chart 1.09 from the MTO Drainage Manual are included in Appendix A.

2.5 Fish Habitat

The existing storm sewer ultimately outlets to Head Lake, which provides habitat for aquatic species.

Accordingly, the receiving outlet should be considered “sensitive” and a “enhanced” level of quality control applied in accordance with the MECP Storm Water Management Planning and Design Manual (MECP, 2003).

3.0 HYDROLOGY

A hydrologic model has been prepared for the site. The intent of the model was to provide quantitative estimates of runoff rates under both existing and proposed development conditions. These estimates can then be compared to determine the impact of the proposed development on the study area.

3.1 Model Selection

The rainfall runoff event simulation model MIDUSS (Microcomputer Interactive Design of Urban Storm water Management Systems) was used to simulate watershed response to design rainfall events.

3.2 Design Storms

The following design storms were modelled as part of our evaluation:

- 5-year design storm
- 100-year design storm

The selected storm water management criteria are discussed further in *Section 5.1* of this report.

Rainfall intensity - duration frequency (IDF) values for the Muskoka Area were entered into an equation that expresses the time relationship intensity for specific frequency, in the form of:

$$i = \frac{a}{(t+b)^c}$$

where: i = intensity, mm/hr.
t = Time of concentration, minutes
a,b,c = constants developed to fit published IDF curves

The storm events were applied to the hydrologic model. Derivation of the design storm hyetographs were based on the "Chicago" 3-hour distribution using Muskoka Area intensity, duration, frequency (IDF) data.

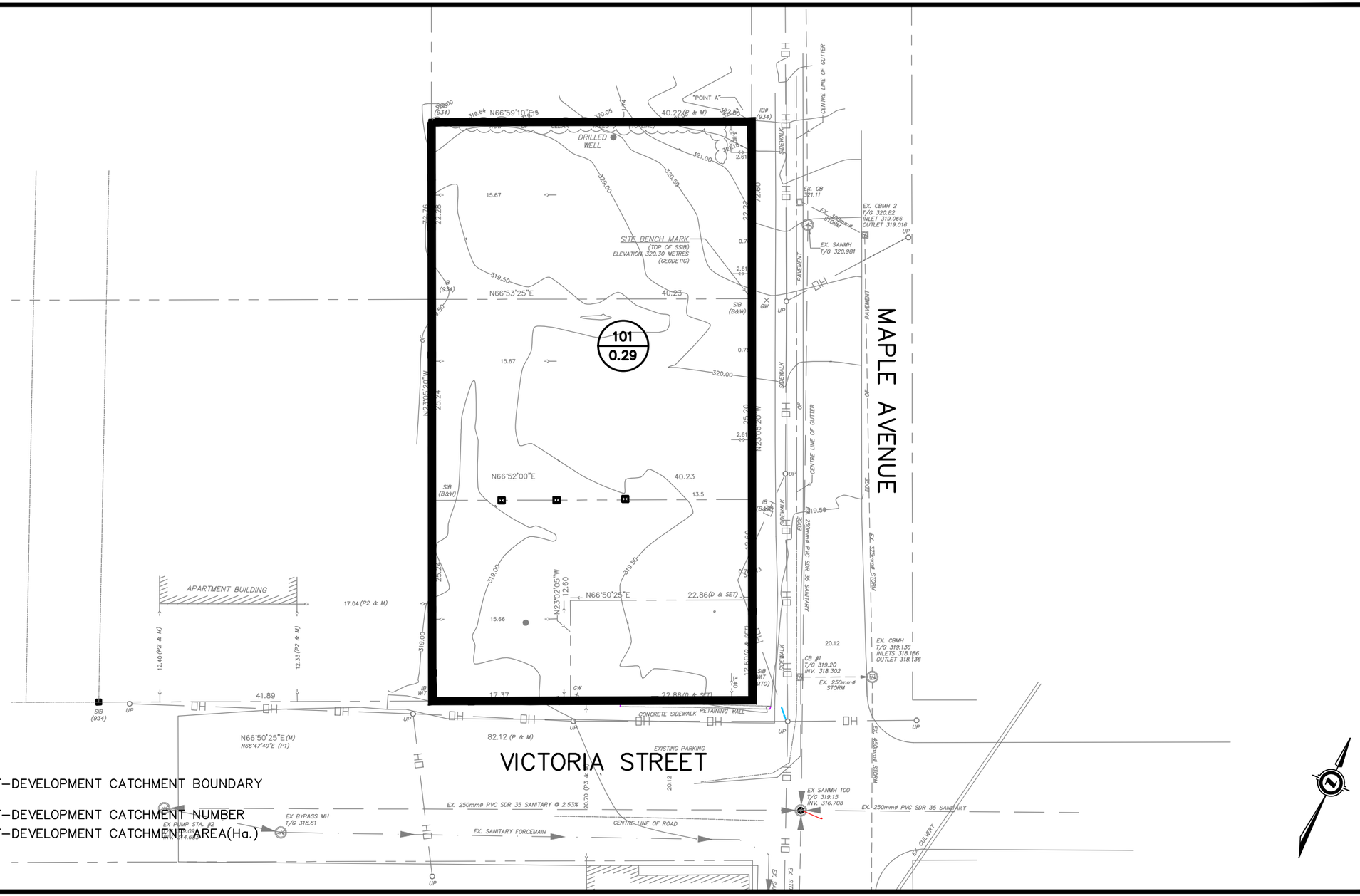
The design storm parameters utilized in the modelling, are outlined in Table 1, below:

Table 1
Design Storm Parameters
Chicago Rainfall Distribution

Rainfall Event	Parameter			Duration (min)
	A	B	C	
5 Yr	950.0	6.75	0.820	180
100Yr	1499.0	5.81	0.825	180

3.3 Drainage Catchments

One (1) pre-development and one (1) post development catchment have been delineated for the site in order to estimate the peak runoff rate exiting the site. The pre-development catchment represents the existing condition of the property. The post development catchment represents the proposed development and grading concept for the site. The pre-development and post development catchment parameters are listed in Table 2 below. The pre-development and post development catchment boundaries are illustrated on Figures 2 and 3 respectively.



101/0.29 POST–DEVELOPMENT CATCHMENT BOUNDARY

POST–DEVELOPMENT CATCHMENT NUMBER
POST–DEVELOPMENT CATCHMENT AREA(Ha.)

PINESTONE ENGINEERING LIMITED | www.pel.ca

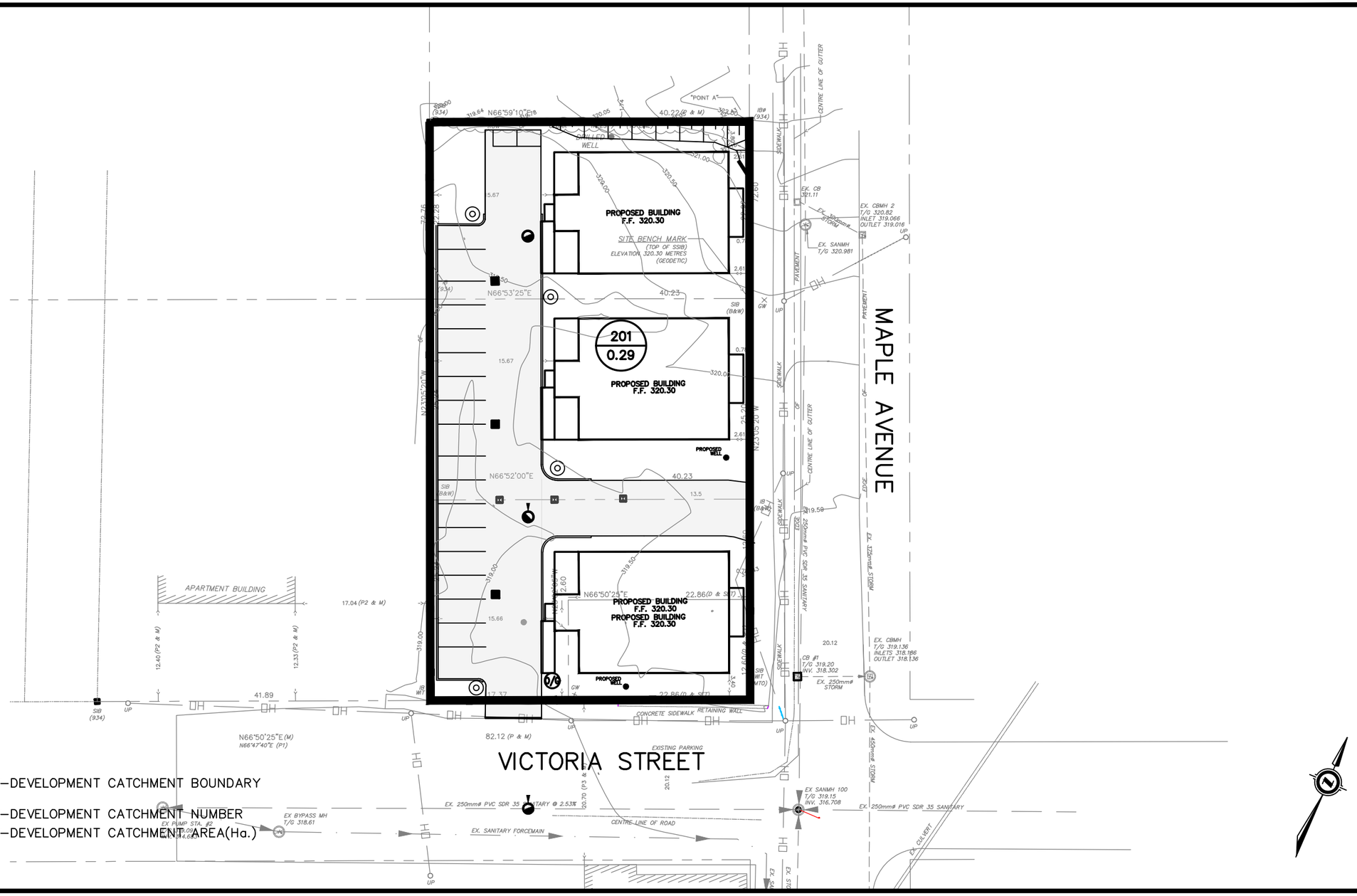
MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

PRE DEVELOPMENT CATCHMENT PLAN

PROJECT NO. 21–11623–M

SCALE: 1:500 | DATE: FEB. 2022

FIGURE 2



PINESTONE ENGINEERING LIMITED | www.pel.ca

MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

POST DEVELOPMENT CATCHMENT PLAN

PROJECT NO. 00-00000

SCALE: 1:500 | DATE: FEB. 2022

FIGURE 3

Table 2
Sub-catchment Parameters

Catchments	Area (ha)	% Impervious	Slope (%)	Pervious SCS Curve #
Pre-Development				
101 – Pre-development Site Area	0.29	7.0	1.0	65
Post Development				
201 – Proposed Residential Apartments	0.29	78.0	2.0	65

Table 3 below outlines the calculated pre-development and post development peak run-off rates (without SWM) during the 5 and 100-year storm events.

Table 3
Run-off Rates

	5Yr	100Yr
Total Pre-development Runoff Rate – Catchment 101 (m^3/sec)	**0.005**	**0.010**
Total Post development Runoff Rate – Catchment 201 (m^3/sec)	**0.053**	**0.093**

Based on the results of the hydrological modelling, an increase in storm water runoff rates can be expected during all major storm events.

MIDUSS input/output calculations are included in Appendix B.

4.0 PROPOSED DEVELOPMENT

The developer is proposing to construct three (3) residential apartment buildings at 48 Maple Ave, in the Village of Haliburton. Associated outdoor surface parking facilities and landscape amenity areas are also proposed for the development. Access to the property will be provided via an asphalt driveway which will extend from Victoria Street.

Drainage from the building and surface parking facility will be directed to surface ponding storage areas created within the parking lot. Controlled storm water will be conveyed offsite via a storm sewer system to the existing storm sewer network underneath Maple Avenue.

5.0 STORM WATER MANAGEMENT PLAN

5.1 Storm Water Management Criteria

For site plan developments within the County of Haliburton, both quality and quantity control of post development storm runoff is required. As well, the Municipality requires development proponents to identify the mitigation measures that will be put in place during construction to address erosion and sediment control.

Based on the guidelines for sensitive receiving outlets outlined in the current MECP SWM Planning and Design Manual (MECP,2003), the design criteria for this site is as follows:

- Peak flow attenuation to pre-development levels for storm events up to and including the 100-year storm event based on Muskoka area IDF parameters. The grading design of the site should ensure that post development flows from storm events in excess of the 100-year event are safely conveyed from the site.

- Water quality enhancement to an 'enhanced' level of protection through the use of accepted control techniques such as detention storage, permanent pool storage, enhanced grass swales, level spreaders, infiltration facilities, and oil / grit removers.

- Preparation of a detailed erosion and sediment control and construction mitigation plan to be implemented as part of the construction program.

5.2 Quantity Control

As noted in the comparison of the pre-development and post development flows, an increase in runoff will occur as a result of the proposed development of the site to construct the new buildings and associated hard surface driving and parking areas.

To satisfy the selected design criteria, peak flow attenuation of post development flows to pre-development levels for storm events up to and including the 100-year storm event will be provided by using parking lot storage.

Peak flow attenuation for 201 will be achieved using surface parking lot ponding. Attenuated drainage will ultimately outlet to Head Lake via the existing storm sewer system on Maple Avenue. Post development flow rates will be attenuated to match pre-development rates and will not impact the MTO Highway 118 drainage system.

