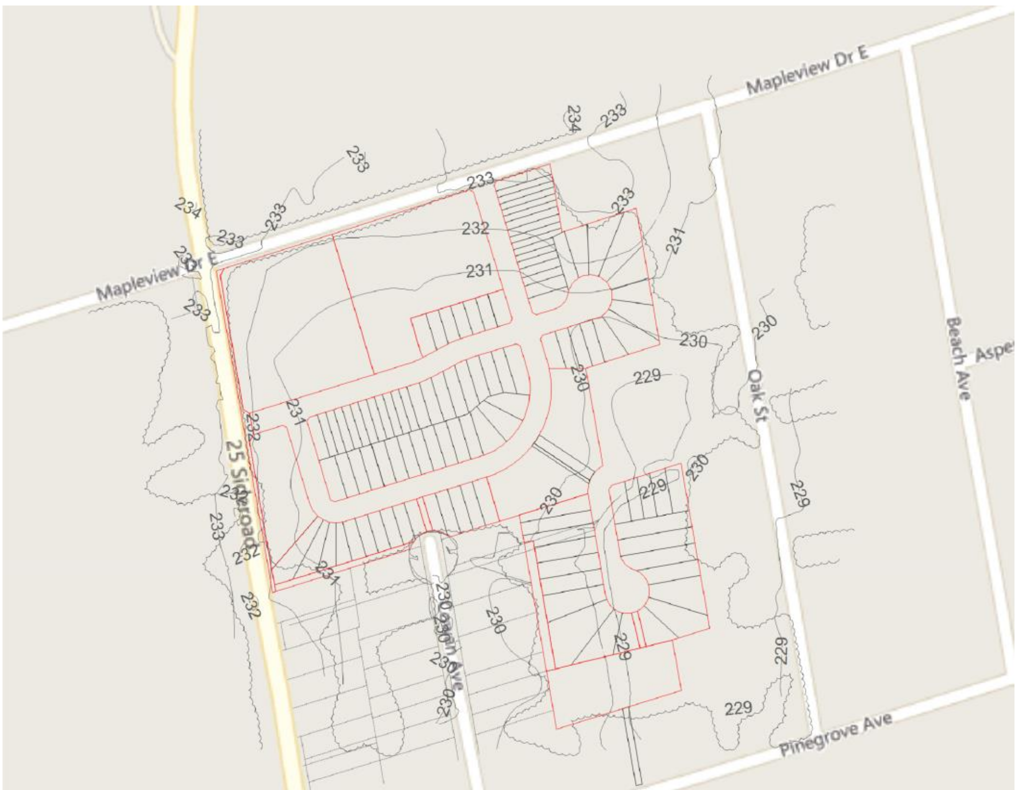
FUNCTIONAL SERVICING REPORT

PROPOSED TEROMI PLAN OF SUBDIVISION

PART OF LOT 26, CONCESSION 11

TOWN OF INNISFIL, COUNTY OF SIMCOE



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1.0 INTRODUCTION

1.1 APPOINTMENT

JFive Developments Ltd., Consulting Engineer, has been retained by Mr. D. Jerry of Teromi Inc. to provide civil engineering services related to the proposed Teromi Draft Plan of subdivision. The Teromi property (Property), is located at the southeast corner of Mapleview Drive East and the 25th Sideroad in the Town of Innisfil.

This report is prepared in support of the proposed Draft Plan of Subdivision, (Plan), prepared by Celeste Phillips Planning Inc., dated July 22, 2017. This report shall demonstrate that the development can be appropriately serviced. See the Plan in **Appendix 'A'**.

This report identifies the conceptual servicing of the property in relation to:

(1) Phase Limit Assessment,
(2) Water System Servicing,
(3) Sanitary Sewer Servicing,
(4) Stormwater Management System,
(5) Roads Network,
(6) Lot Grading Works, and,
(7) Utility Servicing.

This report will be submitted to the Town of Innisfil and other required agencies in support of applications for an Official Plan Amendment, Plan of Subdivision approval and Rezoning for the subject property. The Property is approx. 14 ha (34.6 acres) in area. The Plan proposes the following.

- Commercial block,
- Apartment and mixed use buildings block,
- Townhouse units,
- Semi-detached lots,
- Single family lots, and,
- Servicing blocks.

Supporting documents include the following:

- A Traffic Impact Study by JD Engineering, dated May, 2017,
- Topographical Survey by Eplett Worobec Raikes Surveying Ltd. dated 2015,
- A Planning Justification Report by Celeste Phillips Planning Consultant,
- An EIS by Azimuth Environmental Consulting Inc., and,
- CC Tatham letter dated August 28, 2015.

1.2 SUBJECT PROPERTY

The 14-hectare property is irregular in shape, and comprises of Part of the lot 26, Concession 11, in the Town of Innisfil. Refer to **Figure 1.1, Location Plan.**

The property is bordered on the north side by Mapleview Drive East, and 4 residential lots at the NE corner. The 25th Sideroad abuts the west side of the Property. Existing residential properties and Cowan Avenue abuts the south limit of the Property and residential properties and a vacant parcel abuts the easterly limit.

The predominant groundcover on site is brush, shrubs, and trees with some meadow areas. Please refer to the EIS for more detailed description of the vegetative coverage.

The overall site drainage is towards the southeast corner of the Property via overland sheet flow drainage into several drainage ditches. Refer to **Section 5.0, Stormwater Servicing**, for details of these drainage ditches. Overall, the storm drainage from the Property outlets to the existing culvert across Pinegrove Avenue, located to the south of the Property.

The topographical information and generated contour/elevations have been obtained from the survey completed by Eplett Worobec Raikes Surveying Ltd., dated 2015. This topographical data has been provided on the Plan and has also been used to complete the preliminary design for the project and has been provided on the various figures in this report.

The project is anticipated to proceed as 2 phases. The phase limits have been identified on **Figure 2.1, Phase Limits.** The details of the servicing for each phase is identified in each section to follow.

