Proposed Residential Site Plan Development and
Single Estate Lot
2031818 Ontario Ltd., Town of Caledon

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

January 2017

MAEL Reference 03-141

MASONGSONG ASSOCIATES ENGINEERING LIMITED
ENGINEERING SUSTAINABLE FUTURES

FUNCTIONAL SERVICING AND
STORMWATER MANAGEMENT REPORT

PROPOSED RESIDENTIAL SITE PLAN DEVELOPMENT AND SINGLE ESTATE LOT

FOR

2031818 Ontario Ltd.

TOWN OF CALEDON

January 2017

Prepared by:

MASONGSONG ASSOCIATES ENGINEERING LIMITED
7800 Kennedy Road, Suite #201
Markham, Ontario • L3R 2C7
T (905) 944-0162 F (905) 944-0165
Project No: MAE 2003-141

Masongsong Associates Engineering Limited has been retained by 2031818 Ontario Ltd. to prepare this Functional Servicing and Stormwater Management Report in support of an Official Plan Amendment and Rezoning application for a proposed residential development in the Town of Caledon.

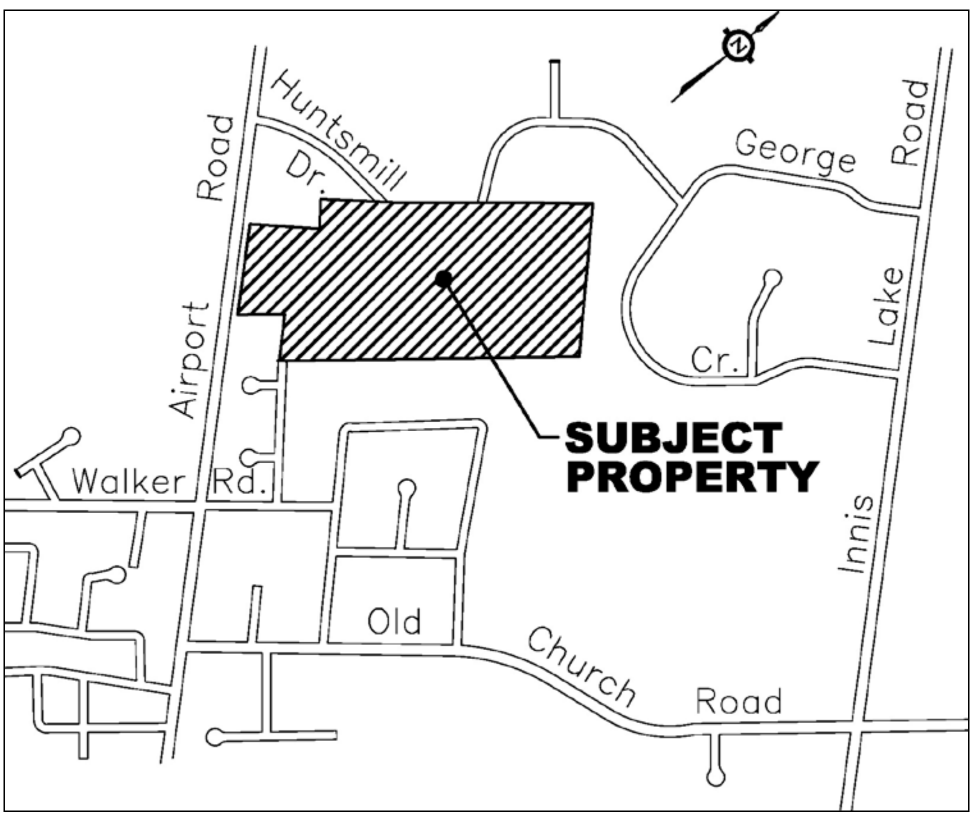
The purpose of this report is to identify the requirements for servicing and stormwater management, and to demonstrate how this site will function within the framework of existing infrastructure.

Preliminary engineering plans are enclosed in the rear Figures Appendix A for reference throughout this report.

1.0 BACKGROUND

The roughly rectangular shaped site comprises an area of approximately 18.85 ha (46.58 acres), located approximately 800m north of Old Church Street on the east side of Airport Road. The legal description of the property is Part of Lot 22 Concession 1 in the Town of Caledon, Region of Peel. A site location plan is illustrated as Figure 1.

Figure 1 *Site Location Plan*



A prominent natural feature, a branch of the Boyce's Creek tributary, traverses the property north to south, effectively "severing" the lands into distinct east and west portions. Other major constraints on the site include a hill landform to the south, a woodlot adjacent to Airport Road and a Locally Significant Wetland (LSW) through the north and central portions of the site. The remaining developable area has been delineated through joint studies by Terraprobe (Geotechnical and Slope Stability analysis), Azimuth Environmental (Natural Environment, features limits) and Masongsong Associates Engineering Limited (floodplain mapping), and it is on this basis that the current site plan concept has been developed.

The subject site is currently zoned as RE (Residential – Estate) and the applicant proposes to rezone the west half of the site to permit a single family type residential development, while retaining a single estate residential lot on the east half of the property.

The subject site was original draft approved in 1986 as an estate residential subdivision with three points of road connections to adjacent subdivisions: McKee Drive to the southwest and northeast, and Huntsmill Drive to the northwest. A copy of the original Draft Plan is enclosed in Appendix A for reference. Although the original Draft Plan approval has since expired, the external road connections, namely McKee Drive, provides the contextual framework on how the subject site has been and is proposed to be serviced by existing infrastructure.

The westerly portion will comprise 21 condominium single family units on a net developable area of approximately 2.33 ha (5.76 acres). Driveway access and municipal servicing for this portion of the site will be via existing McKee Drive to the southwest corner.

The easterly portion will comprise a single estate residential lot, privately serviced (septic, well and soak away pits), situated in the far northeast corner of the site where there is a table-land plateau. Access to the lot will be via a private driveway extended from the current terminus of McKee Drive to the northeast.

The existing adjacent property uses are residential lands. The subject site is bounded to the north and east by estate residential subdivisions, and to the south by low-density single-family homes. The westerly limit of the site is bounded by Airport Road.

1.1 Existing Grading and Landform

From the topographic survey, the hill landform near the south central portion of the site has slopes in the range of 20%(5:1) to 33.3%(3:1) and creates two distinct drainage catchment areas: approximately 11.07 ha drains to the Boyce's Creek watercourse, and another portion of approximately 9.39 ha drains in a north to south direction passed the wetland feature and to an existing catchbasin immediately east of the development driveway.

Due to the significant topographic relief, the site grading constraints for the property will result in having proposed road grades for the residential site plan development reaching the maximum municipal gradients of 5% - 6%.

The latter drainage area of 9.39 ha has been accounted for in the design of the existing Mckee Drive South storm system, and provides the subject site with an existing storm service connection manhole at the property limit. The Mckee Drive storm sewers have been sized for the 2 year storm event (refer to Drainage Plan drawing DR1 for flow calculation and storm design sheet). The site does not receive any significant external drainage and an on-site visit has determined there is an existing ditch inlet catchbasin tied to the Mckee Drive storm sewer and is located within the wetland feature providing an outlet for this drainage area (Refer to Site Picture in Appendix B).

1.2 Existing Infrastructure

As noted above, the **single estate lot east of Boyce's Creek** will be privately serviced with septic, well and soak away pits.

For the proposed **residential site plan west of Boyce's Creek**, the key existing infrastructure which have been reviewed in support of the subject lands include:

Water An existing 300mm diameter watermain is located within the east boulevard of McKee Drive. It is presently stubbed at the terminus of McKee drive with a connection point for the proposed development, and has always been intended to extend into the subject lands.

Sanitary An existing 250mm diameter local sanitary sewer runs within the Mckee Drive subdivision immediately to the south of the subject land. A sanitary manhole approximately 20 m south of the property limit will provide a suitable point of connection for the subject site.

Storm The existing topography can be delineated into 2 catchment areas: approximately 11.07 ha naturally drains to the watercourse and approximately 9.39 ha of drainage area has been accounted for in the design of McKee Drive subdivision.

There are no other external drainage areas tributary to Mckee Drive south. The existing subdivision storm sewers have been design to accept the 2 year storm event, and it is therefore estimated that the allowable flow from the 9.39 ha of tributary area to the McKee storm system is 257.57 L/s.

2.0 PROPOSED DESIGN CONSIDERATIONS

For reference throughout the following sections on functional design and servicing feasibility, the layout of existing and proposed infrastructure is illustrated on the proposed servicing plan enclosed with this report. (Refer to Drawing Nos. S-1 and S-2 in Appendix A)

Site servicing is largely governed by the overall road network and drainage patterns. The functional design standards considered in the preliminary road design utilizes Town of Caledon and Region of Peel development standards.

2.1 Road Alignment and Lot Grading

Although the subject site is a condominium-type tenure, all internal roads will nonetheless be designed to generally meet the Town of Caledon standard No. 110 Geometric Design Standards for Roads. Based on the relatively steep existing site topography, it is anticipated that residential site plan grading will fall within the split draining, front and back walkout condition categories. There are significant topographic features which may warrant retaining walls at the detailed design stage. In this functional review of grading constraints, areas of notable grading constraints have been highlighted below, and are illustrated on the enclosed Grading Plan (Drawing No. GR1) and Cross Sections Plans (Drawings CS1 and CS2):

- Based on the boundary grading constraints preliminary road profiles developed for the proposed plan indicates road grades approaching 6%.
- Units 7 and 8, at the rear a retaining wall will be required to tie into existing ground elevations.
- At the end of the proposed roadway east of unit 14, a retaining wall will be required to tie into existing ground elevations at the top of the hill side.

The Terraprobe geotechnical report suggests a long-term stable slope incline of 3:1 for any grade alteration of the existing hill. Therefore, all grading into the hilly form must maintain a maximum 3:1 cut slope, and restored with bank stabilization (ground cover) immediately following earth moving activities.

With respect to the single estate lot on the east side of Boyce’s Creek, grading will be in accordance with Town of Caledon section 3.12 Residential Lot Drainage and Sodding criteria. As the site will be a single custom-designed homes, the lot grading will be subject to site plan approval.

2.2 Water Distribution

A new 150mm diameter PVC watermain is proposed to be extended from the existing McKee Drive 300 mm diameter watermain, as a 300mm main would be too large for the condominium residential site. A physical connection can be made with a 300x150 reducer at the property limit, complete with check valve in chamber in accordance with Region of Peel standard drawing number 1-8-2. Internally the 150mm PVC watermain will loop around the condominium roadways and each unit will be supplied with a 19mm diameter Type `K' copper water service connection and meter.

There will be five 5 fire hydrants provided within the proposed site to meet the municipal specified spacing design requirement for fire protection.

As requested by the Region of Peel Water Connection Demand Table in Appendix A stipulates single family complex water demand results required for their use to conduct a site water model analysis.

The single estate lot east of Boyce's Creek will have a private water well installed. It is not intended to extend the municipal water main system under the creek to service a single lot.

For existing and proposed waterman infrastructure layout see Site Servicing Drawings SS-1 and SS-2.

2.3 Sanitary Sewerage

The receiving sanitary connection point for the subject site is proposed to be the existing 250mm diameter sanitary sewer located within the McKee Drive south roadway. A new 250mm diameter PVC sanitary sewer will be extended and terminated with a sanitary control manhole at the property limit. An internal sanitary sewer system will service the condominium site plan, and the units will be provided with Single Sanitary and Storm Service Connections in Common Trench in accordance with municipal standards.

The proposed development comprises of 21 dwelling units within a 2.33 ha area. The residential density for single family housing is 70 persons/ha therefore the population is estimated at:

Population = 2.33ha x 70 persons/ha
= 163 persons

The sanitary sewage flow estimates are calculated based on the population forecasts plus extraneous ground water infiltration. Using the above population estimates, the future sanitary sewerage rate from the subject site is calculated as follows.

Proposed Site Design Flow:

Peak Flow Design Parameters

Total Population	= 163 p
Residential Avg. Flow	= 302.8 L/p/d
Peaking Factors	= $1 + 14/(4+(P/1000)^{0.50})$ max 4.0 = 4.0
Site Area	= 2.33 ha
Proposed Manholes	= 18 mh
Manhole Infiltration Rate	= 0.00028 m^3/s/mh*18 mh*1000 L/1 m^3 = 5.04 L/s
Sewer Infiltration Rate	= 0.0002 m^3/s/ha*2.33 ha*1000 L/1 m^3 = 0.466 L/s
Total Infiltration Rate	= 5.51 L/s

Calculation of Peak Design Flow

Design flow, $Q_{SANITARY}$ = average daily flow x peaking factor + infiltration flow
=(163 p x 302.8 L/p/d / 86400 s/d) x 4.00 + 5.51 L/s
=(1.43 L/s x 4.00) + 5.51 L/s
=2.29L/s + 5.51 L/s
=7.8 L/s

The site sewage generation flow rate is calculated to be 7.8 L/s including infiltration. The receiving existing sanitary sewer readily has the available capacity to accommodate the proposed flows.

Refer to Site Servicing Drawings SS-1, SS-2 and the sanitary sewer design sheet in Appendix A.

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

3.1 Development Constraints

The residential development is adjacent to the LSW defined by the Ministry of Nature Resources as the Caledon East Wetland Complex. It proposed to maintain the pre-development wetland tributary area as much as possible by introducing a cut off swale for the site driveway entrance along the north property limit directing stormwater to two storm sewer bypasses and then out to the wetland. The storm sewer by-pass will be sized for the 100 yr storm event (total capture) at the detailed design stage. A second cut off swale is proposed at the rear of units 16 to 20 further contributing to the pre-development storm drainage area to the wetland.

Refer to Pre-Development Plan drawing PRE and Drainage Plan drawing DR1 for the minor 2yr storm event flow calculations. The site plan will be controlled to the 2yr storm event allowable discharge rate of 34.29 L/s. This translates to 13.3% of the total flow 257.57 L/s for the west drainage shed. The balance of approximately 223.28 L/s shall be directed to the wetland feature maintaining it. It can be said the proposed site plan development will have a nominal effect to the LSW. The Water Balance/Erosion Control Section 3.3 discusses low impact designs (L.I.D.) implemented for the site plan. L.I.D's proposed for the development will provide additional groundwater recharge to LSW essentially evening the pre-development condition.

Excluding the pre-development (existing) LSW drainage area from the site will also reduce the land development area required for stormwater management, and in turn reduce the impact to the environmentally sensitive land.

The existing McKee Drive subdivision was designed to accept a drainage area of approximately 9.39 ha from the subject lands at the 2 year storm event rate. As a result of the protected features (Woodlot and Wetland) and the much reduced developable area, the proposed development drainage area to McKee Drive has been significantly reduced to approximately 1.77 ha. This significant reduction in drainage area provides an opportunity for the residential site plan to control all storm events up to and including the 100 year event to the 2 year release rate.

A Hydrogeological Report by Terraprobe reveals that the groundwater level for borehole 7 is 0.5m below the existing surface at the elevation of 297.70m (Refer to Borehole Logs and Location Plan in Appendix B). The report also reveals for boreholes 8 and 9 located further east along the south hill side where the proposed single family residential site plan will be situated that upon drill completion boreholes were dry with no water table present. Therefore is our recommendation for this development to locate the proposed stormwater management system within the area of the single family units to avoid the groundwater condition for the LSW. The proposed storm sewers, sanitary sewers and watermain downstream from stormwater management system where the infrastructure will encounter the groundwater condition shall be installed water tight.

3.2 Stormwater Management

Based on reviewing the available information provided by the Town of Caledon, the stormwater management criteria of the residential townhouse site can be summarized as controlling the post-development flow to a maximum pre-development 2 year storm release rate , or a total of $\mathbf{Q_{allowable} = 34.29}$ **L/s** (Pre-Development Plan Drawing No. PRE).

3.2.1 Post-Development Discharge

Post development storm drainage areas and composite runoff coefficients were delineated for the site (See Table 2 and Post-Development Plan Drawing No. POST). The calculation of post development peak flows are following.

Table 3.1 *Post Development Peak Flows*

Area type	Hectares	Runoff Coefficient "r"	Area x R
Landscaped	1.0407	0.25	0.2602
Paved	0.2570	0.90	0.2313
Building	0.4749	0.90	0.4274
	SUM = 1.7726		$\sum$ A x R = 0.9189
			AVERAGE R = 0.52

Without any control devices in place, the 100-year post development storm run-off from these areas is calculated as follows:

Q=2.78CIA where

C = 0.52
I_{100} = 196.54 mm/hr (Tc=10.0 minutes)
A = 1.7726 ha

$\mathbf{Q_{100\ POST}}$ = (2.78)(0.52)(196.54)(1.7726)
= 503.63 L/s

Since $Q_{100\ POST}$ is greater than $Q_{Allowable}$, stormwater quantity management control in the form of orifice tube device and on-site storage system is proposed.

3.2.2 Quantity Control

The attached on-site storage calculator sheet Table 4 uses the Mass Rational method to calculate the 100-year storage requirement for the site based on an average weighted run-off coefficient of 0.52.

The stage-discharge-storage relationship is computed iteratively, but only the final solution is presented below.

In order to control the release rate during the 100-year storm, Control MH 6 will be fitted with a 75mm diameter orifice pipe and will discharge **24.96 L/s** based on a high water level of 301.46 m. The required storage is **586.30 m^3**.

The peak controlled discharge of 24.96 L/s is less than the allowable discharge of 34.29 L/s. The required attenuation storage volume is proposed to be accommodated in superpipe storage and storm tank. The volume available **is 598.90 m^3**, which exceeds the required storage of 586.30 m^3. (See Section 1-1 for Stormwater Management System Details on Drawing No. CS-2). A summary of post development flows is presented in the following Table 3.2:

Table 3.2 *Controlled Release Rates*

Site Drainage Components	Area (ha)	Q_{100} Post-Development Discharge (L/s)	Controlled Release Rate (L/s)
Control Manhole No. 6	1.7726	503.63	24.96
Totals	**1.7726**	**503.63**	**24.96**

Therefore, superpipe storage, storm tank and orifice pipe design system fulfills site discharge and stormwater attenuation criteria.

3.3 Water Balance/Erosion Control

Generally, all units will implement the low impact design (L.I.D.) rainwater downspout disconnection from the storm sewer. The single family units rear rainwater downspouts will discharge through rain barrel cisterns (second L.I.D. feature) onto grassed areas that lead to the third L.I.D. feature which is an infiltration granular trench. This will improve water balance for the development and reduce runoff to the proposed storm sewer system.

Single family units 1 to 6 and 17 to 21 will not be installed with storm connections since the stormwater system proposed will have water levels that fluctuate due to the orifice design installation. These units will require sump pumps to be installed to discharge onto grade levels. The remaining single family units 7 to 16 are able to have storm connections since these buildings are located up on the hillside where the major storm high water level in the storm sewer system will not flood the dwellings.

As the stormwater scheme can only manage the single family area and not the proposed driveway as a result of the shallow groundwater table in the LSW it is recommended that the entrance be installed with a L.I.D. known as porous pavers. The driveway would then be considered a highly porous landscaped entrance feature providing the requisite water quality, balance and erosion criteria for this section of road and maintaining the pre-development state.

The residential site plan area will implement a granular trench L.I.D. at the rear of units 6 to 14 to provide supplementary water balance.

Required 5mm Water Balance/Erosion Control Retention Volume Target

The residential site plan development has a total impermeable area of approximately 7,318 m^2 (See Table 2 and Post Development Plan drawing Post in Appendix A). With an on-site water balance storage of 5mm, yields a volume requirement of:

$$V_{REQUIRED} = 7{,}318\ m^2 \times 0.005\ m$$
$$= 36.6\ m^3$$

Provided Water Balance/Erosion Control Volume

The granular trenches are designed with geometry of 0.6 m width, a depth of 1.0 m, and total length of 130.0 m. The trenches run along all rear yards, allowing for seepage and infiltration to safely migrate into naturalized areas. The trenches will yield a volume of.

$$V_{TRENCH} = 0.6\ m \times 1.0\ m \times 155.0\ m \qquad (W \times H \times L)$$
$$= 93.0\ m^3$$

Clear stone is recommended in the MOE SWMPP manual to have a porosity of ρ = 0.40. Therefore the available storage for the trench is:

$$V_{PROVIDED} = V_{TRENCH} \times \rho$$
$$= 93.0\ m^3 \times 0.40$$
$$= 37.2\ m^3$$

which exceeds the storage required of 36.6 m^3.

The Hydrogeological Report by Terraprobe indicates in-situ soils consist of silty sand with the Infiltration rate ranging from 6.86 mm/hr (or 0.69 cm/hr) to 25.91 mm/hr (or 2.6 cm/hr) based on the Hydrological Soil Properties Classified by Soil Texture Table 3.3.