Based on the hydrologic models prepared for the post development condition, inclusion of an approximately 154.4 cubic meter surface storage area controlled with a 50mm dia. orifice restrictor, installed at the outlet of the proposed catchbasin in the parking lot, will attenuate peak flows for up to the 100-year event for catchment 201. Run-off from storm events greater than the 100-year event will overflow the entrance driveway and drain to Victoria Street.

The stage-storage-discharge relationship of the proposed storage facilities is summarized in Table 4.

Table 4
Stage-Storage-Discharge Relationship of Storage Cells

	Description	Control Stage (m)	Elevation (m)	Storage Volume (m3)	Discharge (m3)
Catchment 202: Parking Lot Storage Cell (50mm dia. orifice tube at CB1 outlet)	Orifice	0.00	318.64	0.0	0.0
	Top of Grate	1.06	319.70	1.0	0.0
	Contour	1.11	319.75	3.1	0.00569
	Contour	1.16	319.80	13.8	0.00582
	Contour	1.21	319.85	40.2	0.00594
	Contour	1.26	319.90	72.9	0.00607
	Weir Overflow	1.31	319.95	112.0	0.00619
	Contour	1.36	320.00	154.4	0.1092

The location of the storm water management facilities and details are identified on the engineering plans included in Appendix D. The control sizing calculations for the orifice and weir are included in Appendix C.

Table 5 summarizes the effectiveness of the proposed storm water attenuation features based on the hydrologic model results. Post development MIDUSS output files, with storm water management implemented, are included in Appendix B.

Table 5
Model Results - 3hr Chicago Distribution

	5Yr	100Yr
Pre-development Runoff Rate (cms)*	**0.01**	**0.01**
Post Development Runoff Rate with SWM (cms)*	**0.01**	**0.01**
Parking Lot Storage Elevation (m)	319.86	319.92
Storage Volume (m3)	43.6	85.5

*rounded to nearest 0.1cms

5.3 Quality Control

The Storm Water Management Planning and Design Manual (MECP, 2003) recommends several suitable water quality enhancement techniques such as detention storage, enhanced grass swales, level spreaders, infiltration facilities, and oil/grit removers.

Quality control of post development run-off will be achieved through the implementation of a treatment train of quality control measures including:

- Installation of an Oil/Grit Treatment unit (Stormceptor or approved equivalent) sized to provide minimum 80% TSS removal

- Provision of 154.4 cubic meters of extended detention storage within the surface ponding storage cell.

- Maintenance of existing lot line vegetation to act as a secondary filter for landscape run-off prior to discharge to adjacent lands.

- Suitable construction mitigation measures to be utilized during the site development.

A Stormceptor oil / grit separator manhole (or approved equivalent) sized for 'enhanced' quality control will be installed at the storm water outlet location prior to discharging to the Maple Ave storm sewer system. An EFO4 unit or equivalent will be installed for catchment 201. The unit will provide at least 80% removal of total suspended solids in accordance with an 'enhanced' level of protection. Design calculations utilizing the manufacturer's software have been provided in Appendix C.

5.3.1 Operation and Maintenance Considerations

In order for the storm water conveyance and management facility to operate effectively, regular maintenance of the facilities will be required.

The frequency of cleaning will be governed by the site operations including the extent of sanding and salting carried out during the winter months. The sand/salt use is expected to be less than that of a typical municipal or provincial roadway.

The storm water management area control orifice should also be inspected on a regular basis to ensure they remain free of debris.

We recommend inspections be carried out as follows:

- After every major rainfall event.
- Prior to first snowfall.
- Following a winter thaw.
- At a minimum once a week during the spring thaw.

6.0 EROSION AND SEDIMENT CONTROL

Sedimentation and erosion control measures are required during construction and until such a time that site development has been completed and the parking area has been paved and vegetation established.

The use of various siltation control measures will be implemented to protect the adjacent properties and receiving waterbodies from migrating sediments.

These works include but may not be limited to:

- Installation of siltation fencing along down gradient portion of the development area.
- Installation of filter cloth under catch basin grates to protect the receiving storm sewers from sediment deposition.
- Installation of a mud mat to control vehicle debris tracking onto public roads.

The location of the siltation control measures and typical details are shown on the engineering plans included in Appendix D.

6.1 During Construction

Prior to carrying out site grading the siltation barriers noted above shall be in place. The storm sewer works will not be permitted to outlet from the site until the site has been stabilized. Other temporary installations of silt fence or other appropriate measures may be required during grading to minimize silt migration from the site. The measures will need to be removed, replaced and relocated as required during the construction period until the site works have been completed and vegetation established. During construction all stockpiled material will be placed up-gradient of the siltation controls.

If site works are to continue through the winter and spring, the engineer shall be contacted by the owner to review the measures in place with the contractor on a regular basis to ensure that the facilities are adequate and in good working order. All reasonable methods to control erosion and sedimentation are to be taken during construction.

6.2 Monitoring and Maintenance

It is the responsibility of the contractor and owner to maintain the siltation control devices until suitable grass cover has been established. A regular review of the facilities by the contractor shall be carried out during the construction period to ensure that the facilities are being properly maintained, and if necessary, replaced.

The contractor should inspect the siltation devices immediately after each rainfall. Damaged devices should be repaired immediately, and additional devices installed if necessary. Silt should be removed from the fencing when deposits reach approximately 250mm above original ground.

6.3 Contingency Plan

Should the erosion control measures fail, and sediment migrate beyond the limits of the control works, the following tasks are required to be completed:

- The County of Haliburton should be notified of the event. The area will be assessed and cleaned up to the satisfaction of the agencies.

- Additional sedimentation facilities be installed in the area of the migration and down gradient to contain the sediment.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based on the information and analysis presented in this report:

1) The comparison of pre-development and post development storm water flow rates indicate that peak flows will increase during all the major storm events as a result of the proposed development of the property.

2) The use of parking lot storage has been proposed to attenuate post development flows to pre-development levels.

3) By maintaining pre-development flow conditions, the proposed development's drainage from will not impact the MTO Highway 118 drainage infrastructure.

4) Storm water quality enhancement to the receiving storm sewer system can be achieved using a "treatment train" of quality control techniques including extended detention storage in the parking lot, maintenance of existing lot line vegetation and the installation of an oil grit separator treatment device on the storm sewer outlet.

5) Suitable measures can be implemented during construction to protect the adjacent properties from migrating sediments.

It is recommended that:

1) This report and drawings be submitted to the County of Haliburton for review and approval.

2) The storm water management works shall be constructed in accordance with the design details presented in this report.

3) The construction mitigation measures outlined in this report are utilized as a guideline for construction mitigation management on this site.

All of which is respectfully submitted.

PINESTONE ENGINEERING LTD.

Lauren Trividic, P.Eng.

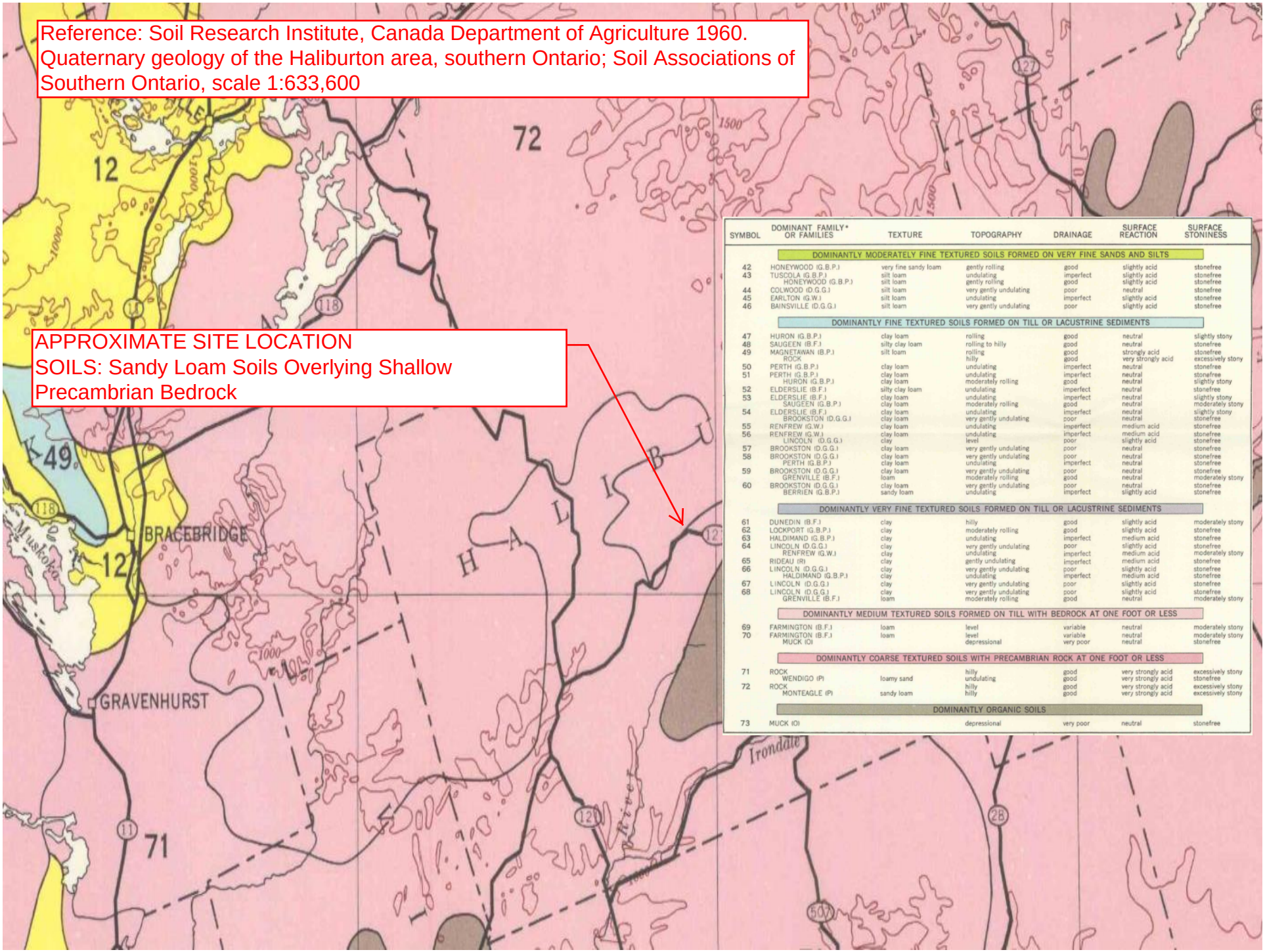
APPENDIX A

Soils Mapping

PINESTONE ENGINEERING LTD.

Reference: Soil Research Institute, Canada Department of Agriculture 1960. Quaternary geology of the Haliburton area, southern Ontario; Soil Associations of Southern Ontario, scale 1:633,600

APPROXIMATE SITE LOCATION
SOILS: Sandy Loam Soils Overlying Shallow Precambrian Bedrock



SYMBOL	DOMINANT FAMILY* OR FAMILIES	TEXTURE	TOPOGRAPHY	DRAINAGE	SURFACE REACTION	SURFACE STONINESS
	DOMINANTLY MODERATELY FINE TEXTURED SOILS FORMED ON VERY FINE SANDS AND SILTS					
42	HONEYWOOD (G.B.P.)	very fine sandy loam	gently rolling	good	slightly acid	stonefree
43	TUSCOLA (G.B.P.)	silt loam	undulating	imperfect	slightly acid	stonefree
	HONEYWOOD (G.B.P.)	silt loam	gently rolling	good	slightly acid	stonefree
44	COLWOOD (D.G.G.)	silt loam	very gently undulating	poor	neutral	stonefree
45	EARLTON (G.W.)	silt loam	undulating	imperfect	slightly acid	stonefree
46	BAINSVILLE (D.G.G.)	silt loam	very gently undulating	poor	slightly acid	stonefree
	DOMINANTLY FINE TEXTURED SOILS FORMED ON TILL OR LACUSTRINE SEDIMENTS					
47	HURON (G.B.P.)	clay loam	rolling	good	neutral	slightly stony
48	SAUGEEN (B.F.)	silty clay loam	rolling to hilly	good	neutral	stonefree
49	MAGNETAWAN (B.P.)	silt loam	rolling	good	strongly acid	stonefree
	ROCK		hilly	good	very strongly acid	excessively stony
50	PERTH (G.B.P.)	clay loam	undulating	imperfect	neutral	stonefree
51	PERTH (G.B.P.)	clay loam	undulating	imperfect	neutral	stonefree
	HURON (G.B.P.)	clay loam	moderately rolling	good	neutral	slightly stony
52	ELDERSLIE (B.F.)	silty clay loam	undulating	imperfect	neutral	stonefree
53	ELDERSLIE (B.F.)	clay loam	undulating	imperfect	neutral	slightly stony
	SAUGEEN (G.B.P.)	clay loam	moderately rolling	good	neutral	moderately stony
54	ELDERSLIE (B.F.)	clay loam	undulating	imperfect	neutral	slightly stony
	BROOKSTON (D.G.G.)	clay loam	very gently undulating	poor	neutral	stonefree
55	RENFREW (G.W.)	clay loam	undulating	imperfect	medium acid	stonefree
56	RENFREW (G.W.)	clay loam	undulating	imperfect	medium acid	stonefree
	LINCOLN (D.G.G.)	clay	level	poor	slightly acid	stonefree
57	BROOKSTON (D.G.G.)	clay loam	very gently undulating	poor	neutral	stonefree
58	BROOKSTON (D.G.G.)	clay loam	very gently undulating	poor	neutral	stonefree
	PERTH (G.B.P.)	clay loam	undulating	imperfect	neutral	stonefree
59	BROOKSTON (D.G.G.)	clay loam	very gently undulating	poor	neutral	stonefree
	GRENVILLE (B.F.)	loam	moderately rolling	good	neutral	moderately stony
60	BROOKSTON (D.G.G.)	clay loam	very gently undulating	poor	neutral	stonefree
	BERRIEN (G.B.P.)	sandy loam	undulating	imperfect	slightly acid	stonefree
	DOMINANTLY VERY FINE TEXTURED SOILS FORMED ON TILL OR LACUSTRINE SEDIMENTS					
61	DUNEDIN (B.F.)	clay	hilly	good	slightly acid	moderately stony
62	LOCKPORT (G.B.P.)	clay	moderately rolling	good	slightly acid	stonefree
63	HALDIMAND (G.B.P.)	clay	undulating	imperfect	medium acid	stonefree
64	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	RENFREW (G.W.)	clay	undulating	imperfect	medium acid	moderately stony
65	RIDEAU (R)	clay	gently undulating	imperfect	medium acid	stonefree
66	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	HALDIMAND (G.B.P.)	clay	undulating	imperfect	medium acid	stonefree
67	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
68	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	GRENVILLE (B.F.)	loam	moderately rolling	good	neutral	moderately stony
	DOMINANTLY MEDIUM TEXTURED SOILS FORMED ON TILL WITH BEDROCK AT ONE FOOT OR LESS					
69	FARMINGTON (B.F.)	loam	level	variable	neutral	moderately stony
70	FARMINGTON (B.F.)	loam	level	variable	neutral	moderately stony
	MUCK (O)		depressional	very poor	neutral	stonefree
	DOMINANTLY COARSE TEXTURED SOILS WITH PRECAMBRIAN ROCK AT ONE FOOT OR LESS					
71	ROCK		hilly	good	very strongly acid	excessively stony
	WENDIGO (P)	loamy sand	undulating	good	very strongly acid	stonefree
72	ROCK		hilly	good	very strongly acid	excessively stony
	MONTEAGLE (P)	sandy loam	hilly	good	very strongly acid	excessively stony
	DOMINANTLY ORGANIC SOILS					
73	MUCK (O)		depressional	very poor	neutral	stonefree

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

(i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).