1.3 PROPOSED LAND USE

The subject site is proposed to be developed as a residential subdivision, complete with road network, stormwater management block, walkway block, and appropriate servicing easements. The Plan also proposes a neighbourhood commercial land use to be located in a block at the northwest corner of the property. The details of the proposed land uses are reviewed in the Planning Justification Report.

1.4 APPROVING AUTHORITIES

This Report will be submitted to the Town of Innisfil Planning Department in support of the Proposed Draft Plan of Subdivision application submission for circulation as appropriate.

1.5 DESIGN CRITERIA

The following documents have been referenced in preparation of this report:

- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003,
- Town of Innisfil Engineering Design Standard and Specification Manual, revision #3, May, 2016,
- EPA Stormwater Management Model User's Manual Version 5.1, PCSWMM, Sept, 2015,
- LSRCA Technical Guidelines for Stormwater Management Submissions, Sept. 1, 2016,
- Lake Simcoe Protection Plan, June 2, 2009, and,
- Preliminary Soils Mapping, County of Simcoe GIS.

The development of the Property is also subject to the design standards and policies of the Town of Innisfil and the Lake Simcoe Region Conservation Authority.

Preliminary soils information has been assessed based on the County of Simcoe Soil Mapping and, a soils borehole log related to the newly constructed Sewage Pumping Station (SPS-SC1) on the west side of the 25th Sideroad, just located at the NW corner of the Property. This assessment has been used for the stormwater management design for the Property. Refer to **Section 5.0** for the details.

A copy of the As-Built plan and profile drawings associated with the works within the 25th Sideroad have been used to help assess the servicing design for the project, as related to connection to the existing sanitary service lateral located for the phase 1 of the project. The same plans have been used to estimate the connection point to the existing watermain within the 25th Sideroad. Refer to **Appendix 'B'.**

2.0 PHASING LIMIT ASSESSMENT

The phase limits proposed for the development of the property is dependent on the sanitary servicing invert limitation. Currently a proposed phase limit has been identified on **Figure 2.1**. The basis of the sanitary servicing limitations is strictly due to the depth of the sanitary sewer lateral connection provided at the northwesterly corner of the Property. The invert of this lateral at the property line is approx. 229.82m. This sewer lateral discharges into the MH # 1361, which in turn discharges into the sewage pumping station, SPS SC1, constructed by the Friday Harbour development. The invert elevation is identified on the As-Built plan and profile drawings associated with the works within the 25th Sideroad, specifically Dwg 408. Refer to the drawing in **Appendix 'B'**.

Based on preliminary review of a gravity sewer along Street 'B', the depth of fill required to achieve a gravity flowing sewer system to meet current Town of Innisfil criteria will require fill above the existing ground elevation by the distance to the intersection of Streets 'A' and 'B'. There is opportunity to lower the existing service lateral invert elevation by approx. 0.6m by removing the sewer from the discharge to the MH within the pumping station property back to the existing San MH 1361 and across the street to the property. This replacement would lower the service lateral to the Property by the same amount, 0.6m, which in turn could lower any future sanitary sewer within Street 'B' by the same amount. This will therefore reduce the volume of fill imported to accommodate gravity flow for the sanitary sewer system within Street 'B' for the length of the street, while still adhering to the cover requirements over the sanitary sewer system and connecting service laterals. Therefore, the south limit of phase 1 has the possibility to include for the construction of Street 'B', the construction of 150m of Street 'A' from Mapleview Drive East, southerly, and the construction of Street 'C' cul-de-sac.

For the purpose of our assessment of servicing, we have assumed the limit of Phase 1 includes only the commercial block and apartment and mixed use buildings block located on the north side of Street 'B' as shown on **Figure 2.1.**

3.0 WATER SERVICING

All lots are to be provided with full municipal water servicing in accordance with the design standards and criteria of both the Town of Innisfil and Ministry of Environment and Climate Change.

The Plan is proposed to develop in two (2) phases. Refer to **Figure 2.1**.

3.1 Phase 1:

The first phase, as identified on **Figure 2.1**, will be to develop the commercial block and apartment and mixed use buildings block. These blocks will consist of the following:

a) The commercial block of 1.62 ha in area, and,
b) The apartment and mixed use buildings block of 1.53 ha in area, which would accommodate approx. 93 residential units.

The Property is located within the servicing limits of the Town of Innisfil Distribution Network. Refer to the letter/report assessment completed by CC Tatham & Associates (CCTA) on behalf of the Town of Innisfil, dated August 28, 2015 contained in **Appendix 'B'.** In their assessment it was noted that they completed an up-date to the WaterCAD model of the Lakeshore water distribution system, and the proposed 400mm diameter PVC trunk watermain, which now exists, can supply the water system demands for the Teromi property at the required minimum flows and pressures.

Off the existing 400mm diameter PVC watermain within the 25th Sideroad, a 150mm diameter water service lateral connection has been provided to the east side of the 25th Sideroad. This lateral shall provide the service connection for the proposed commercial block and apartment and mixed use buildings block for phase 1.

Town of Innisfil has also identified the requirement to extend an external watermain on Mapleview Drive East to the east limit of the frontage of the Property. This watermain would be connected to the same 400mm PVC watermain at the 25th Sideroad intersection. A 300mm diameter watermain, valve and box and plug on the east side of the intersection of the 25th SR and Mapleview Drive have already been installed for accommodating this extension. Refer to Dwg. 408 in **Appendix 'B'**. Off the external 300mm diameter watermain would be a new 200mm watermain to extend south within Street 'A'. The phase 1 portion of the watermain within Street 'A' will terminate just south of the proposed access/egress for the apartment and mixed use buildings block. This 200mm diameter watermain will allow for a second connection location for the two blocks proposed for phase 1 development. Refer to **Figure 3.1, Conceptual Water Servicing System.**

Therefore, the desired watermain looping will be achieved via the connection to the 150mm diameter off the 25th Sideroad, through to the 150mm diameter connection off the 200mm diameter watermain within Street 'A'. The watermain servicing through the two blocks will also require a servicing easement to accommodate the placement and usage of the system internal to the blocks. A conceptual layout of this system and related servicing easements have been identified on **Figure 3.1, Conceptual Water Servicing System.** The detailed layout of this easement will be reviewed at the formal Site Plan Approval process associated with the development of the phase 1 blocks.