Table 3.3 *Hydrologic Soil Properties Classified by Soil Texture*

Texture Class	Water Storage Capacity	Infiltration Rate (f)		Soil Group
		In/hr	mm/hr	
Sand	0.35	8.27	210.06	A
Loamy Sand	0.31	2.41	61.21	A
Sandy Loam	0.25	1.02	25.91	A
Loam	0.19	0.52	13.21	B
Silt Loam	0.17	0.27	6.86	B
Sandy Clay Loam	0.14	0.17	4.32	C
Clay Loam	0.14	0.09	2.29	D
Silty Clay Loam	0.11	0.06	1.52	D
Sandy Clay	0.09	0.05	1.27	D
Silty Clay	0.09	0.04	1.02	D
Clay	0.08	0.02	0.51	D

(Source: Stormwater Collection Systems Design Handbook, Mays, 2001)

The infiltration granular trench bottom area is 0.6 m x 155.0 m = 93.0 m^2. Therefore, the drain down time for 29.3 m^3 of stormwater to dissipate into the native ground is:

$$\frac{36.6\ m^3}{93.0\ m^2} = 0.3935m \times \frac{100\ cm}{1\ m} = 39.35\ cm$$

$$39.35\ cm = \frac{1.65\ cm}{hr} \text{ (Average Infiltration Rate)}$$

$$hr = 23.85$$

Therefore granular trench will provide the requisite water balance/erosion control requirement where over a maximum 48 hour period 5mm of storm runoff detention is achieved through in-situ soil infiltration. The granular infiltration trenches will be proposed at the detailed site servicing and grading design stage.

At the recommendation from the Toronto and Region Conservation Authority an additional LID measure shall be implemented for the site, which is to install rain barrel cisterns for stormwater harvesting at each dwelling. As noted above the required 5mm water balance/erosion control volume is 36.6 m^3. Therefore with 21 single family homes the average rain barrel will need to be sized for 1.74 m^3 each, to achieve the desired site retention volume. This is readily achievable with pre-fabricated rain barrel devices commonly and widely available.

3.4 Stormwater Quality

The Town of Caledon requires quality control to be implemented for impervious areas. A Stormceptor Model STC 3000 unit is proposed for the residential site plan to be installed. This unit has been sized to treat the impervious areas based on a minimum 80% TSS removal Stormsceptor Sizing Detailed Report is enclosed in Appendix A.

3.5 Major System Controls

The site plan development proposes on-site stormwater management. Therefore all normal flows up to and including the 100-year post-development major storm is proposed to be captured within the site via pipe & tank storage and discharged at the allowable release rate to the municipal storm sewer system. In an emergency or catastrophic rain event overland flow heads towards Mckee Drive which it will continue conveying southerly as it does in the existing pre-development condition.

3.6 McKee Drive Major Overland Flow Analysis

3.6.1 Pre-development Overland Flow Analysis

In accordance with the Town's current request, the major overland flow was determined using the current Town of Caledon IDF curves for the 100-year storm, being $i_{100} = 4688/(td + 17)^{-0.9624}$. For a time of concentration of 29.54 min (for TC calculation refer to Drainage Plan drawing DR1), i_{100} = 116.38 mm/hr.

Based on the existing area of A = 9.39 ha and C= 0.22, the 100-year peak flow rate at McKee Drive is approximately:

$$\begin{aligned} Q_{100\ PEAK} &= 2.78 \times C \times i_{100} \times A \\ &= 2.78 \times 0.22 \times 116.38 \times 9.39 \\ &= \mathbf{668.36\ L/s} \end{aligned}$$

Accounting for the actual inlet into the minor storm sewer system (minor flow calculation, refer to Drainage Plan drawing DR1), the net drainage remaining as overland flow on the road surface at Section A-A, is:

$$\begin{aligned} Q_{100\ OVERLAND} &= Q_{100\ PEAK} - Q_{2YR\ MINOR} \\ &= 668.36 - 257.57\ L/s \\ &= \mathbf{410.79\ L/s\ or\ 0.411\ m^3/s} \end{aligned}$$

The generalized channel capacity analysis Section A-A is included in Appendix A allows for separate Manning's *n*-values for the channel (paved roadway) and overbanks (boulevards). For the main channel, comprising asphalt and concrete gutters, the n-value is recommended to be **n=0.013** (Chow, 1959). Similarly, the boulevards are a combination of grass, concrete curbs and sidewalks, with a composite coefficient of **n=0.020**.

The hydraulic elements are computed at one location of McKee Drive, having longitudinal slope of 2.0% taken from the McKee Drive constructed record drawing. The corresponding cross-sectional analysis at this location yields a road capacity of **7,493 L/s**.

The overland drainage on McKee Drive has been plotted as an overlay on the Section A-A pre-development capacity graph. The high water level of the 100-year overland flow has a depth of **90 mm** which is contained within the main channel and does not breach the crown of the road or street lines.

3.6.2 Post Development Overland Flow Analysis

As noted in this report under section 3.2 Stormwater Management, the residential site plan shall control post development flows (100 year major flows) to a maximum pre-development 2 year storm release rate. Since the site plan will provide its own on-site stormwater management system, while maintaining pre-development flows to McKee Drive subdivision. From the pre-development plan drawing PRE, the area of 1.25 ha can be excluded from the 9.39 ha storm tributary of McKee Drive Subdivision in order to calculate the new major flow to the existing roadway.

Therefore the new major flow is similarly calculated based on the revised area of A = 9.39 ha – 1.25 ha = 8.14 ha and C= 0.22, the 100-year peak flow rate at McKee Drive is approximately:

$$\begin{aligned} Q_{100\ PEAK} &= 2.78 \times C \times i_{100} \times A \\ &= 2.78 \times 0.22 \times 116.38 \times 8.14 \\ &= \mathbf{579.39\ L/s} \end{aligned}$$

Since the actual inlet into the minor storm sewer system is being maintained in the post development scenario. The minor flow calculation from to Drainage Plan drawing DR1 is being carried forward for the purpose of this analysis, the net drainage remaining as overland flow on the road surface, at Section A-A post development, is:

$$\begin{aligned} Q_{100\ OVERLAND} &= Q_{100\ PEAK} - Q_{2YR\ MINOR} \\ &= 579.39 - 257.57\ L/s \\ &= \mathbf{321.82\ L/s\ or\ 0.322\ m^3/s} \end{aligned}$$

The new overland drainage on McKee Drive has been plotted as an overlay on the Section A-A post development capacity graph. The high water level of the 100-year overland flow has a depth of **75 mm** which is contained within the main channel and does not breach the crown of the road or street lines.

In summary with the addition of residential stormwater managed site plan actually reduces the overland flow from 410.79 L/s down to **321.82 L/s** on McKee Drive's surface conveyance roadway system. The site plan proposal ultimately provides greater overland flow conveyance capacity to the existing roadway system downstream from the site which in turn provides more of a flood safety cushion to the privately owned lands. Therefore no further overland flow analysis is required.

3.7 Stormwater Management Residential Estate Lot

The proposed single estate residential lot on the east side of Boyce's Creek will have minimal stormwater management impact on the lands. In consideration of the single-building tenure of the east lot, it is proposed to provide soakaway pits as a lot-level BMP device to receive and intercept roof and driveway discharge. Soakaway pits shall be designed in accordance with the Ministry of Environment SWMPD Manual and lot grading design shall conform to the Town of Caledon criteria.

4. Erosion and Sediment Control

Erosion and sediment control should be implemented for all construction activities within the subject site, and for each consecutive Phase and Stage of Construction, including earthworks, servicing and house building activities. The basic principles considered to minimize erosion and sedimentation and resultant negative environmental impacts include:

- Minimize local disturbance activities (e.g. grading);
- Expose the smallest possible land area to erosion for the shortest possible time;
- Implement erosion and sediment control measures before the outset of construction activities; and,
- Carry out regular inspections of erosion and sediment control measures and repair or maintain as necessary.

The proposed grading, servicing and building construction should be carried out in such a manner that a minimum amount of erosion occurs and such that sedimentation facilities control any erosion that does occur. Erosion and sediment control measures should include but not be limited to the following:

- Temporary off-line siltation control ponds. Current TRCA guidance requires siltation/erosion control for 125 m^3/ha of dry run-off storage for each facility, with a permanent pool of an additional 125 m^3/ha. These ponds are to be located at the low point of the grading, which in this case would be the south end of the proposed driveway.
- Erection of silt fences around all site perimeters. Double-silt fences are to be erected adjacent to the PSW features.
- Provide sediment traps (e.g. rock check dams, straw bales, scour basins) along interceptor swales and points of swale discharge;
- Inlet controls at catchbasins, comprising filter cloth overlain with rip-rap;
- Implement a weekly street sweeping and cleaning program for any mudtracking onto the adjacent municipal roadways;
- Provide gravel "mud mats" at construction vehicle access points to minimize off-site tracking of sediments; and,
- Confine refueling/servicing equipment to areas well away from stormwater minor system or major system elements.

Removal of the erosion and sediment controls should be done once construction is completed and sediment run-off from the construction activities has stabilized. A more detailed Erosion and Sediment Control Report and Plans will be provided at detailed design as part of the Site Alteration permitting and approvals stage.

5. Recommendations And Conclusions

The single estate lot on the east side of Boyce's Creek can be privately serviced with septic, well and soak away pits.

It has been demonstrated that the proposed residential site plan development can be accommodated by existing receiving infrastructure on McKee Drive. In summary:

Water The subject site area can be serviced by the existing 300mm diameter main at the current terminus of McKee Drive south of the subject site. A bulk meter at the property line and an internal 150mm diameter watermain is proposed to provide internal site servicing.

Sanitary The total sanitary sewage flow for the residential site plan development is approximately 7.8 L/s. The additional sewerage loading from the subject site is not significant and can be readily accommodated by the existing 250mm sanitary sewer within Mckee Drive. A new 250mm diameter PVC sanitary sewer will be provided with a sanitary control manhole within the private site near the driveway entrance.

Stormwater The residential site plan development will not increase the allowable runoff to the existing municipal storm sewer system. Through the implementation of an orifice pipe design system, superpipe storage & storm tank, oil-grit separator and L.I.D.'s all the Town of Caledon stormwater management water quantity, quality and water balance/erosion control criteria are satisfied.

We trust you will find this submission complete and in order. Should you have any questions, please contact the undersigned.

Respectfully Submitted,

MASONGSONG ASSOCIATES ENGINEERING LIMITED

JAN. 20/17

Professional Engineers
Ontario

Limited Licensee

Name: S. O. GONZALEZ
Number: 100189895
Category: CIVIL See Limitation
Limitations:
This licence is subject to the limitations as detailed on the certificate.
Association of Professional Engineers of Ontario

Steve Omar Gonzalez, PEO L.L., C.E.T.
Sr. Municipal Designer

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Appendix A

Figures

1986 Draft Plan of Subdivision

McKee Drive Plan and Profile

300mm Feedermain Plan and Profile

Site Servicing S-1 & S-2

Grading Plan and Cross Sections

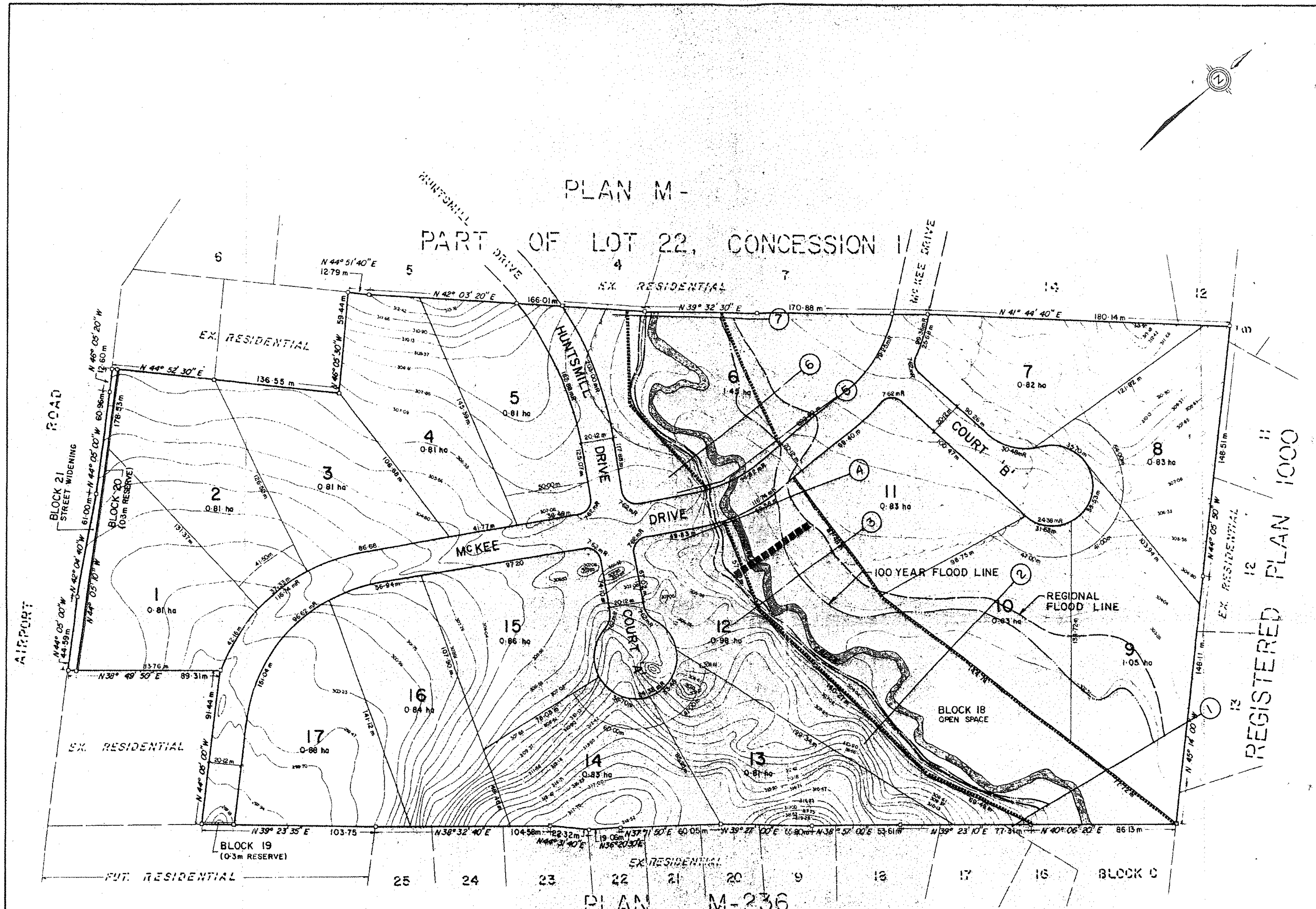
Drainage, Pre and Post Development Plans

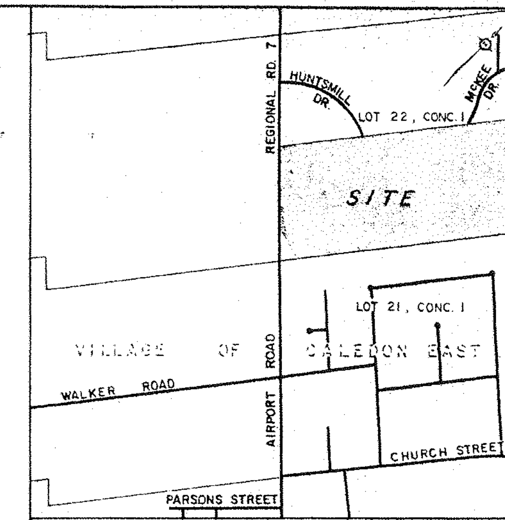
Storm Design Sheets

Sanitary Design Sheet, Connection Demand Table and

Corix Watermain Flow Test

Town of Caledon Std. 110, Region of Peel Std. Std. 1-8-2 and 2-4-3





KEY PLAN SCALE - 1: 10,000

DRAFT PLAN OF SUBDIVISION

PART OF LOT 22, CONCESSION I
E.M.R., TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

OWNER'S AUTHORIZATION

645742 ONTARIO LIMITED,

BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZE PAUL THEIL ASSOCIATES LIMITED TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL

SIGNED: FRANCIS S.M. HO
DATED: March 8, 1986

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: March 5, 1986

A. Kikas
ANTON KIKAS LIMITED
ONTARIO LAND SURVEYOR

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 50(2) OF THE PLANNING ACT

(a) AS SHOWN
(b) AS SHOWN
(c) AS SHOWN
(d) SINGLE FAMILY RESIDENTIAL
(e) AS SHOWN
(f) AS SHOWN
(g) AS SHOWN
(h) PIPED WATER AVAILABLE
(i) SILTY SAND
(j) AS SHOWN
(k) PIPED WATER
(l) AS SHOWN AND SEPTIC TANKS

SITE DATA

LOTS 1 TO 17 inclusive	15·06 ha
ROADS	2·14 ha
BLOCK 18 open space	1·70 ha
BLOCK 19, BLOCK 20 0·3m reserve	·01 ha
BLOCK 21 street widening	·09 ha
TOTAL	19·00 ha

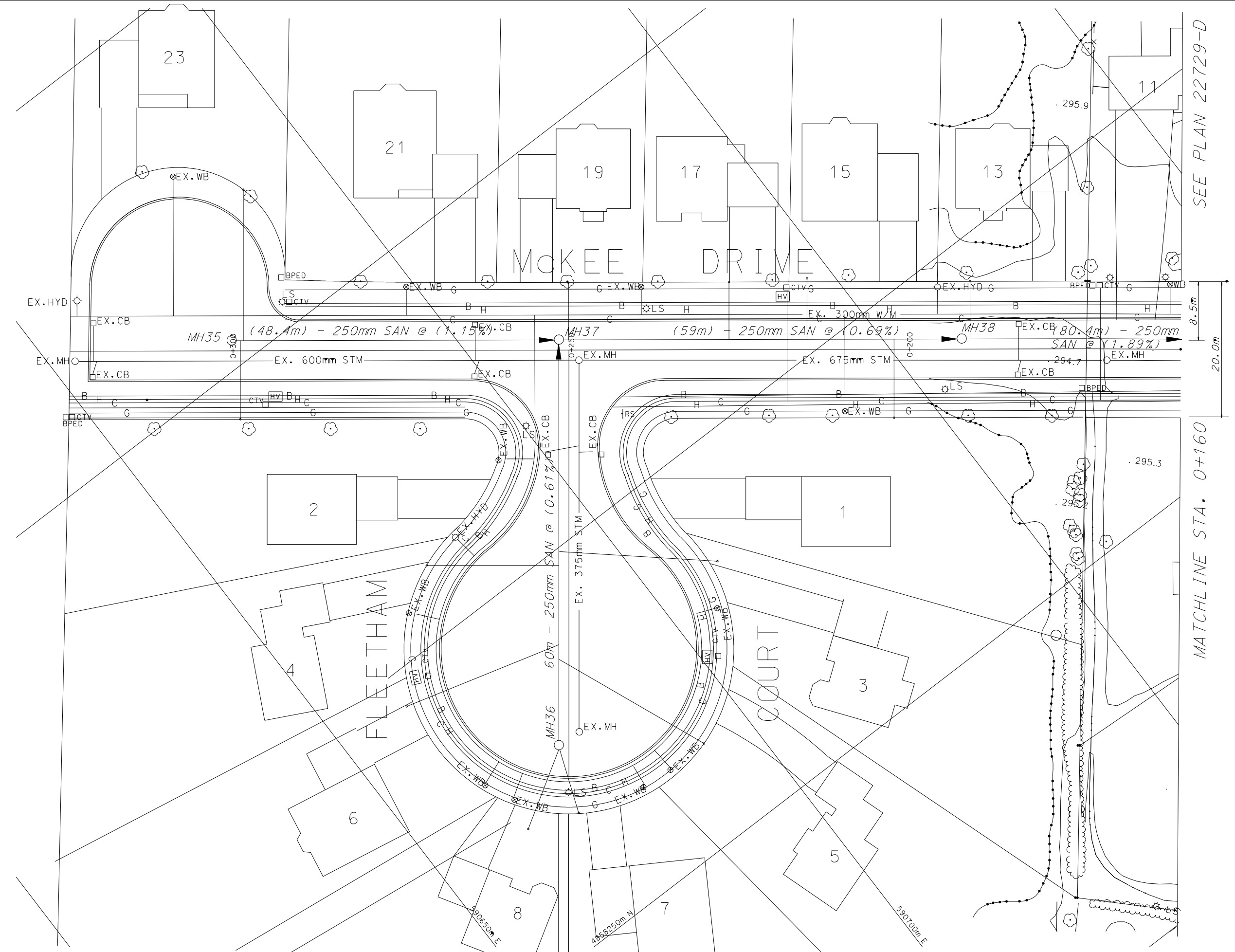
LEGEND

SNOW FENCE / STRAW BALES
EROSION CONTROL WORKS
(1) HEC 2 SECTION LOCATION

REVISED: JAN. 13th 1987
SCALE: 1:1250 DATE: FEBRUARY 1986 JOB Nº: 8563

Figure Nº 2

paul theil associates limited
consulting engineers
700 Balmoral Drive, Bramalea, Ontario



NOTE:

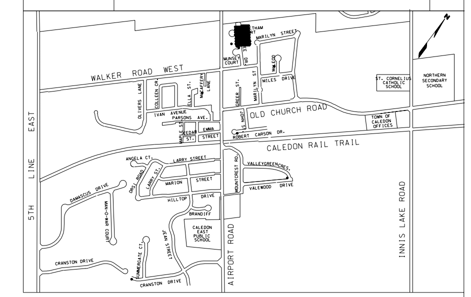
1. SAN. CONNECTION FOR No. 1, 2, 3 AND 5 FLEETHAM COURT WAS INSTALLED UNDER EXISTING STORM.
2. SAN. CONNECTION FOR No. 13, 15, 17, 19, 21 AND 23 WAS INSTALLED MIN. 1.3m FROM OBVERT TO BASEMENT.