(ii) Values in brackets are AMC II and are to be used only for special cases.

(iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

APPENDIX B

MIDUSS Hydrological Modeling

PINESTONE ENGINEERING LTD.

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                      5YR_PRE.out"
"                Licensee name:                                      Windows User"
"                Company                                                         "
"                Date & Time last used:                 2022-01-24 at 1:36:45 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      950.000   Coefficient A"
"        6.750   Constant B"
"        0.820   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           125.977    mm/hr"
"             Total depth                  39.121    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            3   Specify values"
"            1   SCS method"
"          101   101 - PRE-DEVELOPMENT SITE AREA"
"        7.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        1.000   Overland Slope"
"        0.270   Pervious Area"
"       70.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.102   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.858   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.005     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.020      0.290      hectare"
"             Time of concentration  69.311     2.004      43.213     minutes"
"             Time to Centroid       184.960    90.079     148.170    minutes"
"             Rainfall depth         39.121     39.121     39.121     mm"
"             Rainfall volume        105.51     7.94       113.45     c.m"
"             Rainfall losses        35.131     5.546      33.060     mm"
"             Runoff depth           3.990      33.575     6.061      mm"
"             Runoff volume          10.76      6.82       17.58      c.m"
"             Runoff coefficient     0.102      0.858      0.155      "
"             Maximum flow           0.001      0.005      0.005      c.m/sec"
" 38          START/RE-START TOTALS "
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.000    hectare"
"             Total Impervious area                       0.000    hectare"
"             Total % impervious                          0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                      5YR_POST.out"
"                Licensee name:                                        Windows User"
"                Company                                                          "
"                Date & Time last used:                2022-01-25 at 11:24:21 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      950.000   Coefficient A"
"        6.750   Constant B"
"        0.820   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           125.977    mm/hr"
"             Total depth                  39.121    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201 - PROPOSED RESIDENTIAL APARTMENTS"
"       78.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        2.000   Overland Slope"
"        0.064   Pervious Area"
"       70.000   Pervious length"
"        2.000   Pervious slope"
"        0.226   Impervious Area"
"       70.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.102   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.053     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.226      0.290      hectare"
"             Time of concentration  56.298     3.451      5.174      minutes"
"             Time to Centroid       170.272    92.406     94.945     minutes"
"             Rainfall depth         39.121     39.121     39.121     mm"
"             Rainfall volume        24.96      88.49      113.45     c.m"
"             Rainfall losses        35.131     5.730      12.199     mm"
"             Runoff depth           3.990      33.391     26.923     mm"
"             Runoff volume          2.55       75.53      78.08      c.m"
"             Runoff coefficient     0.102      0.854      0.688      "
"             Maximum flow           0.000      0.053      0.053      c.m/sec"
" 38          START/RE-START TOTALS "
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.000    hectare"
"             Total Impervious area                       0.000    hectare"
"             Total % impervious                          0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                      5YR_SWM.out"
"                Licensee name:                                      Windows User"
"                Company                                                         "
"                Date & Time last used:                2022-02-02 at 10:25:28 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      950.000   Coefficient A"
"        6.750   Constant B"
"        0.820   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           125.977    mm/hr"
"             Total depth                  39.121    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201 - PROPOSED RESIDENTIAL APARTMENTS"
"       78.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        2.000   Overland Slope"
"        0.064   Pervious Area"
"       70.000   Pervious length"
"        2.000   Pervious slope"
"        0.226   Impervious Area"
"       70.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.102   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.854   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.053     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.226      0.290      hectare"
"             Time of concentration  56.298     3.451      5.174      minutes"
"             Time to Centroid       170.272    92.406     94.945     minutes"
"             Rainfall depth         39.121     39.121     39.121     mm"
"             Rainfall volume        24.96      88.49      113.45     c.m"
"             Rainfall losses        35.131     5.730      12.199     mm"
"             Runoff depth           3.990      33.391     26.923     mm"
"             Runoff volume          2.55       75.53      78.08      c.m"
"             Runoff coefficient     0.102      0.854      0.688      "
"             Maximum flow           0.000      0.053      0.053      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.053     0.053     0.000     0.000"
" 54          POND DESIGN"
"        0.053   Current peak flow    c.m/sec"
"        0.027   Target outflow    c.m/sec"
"         78.1   Hydrograph volume    c.m"
"           7.   Number of stages"
"      319.700   Minimum water level    metre"
"      320.000   Maximum water level    metre"
"      319.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                319.700     0.000     1.000"
"                319.750   0.00569     3.100"
"                319.800   0.00582    13.800"
"                319.850   0.00594    40.200"
"                319.900   0.00607    72.900"
"                319.950   0.00619   112.000"
"                320.000    0.1092   154.400"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                319.950     0.900     6.000     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                318.640     0.630    0.0500     1.000"
"             Peak outflow                  0.006    c.m/sec"
"             Maximum level               319.855    metre"
"             Maximum storage              43.636    c.m"
"             Centroidal lag                2.832   hours"
"                  0.053     0.053     0.006     0.000 c.m/sec"
" 38          START/RE-START TOTALS 201"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.290    hectare"
"             Total Impervious area                       0.226    hectare"
"             Total % impervious                         78.000"
```

```
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                    100YR_PRE.out"
"                Licensee name:                                       Windows User"
"                Company                                                          "
"                Date & Time last used:                2022-01-24 at 1:52:15 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1499.000   Coefficient A"
"        5.810   Constant B"
"        0.825   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           210.327    mm/hr"
"             Total depth                  60.387    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            3   Specify values"
"            1   SCS method"
"          101   101 - PRE-DEVELOPMENT SITE AREA"
"        7.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        1.000   Overland Slope"
"        0.270   Pervious Area"
"       70.000   Pervious length"
"        1.000   Pervious slope"
"        0.020   Impervious Area"
"       20.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.197   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.010     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.020      0.290      hectare"
"             Time of concentration  38.504     1.611      29.067     minutes"
"             Time to Centroid       149.429    87.996     133.715    minutes"
"             Rainfall depth         60.387     60.387     60.387     mm"
"             Rainfall volume        162.86     12.26      175.12     c.m"
"             Rainfall losses        48.502     6.119      45.535     mm"
"             Runoff depth           11.885     54.268     14.852     mm"
"             Runoff volume          32.05      11.02      43.07      c.m"
"             Runoff coefficient     0.197      0.899      0.246      "
"             Maximum flow           0.006      0.009      0.010      c.m/sec"
" 38          START/RE-START TOTALS "
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.000    hectare"
"             Total Impervious area                       0.000    hectare"
"             Total % impervious                          0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                   100YR_POST.out"
"                Licensee name:                                       Windows User"
"                Company                                                          "
"                Date & Time last used:                2022-01-25 at 11:09:06 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1499.000   Coefficient A"
"        5.810   Constant B"
"        0.825   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           210.327    mm/hr"
"             Total depth                  60.387    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201 - PROPOSED RESIDENTIAL APARTMENTS"
"       78.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        2.000   Overland Slope"
"        0.064   Pervious Area"
"       70.000   Pervious length"
"        2.000   Pervious slope"
"        0.226   Impervious Area"
"       70.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.197   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.093     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.226      0.290      hectare"
"             Time of concentration  31.275     2.775      4.432      minutes"
"             Time to Centroid       140.255    89.876     92.806     minutes"
"             Rainfall depth         60.387     60.387     60.387     mm"
"             Rainfall volume        38.53      136.59     175.12     c.m"
"             Rainfall losses        48.503     6.099      15.428     mm"
"             Runoff depth           11.884     54.287     44.958     mm"
"             Runoff volume          7.58       122.80     130.38     c.m"
"             Runoff coefficient     0.197      0.899      0.745      "
"             Maximum flow           0.002      0.093      0.093      c.m/sec"
" 38          START/RE-START TOTALS "
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.000    hectare"
"             Total Impervious area                       0.000    hectare"
"             Total % impervious                          0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                               Z:\Project Documents\"
"                      11623M Maple St. Apartments Haliburton\Design\SWM\MIDUSS"
"                Output filename:                                    100YR_SWM.out"
"                Licensee name:                                       Windows User"
"                Company                                                         "
"                Date & Time last used:                2022-02-02 at 10:24:52 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1499.000   Coefficient A"
"        5.810   Constant B"
"        0.825   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           210.327    mm/hr"
"             Total depth                  60.387    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   201 - PROPOSED RESIDENTIAL APARTMENTS"
"       78.000   % Impervious"
"        0.290   Total Area"
"       70.000   Flow length"
"        2.000   Overland Slope"
"        0.064   Pervious Area"
"       70.000   Pervious length"
"        2.000   Pervious slope"
"        0.226   Impervious Area"
"       70.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.197   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.093     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.226      0.290      hectare"
"             Time of concentration  31.275     2.775      4.432      minutes"
"             Time to Centroid       140.255    89.876     92.806     minutes"
"             Rainfall depth         60.387     60.387     60.387     mm"
"             Rainfall volume        38.53      136.59     175.12     c.m"
"             Rainfall losses        48.503     6.099      15.428     mm"
"             Runoff depth           11.884     54.287     44.958     mm"
"             Runoff volume          7.58       122.80     130.38     c.m"
"             Runoff coefficient     0.197      0.899      0.745      "
"             Maximum flow           0.002      0.093      0.093      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.093     0.093     0.000     0.000"
" 54          POND DESIGN"
"        0.093   Current peak flow    c.m/sec"
"        0.027   Target outflow    c.m/sec"
"        130.4   Hydrograph volume    c.m"
"           7.   Number of stages"
"      319.700   Minimum water level    metre"
"      320.000   Maximum water level    metre"
"      319.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                319.700     0.000     1.000"
"                319.750   0.00569     3.100"
"                319.800   0.00582    13.800"
"                319.850   0.00594    40.200"
"                319.900   0.00607    72.900"
"                319.950   0.00619   112.000"
"                320.000    0.1092   154.400"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                319.950     0.900     6.000     0.000     0.000"
"           1.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                318.640     0.630    0.0500     1.000"
"             Peak outflow                  0.006    c.m/sec"
"             Maximum level               319.916    metre"
"             Maximum storage              85.507    c.m"
"             Centroidal lag                3.859   hours"
"                  0.093     0.093     0.006     0.000 c.m/sec"
" 38          START/RE-START TOTALS 201"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.290    hectare"
"             Total Impervious area                       0.226    hectare"
"             Total % impervious                         78.000"
```