3.2 Phase 2:

All proposed streets shall conform to the Town std. TOISD 201, Urban Local Road, (see this detail in **Appendix 'B').** As such, a conceptual watermain system design has been proposed taking into account the locations identified on this standard. The watermain system will also require placement of intersecting valves, fire hydrants and a blow-off valves. As noted above, a conceptual design has been presented on **Figure 3.1**.

On the same **Figure 3.1**, we have identified a conceptual design associated with the external watermain works on Oak Street and the connection point to Oak Street, off Balsam Street. The external watermain works within Oak Street and a portion of the Mapleview Drive East have been identified as future works which will be completed by others, or front ended upon the development of the proposed Balsam Street cul-de-sac extension.

4.0 SANITARY SERVICING

All lots and blocks are to be provided with full municipal sanitary sewer servicing. The internal sanitary sewer system will be designed to meet the Town of Innisfil and the Ministry of the Environment and Climate Change design criteria guidelines.

The Plan is proposed to develop in two (2) phases. Refer to **Figure 2.1**.

4.1 Phase 1:

The first phase, as identified on **Figure 2.1**, will be to develop the commercial block and the apartment and mixed use buildings block. These blocks will consist of the following:

a) The commercial block of 1.62 ha in area, and,
b) The apartment and mixed use buildings block of 1.53 ha in area, which would accommodate approx. 93 residential units.

The design population is based on the land use concepts being considered for the development ultimate yield as follows:

- Commercial Block, 1.62 ha.,
- Apartment Block, 93 units,
- Townhouse lots, 25 units,
- Semi-detached lots, 20 units, and,
- Singles lots, 75 units.

A conceptual sanitary sewer servicing plan has been presented on **Figure 4.1.** On this figure, the phase 1 works will require coordination between the commercial block development to accommodate sewer servicing for the apartment and mixed use buildings block. A sanitary sewer layout has been presented on **Figure 4.1, Conceptual Sanitary Servicing Plan**. The location of the sewer system will also require incorporating easements to accommodate the sewer system. The fine tuning of easement locations will be addressed at the Site Plan development stage when the detailed design is completed. It will make sense to coordinate such servicing easement locations with the watermain servicing easement locations should the opportunity permit.

In support of this layout proposed for the Plan, a submission was made to the Town of Innisfil on April 24, 2015 in relation to the detailed design being completed for the Friday

Harbour Pumping Station and the external trunk watermain system within the 25th Sideroad. This submission was made by JFIVE Developments Ltd., Consulting Engineer to Mr. S. MacKenzie, Town of Innisfil. A copy of this submission is available upon request. The submission was reviewed on behalf of the Town of Innisfil by CC Tatham & Associates (CCTA) in a letter/report dated August 28, 2015. A copy of this letter/report has been enclosed in **Appendix 'B**. The author of the letter noted that they completed an up-date to the SewerCAD model of the sewage collection system, and the currently proposed trunk infrastructure, which has now been constructed, can accommodate the commercial block as was noted on the April 24, 2015 submission. They have noted that a 1 to 5 ha block would have a small impact (1% - 2%) on the pumping station (SPS-SC1) and forcemain sizing. The area they assessed was for 3.6ha commercial block.

Since that submission, the new proposal has been modified to accommodate additional lands to the east of that which was presented in May, 2015. The expansion closely reflects the suggested area identified in the CCTA letter of August 28, 2015. The current Plan proposes 1.62 ha of commercial and 1.53 ha high density residential, (total of 3.15 ha). Below is calculated the peak sewage flow rates on this proposed land use as follows:

Block 121, commercial, area = 1.61853 ha
Peak flow rate Q = 1.61853 ha x(20,000 l/ha/day) = 0.375 l/s
+ infiltration flow = 1.61853 ha x (20,000 l/ha/day = 0.375 l/s
Q = 0.75 l/s

Block 122, Apartment, 93 units at 2.65 p/unit = 246 persons

M = harmon peaking factor = 4.11, use max = 4.00
Q ave = 350 l/cap/day

Q = 246 x 350 x 4.11/(24 x 60 x 60) = 4.11 l/s

TOTAL Q = 4.85 /l/s

The actual design flow calculations used for the detailed design of the SPS SC-1 pumping station flow have not been made available. As such, it cannot be confirmed what the actual impact of this minor increase of flows on the pumping facility will be. However, the increase from 1.7 l/s as calculated by CC Tatham & Associated Ltd. in their letter of October 30, 2017 to 4.85 l/s as calculated above, over the peak flow rate of 121 l/s as suggested in their letter represents an increase of only approx. 1.6% increase over the 121 l/s. It is our opinion that this minor increase is well within the normal design range for such a facility. This minor increase should comfortably be accommodated by the existing facility. In conclusion, as noted in the CCTA letter/report conclusion, and as noted above, the SPS SC-1 system can accommodate the 3.15 ha as proposed.

4.2 Phase 2:

All proposed streets shall conform to the Town std. TOISD 201, Urban Local Road, see detail in **Appendix 'B'.** As such, a conceptual sanitary sewer system design has been proposed taking into account the locations identified on the std. All internal sewers are to be 200 dia. with minimum slopes to ensure self cleansing velocities are achieved. Self-cleansing velocities are obtained at pipe full flow as per Town standard, having a full flow velocity of 0.61m/s. All service lateral connections for the residential units shall be 125mm diameter PVC at minimum slopes of 2%. A Conceptual Sanitary Servicing Plan has been presented on **Figure 4.1**.