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		

SERVICE DATA

REVISIONS

DATE	DETAILS	INIT.
1 MAY 96	CONSTRUCTION RECORD	B.D.

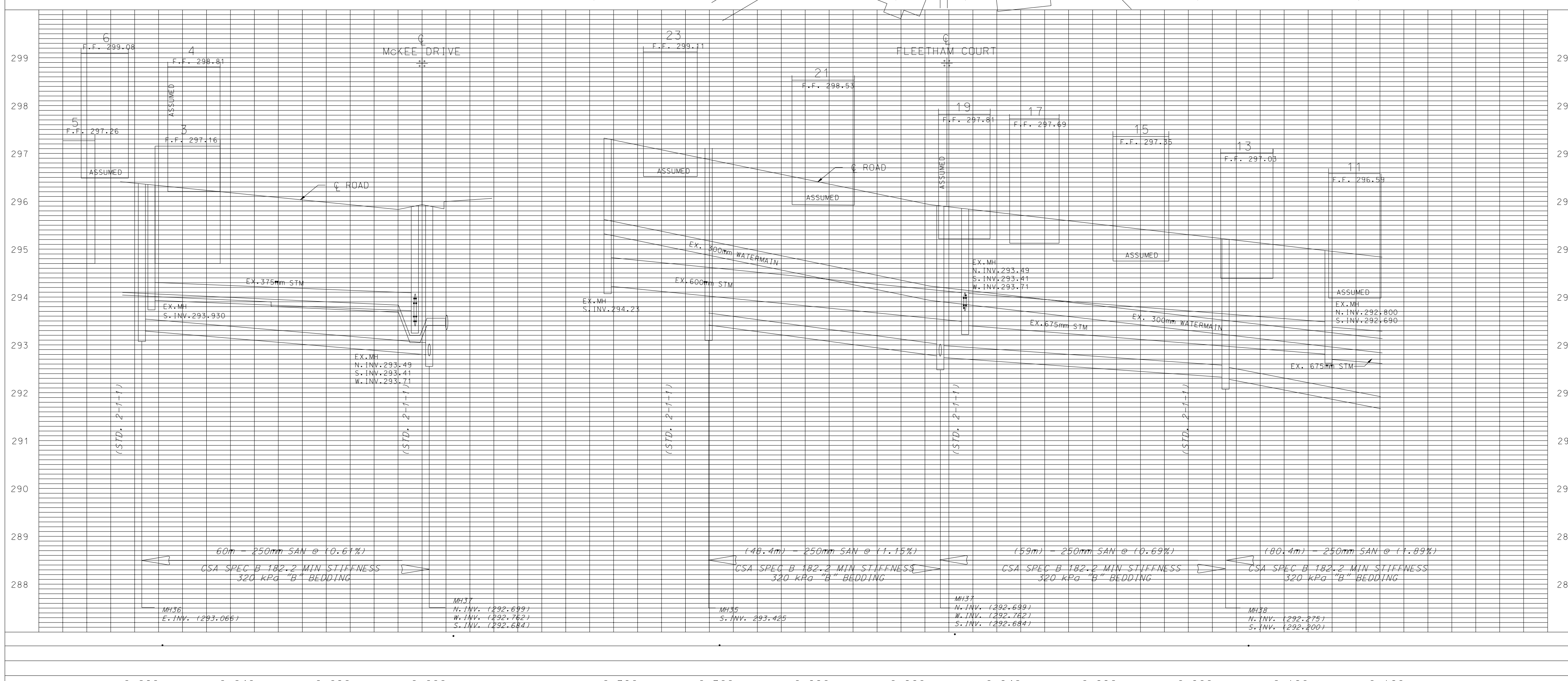


KEY PLAN
SCALE - 1:25,000

NOTE:
THE CONSTRUCTION RECORD DATA INCLUDED ON THIS DRAWING WAS A COMPILATION OF ALL SANITARY, STORM, WATERMAIN AND RECONSTRUCTION DRAWINGS FOR THIS AREA, ALL OTHER DRAWINGS FOR THIS AREA HAVE BECOME OBSOLETE.

ALL CONSTRUCTION DATA IS IN BRACKETS "(   )"

PROFILE FOR FLEETHAM COURT



General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

KMK Consultants Limited
Brampton ◦ Kitchener ◦ Cobalt

Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
TOWN OF CALEDON WORKS DEPT.
BELL TELEPHONE COMPANY
CONSUMERS GAS COMPANY
MINISTRY OF TRANSPORTATION
MINISTRY OF ENVIRONMENT
HYDRO ELECTRIC POWER COMM. OF ONTARIO
ORANGEVILLE CABLE VU LTD.

Region of Peel

Department of Public Works

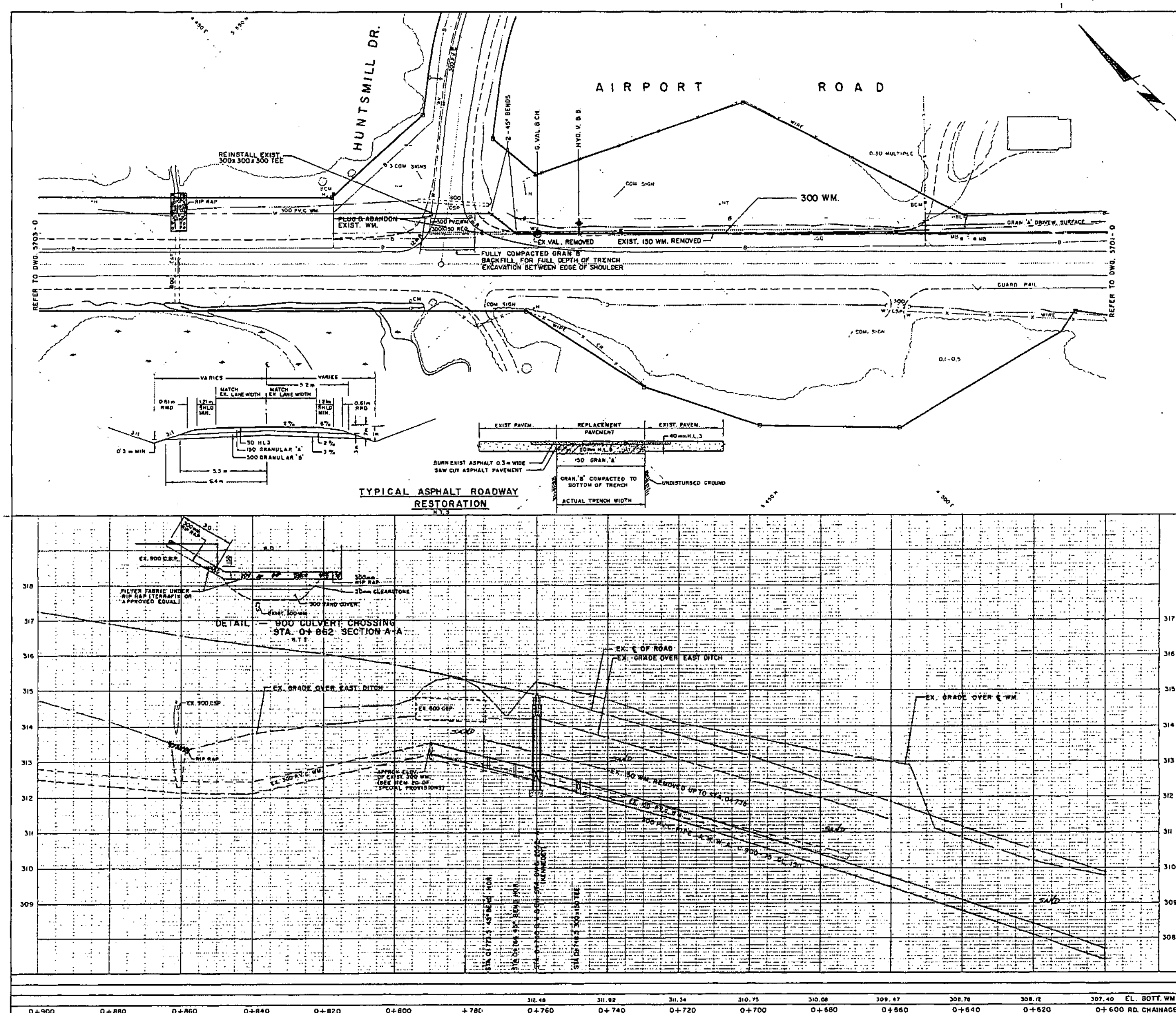
CALEDON EAST SANITARY SERVICING

McKEE DR./FLEETHAM CT.
SANITARY SEWERS

STA. 0+160 TO STA. 0+350

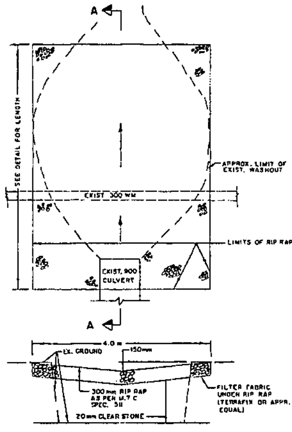
Lots:	File Ref: 1707.03-A-121	Project No. 94-2135
Scale: Hor. 1:500 Ver. 1:50	Drawn by: G.D.	Checked by M.T.
Date: 17 JUNE 94	Sheet: 94 OF 231	Plan No. 22730-D

22730-D (94)



SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		

REVISIONS		
DATE	DETAILS	INIT.
19.12.1983	AS CONSTRUCTED	I.F.



DETAIL — 900 CULVERT CROSSING
STA. 0+862
N.T.S.

General Notes

- — All Driveways Gravel Unless Otherwise Noted.
- — All Service Locations Are Approximate And Must Be Located Accurately In Field.
- Denotes Building — Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. N° Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by
Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL TELEPHONE COMPANY
CONSUMERS GAS COMPANY
MINISTRY OF TRANSPORTATION
MINISTRY OF ENVIRONMENT
HYDRO ELECTRIC POWER COMM. OF ONTARIO
HYDRO ELECTRIC COMM. CITY OF MISSISSAUGA
HYDRO ELECTRIC COMM. CITY OF BRAMPTON
HYDRO ELECTRIC COMM. PORT CREDIT
HYDRO ELECTRIC COMM. STREETSVILLE
CABLE TELEVISION

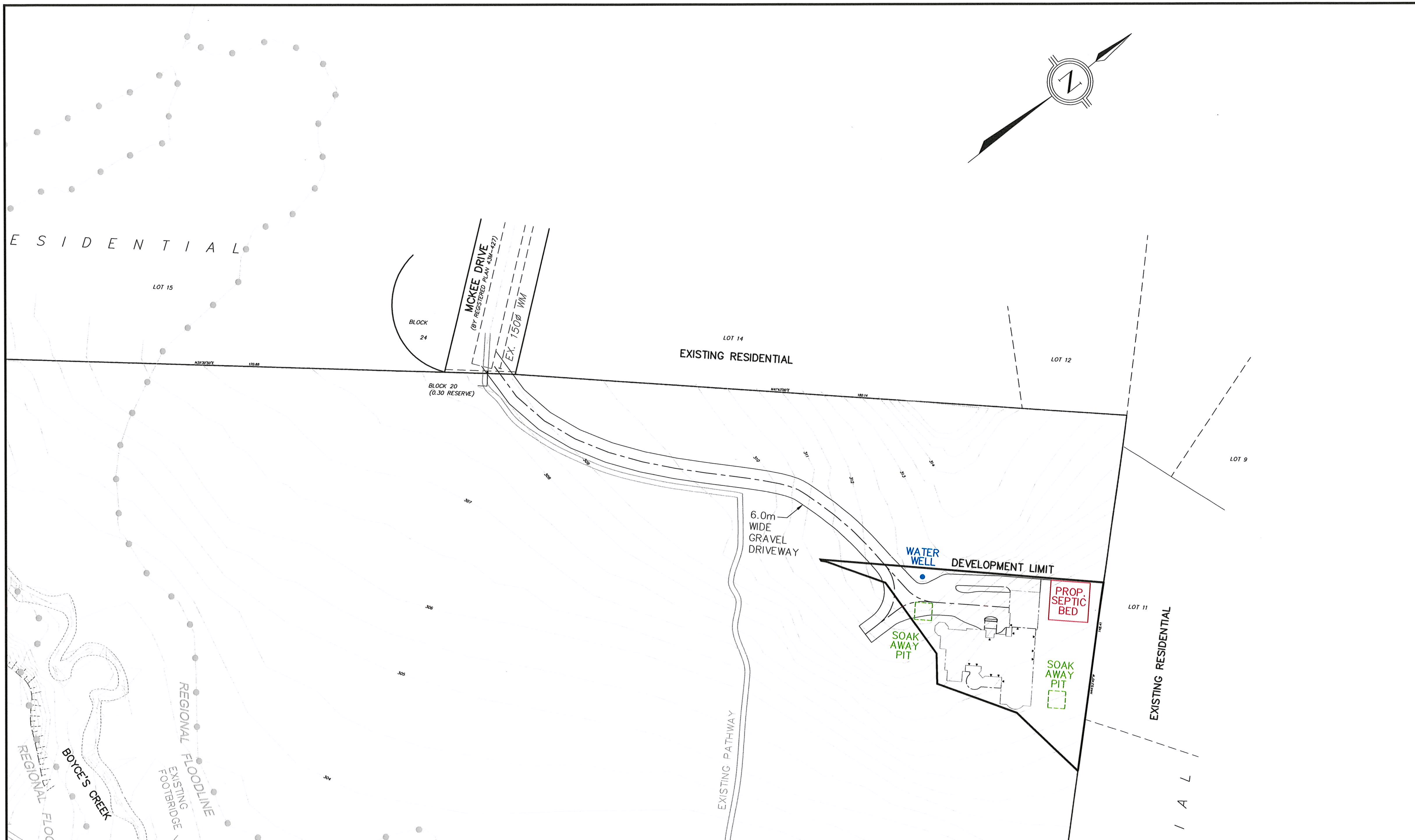
Region of Peel

Department of Public Works

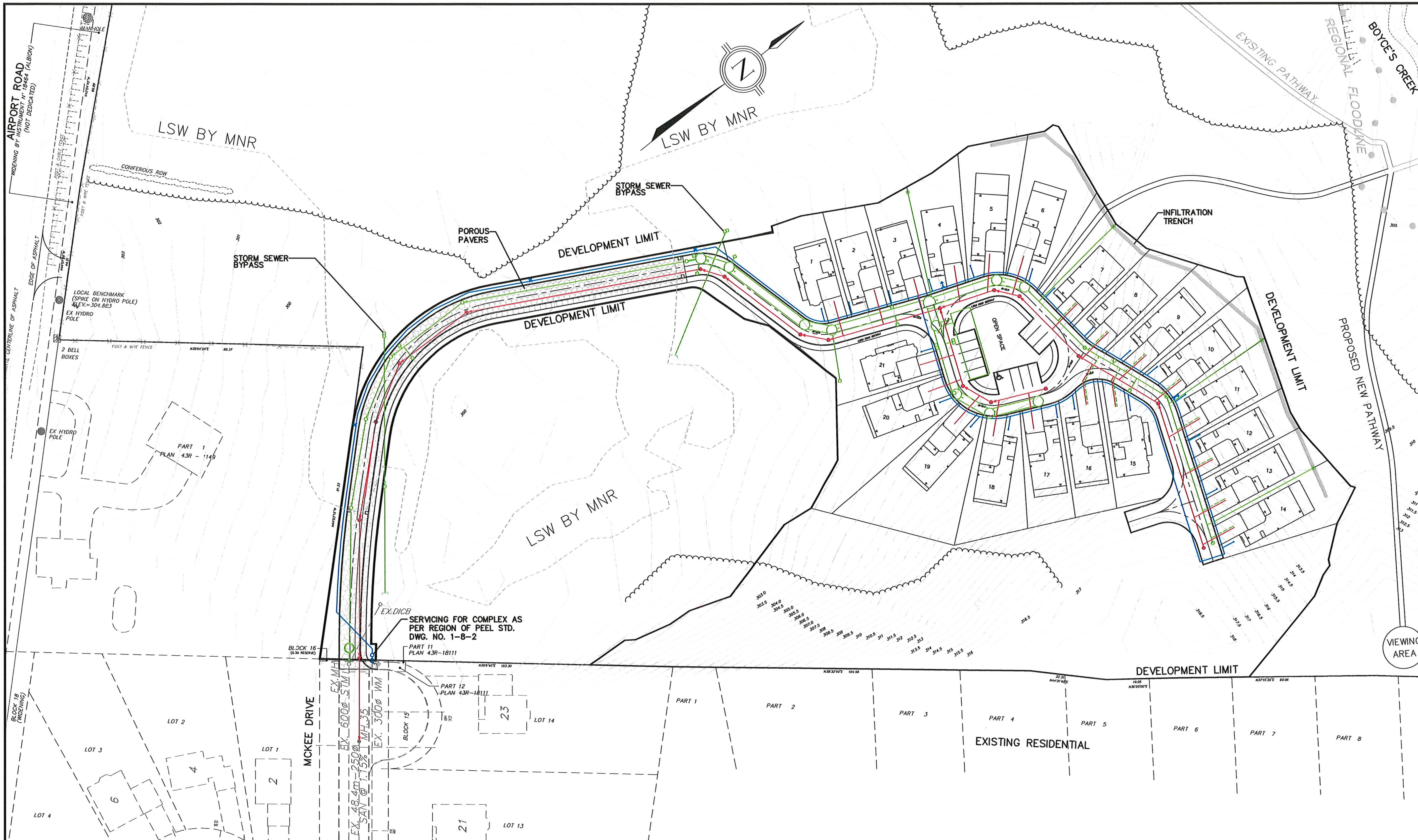
AIRPORT ROAD (REGIONAL ROAD 7)
WALKER RD. TO RESERVOIR (CALEDON EAST)
300 FEEDERMAIN
Sta. 0+600 To Sta. 0+900

Lots	Area C-48	Project No. 83-1530
Scale Hor. 1:500 Ver. 1:100	Drawn by I. FRANKE	Checked by
Date JUNE 83	Sheet 3 of 7	Plan No. 5702-D