```
" 19          EXIT"
```

APPENDIX C

Design Calculations

PINESTONE ENGINEERING LTD.

MAPLE AVE CONDO DEVELOPMENT
PARKING LOT PONDING
STAGE/STORAGE/DISCHARGE CALCULATIONS

02-Feb-22

Rating Curve

Elevation (m)	Discharge (m³/s)	Storage (m³)
319.70	0.0000	0.00
319.75	0.0054	3.13
319.80	0.0056	16.92
319.85	0.0057	40.20
319.90	0.0058	72.90
319.95	0.0059	112.01
320.00	0.1201	154.38

Volume Estimation

Elevation (m)	Area (m²)	Volume (m³) Increment	Volume (m³) Accumulated
319.70	0.00	0.000	0.000
319.75	187.50	3.125	3.125
319.80	375.00	13.794	16.919
319.85	562.50	23.280	40.199
319.90	750.00	32.700	72.899
319.95	815.00	39.114	112.013
320.00	880.00	42.365	154.378

Weir Flow Calcs.

Elevation (m)	Weir (m³/s)	Parameters
319.70	0.000	
319.75	0.000	Crest Elev. (m)
319.80	0.000	319.950
319.85	0.000	Crest Width (m)
319.90	0.000	6.000
319.95	0.000	
320.00	0.114	Side Slope (H:V) (?:1)
		0.000

Drop Inlet Flow

Elevation (m)	Orifice Flow (m³/s)	Parameters
319.70	0.000	
319.75	0.005	Orifice Elev (m)
319.80	0.006	318.640
319.85	0.006	Diameter (mm)
319.90	0.006	50.000
319.95	0.006	
320.00	0.006	Orifice Coeff.
		0.600
		Orifice Area
		0.001963

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/25/2022

Province:	Ontario
City:	Haliburton
Nearest Rainfall Station:	PETERBOROUGH
Climate Station Id:	6166456
Years of Rainfall Data:	15
Site Name:	
Drainage Area (ha):	0.29
% Imperviousness:	78.00

Runoff Coefficient 'c': 0.76

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	8.30
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	6.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Maple Ave Apartments
Project Number:	11623
Designer Name:	Joe Voisin
Designer Company:	PEL
Designer Email:	jvoisin@pel.ca
Designer Phone:	705-645-8853
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	88
EFO6	96
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 88

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

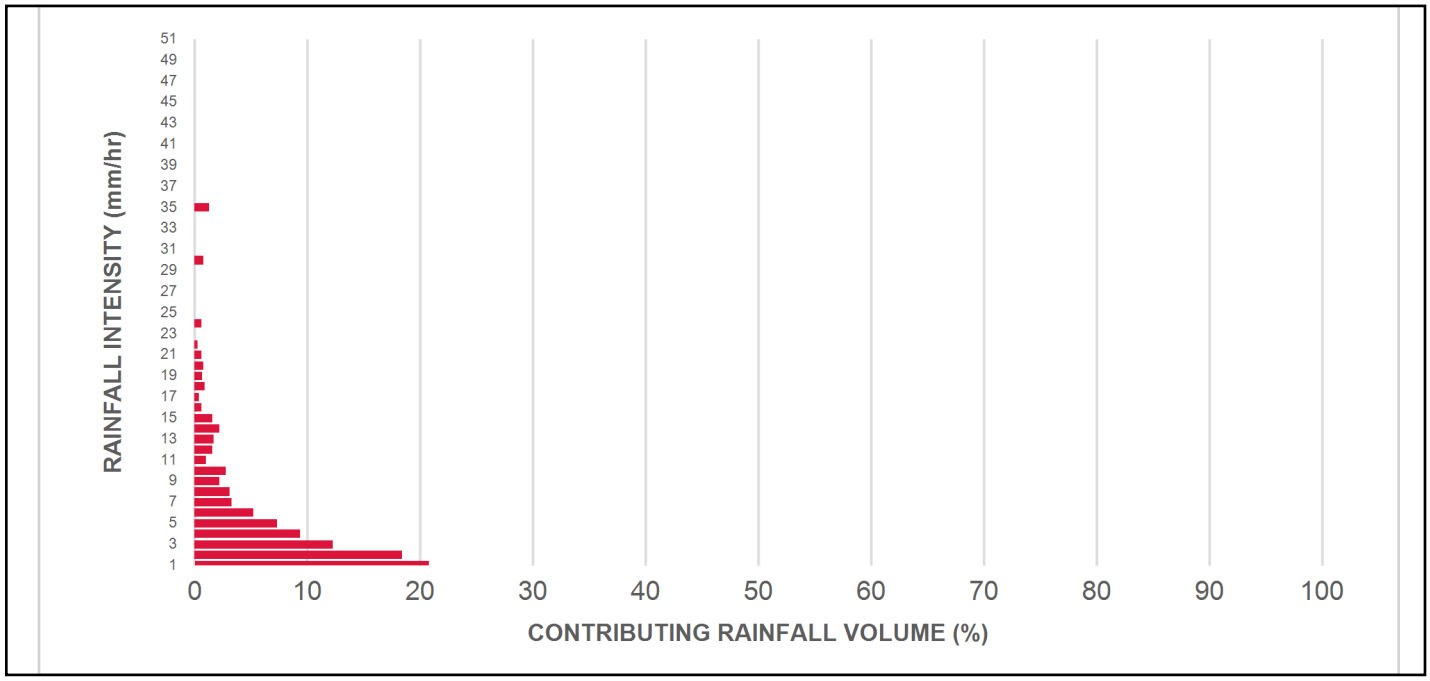
imbrium

Upstream Flow Controlled Results

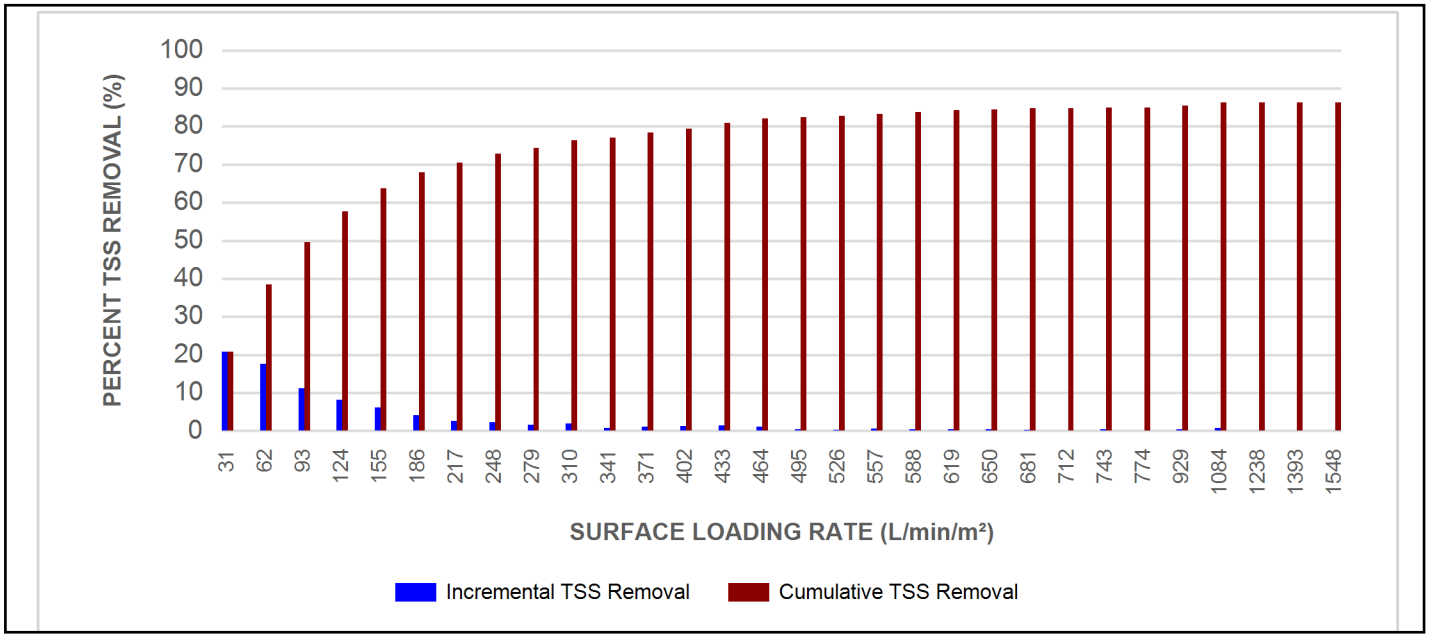
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	20.8	20.8	0.62	37.0	31.0	100	20.8	20.8
2	18.4	39.2	1.24	74.0	62.0	96	17.6	38.4
3	12.3	51.5	1.86	111.0	93.0	90	11.1	49.6
4	9.4	60.9	2.48	149.0	124.0	87	8.1	57.7
5	7.3	68.2	3.10	186.0	155.0	83	6.1	63.8
6	5.2	73.4	3.71	223.0	186.0	80	4.1	67.9