It should be noted however that the phase 2 portion of the plan cannot proceed with full sanitary servicing until such time as the external sanitary servicing systems are constructed. This construction will not only include for the external sewer system works as conceptually presented on **Figure 4.1**, but will also require the construction of the future sewage pumping station SPS SC-3. Refer to the **Figure 4.2, Wastewater Servicing Innisfil North**, which identifies the location of the proposed SPS SC3 facility. All of the phase 2 portion of the plan is tributary to this future pumping station and forcemain system. The timeline for the completion of these external works is not known at this point in time.

The external works required to accommodate phase 2 will also include the local improvements of local sewers within Oak Street and Pinegrove Avenue.

5.0 STORMWATER SERVICING

The Stormwater Management (SWM) works presented in this section outlines the design criteria for the proposed stormwater management control for the site. As well, a preliminary SWM pond and stormsewer layout design has been presented in this section of the Report.

This section of the report also includes discussions on site physiology (existing and proposed drainage conditions), hydrology (hydrogeological modeling of pre and post development conditions) and a Stormwater Management Plan utilizing Best Management Practices for the site.

The property in located within the Lake Simcoe Region Conservation Authority (LSRCA) regulated limits. Please refer to the attached **Figure 5.1, LSRCA Ontario Regulation 97/04 map**, which is a reduction of the LSRCA sheet no. 71.

All calculations associated with the assessment of the pre and post development conditions have been included in **Appendix 'C', Stormwater Management Calculations.** To complete the calculations/assessment, the PCSWMM 2016 Professional model 5.1 has been used. The following is a summary of the design criteria used in the assessments. Print out of the same criteria is provided in **Appendix 'C'.**

A) Runoff Coefficients:

Design Chart 1.07, 22.0 Rural Run-off Coefficients,
Design Chart 1.07, 21.0 Urban Run-off Coefficients.
Table 6, Minimum Runoff Coefficients from Town of Innisfil criteria.
The runoff coefficients calculations have been provided in **Appendix C** for the pre and post development model assessment.

B) Design Storm Events modelled:

SCS 25hr Type II, 24 hr., for the 2, 5, 25 and 100 year events,
SCS 25hr Type II, 6hr., for the 2, 5, 25 and 100 year events,
Chicago Method, 4 hr. for the 2, 5, 25 and 100 year events.

To establish the rainfall intensities and depths, we have referred to the MTO website http://www.mto.gov.on.ca/IDF_Curves/terms.shtml for the **IDF Curve Lookup** specifically for the site area to determine the criteria for the rainfall for each event.

For the Chicago Method, we have used Table 7.1 from the City of Barrie criteria to establish the WPCC IDF values, (sheet 15 of 26 in Appendix 'C').

C) Soils Types:
Soil types for the property has been established from two sources.

- Simcoe County Soil Map, dated 1959. Based on the map, the soil type is classified as 'Stsl, which is Sargent, gravelly sand loam'.
- Borehole logs provided for the SPS-SC1. The boreholes identify fill. However, below the fill is noted 'SW' sand, trace to some silt. Below this is 'CL' sandy SILTY CLAY, some gravel. A copy of these logs are provided in **Appendix 'B'**.

Based on the above, we have estimated that the native soil type throughout the subject property is generally consistent to a hydrological soil type A, which is indicative of the gravelly sand loam.

D) Depression storage parameters have been selected from Table 7.5 from the City of Barrie guidelines, (sheet 8 of 36 in Appendix 'C').

E) Green-Ampts Method has been modelled. The values have been assigned based on Table 7.8 from City of Barrie guidelines for hydraulic soil group type A, (sheet 7 of 36 in Appendix 'C').

Suction head	= 100mm
Saturated hydraulic conductivity	= 25mm/hr
Initial moisture deficit	= 0.34 mm/mm

F) Times of Concentration (Tc) are all self calculating in the PCSWMM model. Only the path of flow length is measured for the pre-development model assessment. This is identified in the hand calculations and was input accordingly in the pre-development model. In the post development model assessment, the various junctions and conduit lengths assess Tc values internal to the PCSWMM model.

5.1 <u>Existing Drainage Assessment:</u>

The subject property is located at the SE corner of the 25th Sideroad and Mapleview Drive East. The property currently intercepts external drainage from approx. 6.0 ha north of Mapleview Drive, Mapleview Drive along the north limit of the site and the east side of the 25th Sideroad. Lands located to the east of the site are also tributary to the existing drainage system located within the site.

The existing drainage system has been identified on **Figure 5.2, Existing Drainage Conditions Plan.** On this figure the existing drainage conditions for the site identify that drainage flows off the east half of the 25th Sideroad into an existing drainage channel, C1, which flows to the road side ditch at the end of Cowan Avenue and then via a ditch labelled conduit C2 and then C3. Sheet drainage across the site from the NW corner also drains into this conduit C3. Drainage also flows as sheet drainage into conduit C4. From these two intersecting channels, the drainage flows into conduit C5, the ultimate outlet channel, which flows to the outlet for the site. From this outlet point for the Property, the drainage flows to the culvert which crosses Pinegrove Avenue.

To assess the flow capabilities of the various drainage channels, ie, C1, C2, C3, C4 and C5, a site walk was conducted to determine channel dimensions. These has been identified in **Appendix 'C'**. There are also photos of these channels provided for additional clarity on sheets 11 and 12 in Appendix 'C'.

For assessing the existing drainage conditions, the PCSWMM model has been used. The existing drainage boundary conditions have been identified on **Figure 5.3, Pre-Development Conditions, PCSWMM**, which is the input associated with the PCSWMM model program.