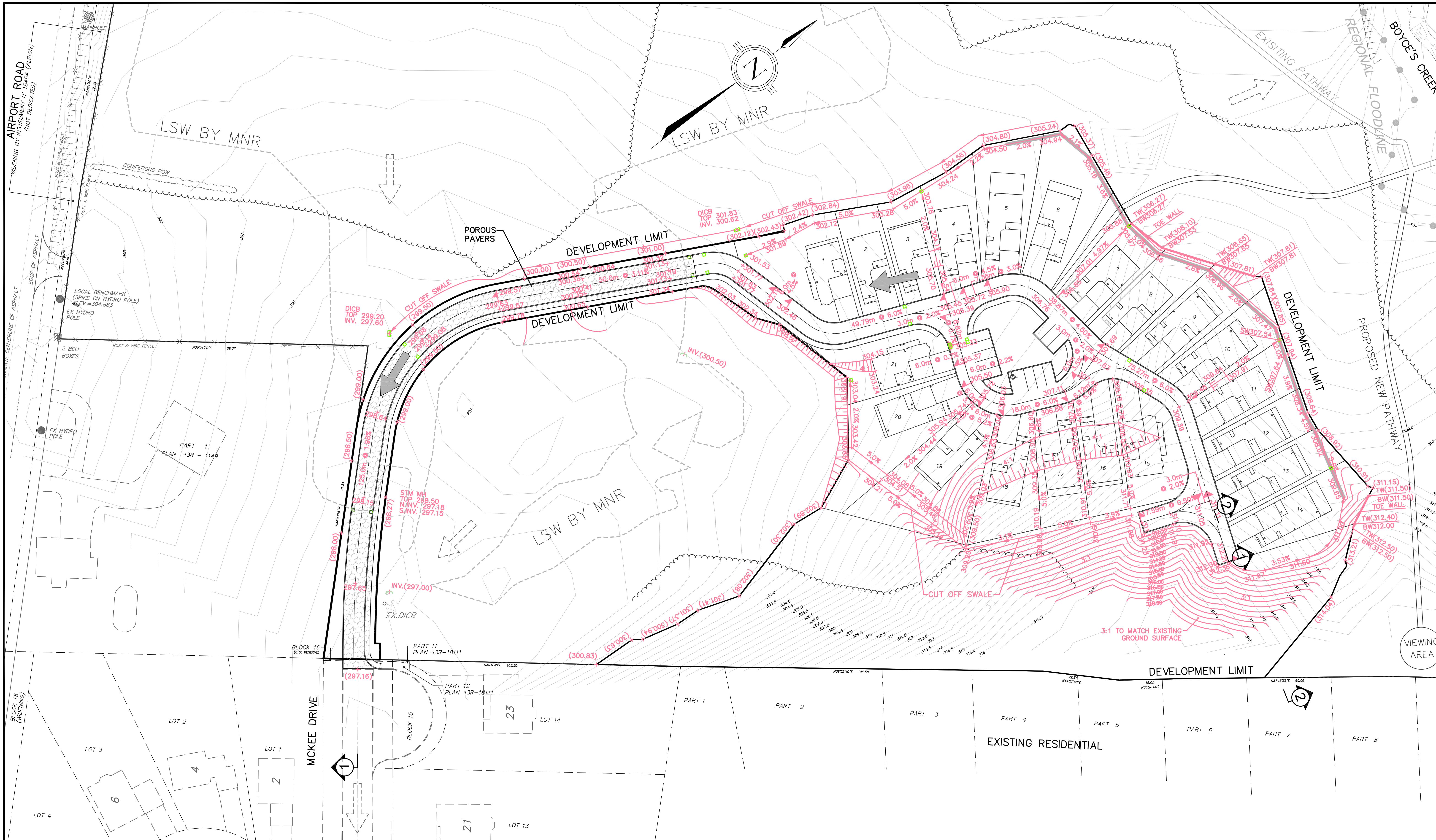
5702-D



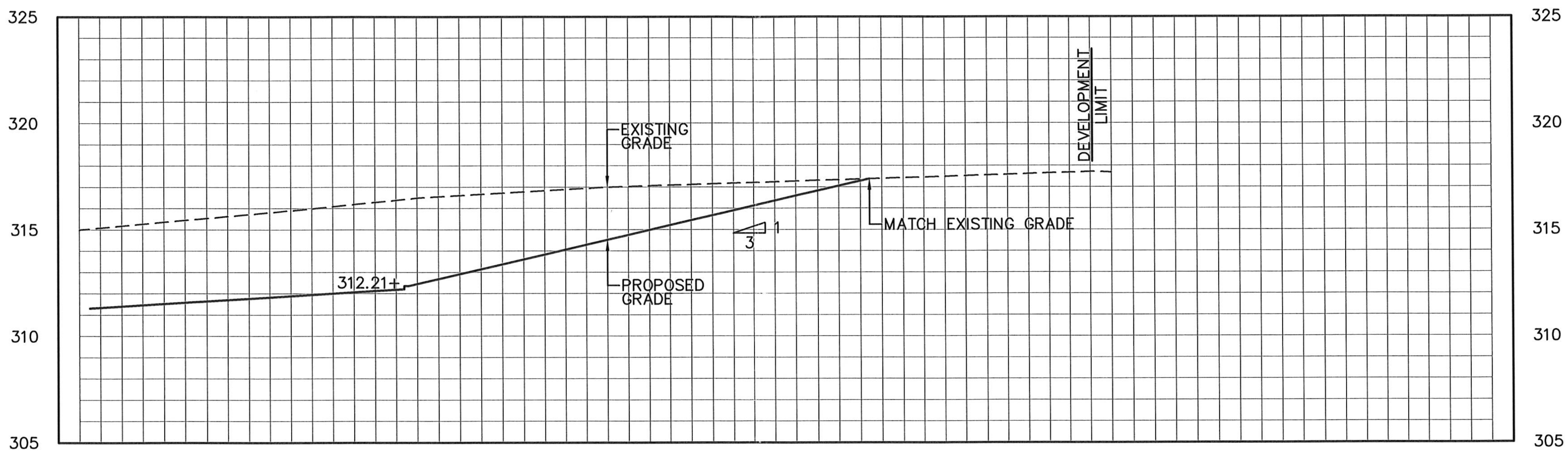
Project:	Dwg.Title:		Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	PROPOSED SERVICING PLAN	MASONGSONG ASSOCIATES 7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:1000	APRIL 2013
			Project Number	Drawing No.
			03-141	S-1



Project:	Dwg.Title:		Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	PROPOSED SERVICING PLAN	MASONGSONG ASSOCIATES 7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:1000	APRIL 2013
			Project Number 03-141	Drawing No. S-2



Project:	Dwg.Title:		Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	PROPOSED GRADING PLAN	MASONGSONG ASSOCIATES 7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:1000	APRIL 2013
			Project Number 03-141	Drawing No. GR1

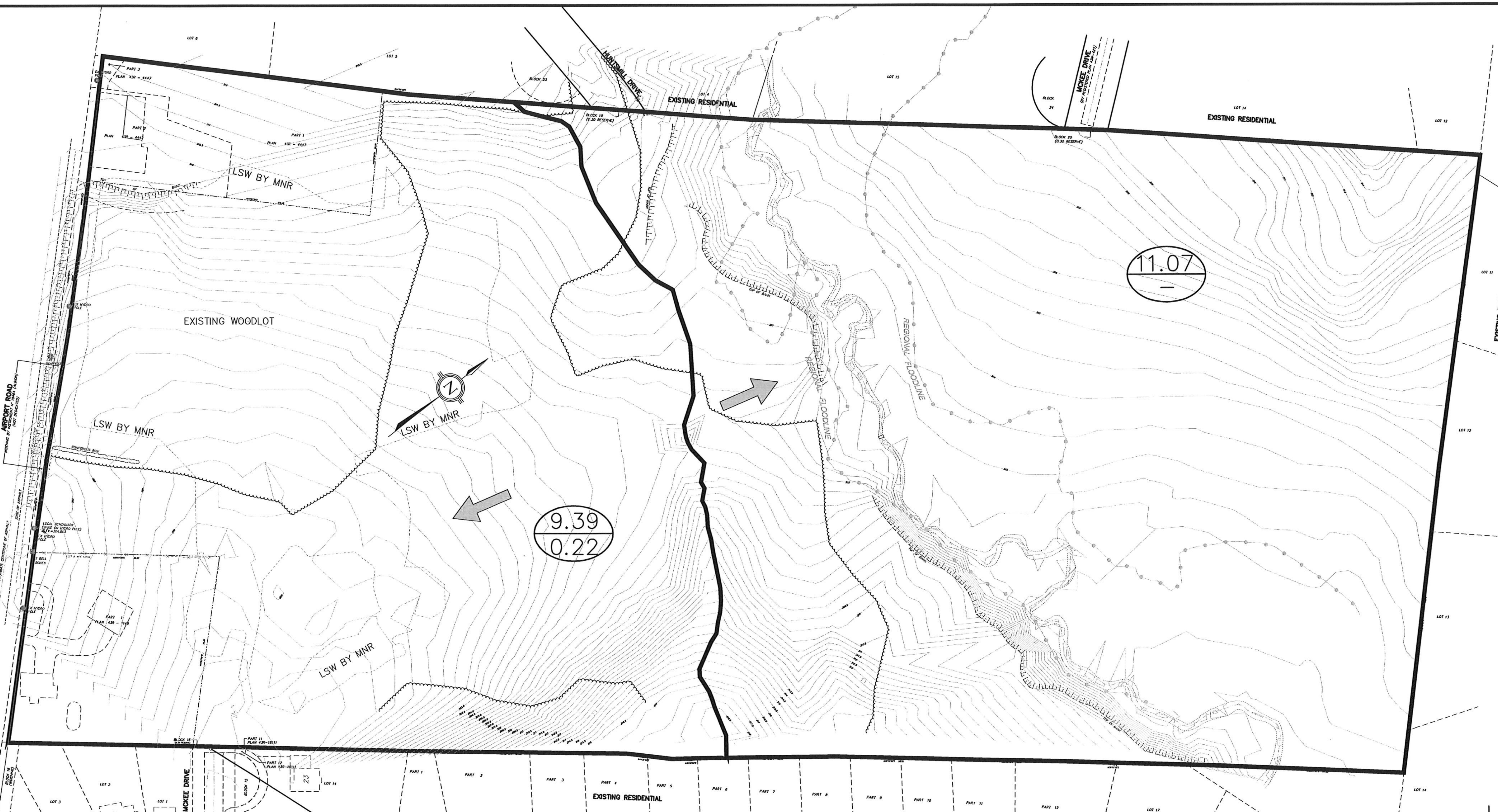


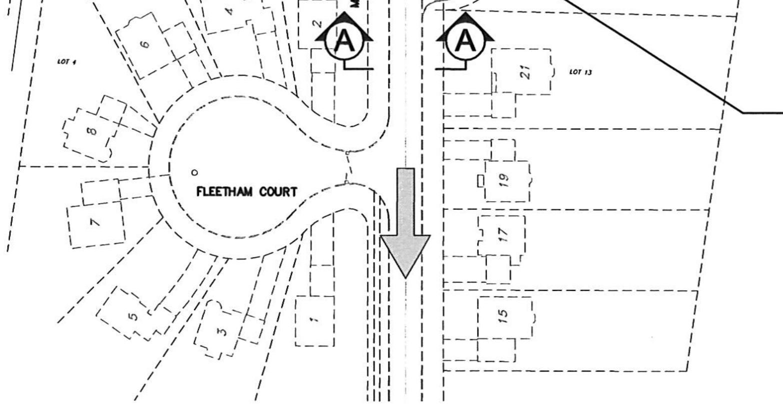
SECTION 2-2
SCALE 1:250

Project: PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	Dwg.Title: CROSS SECTIONS	MASONGSONG ASSOCIATES 7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	Scale: 1:250 / Project Number 03-141	Date: APRIL 2013 / Drawing No. CS1

SECTION 1-1
SCALE 1:250

Project: PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	Dwg.Title: CROSS SECTIONS	MASONGSONG ASSOCIATES	Scale: 1:250	Date: APRIL 2013	
			Project Number: 03-141	Drawing No.: CS2	





TC AIRPORT METHOD

$$TC = \frac{3.26*(1.1-C)*L^{0.5}}{Sw^{0.33}}$$

C = 0.22
L = 312.02 m
Sw = 5.13 %
TC = 29.54 MIN

McKEE DRIVE SUBDIVISION
TOTAL FLOW (2YR MINOR STORM EVENT)

C = 0.22
I_{2YR} = 44.85 mm/hr TC = 29.54 MIN
A = 9.39 ha
Q = 2.78 CIA
Q = (2.78)(0.22)(44.85)(9.39)
Q_{2YR} = 257.57 L/s (TOTAL FLOW)

McKEE DRIVE SUBDIVISION
TOTAL FLOW (100YR MAJOR STORM EVENT)

C = 0.22
I_{100YR} = 116.38 mm/hr TC = 29.54 MIN
A = 9.39 ha
Q = 2.78 CIA
Q = (2.78)(0.22)(116.38)(9.39)
Q_{100YR} = 668.36 L/s (TOTAL FLOW)

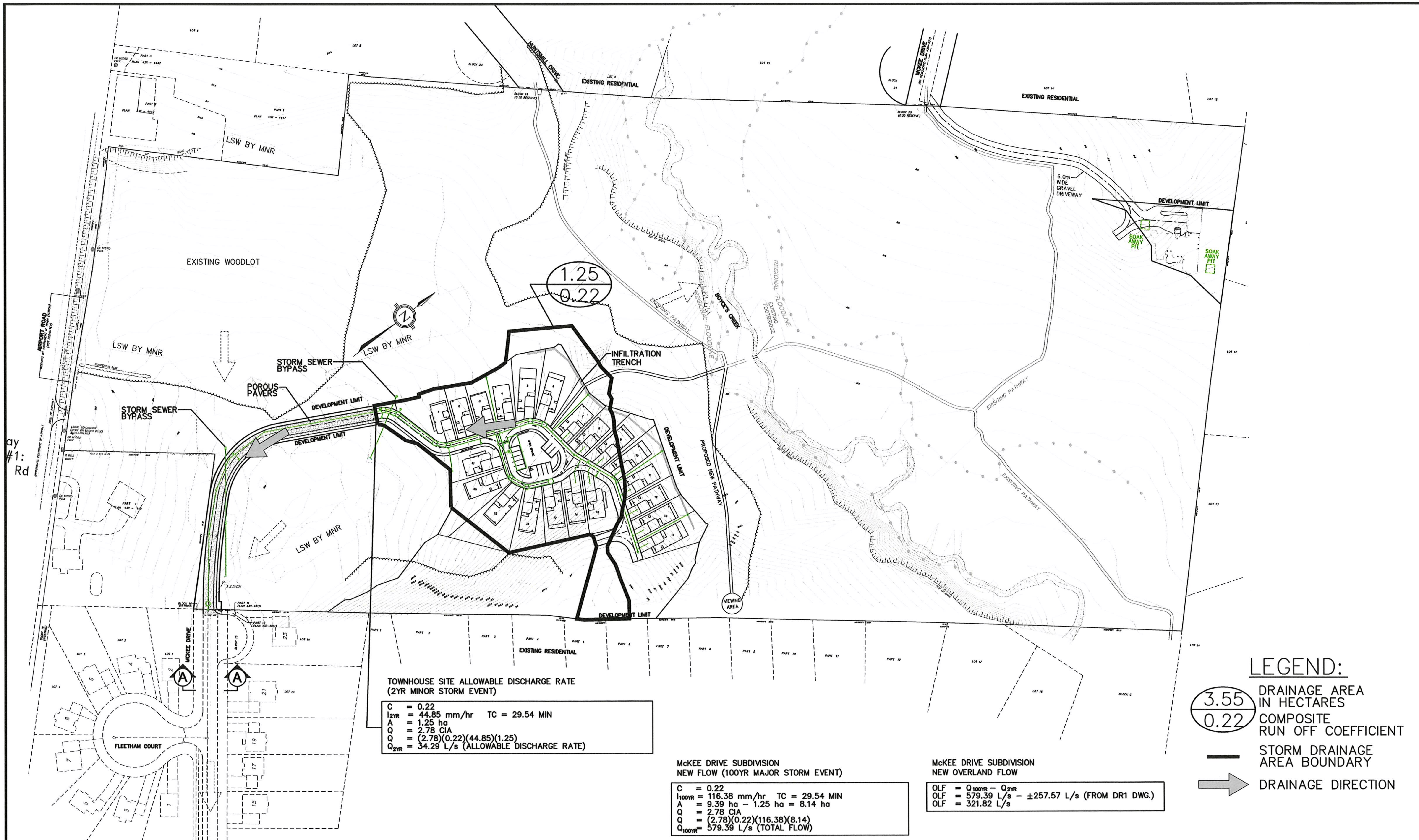
McKEE DRIVE SUBDIVISION
TOTAL OVERLAND FLOW

OLF = $Q_{100YR} - Q_{2YR}$
OLF = 668.36 L/s − 257.57 L/s
OLF = 410.79 L/s

LEGEND:

9.39 — DRAINAGE AREA IN HECTARES
0.22 — COMPOSITE RUN OFF COEFFICIENT
STORM DRAINAGE AREA BOUNDARY
DRAINAGE DIRECTION

Project:	Dwg.Title:			Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	DRAINAGE PLAN	MASONGSONG ASSOCIATES	7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:2000	APRIL 2013
				Project Number	Drawing No.
				03-141	DR1



TOWNHOUSE SITE ALLOWABLE DISCHARGE RATE
(2YR MINOR STORM EVENT)

$C = 0.22$
$I_{2YR} = 44.85$ mm/hr TC = 29.54 MIN
$A = 1.25$ ha
$Q = 2.78$ CIA
$Q = (2.78)(0.22)(44.85)(1.25)$
$Q_{2YR} = 34.29$ L/s (ALLOWABLE DISCHARGE RATE)

McKEE DRIVE SUBDIVISION
NEW FLOW (100YR MAJOR STORM EVENT)

$C = 0.22$
$I_{100YR} = 116.38$ mm/hr TC = 29.54 MIN
$A = 9.39$ ha $-$ 1.25 ha = 8.14 ha
$Q = 2.78$ CIA
$Q = (2.78)(0.22)(116.38)(8.14)$
$Q_{100YR} = 579.39$ L/s (TOTAL FLOW)

McKEE DRIVE SUBDIVISION
NEW OVERLAND FLOW

$OLF = Q_{100YR} - Q_{2YR}$
OLF = 579.39 L/s − ±257.57 L/s (FROM DR1 DWG.)
OLF = 321.82 L/s

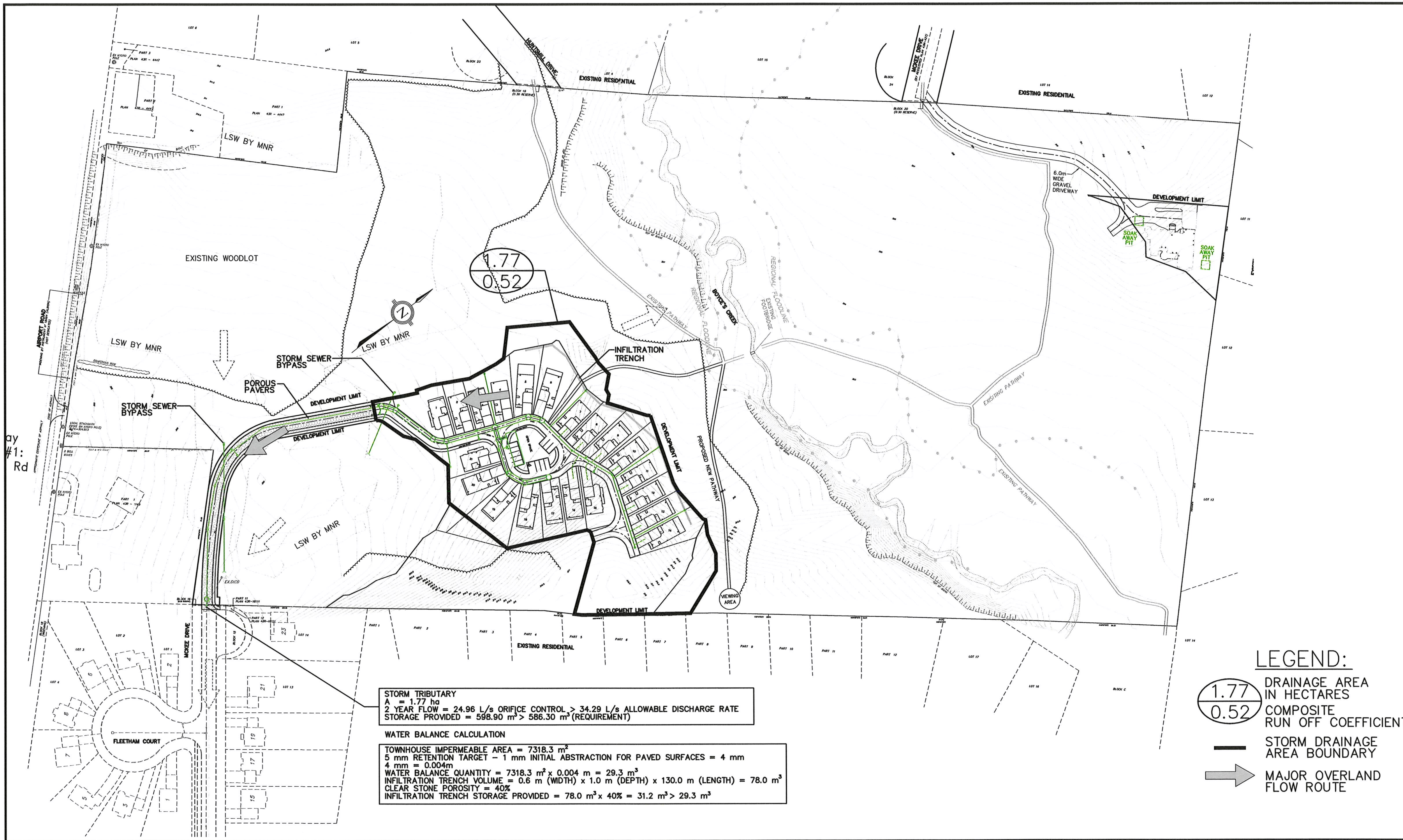
LEGEND:

3.55 / 0.22 — DRAINAGE AREA IN HECTARES / COMPOSITE RUN OFF COEFFICIENT

STORM DRAINAGE AREA BOUNDARY

DRAINAGE DIRECTION

Project:	Dwg.Title:			Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	PRE-DEVELOPMENT PLAN	MASONGSONG ASSOCIATES	7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:2000	APRIL 2013
				Project Number	Drawing No.
				03-141	PRE