7	3.3	76.7	4.33	260.0	217.0	77	2.6	70.5
8	3.1	79.8	4.95	297.0	248.0	75	2.3	72.8
9	20.2	100.0	5.57	334.0	279.0	74	15.0	87.8
10	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
11	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
12	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
13	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
14	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
15	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
16	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
17	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
18	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
19	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
20	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
21	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
22	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
23	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
24	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
25	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
30	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
35	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
40	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
45	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
50	0.0	100.0	6.00	360.0	300.0	73	0.0	87.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**88 %**

Climate Station ID: 6166456 *Years of Rainfall Data*: 15

RAINFALL DATA FROM PETERBOROUGH RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

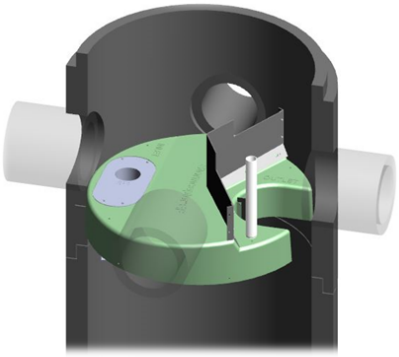
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

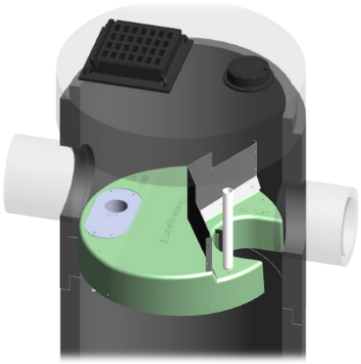
DESIGN FLEXIBILITY

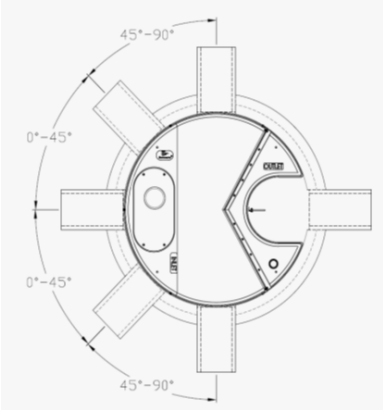
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

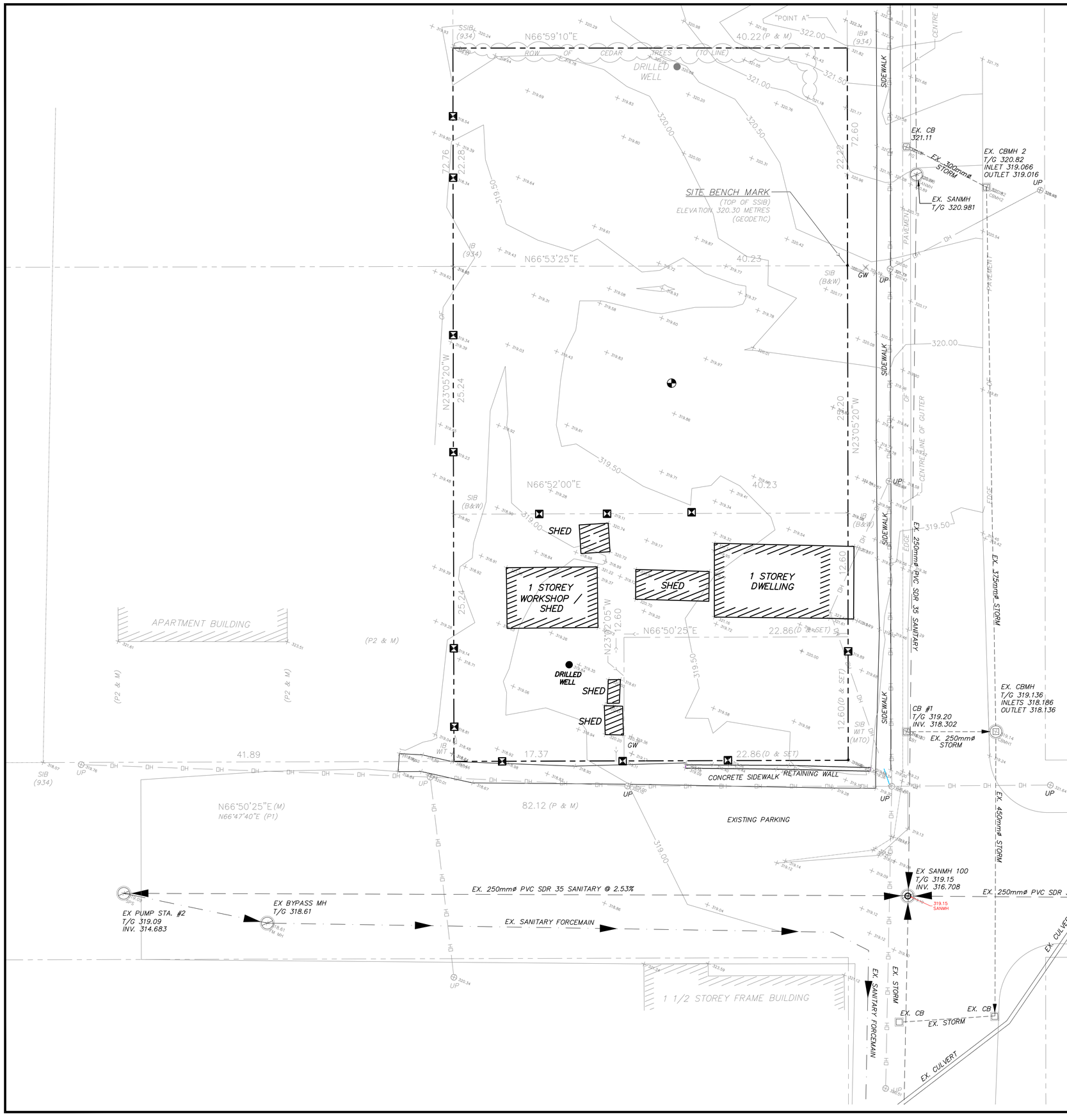
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m2 to 2600 L/min/m2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

APPENDIX D

Drawings

PINESTONE ENGINEERING LTD.



PEL

PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY GREG BISHOP SURVEYING AND CONSULTING LTD., 2021.

LEGEND

- 221.0 — CONTOUR
- EXISTING HYDRO POLE
- EXISTING TREELINE
- EXISTING SANITARY MANHOLE
- DITCH CENTERLINE
- DIRECTION OF OVERLAND FLOW

BENCHMARK

TBM#1
SIB ON EAST SIDE OF THE PROPERTY
ELEVATION 320.30