A summary of the pre development peak flow rates at the outlet location for the Property are summarized in Table 5.1 below:

TABLE 5.1
SUMMARY OF PRE-DEVELOPMENT
PEAK FLOW RATES AT OUTFALL LOCATION

Storm Event (yr)	**SCS 6 hr.** (cu.m/sec)	**SCS 24hr** (cu.m/sec)	**Chicago 4 hr** (cu.m./sec)
2	0.572	0.893	1.007
5	0.761	1.216	1.393
25	1.072	1.962	2.044
100	1.488	2.984	2.661

Summary of the PCSWMM model print out is printed in **Appendix 'C' as** file:
Teromi Pre D Test 4

5.2 <u>Proposed Drainage System:</u>

For assessing the proposed drainage system, the PCSWMM model has been used. The proposed stormwater servicing is shown on **Figure 5.4, Post Development Conditions, PCSWMM.** This figure identifies the node locations, which represents the various manhole structures throughout the PCSWMM model. As well, the overland flow route system is provided on the same figure. **Figure 5.6, Conceptual Stormwater Management Pond** identifies a preliminary design layout for this facility.

The proposed drainage system parameters have been established based on the calculations provided in **Appendix 'C'**.

To ensure the pre-development peak flows rates are not exceeded at the outlet for the Property, a stormwater management pond facility has been proposed. The details used to establish the pond geometrics are provided in **Appendix 'C'** as well.

A summary of the post flow rates at the outlet location for the Property are summarized in Table 5.2 below. This summary has been provided with the implementation of a stormwater management (SWM) facility.

TABLE 5.2
SUMMARY OF POST DEVELOPMENT
PEAK FLOW RATES AT OUTFALL LOCATION

Storm Event (yr)	**SCS 6 hr.** (cu.m/sec)	**SCS 24hr** (cu.m/sec)	**Chicago 4 hr** (cu.m./sec)
2	0.334	0.333	0.244
5	0.517	0.532	0.414
25	0.798	0.881	0.700
100	1.088	1.252	0.961

Summary of the PCSWMM model print out is printed in **Appendix 'C' as** file:
Teromi Post D with SWMP and Dual System Test 6

Based on the comparison of the peak flow rates for the pre to post situation, Tables 5.1 and 5.2, there will be no increases for all storm events with the implementation of the proposed SWM facility. In fact, based on the preliminary design for the SWM facility, there will be a significant reduction in peak flow rates. As such, there is ample space available to modify the pond facility to accommodate conservative design approach for the system and to increase the buffers provided on all sides of the facility. This will be completed at the detailed design for the overall subdivision.

5.3 Phasing of Storm Drainage System:

The storm drainage system shall be designed in consideration of the proposed phasing of the plan as follows:

5.3.1 Phase 1

Figure 5.5, Proposed Phase 1 Drainage System identifies the required works to accommodate this portion of the development. To ensure appropriate quantity and quality control for this phase, all stormwater drainage from the developed portion of the phase shall be directed via a ditch system to SWM block. The SWM facility will also be constructed. The ditch system will be constructed along the south side of Street B, across Street A and the Park block to the future r.o.w. of the future Balsam Street and to the outlet into the SWM pond block.

It is proposed that the SWM facility will be constructed to accommodate the phase 1 works only. Though the pond will be built for the ultimate required size for the entire property. the outlet control system will be sized to accommodate the Phase 1 flow rate increases. All external lands tributary to the facility will also be control as required.

5.3.2 Phase 2

Upon development of the phase 2 lands, which will be the full development scenario, the SWM outlet controls will be modified accordingly to ensure post development peak flow rates do not exceed the pre-development peak flow rates.

Minor flows for the ultimate development of the Property will be conveyed via the internal minor storm events via the proposed stormsewer system into the proposed SWM facility located at the southerly limit of the Property. The major flow shall be conveyed via the existing drainage channels and the various proposed road allowances and drainage blocks into the same SWM facility.

5.4 Wet Pond Specifications:

The design of the wet land components of the SWM facility has been completed in accordance with the current MOE guidelines for an 'enhanced level' of control and has met the specified criteria as follows:

a) Extended Detention volume, required volume = 726.8 cu.m.
provided volume = 792.5 cu.m.

b) Permanent Detention Volume, required volume = 1009 cu.m.
provided volume = 1020 cu.m.

c) Drainage area is greater than the min. suggested of 5 ha = 18.17 ha

d) Active storage detention time is greater than suggested 12 hr
provided time = 15.6 hr.

e) Forebay plunge pool depth is 1.0 m as specified

f) Area of forebay is 25% of permanent pool area

g) Length to width ratio
- for the forebay, required = 2:1
- provided = 30 : 15 = 2 : 1
- for the overall SWMP requ'd = 3:1
- provided = 110 : 35 = 3.1 : 1

h) Active storage depth
- required max. for 10 yr event = 1 m
- provided for 10 yr SCS 6 hr = 228.4 – 227.5 = 0.9 m

i) Side slope not to be less than 5 : 1 for active storage area
Provided side slope are 7:1 as per Township stds.

j) Avoid clogging of extended detention outlet. Provide min. 150mm dia

k) Inlet pipe, required to be a min. 450mm dia.
provided inlet pipe is 900mm dia.

l) Outlet pipe other than the extended detention pipe,
- required to be min. 450mm dia.
- provided, 600mm dia.

m) Maintenance road to be provided. Proposal is for a looped gravel road on top of the berm at a 4m width.

n) Buffer from permanent water level,
- required to be min. 7 m
- provided at 8 m

As noted above, preliminary design of the water quality control aspects of the SWM facility satisfies all the criteria outline in the current MOE guideline. At the detailed design, these specifications are to be adhered to.

5.5 Water Balance Review:

Ground water recharge is a requirement of the design in order to ensure that pre-development and post development water balance, ie, infiltration flows, are maintained. This shall be achieved through the implementation of the individual bio-basins proposed within the commercial block and apartment and mixed use buildings block proposed in Phase 1. A sample of a typical bio-retention basin (infiltration basin) is provided as a figure in **Appendix 'C'**. It is anticipated that the water balance shall be achieved in these two blocks to ensure that the post development rate is comparable to the pre-development rate.