STORM TRIBUTARY
A = 1.77 ha
2 YEAR FLOW = 24.96 L/s ORIFICE CONTROL > 34.29 L/s ALLOWABLE DISCHARGE RATE
STORAGE PROVIDED = 598.90 m^3 > 586.30 m^3 (REQUIREMENT)

WATER BALANCE CALCULATION

TOWNHOUSE IMPERMEABLE AREA = 7318.3 m^2
5 mm RETENTION TARGET – 1 mm INITIAL ABSTRACTION FOR PAVED SURFACES = 4 mm
4 mm = 0.004m
WATER BALANCE QUANTITY = 7318.3 m^2 x 0.004 m = 29.3 m^3
INFILTRATION TRENCH VOLUME = 0.6 m (WIDTH) x 1.0 m (DEPTH) x 130.0 m (LENGTH) = 78.0 m^3
CLEAR STONE POROSITY = 40%
INFILTRATION TRENCH STORAGE PROVIDED = 78.0 m^3 x 40% = 31.2 m^3 > 29.3 m^3

LEGEND:

1.77 / 0.52 — DRAINAGE AREA IN HECTARES / COMPOSITE RUN OFF COEFFICIENT

STORM DRAINAGE AREA BOUNDARY

MAJOR OVERLAND FLOW ROUTE

Project:	Dwg.Title:			Scale:	Date:
PROPOSED RESIDENTIAL SITE PLAN & SINGLE ESTATE LOT	POST DEVELOPMENT PLAN	MASONGSONG ASSOCIATES	7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	1:2000	APRIL 2013
				Project Number 03-141	Drawing No. POST

TOWN OF CALEDON
ENGINEERING DEPARTMENT

DESIGN STORM:	2 YEAR RETURN
I (2-YEAR):	I = 1070/ (T.C. + 7.85)^0.8759

PROPOSED RESIDENTIAL SITE PLAN DEVELOPMENT & SINGLE ESTATE LOT

Masongsong Associates Engineering Limited

PREPARED BY:	SG
CHECKED BY:	AI
FILE No.:	2003-141
DATE	09-Jun-15

STORM SEWER DESIGN SHEET

	MANHOLES				A	C	LEG	ACC.	Tc	I	Q_{2yr}	STORM SEWER DESIGN INFORMATION					TIME	Q_{2yr}/Q_{full}
LOCATION	FROM	INVERT	TO	INVERT	area (ha)	runoff coeff.	A x C	A x C	(min)	(2-YR) (mm/hr)	uncontrol (l/s)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)	SECT. (min)	Capacity (%)
McKee Drive Service MH	EX. STM MH	294.23	EX. STM MH	293.49	9.39	0.22	2.07	2.07	29.54	44.85	257.60	600	1.00	73.76	614	2.17	0.57	42%

AREA I.D.	DRAINAGE PLAN TOTAL AREA SUMMARY (sq.m.)			TOTAL AREA (ha.)	COMPOSITE 'R'
	GRASS ('R'=0.20)	PAVED ('R'=0.90)	BUILDING ('R'=0.90)		
WEST DRAINAGE SHED	91865.08	1289.93	732.89	9.39	0.22

Grassed Area:	9.1865	ha.
Paved Area:	0.1290	ha.
Building Area:	0.0733	ha.
SITE AREA:	9.39	ha.
COMPOSITE 'R' VALUE:	0.22	
Percent Impervious:	2.15%	

Table 1

AREA I.D.	POST-DEVELOPMENT TOTAL AREA SUMMARY (sq.m.)			TOTAL AREA (ha.)	COMPOSITE 'R'
	GRASS ('R'=0.25)	PAVED ('R'=0.90)	BUILDING ('R'=0.90)		
SINGLE FAMILY DEVELOPMENT	10406.57	2569.78	4748.52	1.77	0.52

Grassed Area:	1.0407	ha.
Paved Area:	0.2570	ha.
Building Area:	0.4749	ha.
SITE AREA:	1.77	ha.
COMPOSITE 'R' VALUE:	0.52	
Percent Impervious:	41.29%	

Table 2

Table 3 Orifice Sizing Calculation

$$\boxed{Q = CA(2 \times g \times h)^{0.5}}$$

Where:

C =	0.80	*Orifice Coefficient (0.80 Tube, 0.62 Plate)*
A =	0.0044	m^2, *area of orifice(sq.m.)*
g =	9.81	m/s^2, *gravitational constant*
h =	2.54	m, *head = (HWL elevation - springline of orifice)*
d =	**0.075**	**m, orifice diameter**

and:

Invert Elevation =	298.88	m
Springline of Orifice =	298.92	m, *Invert elev + 1/2 of orifice diameter*
HWL Elevation =	301.46	m

Therefore:

Q =	0.0250	m^3/s, Total Flow
	24.96	L/s

Compare:

$Q_{ALLOWABLE}$ =	34.29	L/s

Table 4 100-year Attenuation Volume

On-Site Storage Calculator
CALEDON 100 -Year

Project: SINGLE FAMILY DEV.
Project No.: 03-141
By: S.G.
Date: 27-Mar-13

Location: **SINGLE FAMILY DEVELOPMENT**

A = 1.77 ha.
C = 0.52
Qactual = 0.0250 m^3/s

$$I_{100}=4688/(T_C+17)^{0.9624}$$

t_c (min)	i_{100} (mm/hr)	Q_{100} (m^3/s)	Q_{stored} (m^3/s)	Peak Volume (m^3)	
60	71.685	0.183	0.158	569.934	
61	70.800	0.181	0.156	571.154	
62	69.938	0.179	0.154	572.312	
63	69.096	0.177	0.152	573.410	
64	68.275	0.175	0.150	574.450	
65	67.473	0.173	0.148	575.434	
66	66.691	0.171	0.146	576.364	
67	65.927	0.169	0.144	577.242	
68	65.180	0.167	0.142	578.070	
69	64.451	0.165	0.140	578.848	
70	63.737	0.163	0.138	579.580	
71	63.040	0.161	0.136	580.266	
72	62.358	0.159	0.134	580.908	
73	61.691	0.158	0.133	581.508	
74	61.039	0.156	0.131	582.066	
75	60.400	0.154	0.129	582.584	
76	59.775	0.153	0.128	583.063	
77	59.163	0.151	0.126	583.505	
78	58.563	0.150	0.125	583.910	
79	57.976	0.148	0.123	584.280	
80	57.401	0.147	0.122	584.615	
81	56.837	0.145	0.120	584.918	
82	56.284	0.144	0.119	585.187	
83	55.743	0.143	0.118	585.426	
84	55.211	0.141	0.116	585.634	
85	54.690	0.140	0.115	585.812	
86	54.179	0.139	0.114	585.961	
87	53.678	0.137	0.112	586.082	
88	53.186	0.136	0.111	586.176	
89	52.703	0.135	0.110	586.243	
90	52.229	0.134	0.109	586.285	
91	51.763	0.132	0.107	586.301	***
92	51.306	0.131	0.106	586.292	
93	50.857	0.130	0.105	586.260	
94	50.416	0.129	0.104	586.205	
95	49.983	0.128	0.103	586.127	
96	49.557	0.127	0.102	586.026	
97	49.139	0.126	0.101	585.905	
98	48.727	0.125	0.100	585.762	
99	48.323	0.124	0.099	585.599	
100	47.925	0.123	0.098	585.415	
101	47.534	0.122	0.097	585.212	
102	47.150	0.121	0.096	584.991	

TABLE 5
AVAILABLE STORAGE UNDERGROUND IN SEWERS

FROM	TO	LENGTH BELOW HWL (m)	SIZE (mm)	VOLUME (cu.m.)
MH1	MH2	5.5	1829X1219	12.26
MH2	MH3	24.5	1829X1219	54.62
MH3	MH4	5.0	1829X1219	11.15
MH4	MH5	26.0	1829X1219	57.97
MH5	MH6	18.0	1829X1219	40.13
MH6	MH7	5.5	1829X1219	12.26
MH5	MH10	4.0	1829X1219	8.92
MH10	MH9	18.0	1829X1219	40.13
MH9	MH8	8.5	1829X1219	18.95
MH8	MH11	11.5	1829X1219	25.64
MH10	TANK	3.5	900	2.23
TANK	TANK	1.219 m (HEIGHT)	119.70 m^2 (AREA)	145.91

AVAILABLE STORAGE UNDERGROUND IN MANHOLES
(BELOW ELEVATION of 301.46m HWL) :

MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIAMETER (m)	VOLUME (cu.m.)
MH1	301.460	298.890	3.00	18.17
MH2	301.460	298.960	3.00	17.67
MH3	301.460	299.080	3.00	16.82
MH4	301.460	299.150	3.00	16.33
MH5	301.460	299.280	3.60	22.19
MH6	301.460	299.430	3.00	14.35
MH7	301.460	300.240	3.00	8.62
MH8	301.460	300.000	3.00	10.32
MH9	301.460	299.810	3.00	11.66
MH10	301.460	299.480	3.60	20.15
MH11	301.460	300.240	3.60	12.42

TOTAL VOLUME AVAILABLE UNDERGROUND IN SEWERS AND MANHOLES (cu.m.) ***598.89***

>586.30 REQUIRED

Stormceptor® FORTERRA

Detailed Stormceptor Sizing Report – Caledon Residential Site Plan

Project Information & Location			
Project Name	Caledon Residential Site Plan	Project Number	03-141
City	Town of Caledon	State/ Province	Ontario
Country	Canada	Date	4/18/2016
Designer Information		**EOR Information (optional)**	
Name	Steve Gonzalez	Name	
Company	Masongsong Associates Engineering Limited	Company	
Phone #	905-944-0162	Phone #	
Email	steveg@maeng.ca	Email	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Caledon Residential Site Plan
Recommended Stormceptor Model	STC 3000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	City of Toronto PSD
Rainfall Station	TORONTO CENTRAL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 300	62
STC 750	73
STC 1000	74
STC 1500	75
STC 2000	78
STC 3000	80
STC 4000	84
STC 5000	85
STC 6000	87
STC 9000	90
STC 10000	90
STC 14000	92
Stormceptor MAX	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	3329
Rainfall Station Name	TORONTO CENTRAL	**Total Rainfall (mm)**	13189.2
Station ID #	0100	**Average Annual Rainfall (mm)**	732.7
Coordinates	45°30'N, 90°30'W	**Total Evaporation (mm)**	481.6
Elevation (ft)	328	**Total Infiltration (mm)**	8286.1
Years of Rainfall Data	18	**Total Rainfall that is Runoff**	4421.5

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	1.98
Imperviousness %	36.9

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

City of Toronto PSD		
Particle Diameter (microns)	Distribution %	Specific Gravity
10.0	20.0	2.65
30.0	10.0	2.65
50.0	10.0	2.65
95.0	20.0	2.65
265.0	20.0	2.65
1000.0	20.0	2.65

Site Name	Caledon Residential Site Plan

Site Details

Drainage Area	
Total Area (ha)	1.98
Imperviousness %	36.9

Surface Characteristics	
Width (m)	281.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (lps)	0

Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	

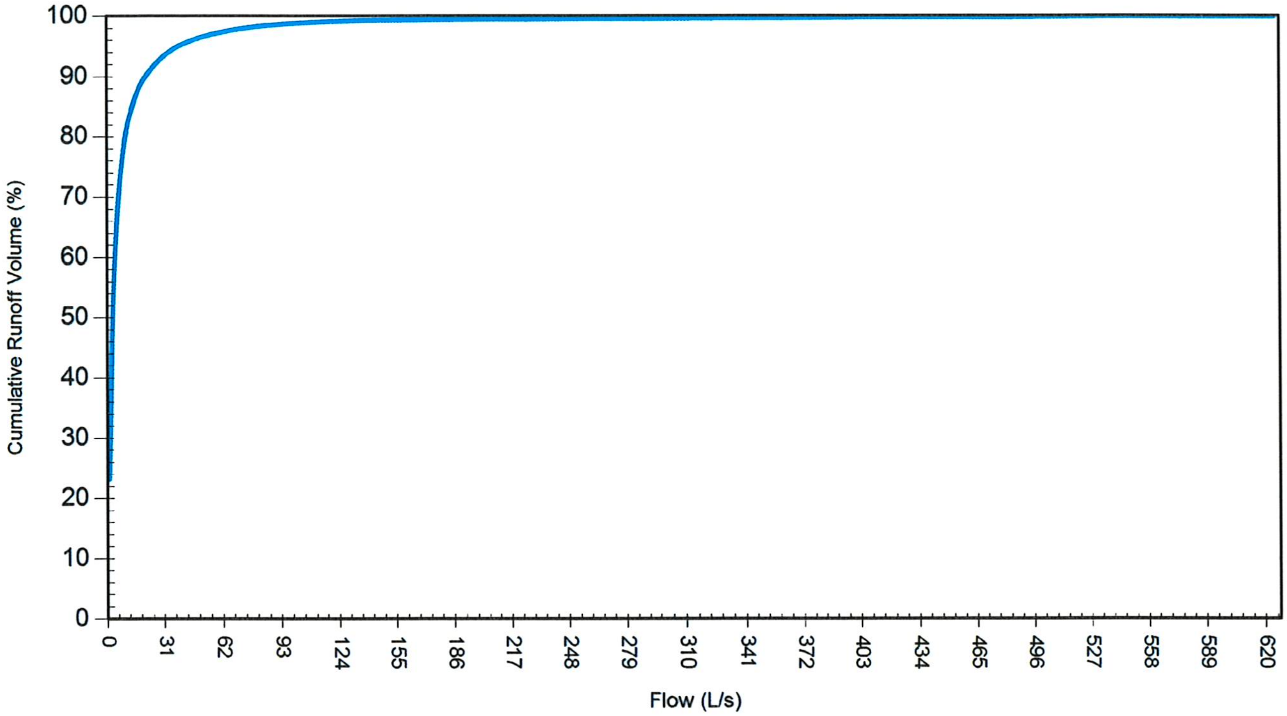
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters	
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	20.46	67.882	23.2
4	50.93	37.41	57.7
9	68.48	19.86	77.5
16	76.645	11.694	86.8
25	80.907	7.432	91.6
36	83.438	4.9	94.5
49	85.069	3.269	96.3
64	86.118	2.22	97.5
81	86.819	1.519	98.3
100	87.286	1.052	98.8
121	87.581	0.757	99.1
144	87.698	0.64	99.3
169	87.78	0.558	99.4
196	87.861	0.477	99.5
225	87.932	0.406	99.5
256	87.98	0.358	99.6
289	88.018	0.32	99.6
324	88.05	0.288	99.7
361	88.083	0.255	99.7
400	88.118	0.22	99.8
441	88.155	0.183	99.8
484	88.191	0.147	99.8
529	88.218	0.12	99.9
576	88.247	0.091	99.9
625	88.276	0.062	99.9

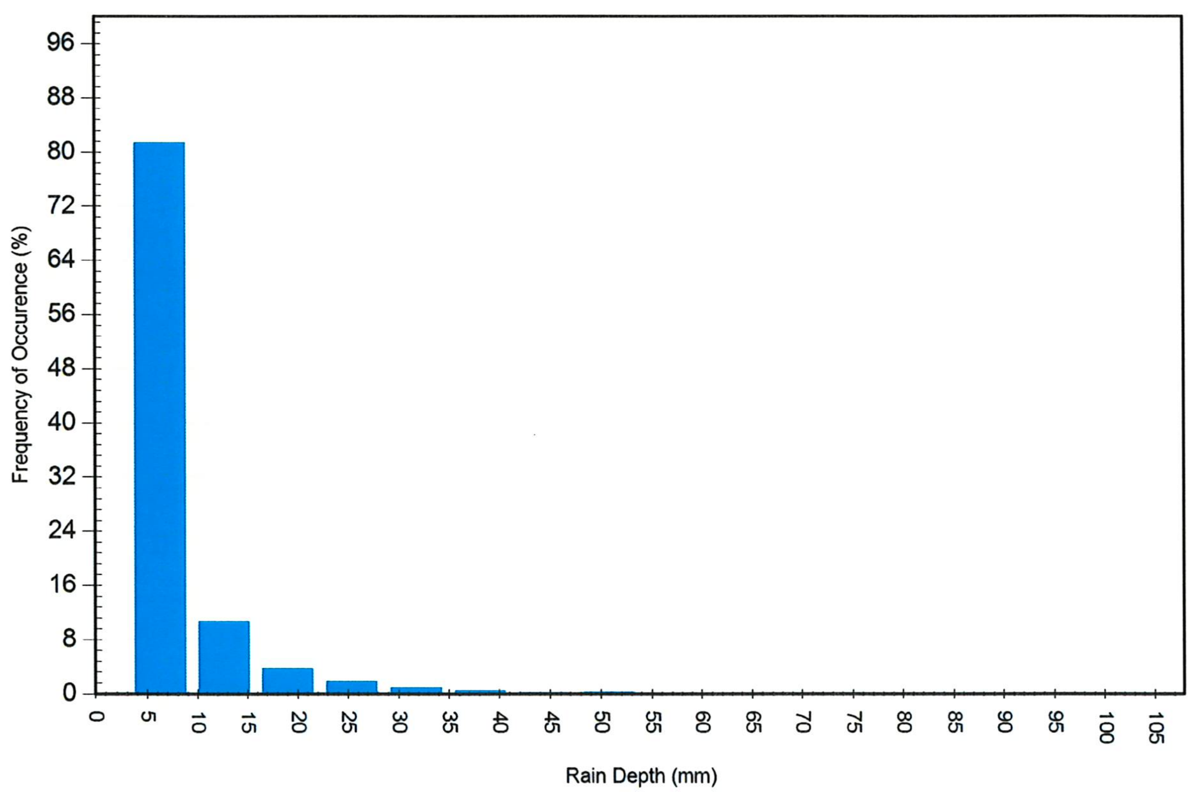
Cumulative Runoff Volume by Runoff Rate

For area: 1.98(ha), imperviousness: 36.9%, rainfall station: TORONTO CENTRAL



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2711	81.4	3900	29.6
12.70	356	10.7	3266	24.8
19.05	127	3.8	1991	15.1
25.40	62	1.9	1346	10.2
31.75	32	1.0	905	6.9
38.10	16	0.5	541	4.1
44.45	8	0.2	334	2.5
50.80	11	0.3	519	3.9
57.15	2	0.1	106	0.8
63.50	2	0.1	120	0.9
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	1	0.0	77	0.6
88.90	1	0.0	85	0.6
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths



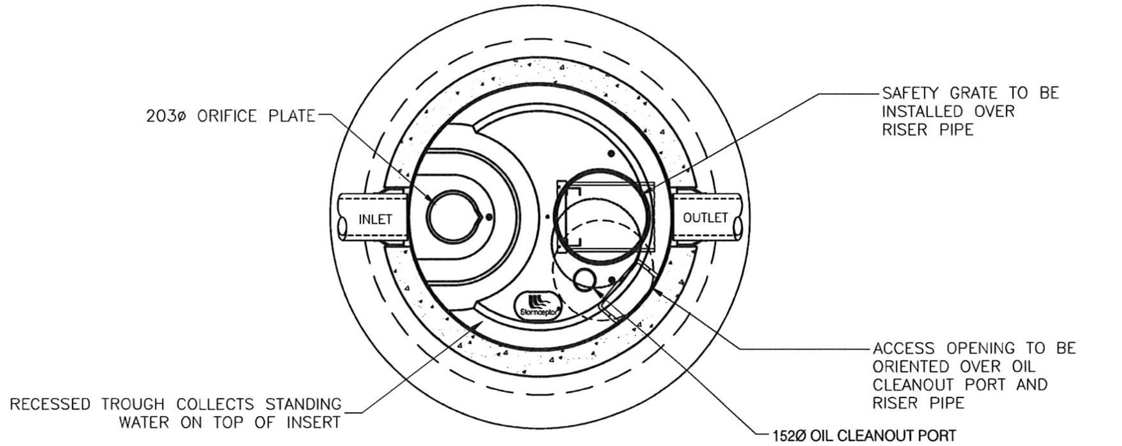
Stormceptor®

FORTERRA™

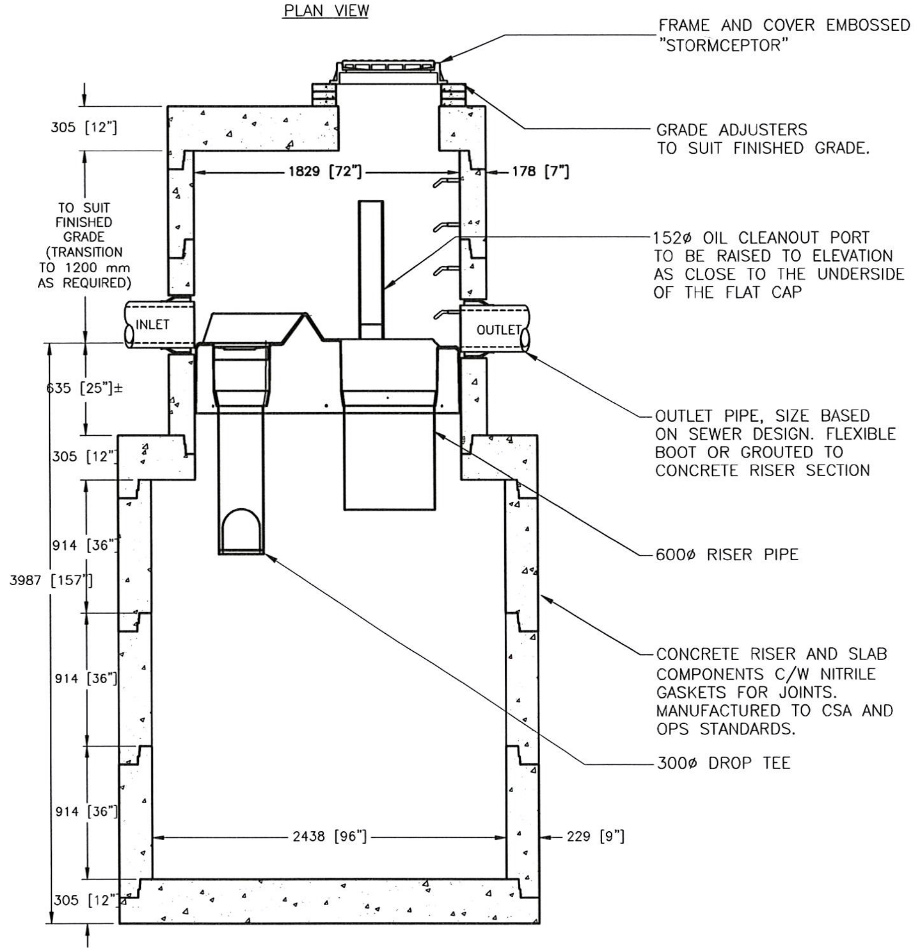
For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