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
L.M. TRIVIDIC
100220753
FEB 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	T.H.
DRAWN BY:	G.N.
CHECKED	T.H.
DATE:	FEBRUARY 2022
SCALE:	1:200

CLIENT/PROJECT

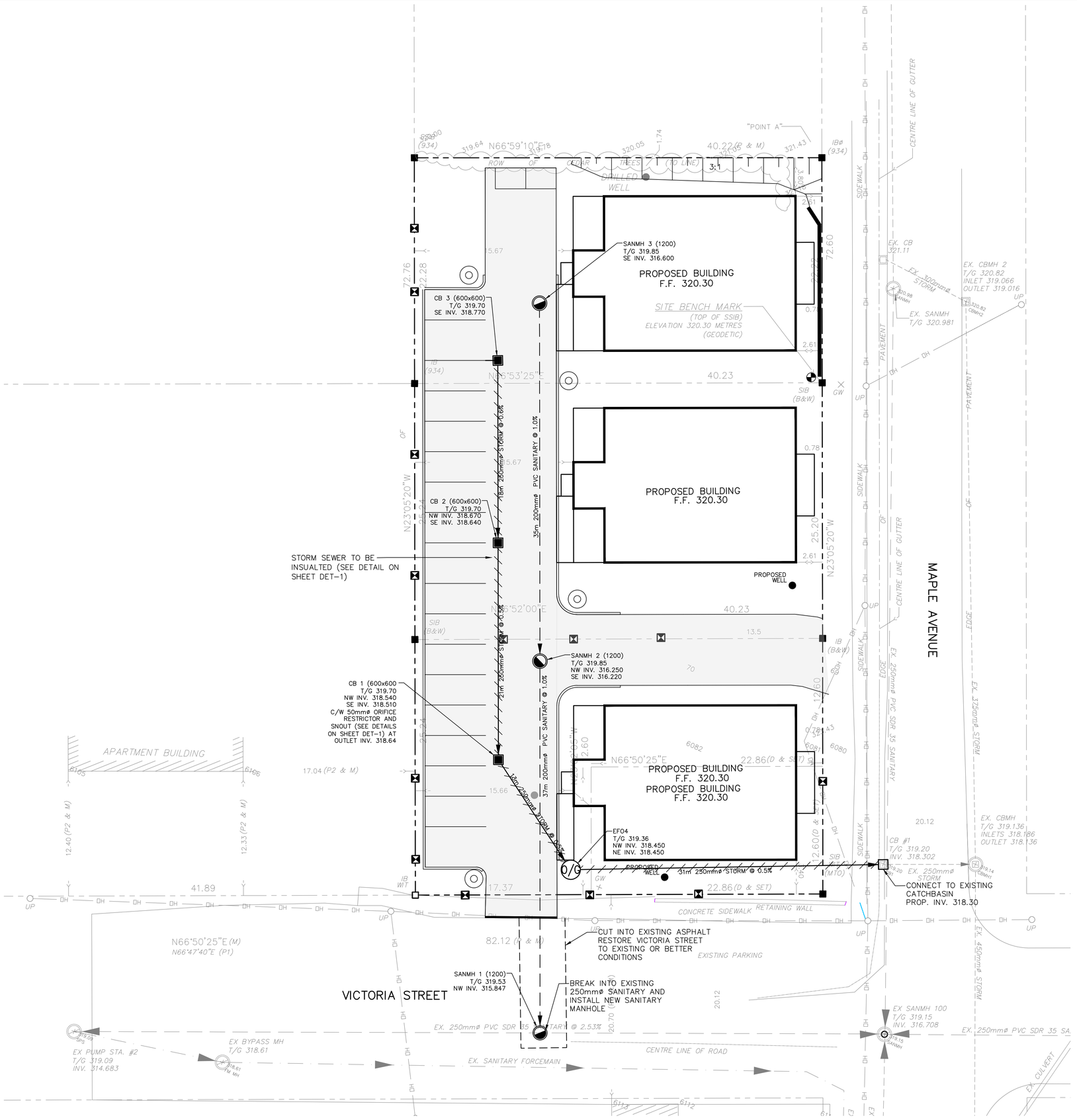
MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

DRAWING TITLE

EXISTING CONDITIONS PLAN

PROJECT NO.	DRAWING NO.	REVISION
21-11623-M	EX-1	0

DWG NAME



PEL

PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY GREG BISHOP SURVEYING AND CONSULTING LTD., 2021.

LEGEND

- PROPOSED CATCHBASIN
- PROPOSED OIL/GRIT SEPERATOR
- PROPOSED SANITARY MANHOLE/CLEANOUT

BENCHMARK

TBM#1
SIB ON EAST SIDE OF THE PROPERTY
ELEVATION 320.30

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
L.M. TRIVIDIC
100220753
FEB 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	T.H.
DRAWN BY:	G.N.
CHECKED	T.H.
DATE:	FEBRUARY 2022
SCALE:	1:200

CLIENT/PROJECT

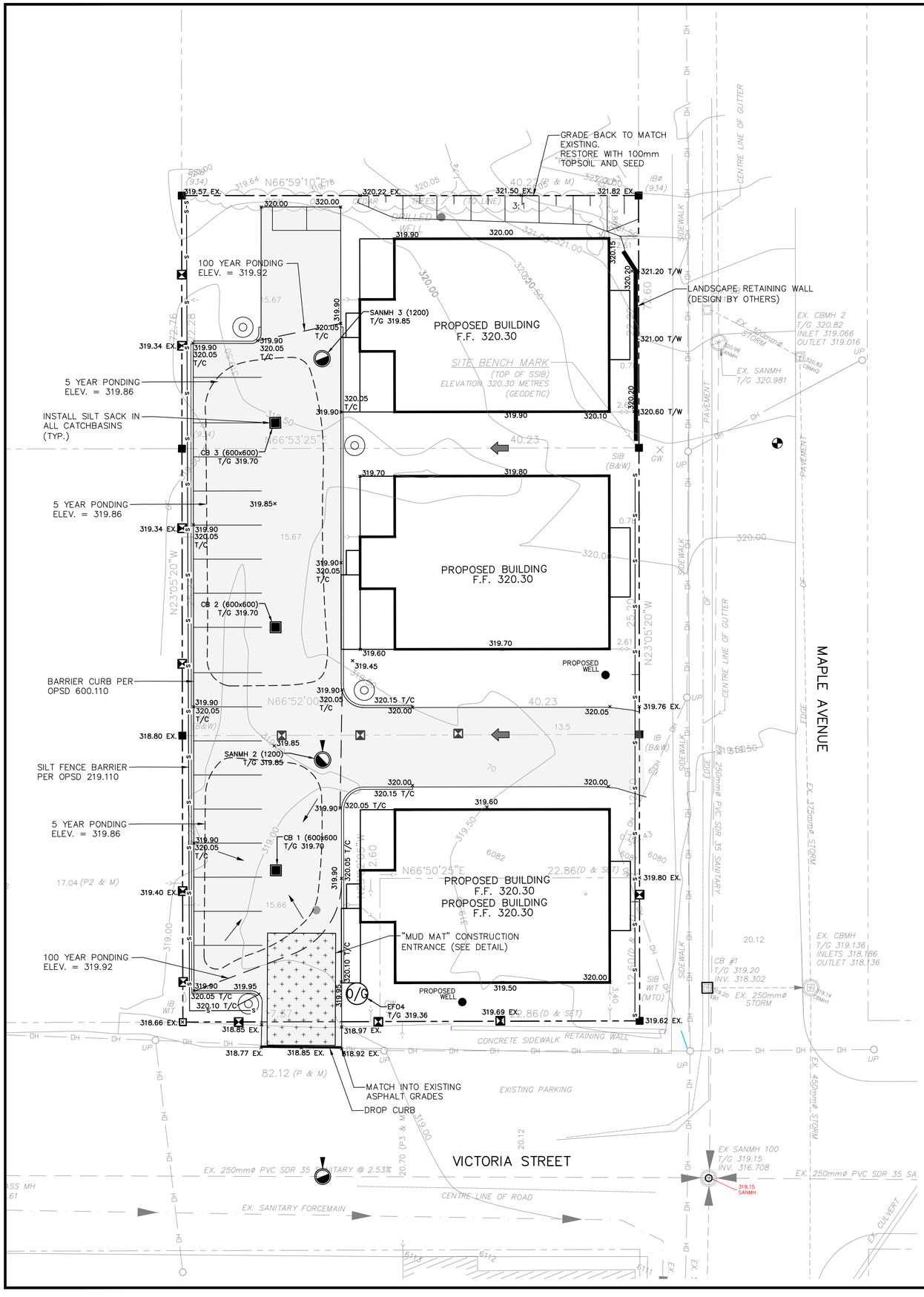
MAPLE AVENUE SUITES

HALIBURTON, ONTARIO

DRAWING TITLE

SERVICING PLAN

PROJECT NO.	DRAWING NO.	REVISION
21-11623-M	SERV-1	0

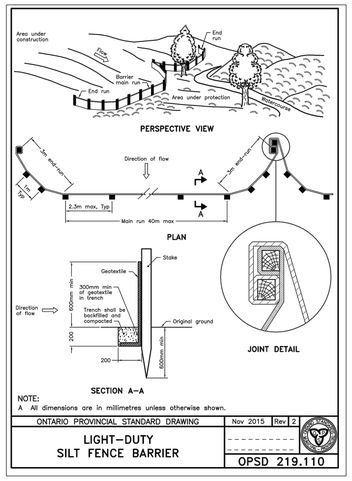


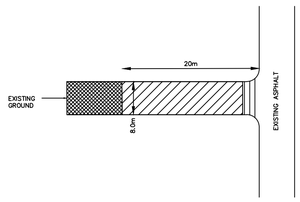
ROAD RESTORATION

1. Asphalt to be saw cut full depth. Depth of granular B, granular A, and asphalt to match existing depth. The existing asphalt is to be milled to allow the new asphalt to be lapped at minimum 0.3m with a tack coat. Sidewalks to be sawcut at the first joint of any undamaged section and replaced to OPSD 310.010.

EROSION CONTROL NOTES:

1. All silt fencing to be installed prior to any grading or excavation.
2. Erosion control fencing to be installed around the base of all stockpiles.
3. Additional erosion control measures may be required as site development progresses. Contractor to provide all additional erosion control structures as directed by the engineer.
4. Pinestone Engineering Ltd. to monitor erosion control structures to ensure fencing is installed and maintenance is performed to municipal requirements.
5. Erosion control structures to be monitored regularly and any damage repaired immediately. Sediments to be removed when accumulations reach a maximum of 1/2 the height of the fence.
6. All erosion control structures to remain in place until all disturbed ground have been re-stabilized either by paving or restoration of vegetative ground cover.