Other locations will be selected where possible throughout the phase 2 portion of the site. However, municipal streets do not typically promote such basins, especially when curb and gutter roads are required. There will be opportunity to provide additional ground water infiltration within the park block or other public areas subject to acceptance by the municipality. This is to be implemented in the phase 2 development as bi-basins and the natural ground cover of grasses and flat slopes.

The proposed SWM facility at the southeasterly corner of the site will also provide excellent opportunity for groundwater recharge through the implementation of the proposed wetland design.

A preliminary water balance assessment for the site based on the current conceptual design will be completed by Azimuth Environmental to establish the target for infiltration required for the site development in the detailed design. The detailed design will assess the extent of ground water recharge to ensure a comparable volume of infiltration is achieved over a one-year span in the post development situation as in the pre-development conditions.

5.6 Phosphorous Removal:

To calculate the phosphorous loading, we have used Phosphorous Loading Database Tool v2.2.0. Please refer to **Appendix 'C'** for the supporting software print-out. The analysis has revealed the following:

Pre-development condition for the Property only for a total load per year = 0.96 kg
Post Development condition for the Property without BMP's in place
total load per year = 8,039.67 kg

With the proposed development of the Property, (the changes in the site area coverage), the calculated increase in phosphorous loading must be addressed through the implementation of BMP's such as:

1. Bio-retention basins,
2. Wet detention pond, ie, the SWM pond facility,
3. Enhanced grass/water quality swales,
4. Soak-away pits / infiltration trenches,
5. Vegetative filter strips/stream buffers,

With the proposed usage of the BMP's noted above and assessed in **Appendix 'C'** on pages 32 to 36 with the PLDT v2 made available through the NVCA, the overall phosphorous loading for the site can be reduced to 2,451.55 kg/yr. Further review of BMP opportunities is recommended at the detailed design to ensure additional reduction can be achieved for a balance of the pre to post development phosphorous net loading per year.

5.7 Erosion and Sediment Controls:

5.7.1 Temporary Controls

The following practises for erosion and siltation controls (ESC) shall be adhered to for all development within the site area:

1. Adopt a multi-barrier approach to provide ESC through erosion controls first.
2. Retain existing ground cover and stabilize exposed soil with vegetation whenever possible.
3. Limit the duration of exposure of soils and phase the construction accordingly.
4. Limit the size of disturbed areas by minimizing nonessential clearing and grading,
5. Minimize slope length and gradient of disturbed areas,
6. Maintain overland sheet flow and avoid concentrated flows, and when not possible, provide erosion protection materials for such flow to flow over and through,
7. Ensure the contractor understands the importance of the provision of implementation of such controls, inspects such regularly and maintains such as required,
8. Make adjustments to the ESC on-site as required, subject to the construction activities,
9. Assess all the ESC before, during and after all rainfalls, significant snowfalls and snow melt events,
10. Maintain a detailed inspection record of the inspection works.

The following sequence of ESC works are proposed:

i) First the installation of the temporary construction mud mat shall be completed at the new entrance location.
ii) The siltation control fence works shall be installed as identified on the details design plans.
iii) Minimize the length of open trenches during the installation of underground services,
iv) During any works stoppages during the installation of underground services, provide temporary plugs to ensure silt laiden drainage does not flow into the existing downstream sewers.
v) Provide temporary catch basin sediment protection as detailed on the related Civil design drawings,
vi) All silt laiden water pumped from construction trenches must be directed into a filter ringed areas (basin) or filter bags prior to such water being directed to the sedimentation control basin,
vii) Dust control shall be provided during the dry periods as directed by the site engineer.
viii) All streets and hard surface areas shall be swept on a regular basis, as directed by the site engineer.
ix) Temporary sedimentation basins shall be strategically positioned in the design. These basins shall be constructed and operational as a sediment control basin prior to the site earthworks proceeding. The sizing for these ESC basins required for the

construction stage will be completed once the schedule of works has been established at the detailed design stage. All captured materials within the ESC basins shall be removed and disposed of off-site prior to the completion of the project.

x) Where surface drainage is not directed to be captured by the existing (temporary) pond, site surface drainage shall be directed as sheet flow and swale flow through the proposed siltation control fences during the construction phase.

xi) All disturbed landscaped areas shall be provided with top soil and seeded and/or sodded at the earliest opportunity in order to assist in erosion control.

xii) All CB inlet structures shall be fitted with temporary filter cloths under the lids and be maintained sufficiently enough to ensure continued filtering of silt laiden stormwater runoff.

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

5.7.2 Permanent Controls:

The following practises are proposed to provide permanent water quality control:

- Provide surface infiltration within swales and the landscape areas;
- Provide infiltration of stormwater within the bottom of the newly excavated bio-retention infiltration basin, where such can occur;
- Where possible, direct surface drainage from the asphalt areas as overland flow over landscaped and grassed areas prior to discharging into the downstream storm drainage system;

Permanent water quality control for this site has been provided in the design based on the criteria outlined above and as discussed in detail in **Section 5.2.**

5.8 Inspection and Maintenance:

The following is a minimum recommended inspection schedule which should be implemented and adhered to for the full length of the construction period:

1. All erosion and siltation control devises shall be inspected on a weekly basis by the consultant's resident inspector.
2. All erosion and siltation controls shall be inspected after each and every significant rainfall event by the consultant's resident inspector.
3. All erosion and siltation controls shall be inspected after significant snowfall events by the consultant's resident inspector if construction operations are occurring during such time events.
4. All erosion and siltation controls shall be inspected daily during the extended rainfall or snowmelt events by the consultant's resident inspector,
5. A detailed written and photo record shall be maintained and provided to the Town of Innisfil for each inspection related to the erosion and siltation control inspections and maintenance works.
6. During inactive construction periods where the site is left with no works for 30 days or longer, a monthly inspection shall be conducted.