DRAWING NOT TO BE USED FOR CONSTRUCTION

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:
United States Patent No. 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690 • 7,582,216 • 7,666,303 | Australia Patent No. 693,164 • 707,133 • 729,096 • 779,401 • 289,647 • 2008,279,378 • 2008,288,900 | Canadian Patent No. 2,009,280 • 2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 | Indonesian Patent No. 007058 | Japan Patent No. 3581233 • 9-11476 | Korea Patent No. 10-1451593 • 0519212 | Malaysia Patent No. 118987 | New Zealand Patent No. 314,646 • 583,583 • 583,008 | South African Patent No. 2010/00683 • 2010/01796 |



PLAN VIEW



SECTION VIEW

Stormceptor®

imbrium®
WWW.IMBRIUMSYSTEMS.COM
605 GLOBAL WAY, SUITE 113, LINTHICUM, MD 21231
USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

STC 3000 STANDARD MODEL	REV #	DATE	REVISION DESCRIPTION	BY	SHEET NUMBER
####					1
					OF 1
DATE:########	SCALE: 50	PROJECT No.: #####	DRAWN: ###		CHECKED: ###

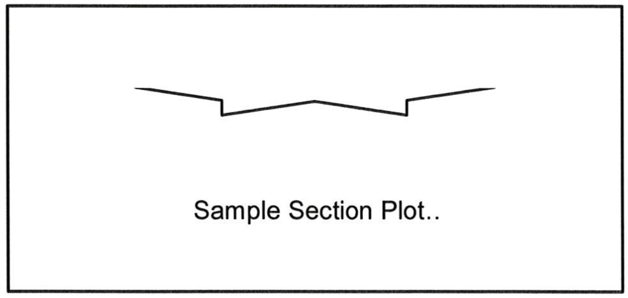
I:\IMBRIUM\PRIVATE\CAD\STANDARD PRODUCT LINE\STORMCEPTOR STC\STC - NEW IMBRIUM METRIC TEMPLATES\STC 3000.DWG 1/6/2015 11:30 AM

Generalized Cross Section Capacity Analysis

SECTION A-A

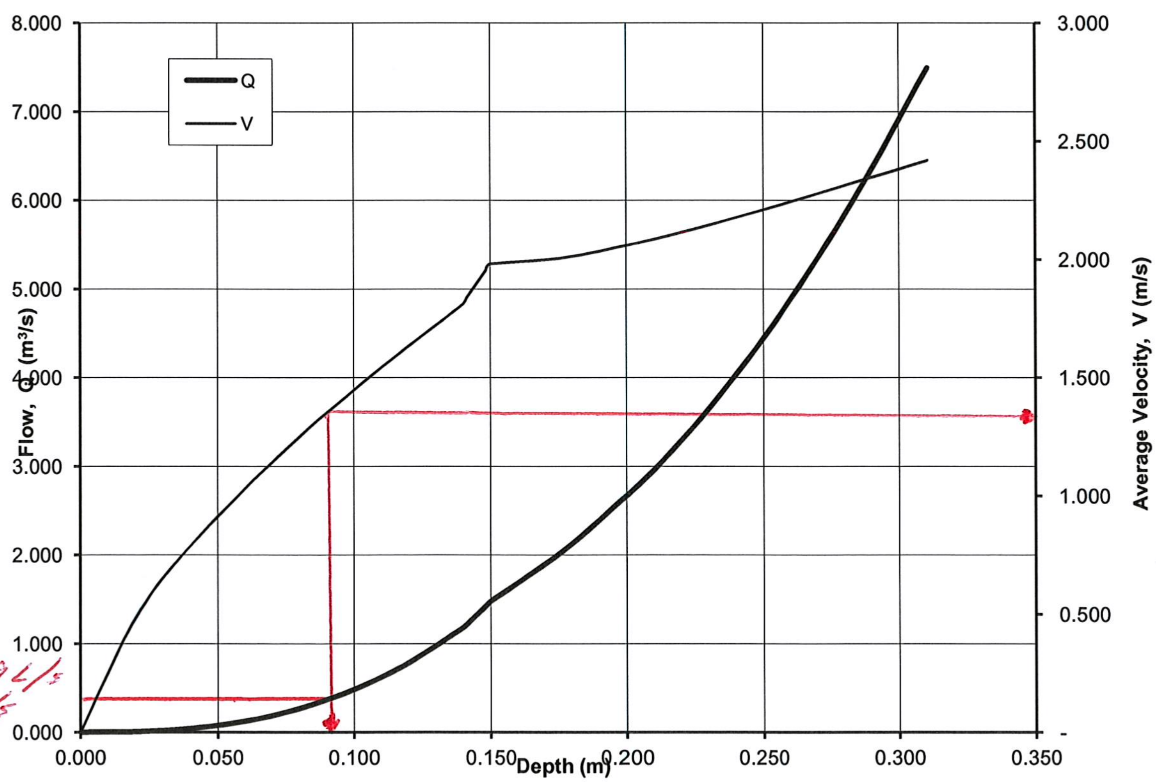
PRE-DEVELOPMENT

Channel Width	20.00	m
Bottom Length	9.30	m
Crossfall:	-0.030	m/m
	0.150	m
Channel Roughness:	0.013	Manning n
Longitudinal Slope:	0.0200	m/m
Side Slope	0.030	m/m
Side Roughness:	0.020	Manning n
Side Slope Length	5.35	m
Graph Exageration:	7.50	Vertical
Max Depth of Flow	310.50	mm
Max Flow	$\boxed{7.4931}$	m^3/s



Case 1: Crown LOWER than top of Curb

Cross-Section Rating Curve
Flow and Velocity



V = 1.35 m/s

OLF = 410.79 L/s
or 0.411 m³/s

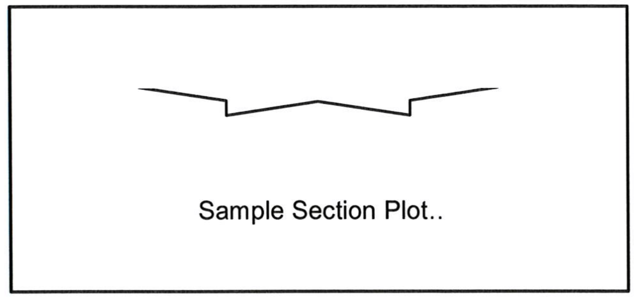
D = 0.09 m
or 90 mm

Generalized Cross Section Capacity Analysis

SECTION A-A

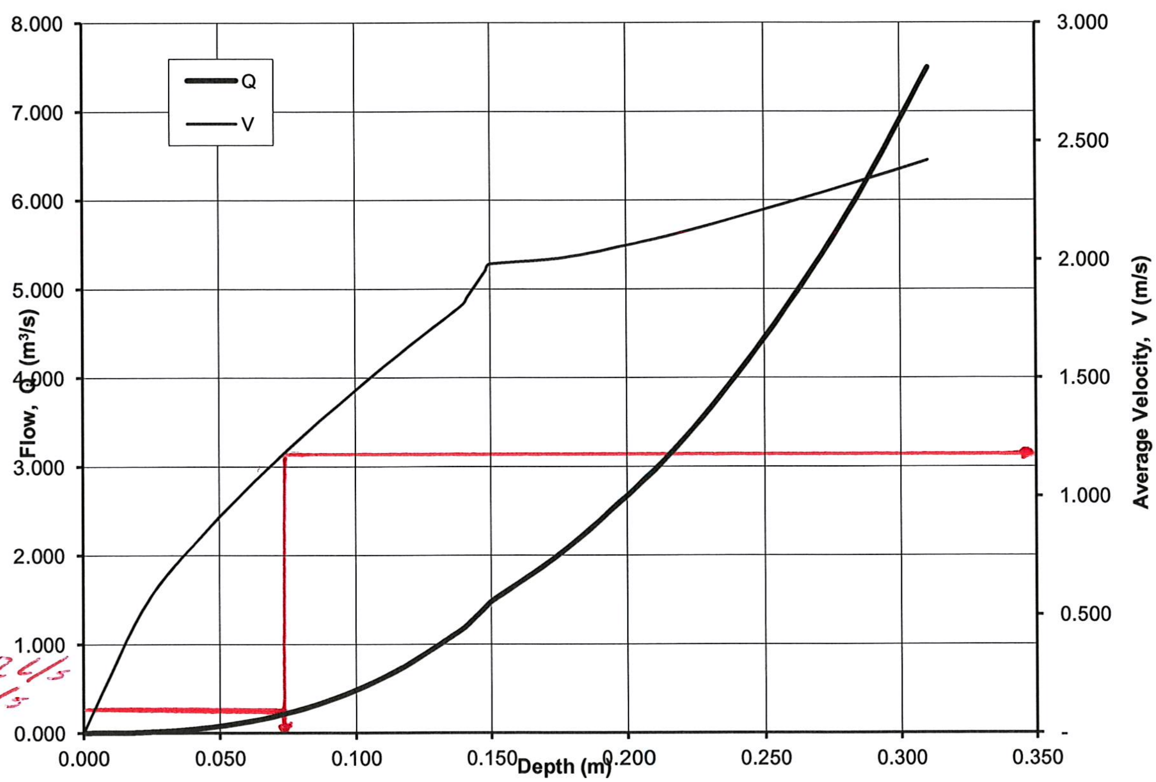
POST DEVELOPMENT

Channel Width	20.00	m
Bottom Length	9.30	m
Crossfall:	-0.030	m/m
	0.150	m
Channel Roughness:	0.013	Manning n
Longitudinal Slope:	0.0200	m/m
Side Slope	0.030	m/m
Side Roughness:	0.020	Manning n
Side Slope Length	5.35	m
Graph Exageration:	7.50	Vertical
Max Depth of Flow	310.50	mm
Max Flow	$\boxed{7.4931}$	m^3/s



Case 1: Crown LOWER than top of Curb

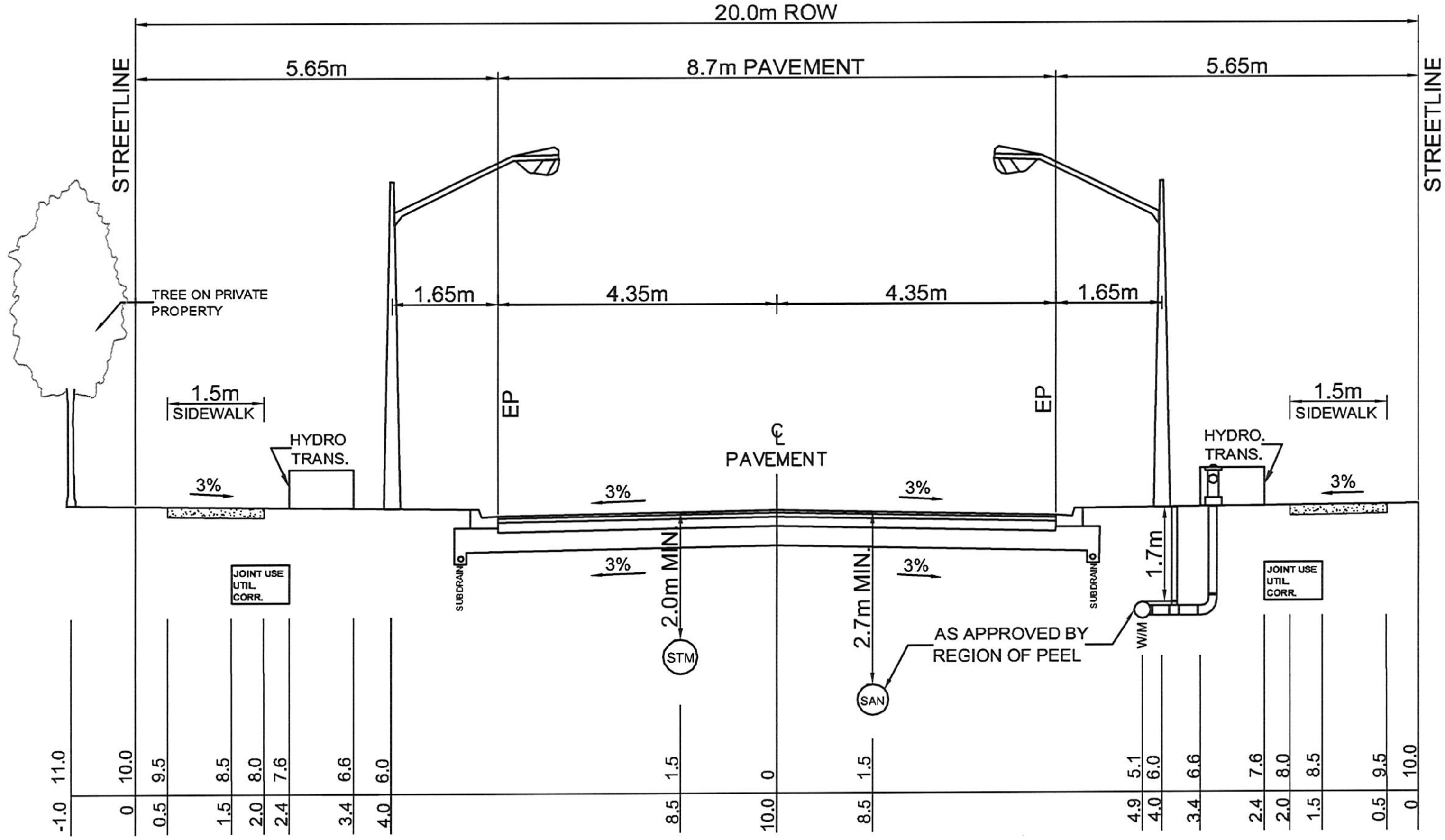
Cross-Section Rating Curve
Flow and Velocity



OLF = 321.82 L/s
or 0.322 m³/s

D = 0.075 m
or 75mm

EXISTING McKEE DRIVE



NOTES:
1. UTILITY CORRIDOR TO HAVE A MINIMUM COVER OF 0.9m.
2. WATERMAIN TO HAVE MINIMUM COVER OF 1.7m.
3. THE FOLLOWING IS A MINIMUM ROAD BASE AND WILL REQUIRE A SOILS REPORT VERIFICATION
   40mm HL3
   65mm HL8
   150mm GRANULAR "A"
   300mm GRANULAR 'B'
4. THE BOULEVARDS REQUIRE A MINIMUM OF 300mm OF TOPSOIL AND NURSERY SOD
5. TREES TO BE PLACED IN LOCATIONS PER APPROVED LANDSCAPE PLAN
6. STREETLIGHT FIXTURE PER APPROVED TOWN STANDARD.
7. ON A CRESCENT THE WATERMAIN SHALL BE PLACED ON THE OUTSIDE.
8. FULL LENGTH MINIMUM 100MM DIA.SUB-DRAINS C/W FILTERCLOTH SHALL BE INSTALLED TO TOWN OF CALEDON STANDARD NO. 219.
9. SUB-GRADE SHALL BE COMPACTED TO A MINIMUM 95% OF S.P.D. AT OPTIMUM MOISTURE CONTENT.
10. WHERE POSSIBLE MANHOLE LIDS TO BE LOCATED OUT OF TIRE LANE OF TRAFFIC.
11. ESTATE RESIDENTIAL 4.0 METERS LANE WIDTH.

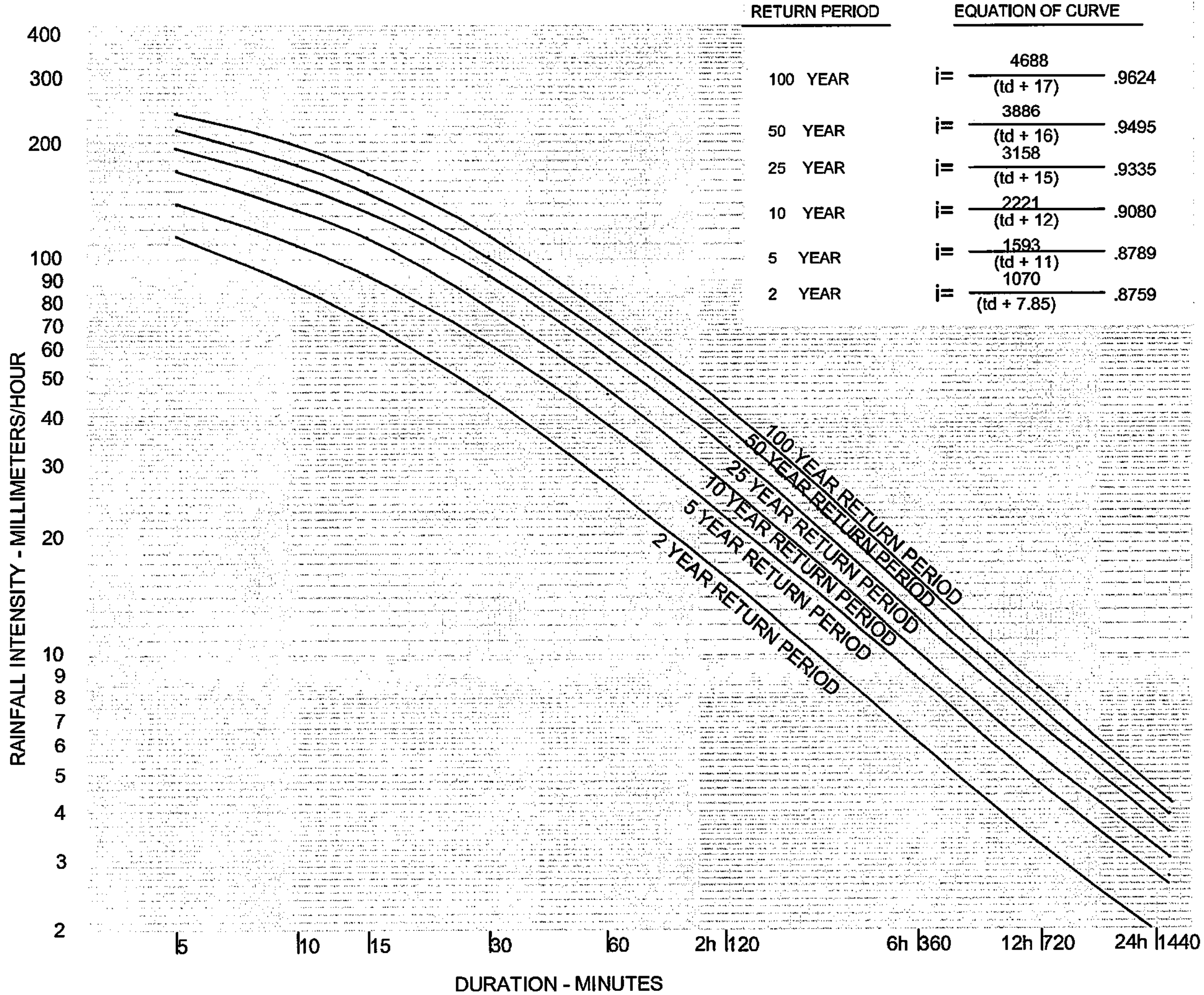
TOWN OF CALEDON

20.0m LOCAL URBAN/RURAL
9.3m ROADWAY (8.7m PAVEMENT)

NO.	REVISION	APR'D	DATE
4	DIMENSION AND TEXT REVISION		JAN. 09
3	DIMENSION, LAYOUT REVISION		JULY 08
2	DIMENSION EDIT, STD No. 201 NOW 203		JUNE 08
1	OFFSETS		APRIL 08

APR'D: C.C.	DATE: 19/01/00
DRAWN: BJM	SCALE: N.T.S.