7. No alternate methods of erosion protection shall be permitted unless approved Pinestone Engineering Ltd. and the Township of Dysart et al. department of public works.
8. Contractor is responsible for municipal roadway to be cleared of all sediments from vehicular tracking etc. at the end of each day.





STONE SIZE
- THE STONE PAD SHALL BE A MIN. 150mm THICK. USE 50mmø STONE OR RECLAIMED CONCRETE EQUIVALENT FOR FIRST 10m FROM ADJACENT ROAD AND 150mmø STONE FOR REMAINDER OF STONE PAD.

LENGTH
- AS REQUIRED BUT NOT LESS THAN 20m

WIDTH
- 8m WIDTH

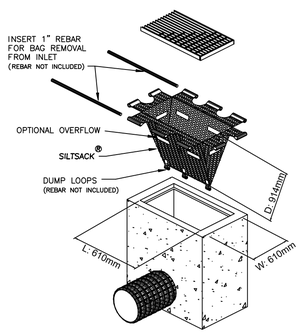
GEOTEXTILE FABRIC
- GEOTEXTILE FABRIC (TERRAFIX 270R OR EQUIVALENT) WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE

SURFACE WATER
- ALL SURFACE WATER FLOWING OR DIRECTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.

MAINTENANCE
- THE CONTRACTOR SHALL MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OF FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT OF WAY MUST BE REMOVED IMMEDIATELY BY THE CONTRACTOR. UPON OBSERVATION OF CONTINUOUS MUD TRACKING ONTO ADJACENT STREETS, THE MAT IS TO BE FULLY REPLACED.

WASHING
- WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AND APPROVED SEDIMENT TRAPPING DEVICE
- INSPECTION AND REQUIRED MAINTENANCE AFTER EACH RAIN SHALL BE PROVIDED BY THE CONTRACTOR.

20m x 8m STONE MUDMAT DETAIL
N.T.S.



TYPICAL SLIT SACK CONSTRUCTION TYPE B
N.T.S.

PEL
PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY GREG BISHOP SURVEYING AND CONSULTING LTD., 2021.

LEGEND

- 221.0 — CONTOUR
- DIRECTION OF OVERLAND FLOW
- PROPOSED CATCHBASIN
- PROPOSED OIL/GRIT SEPERATOR
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED HYDRANT (BY OTHERS)
- x 318.00 PROPOSED ELEVATION
- x (318.00) PROPOSED SWALE ELEVATION
- x 318.00 EX. EXISTING ELEVATION
- x 318.00 T/C TOP OF CURB
- PROPOSED ASPHALT SURFACE
- S —— S SILT FENCE
- RIPRAP
- PROPOSED ROOF LEADER
- 3.0% DIRECTION OF OVERLAND FLOW AND GRADIENT
- PROPOSED SWALE CENTERLINE

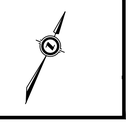
BENCHMARK

TBM#1
SIB ON EAST SIDE OF THE PROPERTY
ELEVATION 320.30

NO.	YY.MM.DD	REVISION	BY

SEAL

NORTH ARROW



DESIGN BY:	T.H.
DRAWN BY:	G.N.
CHECKED	T.H.
DATE:	FEBRUARY 2022
SCALE:	1:200

CLIENT/PROJECT

MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

DRAWING TITLE

GRADING, STORMWATER MANAGEMENT AND CONSTRUCTION MITIGATION PLAN