6.0 ROADS WORKS

Access to the Plan shall be via three locations.

i) 25th Sideroad from the west,
ii) Mapleview Drive East from the north, and,
iii) Balsam Street which comes off Oak Street located east of the site

The supporting Traffic Impact Study provides further details on the specifics of each location.

The proposed streets shall conform to the Town of Innisfil standard TOISD 201. As well, two cul-de-sacs are proposed in accordance with to the town standard TOISD 211. See **Appendix 'B'** for these 2 details. More specifically, the streets shall comprise of a municipal 20m right of way road network, consisting of undivided local roads with 8.5m pavement, curb, and gutter as per municipal standard. Sidewalks will be provided on only one side of the streets at locations to be determined by the municipality. Recommended sidewalk locations have been provided on the enclosed plans.

The typical internal road cross section will include a full urban drainage system including curb and gutter and storm sewer, sanitary sewers, watermain distribution system, and will provide the method of distribution of services and utilities to the proposed units. The road section will also accommodate the standard utilities such as Bell, Gas and Hydro along with locations for hydrants, and light standards as set out by the Town Standard Urban Cross-section.

The Plan shall be constructed in 2 phases. Refer to **Figure 2.1,**

6.1 Phase 1:

The first phase of development, as identified on **Figure 2.1**, will be to develop the commercial block and apartment and mixed use buildings block. These blocks will consist of the following:

a) The commercial block of 1.62 ha in area, and,
b) The apartment and mixed use buildings block of 1.53 ha in area, which would accommodate approx. 93 residential units.

To provide access/egress to the commercial block, approx. 65m of Street 'B', off the 25th Sideroad, shall be constructed to the easterly limit of the proposed Street 'A'. This will ensure safe access and egress for the site to the 25th Sideroad, ie, as a full municipal right-of-way. A second access/egress to the commercial block is currently proposed to Mapleview Drive East, close to the easterly limit of the block. Please refer to the Plan in **Appendix 'A'**. It should be noted that a full Site Plan control submission associated with development of these blocks will proceed at a later date.

To provide access/egress to the apartment and mixed use buildings block, approx. 55m of Street 'A' shall be constructed off Mapleview Drive to the southerly limit of proposed entrance to the block. Please refer to the Plan in **Appendix 'A'**. This will ensure safe access/egress for the site to Mapleview Drive East for the entire site. Exact details on the Site Plan design for this block shall be provided at a later date.

The construction of the short portions of Street 'A' out to the 25th Sideroad and Street 'B' out to Mapleview Drive East shall also include the provision of watermain, sanitary sewer and stormsewer works and applicable servicing laterals, plus any utilities as required and as determined necessary for the ultimate phase 2 development works.

6.2 Phase 2:

The second phase of development, as identified on **Figure 2.1**, will be to develop the remainder of the site to the limits of the existing SWM ponding facility, which shall be constructed as part of the phase 1 stage. This will include all of Streets 'A', 'B' and 'C'. It will also include for the extension of Balsam Street easterly to Oak Street.

The external road works required for accommodating the phase 2 works are as follows:

i) 25th Sideroad intersection works for Street 'A',

ii) Mapleview Drive East intersection works for Street 'A', and,

iii) Balsam Street from the easterly limit of the plan to Oak Street.

7.0 LOT GRADING

Please refer to **Figure 7.1, Conceptual Grading Plan.** On this plan, the existing topographical features of the site have been identified. This is the same topographical survey as provided on the proposed Draft Plan of Subdivision by the OLS.

A conceptual road grading design has been provided on **Figure 7.1**. The design provides for a typical minimum slope of 0.5% on the road centerlines. The standard 2% road cross-fall is to be as per Town Standard.

The Plan shall be constructed in 2 phases. Refer to **Figure 2.1,**

7.1 Phase 1:

The first phase of development, as identified on **Figure 2.1**, will be to develop the commercial block and apartment and mixed use buildings block. These blocks will consist of the following:

i) The commercial block of 1.62 ha, and,

ii) A high density residential bloc of 1.84 ha., which would accommodate approx. 144 residential units.

All surface drainage from these 2 blocks shall be directed to flow as on-site storm sewers and surface drainage and/or parking lot drainage to outlet southerly into a temporary proposed drainage ditch system. The details of this drainage ditch system has been identified in **Section 5.0**, Stormwater Management System and on **Figure 5.5**.

As noted in Section 3.0, in order to provide adequate cover over the sanitary sewer which will service these two (2) block, the development of the site will require placement of approximately 1.25m to 1.75m of fill in the southeasterly quadrant of the apartment and mixed use buildings block. The grading depth for this fill will be determined at the detailed design stage for these 2 blocks to better determine the location of the drainage ditch system and with the objective to minimize the volume of fill required for the development of the 2 blocks.

7.2 Phase 2:

Phase 2 shall proceed once the sanitary servicing for the remaining lands is available. It will consist of the remaining lands.

Based on the conceptual grading design, lot grading designs for the project shall generally consist of back to front lot drainage and split lot drainage in accordance with the Town of Innisfil grading standards. This is identified on **Figure 7.1**.

Rear lot catch basins will be minimized when possible. There are several rear lot drainage channels proposed within the development. The details of these drainage channels are discussed in Section 5.0 above. When grading permit, lots shall also drain into these channels to reduce the flows into the internal storm sewer system and promote natural drainage flows.

All lots backing onto the existing lands shall be graded flush with the abutting existing grades, thereby preserving the existing vegetation along common property lines. Erosion controls shall be provided along these lots lines to ensure that no transport of siltation from surface runoff into other properties. The details of the proposed drainage patterns will be determined at the detailed design stage of the plan of subdivision once the final approved lot fabric has been established.

8.0 UTILITY SERVICING

8.1 HYDRO

Innisfil Hydro Inc. is the electrical service provider for the subject property. Electrical distribution is to be provided via connection to the existing overhead line on 25th Sideroad and Mapleview Drive East. Internal servicing shall be provided as per urban standard, ie, internal hydro distribution will be provided underground.