STANDARD No. 203



RETURN PERIOD	EQUATION OF CURVE
100 YEAR	$i = \frac{4688}{(td + 17)^{.9624}}$
50 YEAR	$i = \frac{3886}{(td + 16)^{.9495}}$
25 YEAR	$i = \frac{3158}{(td + 15)^{.9335}}$
10 YEAR	$i = \frac{2221}{(td + 12)^{.9080}}$
5 YEAR	$i = \frac{1593}{(td + 11)^{.8789}}$
2 YEAR	$i = \frac{1070}{(td + 7.85)^{.8759}}$

INLET TIMES

SUBURBAN RESIDENTIAL	
(ROOF DRAINS UNCONNECTED)	15 min
(ROOF DRAINS CONNECTED)	10 min
SUBURBAN, COMMERCIAL, INDUSTRIAL MULTIPLE FAMILY	10 min
DOWNTOWN COMMERCIAL, HIGH DENSITY APARTMENTS, EXPRESSWAYS	5 min

RUNOFF COEFFICIENT

COMMERCIAL	
- DOWNTOWN & SUBURBAN SHOPPING	0.90
INDUSTRIAL	
- DOWNTOWN	0.90
- SUBURBAN INDUSTRIAL PARKS	0.75
RESIDENTIAL	
- APARTMENTS	0.75
- ROW DWELLINGS	0.70
- DUPLEX DWELLINGS	0.70
- SEMIDETACHED - DOWNTOWN	0.60
- SINGLE FAMILY - DOWNTOWN	0.60
- SEMIDETACHED - SUBURBAN	0.50
- SINGLE FAMILY - SUBURBAN	0.40
SCHOOLS, CHURCHES, HOSPITALS	0.75
PARKS, CEMETERIES, RAIL YARDS	
(OVER 4 Ha)	0.20
(UNDER 4 Ha)	0.25

TOWN OF CALEDON

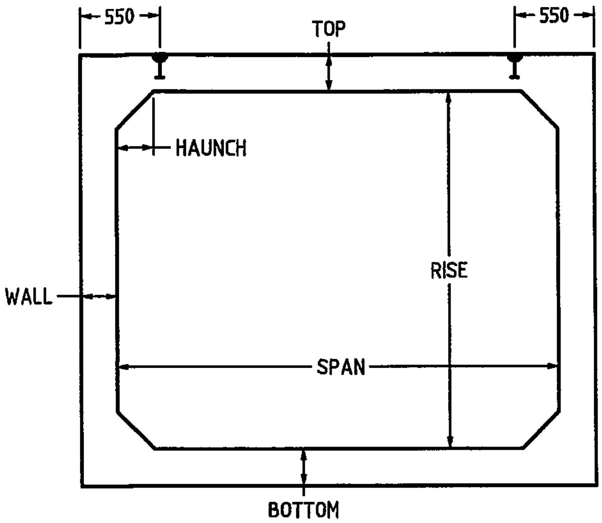
RAINFALL INTENSITY CURVES

NO.	REVISION	APR'D	DATE
1	STANDARD 112.01 NOW 104		JUNE 08

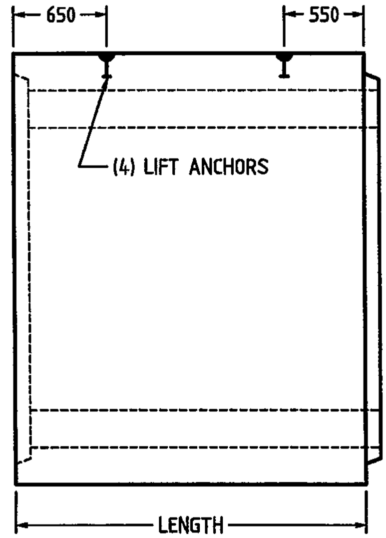
APR'D: C.C. DATE: FEB 2000

DRAWN: BJM SCALE: N.T.S.

STANDARD No. 104



END VIEW



SIDE VIEW

PRECAST BOX CULVERT PARAMETERS (mm)							DESIGN EARTH COVER (m)		SWIFT LIFT ANCHORS
SPAN	RISE	WALL	TOP/BOTTOM	HAUNCH	LENGTH	MASS	OPSS 1821	OHBDC 1991	TON x LENGTH
1800	900	200	200	200	2500	7,922 Kg	0.6 – 5.5	LESS THAN 0.6	4 T x 5.5"
1829	1219	203	203	203	2438	9,004 Kg	0.6 – 5.5	LESS THAN 0.6	4 T x 5.5"
2438	1219	203	203	203	2438	11,126 Kg	0.6 – 3.6	LESS THAN 0.6	4 T x 5.5"
2438	1524	203	203	203	2438	11,883 Kg	0.6 – 3.6	LESS THAN 0.6	4 T x 5.5"
2438	1829	203	203	203	2438	12,615 Kg	0.6 – 3.6	LESS THAN 0.6	4 T x 5.5"
3048	1524	254	254	254	2438	16,738 Kg	0.6 – 3.6	LESS THAN 0.6	8 T x 8.25"
3048	1829	254	254	254	2438	17,690 Kg	0.6 – 3.6	LESS THAN 0.6	8 T x 8.25"
3048	2134	254	254	254	2438	18,617 Kg	0.6 – 3.6	LESS THAN 0.6	8 T x 8.25"
3000	2400	250	250	250	2500	19,082 Kg	0.6 – 3.6	LESS THAN 0.6	8 T x 8.25"

SPECIAL BOX UNITS AND END TREATMENTS AVAILABLE:

- SHORTER LAY LENGTHS
- TEE AND WYE JUNCTIONS
- BENDS AND ELBOWS
- REDUCERS AND INCREASERS
- PLUGS AND CAPS
- RADIUS BOX
- SLOPED AND BEVELLED ENDS
- FLUSH AND EXPOSED MESH ENDS
- DOWELS AND INSERTS
- SCRIBED HOLES
- MAINTENANCE HOLE TEE

GENERAL NOTES:
1. MANUFACTURED IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARD SPECIFICATION (OPSS) 1821.
2. REFER TO LATEST PRICE LIST FOR PRICING STRUCTURE AND CONDITIONS OF SALE.
3. FOR ALL DESIGN EARTH COVERS NOT SHOWN IN THE ABOVE TABLE, PLEASE CONTACT OUR SALES OR ENGINEERING DEPARTMENT.
4. JOINTING MATERIAL SUCH AS RUBBER GASKETS, AND FILTER FABRIC AVAILABLE UPON REQUEST.
5. ADDITIONAL SIZES OR SPECIAL APPLICATION BOX UNITS ARE AVAILABLE UPON REQUEST.

REV.	DESCRIPTION	DATE

CON CAST PIPE
R.R. #3, Guelph, Ontario N1H 6H9
Tel.: (519) 763-8655
Toll Free: (800) 668-7473
Fax: (519) 763-1956

CON CAST PIPE STANDARD DRAWING

PROJECT NAME / DWG TITLE:

PRECAST REINFORCED CONCRETE BOX UNITS
SUMMARY OF STANDARD SIZES

SCALE: NTS	DATE: 15 APR 02	DWG NAME: STD_BOX.DGN
DRAWN BY: PI	G:\REGISTRY\ENGINEERING\REFERENCE DOC\BOX\STD_BOX.DGN REV. 000: APRIL 15, 2002	

REGION OF PEEL

SANITARY SEWER DESIGN SHEET
PROPOSED TOWNHOUSE DEVELOPMENT
CALEDON, ONTARIO

LOCATION	MH FROM	TO MH	AREA (ha)	DENSITY (ppha)	POPULATION	CUMULATIVE AREA (ha)	CUMULATIVE POPULATION	1 SEWAGE FLOW (m^3/sec)	2 INFILTRATION FLOW (m^3/sec)	3 FOUNDATION DRAIN (m^3/sec)	TOTAL FLOW 1+2+3 (m^3/sec)	LENGTH (m)	PIPE DIAMETER (mm)	GRADIENT (%)	CAPACITY (m^3/sec)	VELOCITY (m/sec)	DROP IN LOWER M.H. (m)
McKee Drive South	Prop. Service Connection	EX. MH35	2.330	70	163	2.330	163	0.0024	0.004946	-	**0.0073**	24.0	250	1.00	**0.05947**	1.211	
	EX. MH35	EX. MH37	0.620	50	31	2.950	194	0.0028	0.005350	-	**0.0082**	48.4	250	1.15	**0.06377**	1.299	

Plan No. **S-1**

Consultant: Masongsong Associates Engineering Limited

Subdivision: PROPOSED TOWNHOUSE DEVELOPMENT

Sheet 1 of 1

Project No. **03-141**

Region of Peel
Working for you

Design Criteria:

Population Density:	(ppha)	Infiltration:	0.0002	(m^3/sec/ha)
Single family (greater than 10m lots)	50	Infiltration:	0.00028	(m^3/sec/mh)
Single family (less than 10m lots)	70			
Semi-detached	70			
Row dwellings	175			
Aparments	475			

Sewer flow numbers taken from STD.DWG 2-5-2

Date 08-Jun-15

Designed By: S.G.

Checked By: A.I.

Date

Approved

Connection Demand Table

WATER CONNECTION

Connection point [3] 23 MCKEE DRIVE SOUTH EXISTING FIRE HYDRANT AT THE END OF CUL-DE-SAC (DEAD END)			
Pressure zone of connection point			
Total equivalent population to be serviced [1]		163 PERSONS	
Total lands to be serviced		2.33 ha	
Hydrant flow test			
Hydrant flow test location			
REFER TO WATER CONNECTION POINT ABOVE			
	Pressure (kPa)	Flow (in l/s)	Time
Minimum water pressure	234.42	123.15	8:20 AM
Maximum water pressure	606.74	23.25	8:20 AM

No.	Water demands		
	Demand type	**Demand**	**Units**
1	Average day flow	0.57	l/s
2	Maximum day flow	1.14	l/s
3	Peak hour flow	1.71	l/s
4	Fire flow [2]	63.33	l/s
Analysis			
5	Maximum day plus fire flow	64.47	l/s

WASTEWATER CONNECTION

Connection point [4]		EX. MH 35	(REFER TO SERVICING PLAN DWG. S-1)
Total equivalent population to be serviced [1]		163 PERSONS	
Total lands to be serviced		2.33 ha	
6	Wastewater sewer effluent (in l/s)	7.8 l/s	(REFER TO SECTION 2.3 SANITARY SEWERAGE IN THE FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT)

[1] Please refer to design criteria for population equivencies

[2] Please reference the Fire Underwriters Survey Document

[3] Please specify the connection point ID

[4] Please specify the connection point (wastewater line or manhole ID)
Also, the "total equivalent popopulation to be serviced" and the "total lands to be serviced" should reference the connection point. (The FSR should contain one copy of Site Servicing Plan)

Please include the graphs associated with the hydrant flow test information table
Please provide Professional Engineer's signature and stamp on the demand table
All required calculations must be submitted with the demand table submission.

DENSITY POPULATION = 2.33 ha x 70 PERSONS/ha
= 163 PERSONS

WATER DEMAND

1. AVG. DAILY FLOW = (302.8 L/p/d x 163 P)/86400 s/d
= 0.57 l/s

2. MAX. DAY FLOW = 0.57 l/s x 2.0
= 1.14 l/s

3. PEAK HOUR FLOW = 0.57 l/s x 3.0
= 1.71 l/s

corix®
Water Services

10 Estate Drive, Toronto, Ontario M1H 2Z1
Phone: 416.282.1665 Fax: 416.282.7702 Toll Free: 1.888.349.2493
www.corix.com

SITE NAME: Masongsong Eng. DATE: Oct 21/2014

LOCATION: McKee Drive, Caledon ON.

TEST DATA TIME OF TEST: 8:20 am

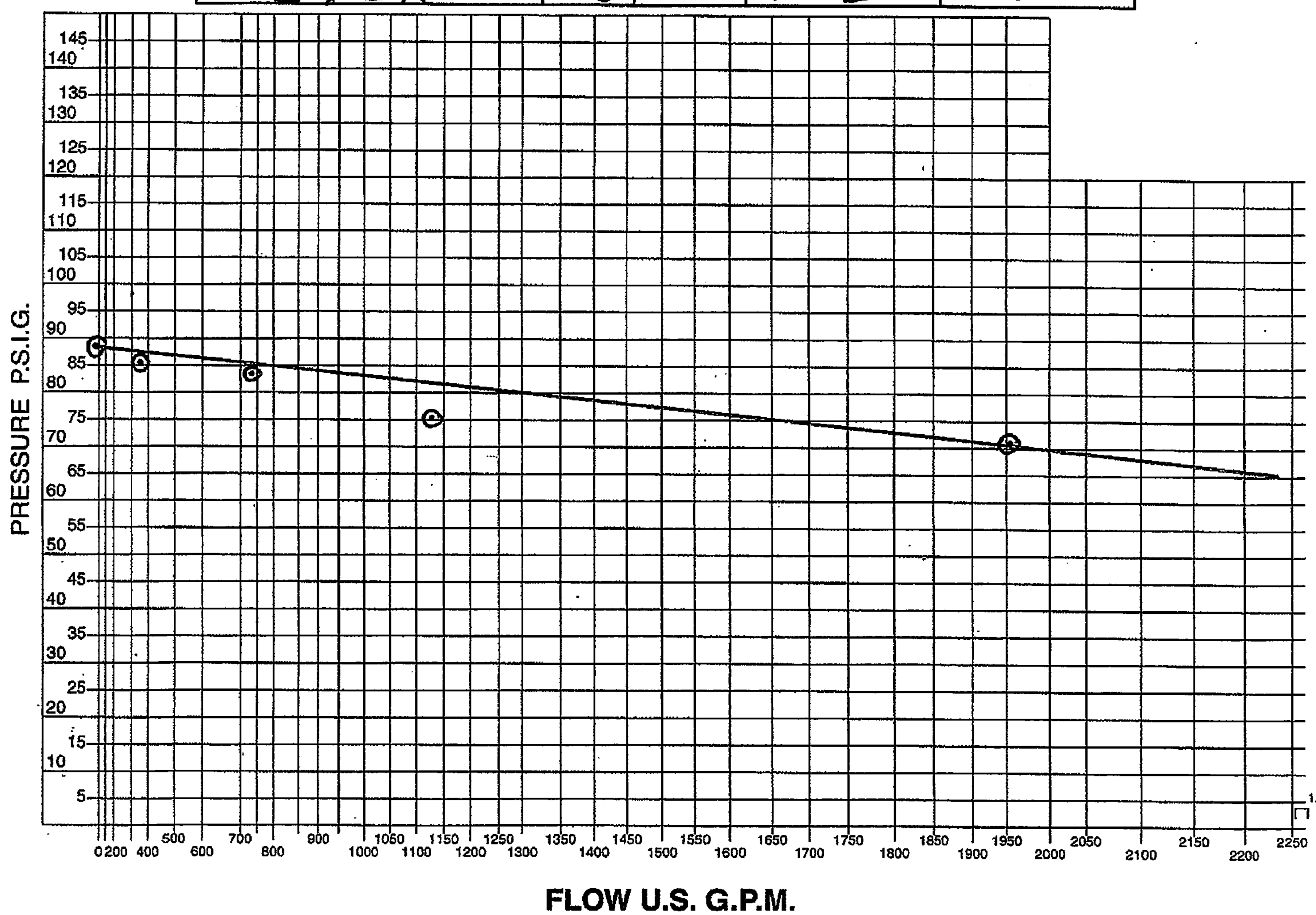
LOCATION OF TEST: (FLOW) 23 McKee Drive, 3 Port AUK (Dead end)

(RESIDUAL) 13 McKee Drive, 3 Port AUK

MAIN SIZE: 300 mm P.V.C

STATIC PRESSURE: 88 psi

	NUMBER OF OUTLETS & ORIFICE SIZE	PITOT PRESSURE	FLOW (U.S. G.P.M.)	RESIDUAL PRESSURE
# 1	1 x 1 1/8"	80	335	85
# 2	1 x 1 3/4"	66	738	83
# 3	1 x 2 1/2"	46	1135	~~8~~ 75
# 4	2 x 2 1/2"	34	1952	71



COMMENTS: Performed one complete NFPA 291 flow test.

Authorized Signature ________ Corix Water Services Signature

	LOCAL RESIDENTIAL ROADS <1000 ADT	LOCAL INDUSTRIAL ROADS	RESIDENTIAL COLLECTOR ROADS 1000 to 3000 ADT	COLLECTOR ROADS 3000 to 10,000 ADT	ARTERIAL ROADS > 6,000 ADT
ESIGN SPEED	50km/h	50km/h	50km/h	60km/h	70km/h
IORIZONTAL URVE ADIUS (m)	90.0m	90.0m	130.0m	190.0m	250.0m
ERTICAL URVE MINIMUM K) AG	12	18	18	25	30
ERTICAL URVE MINIMUM K) REST	8	15	15	25	35
TOPPING IGHT DISTANCE	70.0m	70.0m	95.0m	125.0m	150.0m
OAD GRADE MAXIMUM) CUL-DE-SAC %)	7.00%	4.00%	6.00%	6.00%	6.00%
OAD GRADE MINIMUM) INCLUDING UL-DE-SAC URB)	0.75%	0.75%	0.75%	0.75%	0.75%
RADE HROUGH OADS I NTERSECTIONS MAXIMUM)	3.00%	3.00%	3.00%	3.00%	2.00%

NOTES:
1. THIS STANDARD TO BE USED IN CONJUNCTION WITH THE TOWN OF CALEDON ROAD STANDARDS.
2. CHANGES IN VERTICAL ALIGNMENT SHALL NOT EXCEED 1.5% WITHOUT A VERTICAL CURVE.
3. ON CUL-DE-SACS AND ELBOWS, THE CURB LINES ARE TO MAINTAIN A MINIMUM GRADE OF 0.75%.
4. STOPPING SITE DISTANCE AT INTERSECTIONS SHALL CONFORM TO THE ABOVE MINIMUM REQUIRMENTS.

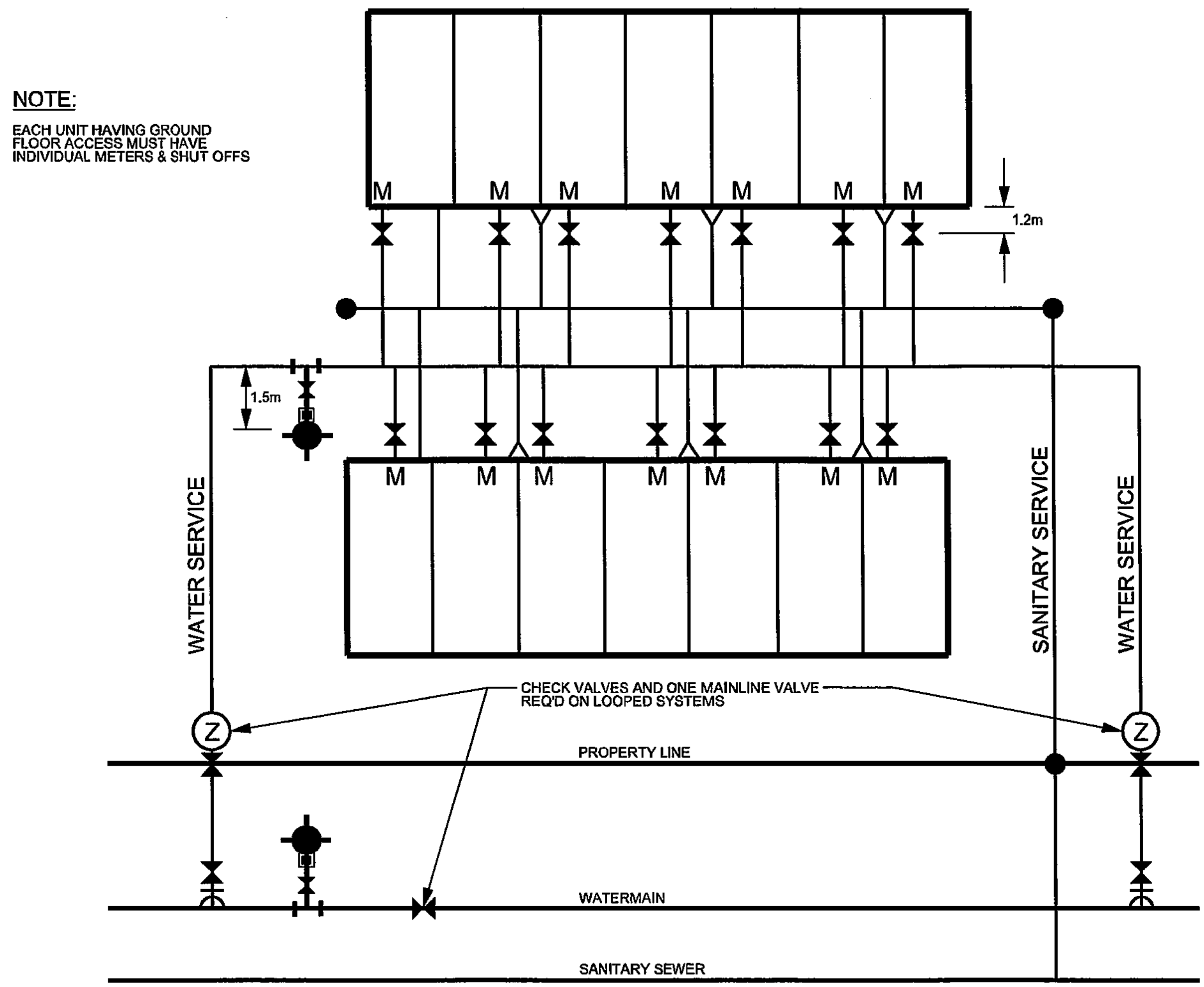
NO.	REVISION	APR'D	DATE
1	ADT Design Minimums		12/01

TOWN OF CALEDON

GEOMETRIC DESIGN STANDARDS FOR ROADS

APR'D:	DATE: DATE
DRAWN: DRAWN	SCALE: N.T.S.