PROJECT NO.	DRAWING NO.	REVISION
21-11623-M	GP-1	0

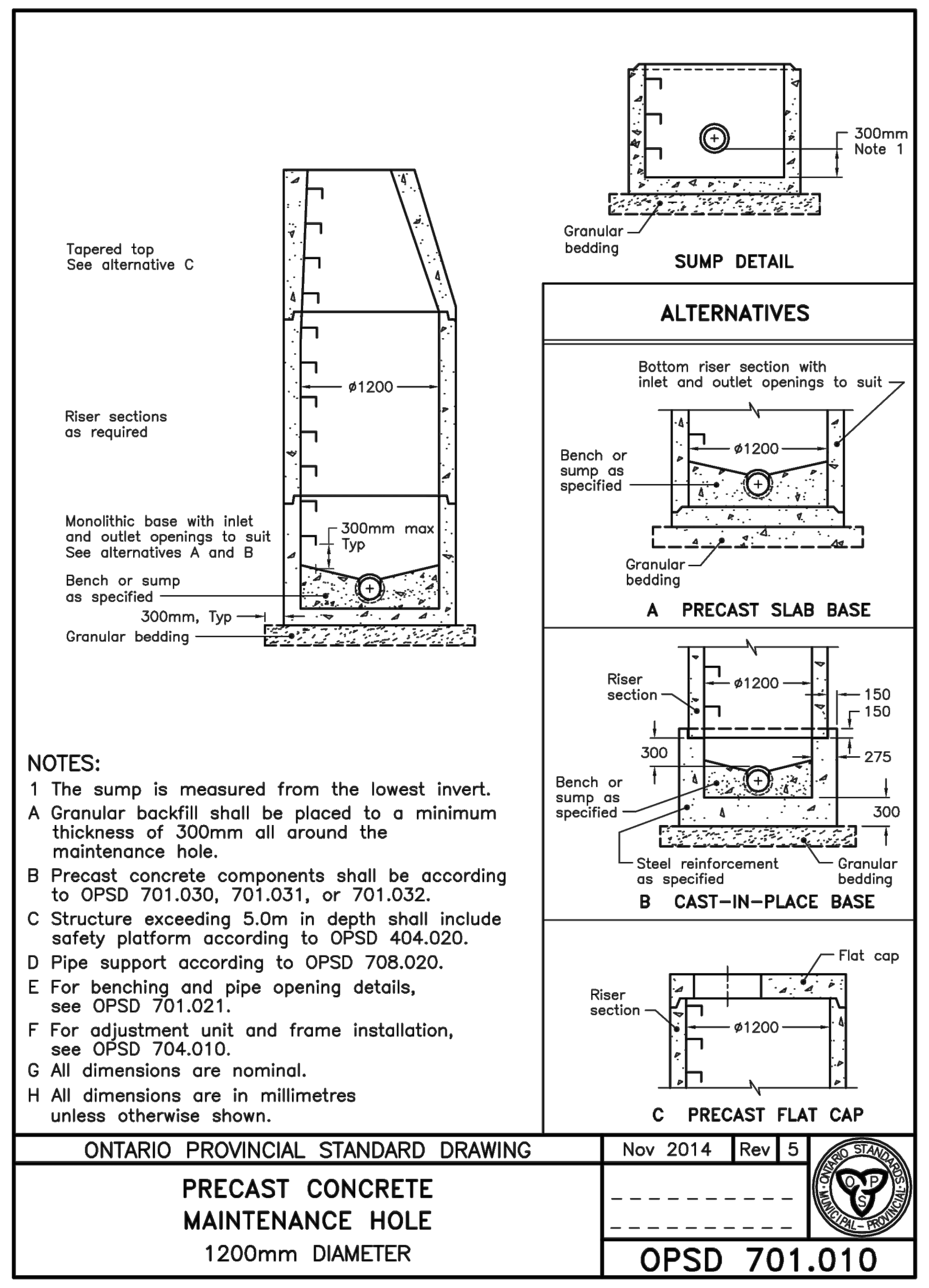
DWG NAME

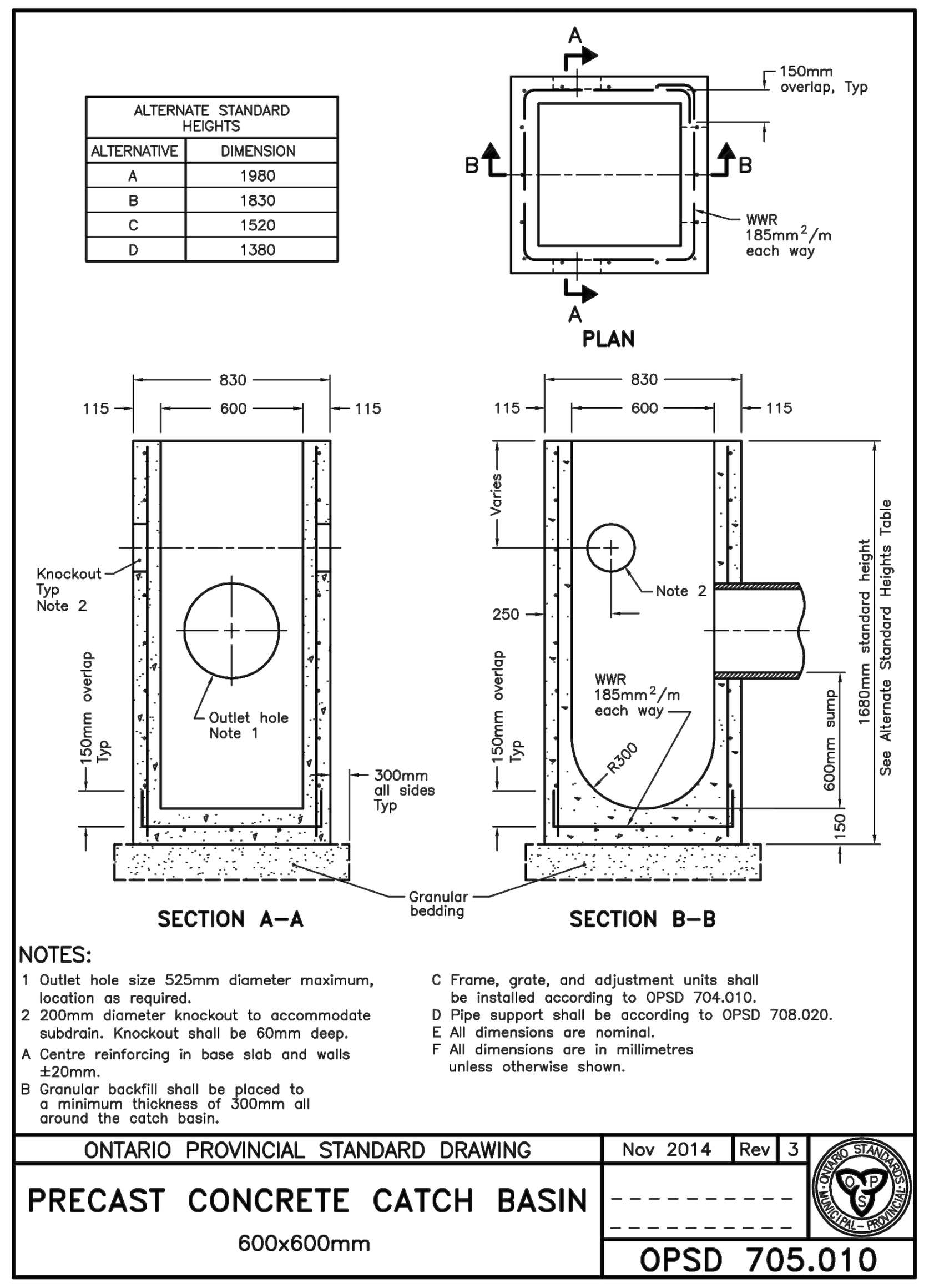
SANITARY SEWERS

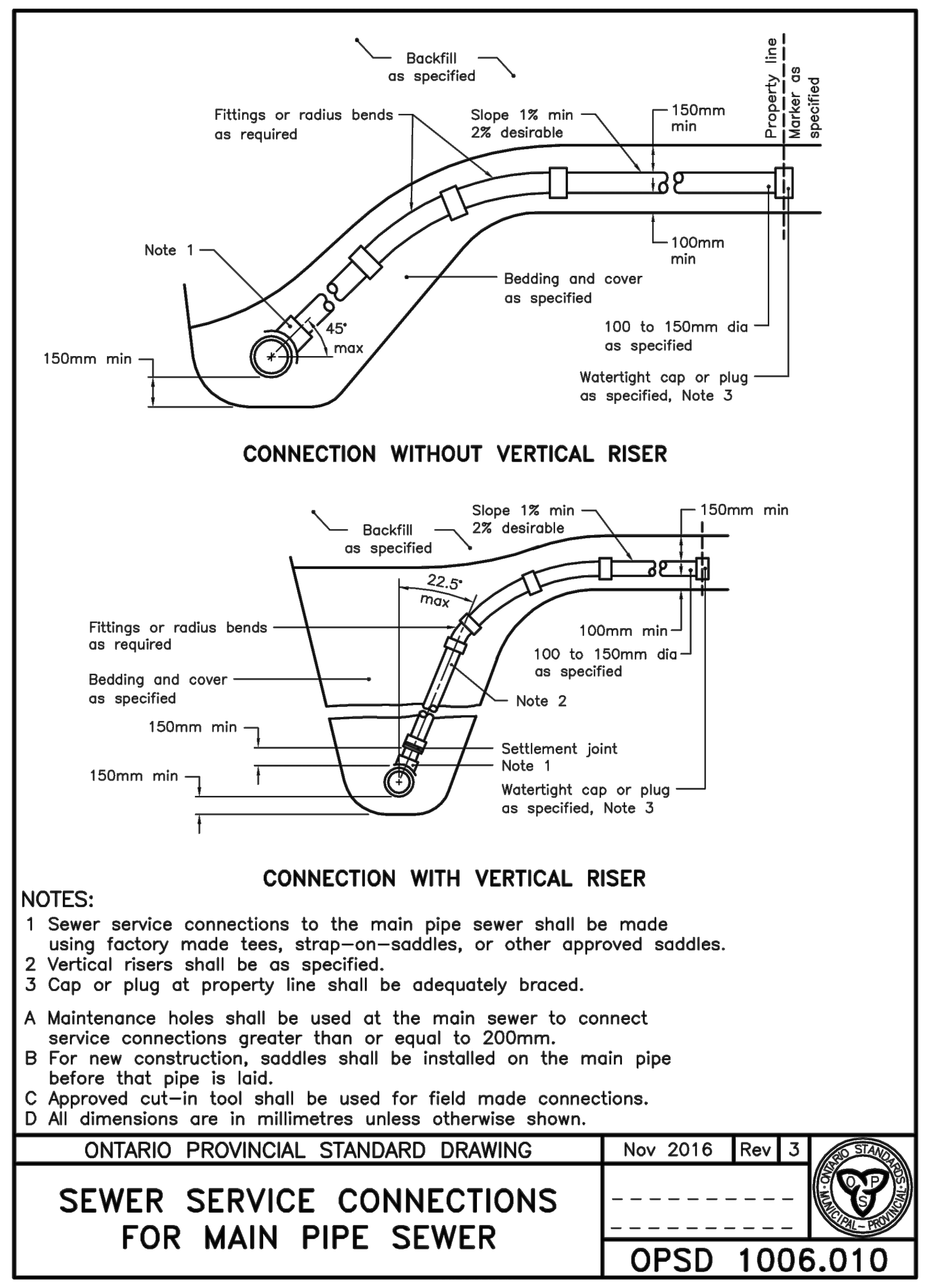
1. Work shall conform to opss 410 and the Ontario Building Code. Pipe embedment and backfill shall conform to OPSD 802.010 and 802.013 and the Ontario Building Code Specifications. Pipe embedment material to springline shall consist of Granular "A" or 19mm diameter springline to 300mm above pipe shall consist of sand. Trench backfill to road subgrade elevation shall consist of approved native material compacted to 95% SPD.
2. Sanitary sewer to be 200mmø PVC DR 35 as shown on the drawings
3. Sanitary sewers to be tested in accordance with the Ontario Building Code and OPSS.409&410.

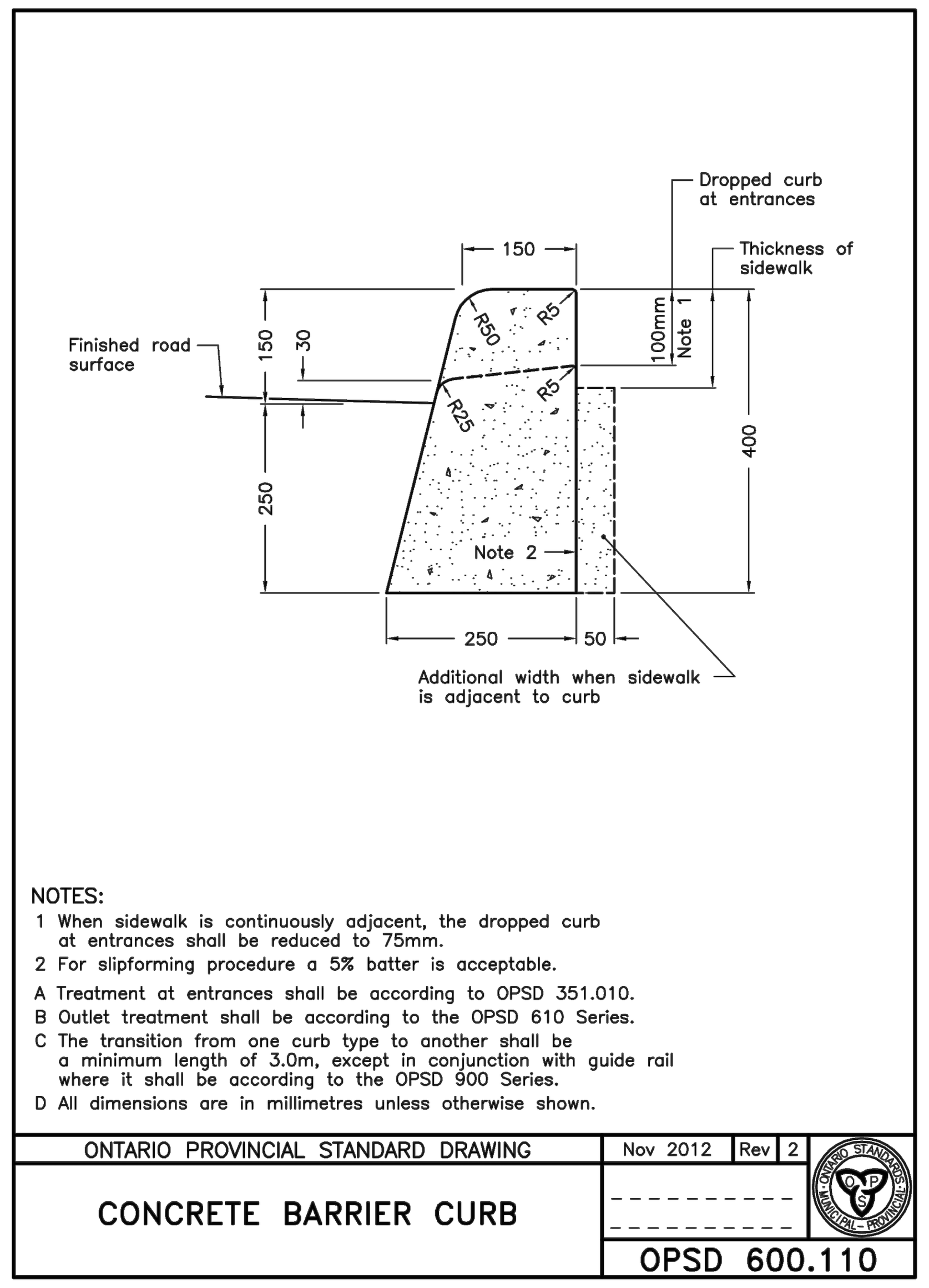
STORM SEWER NOTES

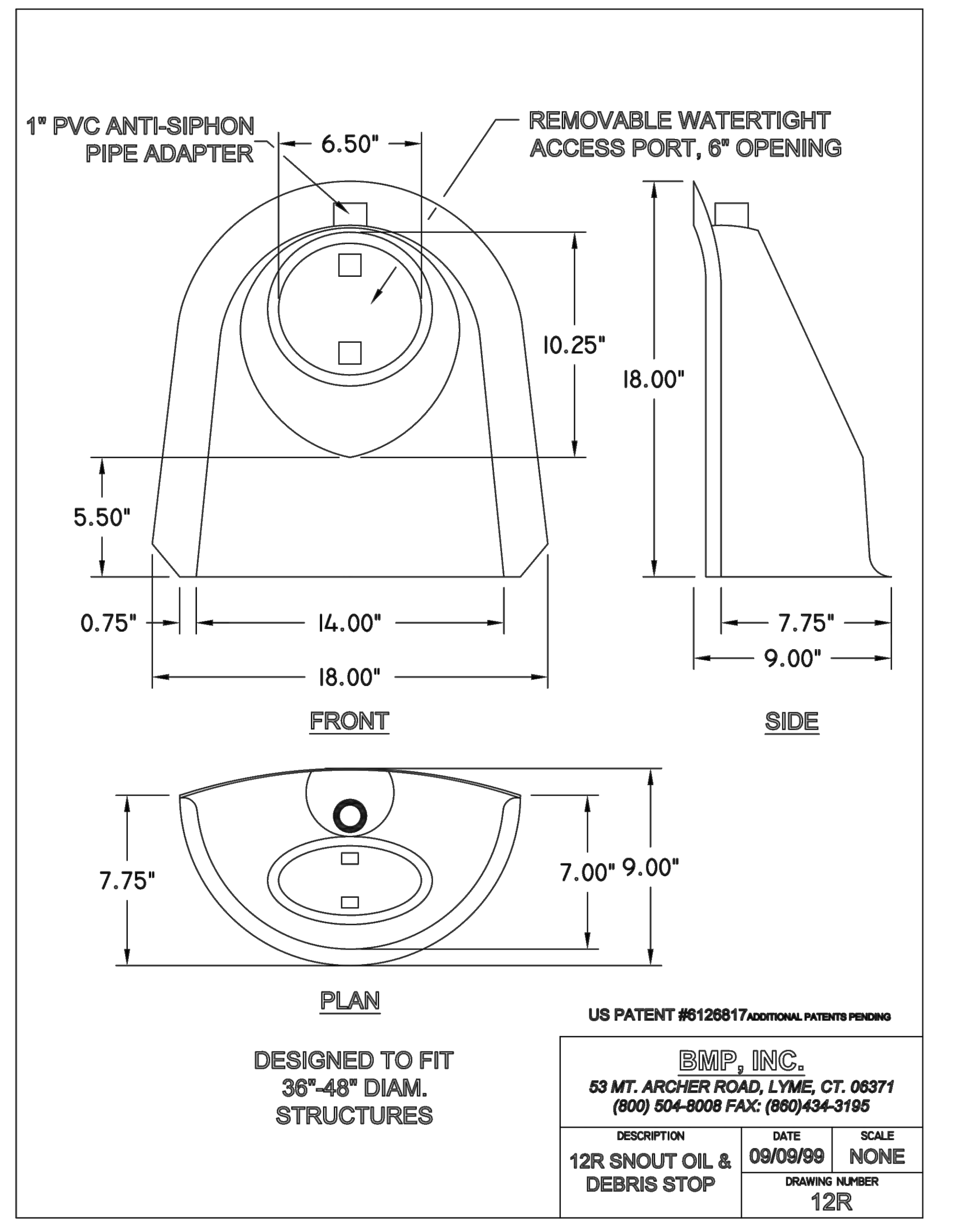
1. Storm sewers shall be smooth wall 320KPa HDPE per BOSS 2000 with bell & spigot joint and conform with OPSS.410. Pipe embedment and backfill shall conform to OPSD 802.010 and 802.013. Pipe embedment material to springline shall consist of Granular "A" or 19mm diameter clear stone. Embedment from springline to 300mm above pipe shall consist of sand. Trench backfill to road subgrade elevation shall consist of approved native material compacted to 95% SPD.
2. CB to be as per OPSD 705.010. Sump to be provided as required for BMP snout. Grate to be as per OPSD 400.020.
3. Sub–drains to be BOSS 2000

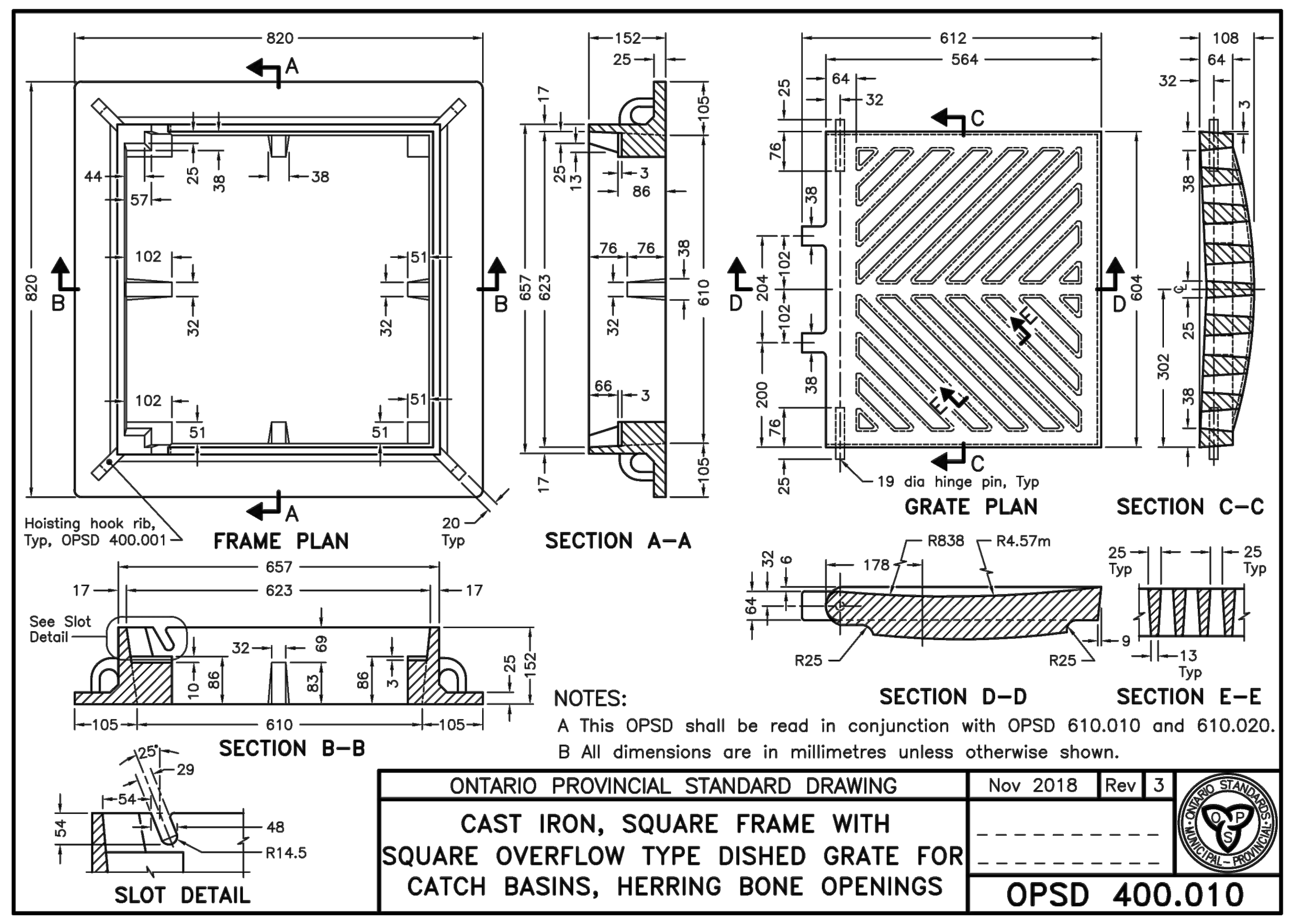


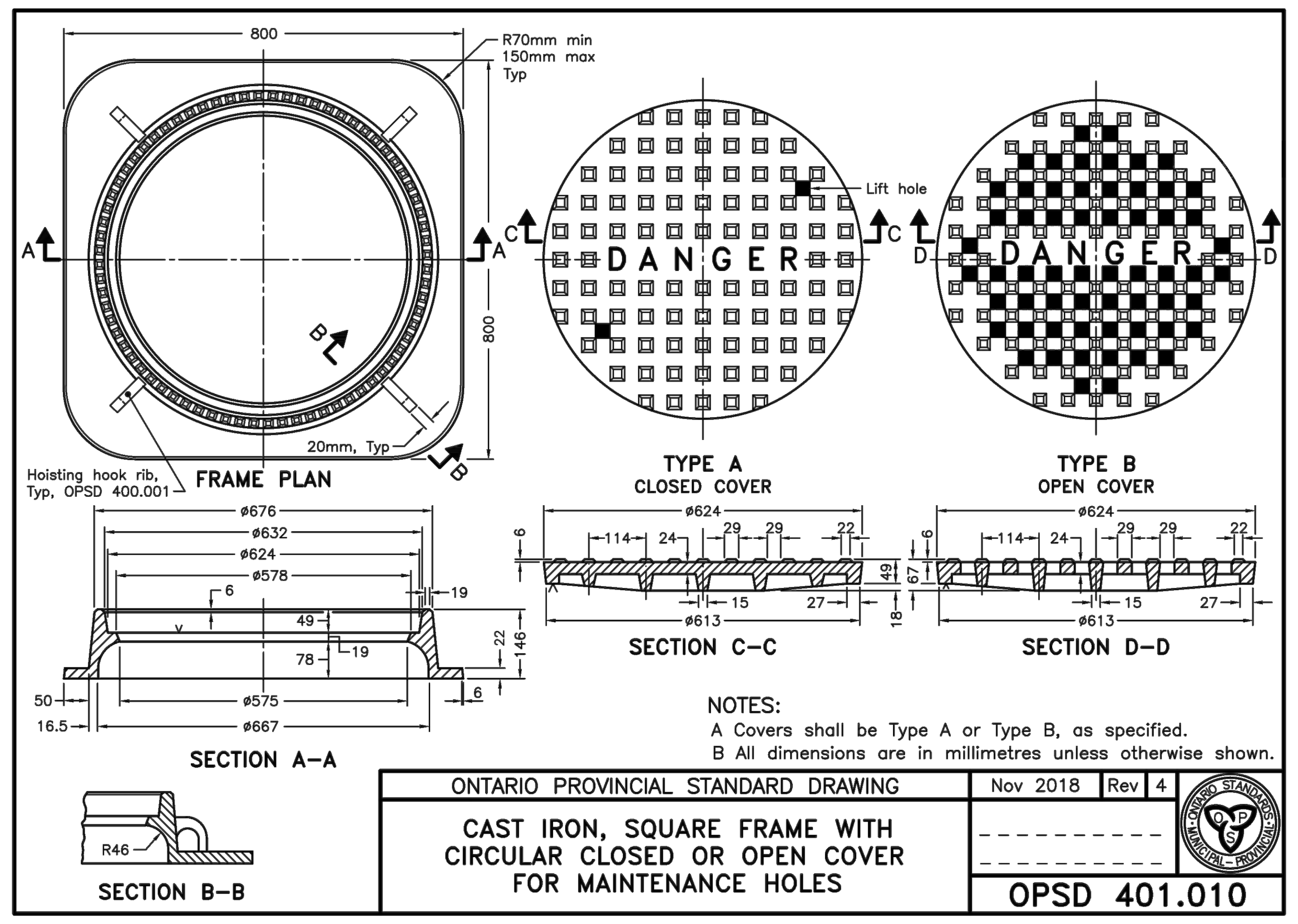


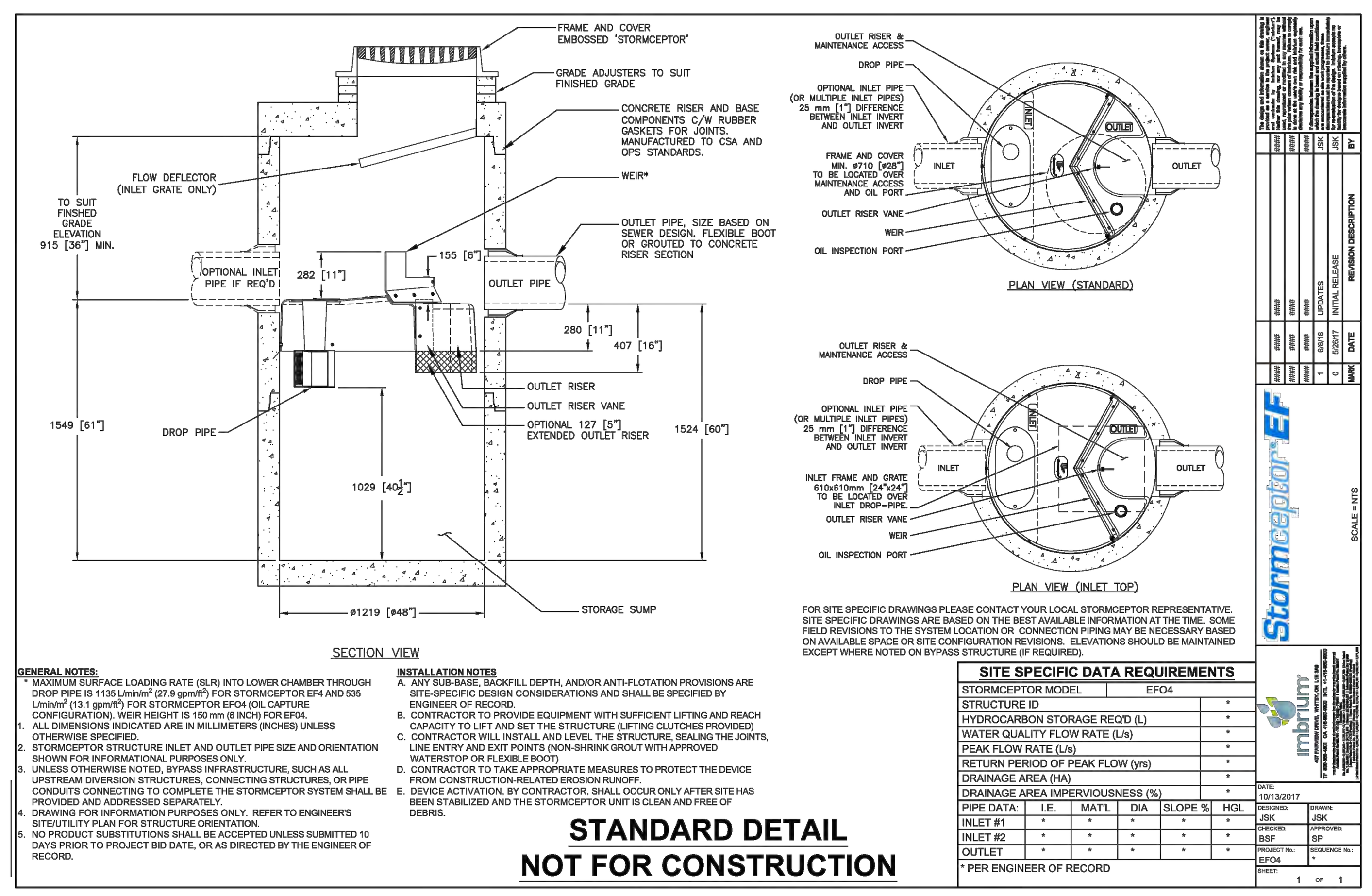


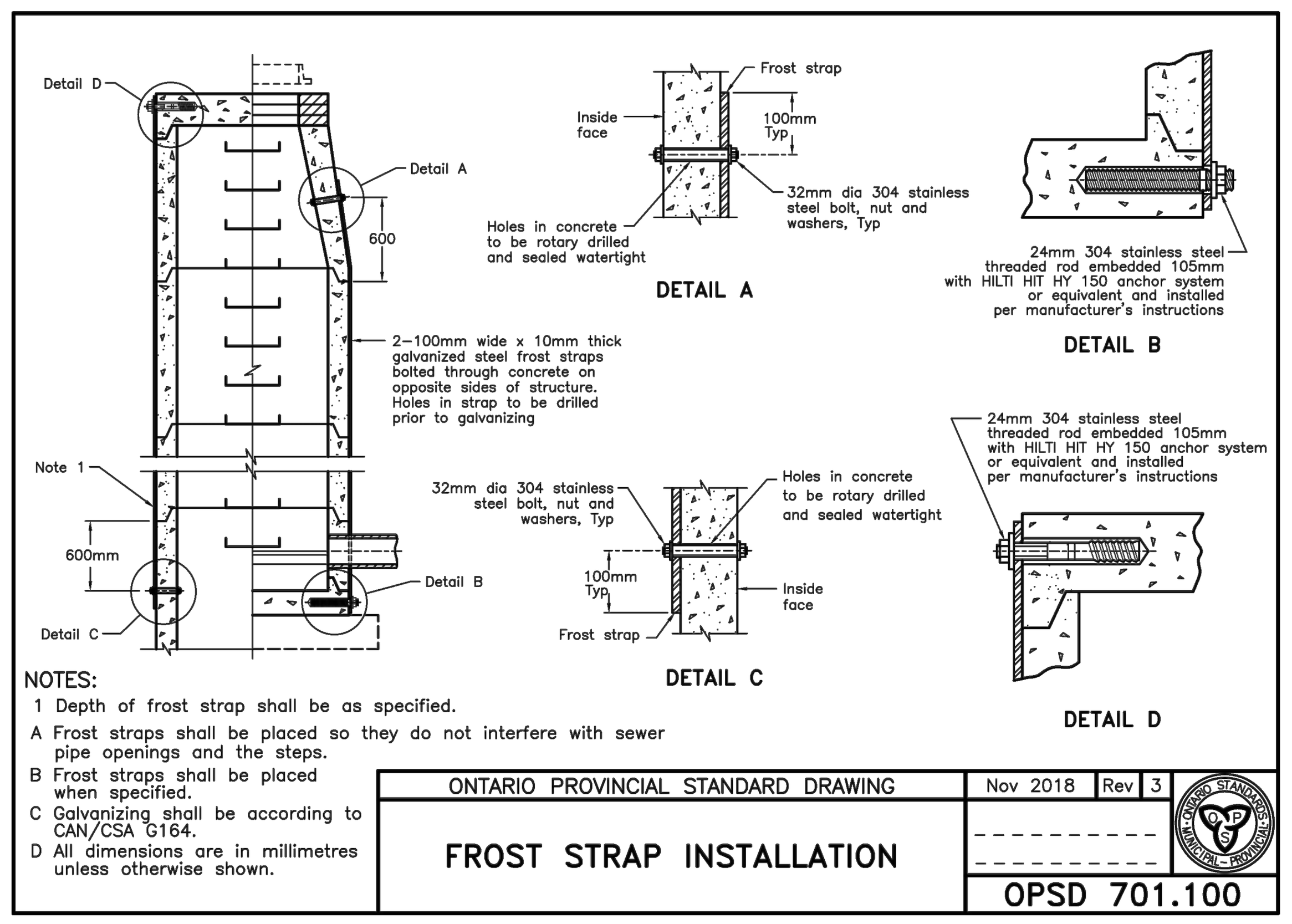


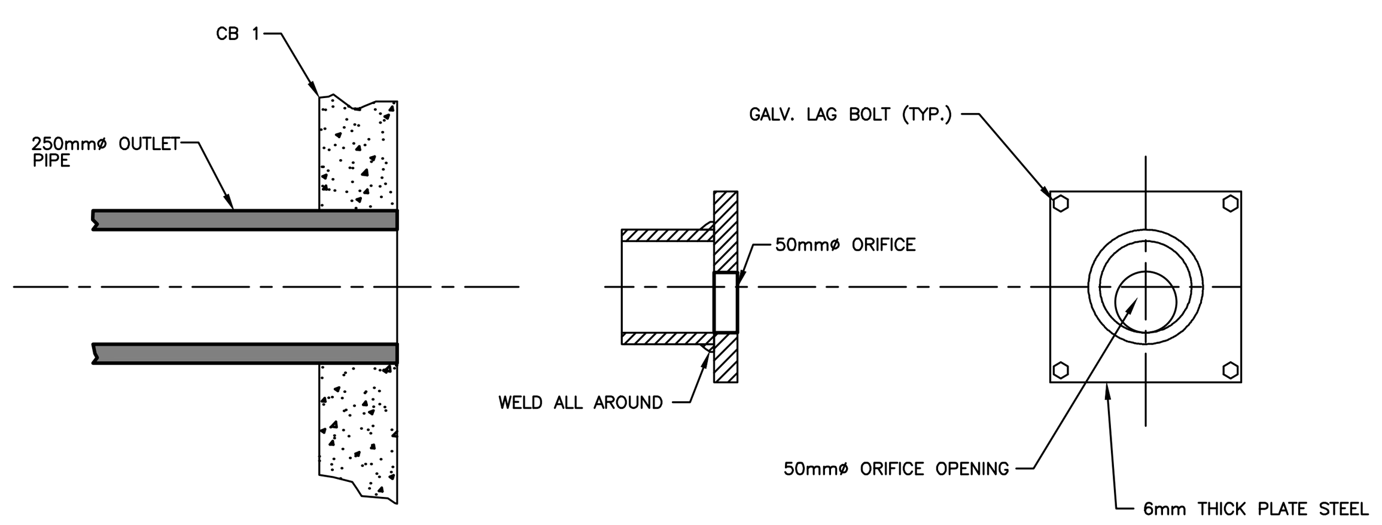












ONLINE ORIFICE DETAIL

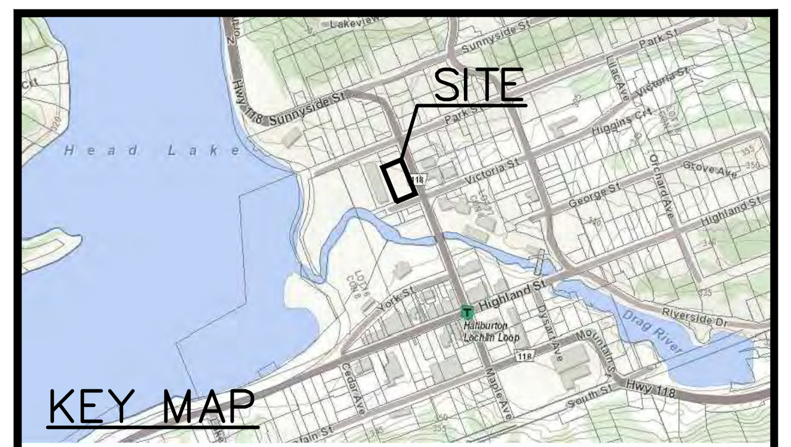
N.T.S.

PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.



KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY GREG BISHOP SURVEYING AND CONSULTING LTD., 2021.

BENCHMARK

TBM #1
SIB ON EAST SIDE OF THE PROPERTY
ELEVATION 320.30

NO.	YY.MM.DD	REVISION	BY

SEAL

NORTH ARROW

DESIGN BY:	T.H.
DRAWN BY:	G.N.
CHECKED	T.H.
DATE:	FEBRUARY 2022
SCALE:	N.T.S.

CLIENT/PROJECT

MAPLE AVENUE SUITES
HALIBURTON, ONTARIO

DRAWING TITLE

CONSTRUCTION NOTES AND DETAILS

PROJECT NO.	DRAWING NO.	REVISION
21-11623-M	DET-1	0

DWG NAME