STANDARD No. 110



LEGEND

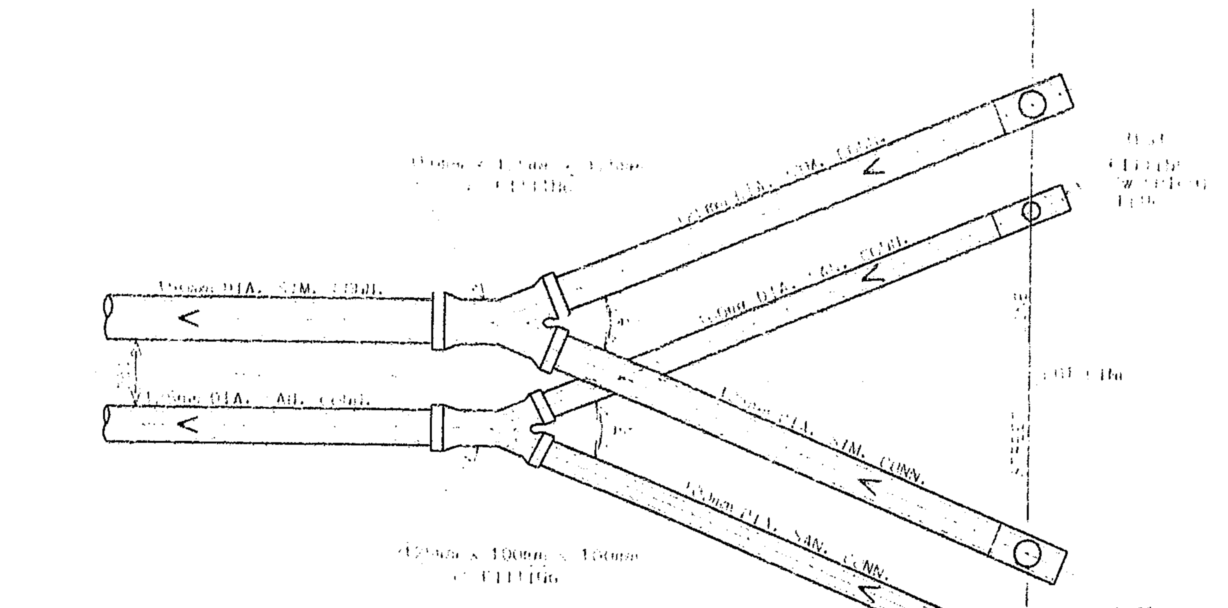
- VALVE & BOX
- DETECTOR CHECK VALVE IN CHAMBER
- CHECK VALVE IN CHAMBER
- TAPPING SLEEVE & VALVE & BOX
- TEE
- FIRE HYDRANT C/W VALVE & BOX
- DIRECTION OF PUMPER NOZZLE
- METER IN CHAMBER
- M METER
- NON SAMPLING SANITARY MAINTENANCE HOLE

Region of Peel
Working for you

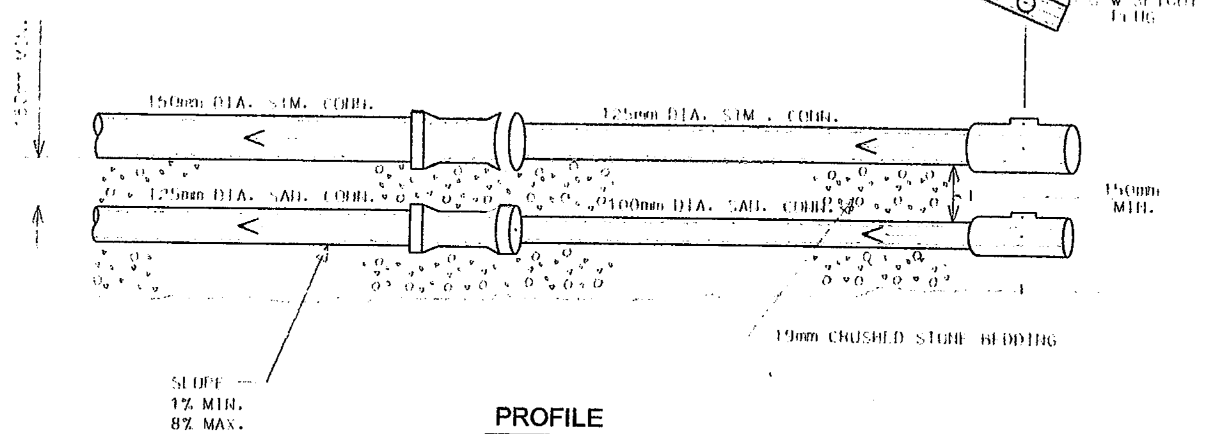
PUBLIC WORKS
STANDARD DRAWING

SERVICING FOR TOWNHOUSE COMPLEX

REV. DATE: NOVEMBER 2011	
APPROVED BY A.P.	DRAWN BY AINLEY GROUP
STD. DWG. NUMBER 1-8-2	SCALE N.T.S.



PLAN



PROFILE

NOTE

1. MINIMUM TRENCH WIDTH TO BE 900mm.
2. 19mm CRUSHED STONE BEDDING TO BE USED FROM BASE OF EXCAVATION TO SPRING LINE OF UPPER PIPE FROM MAINLINE TO TEST FITTING.
3. 125mm DIA. TEST FITTING TO BE MARKED "SAN".
4. SANITARY CONNECTION PIPE TO BE ANY COLOUR EXCEPT WHITE
5. STORM CONNECTION TO BE ON THE LEFT WHEN FACING THE HOUSE.
6. SANITARY CONNECTION MUST BE SECURELY PLUGGED AT PROPERTY LINE WITH AN APPROVED PLUG.
7. SINGLE SANITARY SERVICE CONNECTIONS SHALL BE 125mm.

Region of Peel *Working for you*	PUBLIC WORKS STANDARD DRAWING	REV. DATE: FEBRUARY 2007
		APPROVED BY D.L. / DRAWN BY I.F.
DOUBLE SERVICE CONNECTIONS IN COMMON TRENCH		STD. DWG. NUMBER 2-4-3 / SCALE N.T.S.

Appendix B
Hydrogeological Report

Excerpt of Terraprobe Hydrogeological Evaluation Report

Site Picture


05.09.2014

Terraprobe

LOG OF BOREHOLE 7

PROJECT: Proposed Residential Subdivision
LOCATION: Caledon East, Ontario
CLIENT: Valley Grove Investments

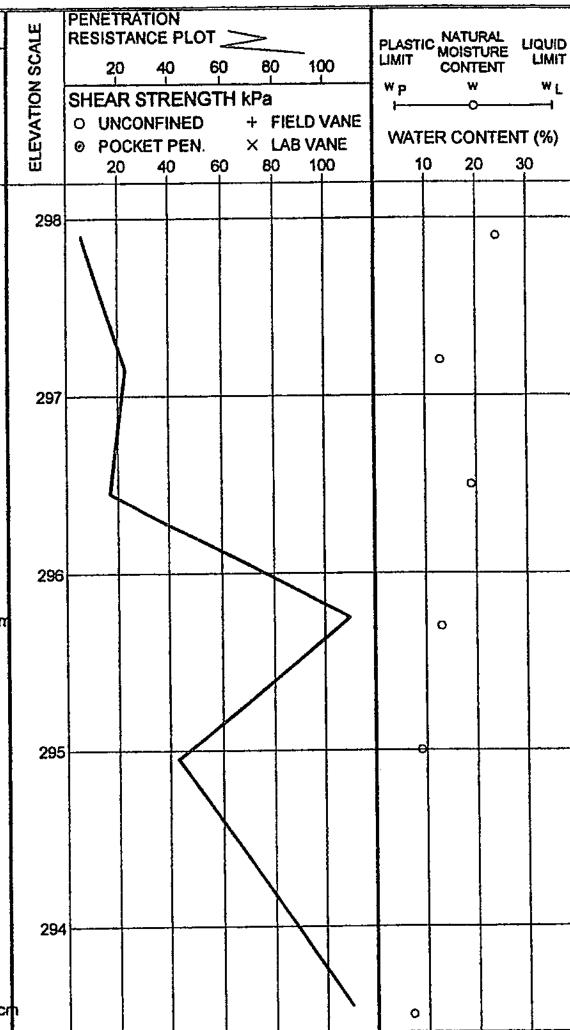
DATE: 22 January 2001
EQUIPMENT: Trackmount 6M2
ELEVATION DATUM: Geodetic
FILE: 01109

SOIL PROFILE

ELEV / DEPTH	DESCRIPTION
298.2	Ground Surface
0.0 / 298.0	**150mm Topsoil**
0.2	Loose, wet, Brown/Dark Brown **FILL** - Sand trace to some silt, trace clay and organics (DISTURBED NATIVE)
297.3 / 0.9	Compact, wet, Brown **SAND** trace silt (Fine to Medium)
295.9 / 2.3	Dense to Very Dense, Brown/Grey, moist **SILTY SAND** some gravel and clay (TILL)
293.4 / 4.8	End of Borehole

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	6
2	SS	23
3	SS	17
4	SS	50/8cm
5	SS	43
6	SS	50/10cm



ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS: ∇ (water level)

NOTES:
Borehole was caving at 1.4m and water level at 0.5m depth on completion of drilling.

Sheet 1 of 1

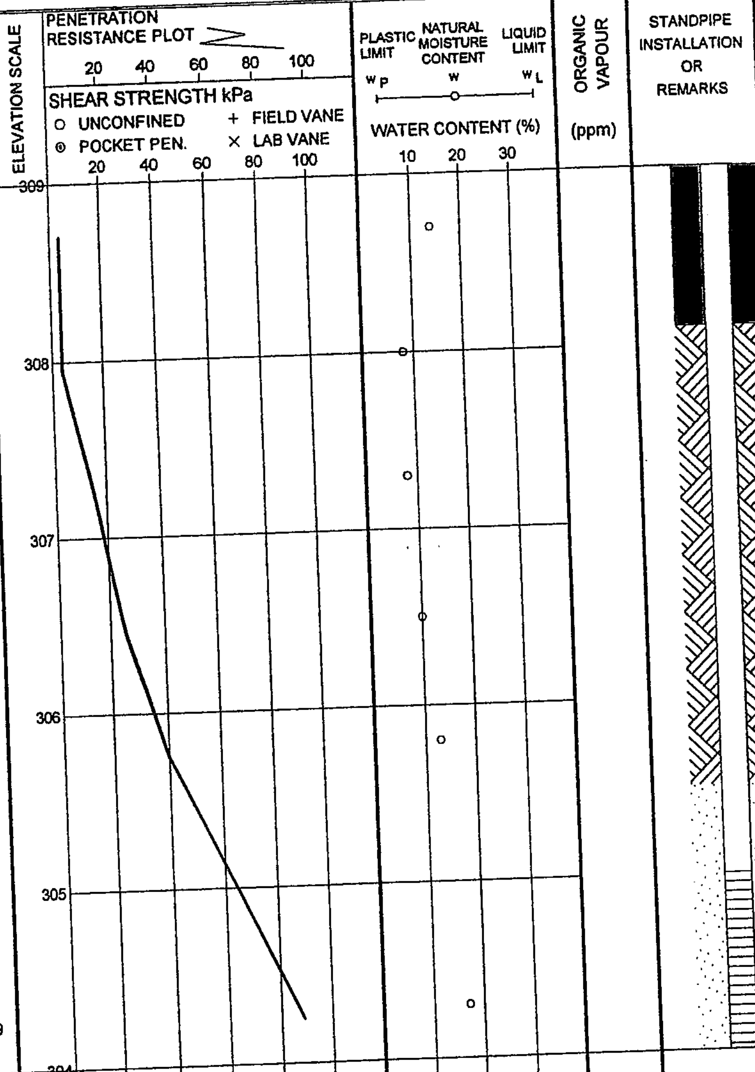
LOG OF BOREHOLE 8

Terraprobe

PROJECT: Proposed Residential Subdivision
LOCATION: Caledon East, Ontario
CLIENT: Valley Grove Investments

DATE: 22 January 2001
EQUIPMENT: Trackmount 6M2
ELEVATION DATUM: Geodetic
FILE: 01109

ELEV / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	"N" VALUES
309.0	Ground Surface			
0.0	350mm Topsoil	1	SS	4
308.6 / 0.4	Loose moist Brown/Dark Brown FILL - Sand trace to some silt, trace clay and organics (DISTURBED NATIVE)	2	SS	4
307.5 / 1.5	Compact to Dense Brown moist SILT trace to some clay & sand TO SANDY SILT trace to some clay	3	SS	15
		4	SS	26
		5	SS	40
	-- grey, locally very dense	6	SS	89
304.0 / 5.0	End of Borehole			



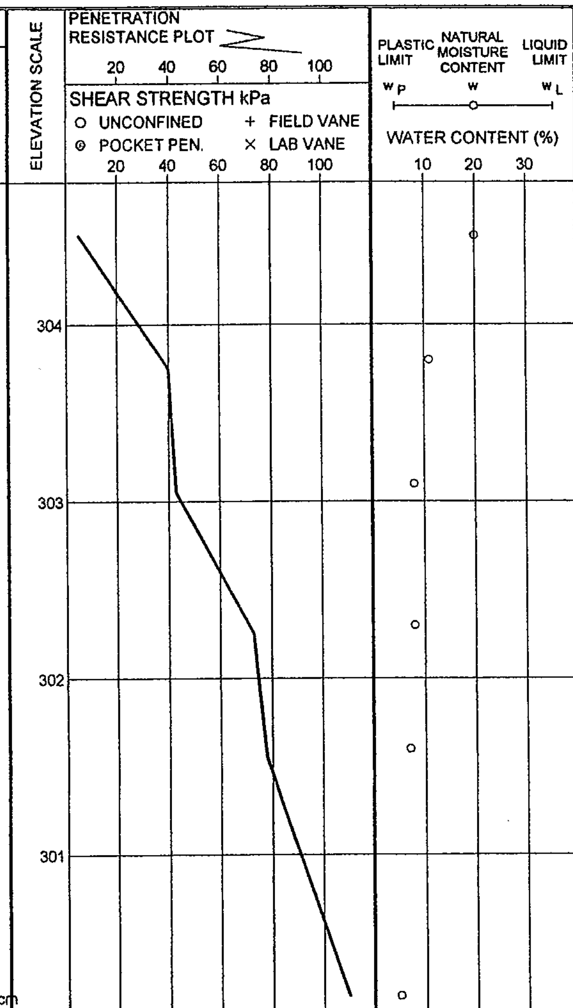
NOTES:
Borehole was open and dry on completion of drilling. Standpipe dry on January 29, 2001.

Terraprobe

LOG OF BOREHOLE 9

PROJECT: Proposed Residential Subdivision
LOCATION: Caledon East, Ontario
CLIENT: Valley Grove Investments
DATE: 22 January 2001
EQUIPMENT: Trackmount 6M2
ELEVATION DATUM: Geodetic
FILE: 01109

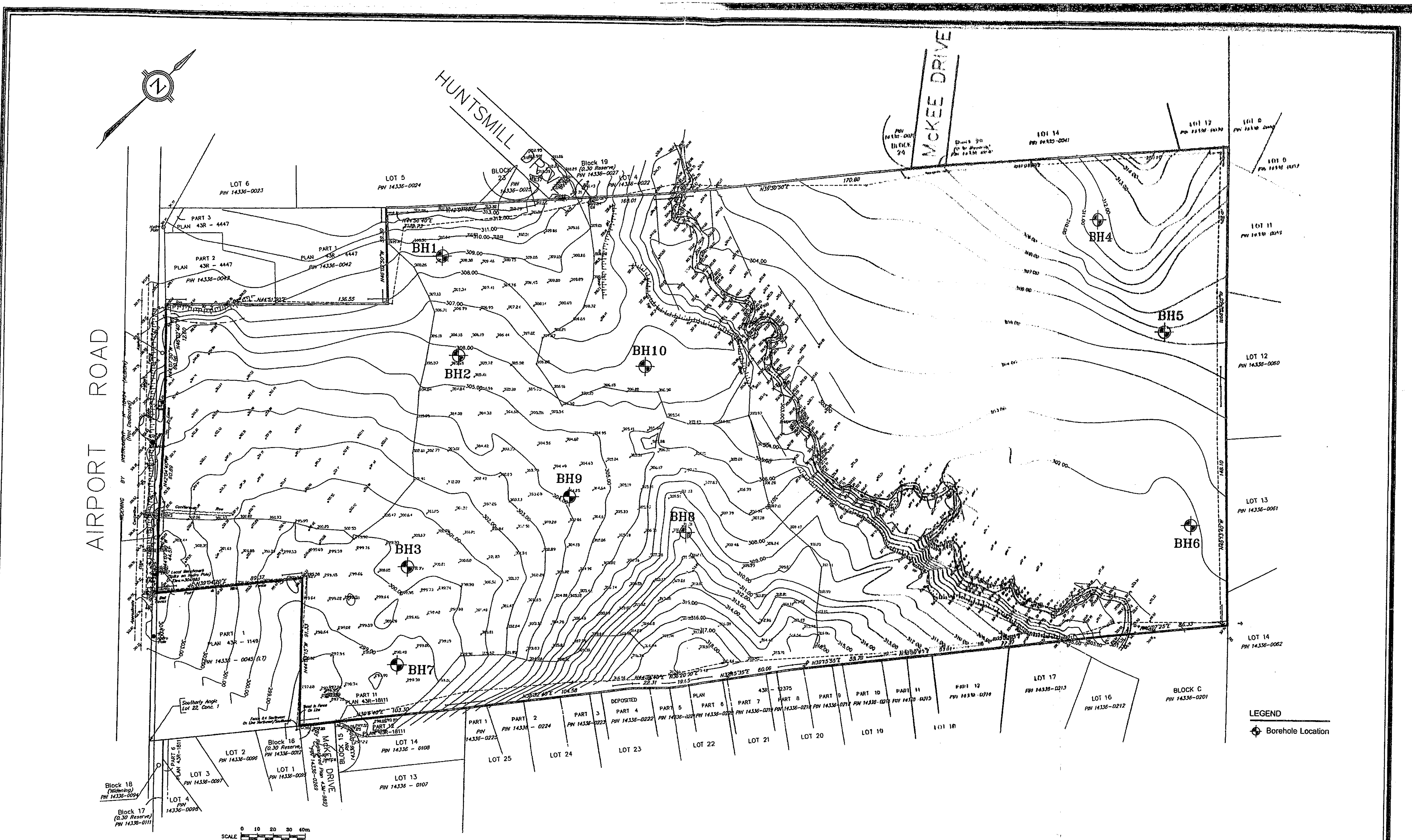
ELEV / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" VALUES
304.8	Ground Surface			
0.0	**350mm Topsoil**	1	SS	5
304.4 / 0.4	**FILL -** Sandy Silt to Silty Sand, trace clay & organics (DISTURBED NATIVE)			
304.0 / 0.8	Dense Brown very moist **SAND** trace silt (Medium to Coarse)	2	SS	40
303.3 / 1.5	Dense to Very Dense Brown/Grey moist **SILTY SAND** some gravel and clay **(TILL)**	3	SS	43
		4	SS	73
		5	SS	78
		6	SS	50/13cm
300.1 / 4.7	End of Borehole			



ORGANIC VAPOUR (ppm)

STANDPIPE INSTALLATION OR REMARKS

NOTES:
Borehole was open and dry on completion of drilling.



BOREHOLE LOCATION PLAN

TERRAPROBE

File No. 1-05-0178

FIGURE 5