Internal and underground 13 KV 1.0 local feeder distribution is required as well as streetlighting will be provided in accordance with Town of Innisfil standards.

As per the Town standard detail TOISD 201, Urban Local Road, hydro, bell and cable are proposed to be installed in a common trench. Co-ordination is to be done amongst the respective utility companies at the detailed design stage.

8.2 OTHER UTILITIES

Natural gas, telephone and cable TV shall be provided via connection to the existing infrastructure with the 25th Sideroad and Mapleview Drive East. Design of these utilities is not included in the municipal engineering services but is left to the respective utility companies. However, coordination of such servicing shall be provided by the Civil Engineering designers.

9.0 CONCLUSIONS

This report identifies the proposal to develop the plan in 2 distinct phases. Phase 1 may proceed at present. Phase 2 will only proceed upon the completion of the external sanitary servicing system which shall include both local sewers within the abutting streets to the south and east and the SPS SC3 sewage pumping station.

The servicing requirements of the development of the subject property as proposed by the Draft Plan is demonstrated on the following plans:

- The provision of watermains as outlined on **Figure 3.1**.
- The provision of gravity sanitary sewers as outlined on **Figure 4.1**.
- The provision of storm sewers and stormwater management facilities as outlined in Section 5.0.
- The provision of road as discussed in Section 6.0 and grading as detailed in Section 7 and **Figure 7.1** of this report.
- The provision of utility infrastructure as outlined in Section 8 of this report.

In conclusion, it is recommended that the Approving Authorities support the application for the proposed Draft Plan of Subdivision.

Respectfully Submitted,

JFIVE Developments Ltd.
Consulting Engineer

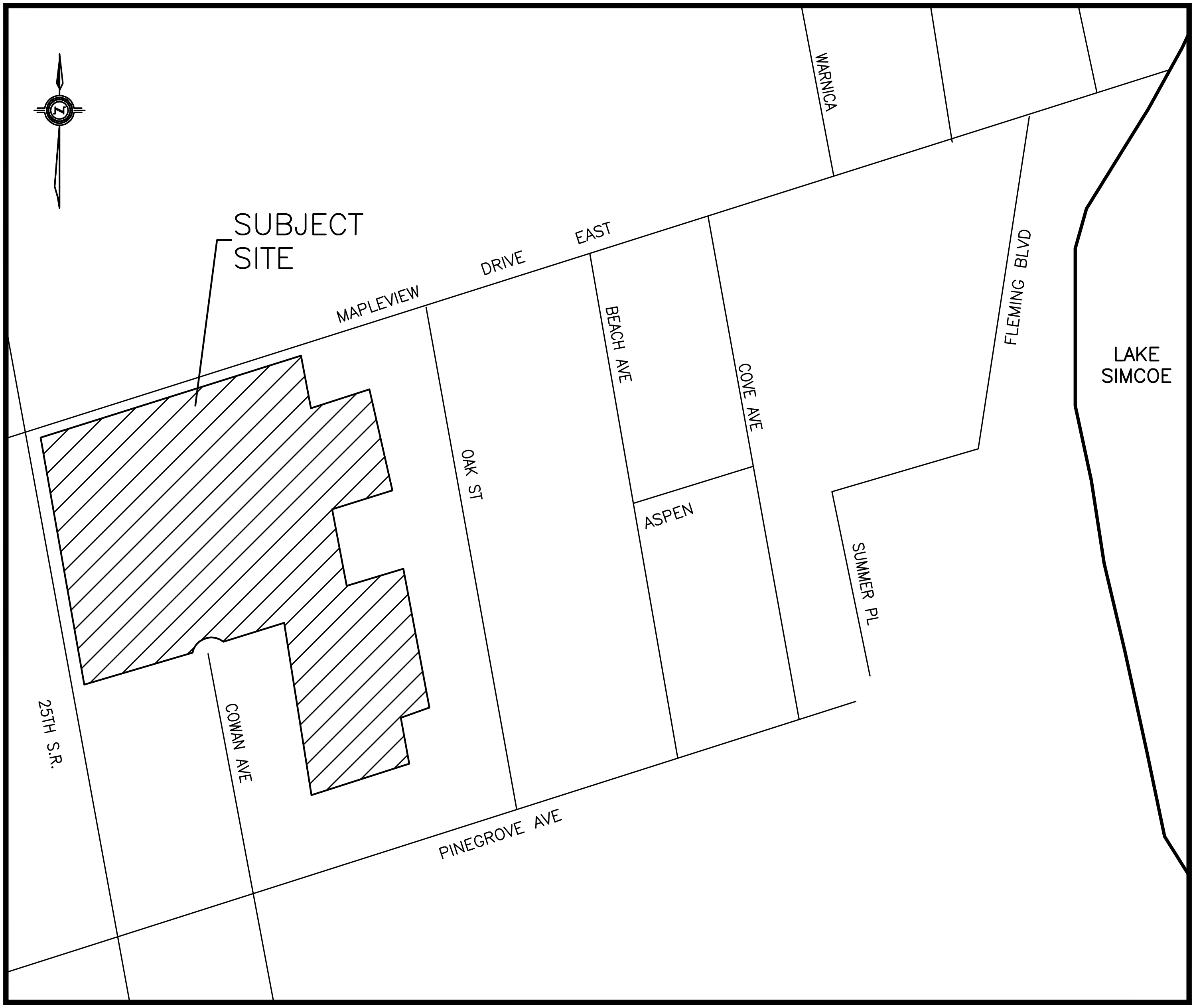
John Foster, P. Eng.
Project Manager/Design Engineer March, 2018

`

FIGURES

DATE: **MARCH, 2018**
PROJECT NO.: **#007**

PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301



PROJECT:

TEROMI SITE

TOWN OF INNISFIL

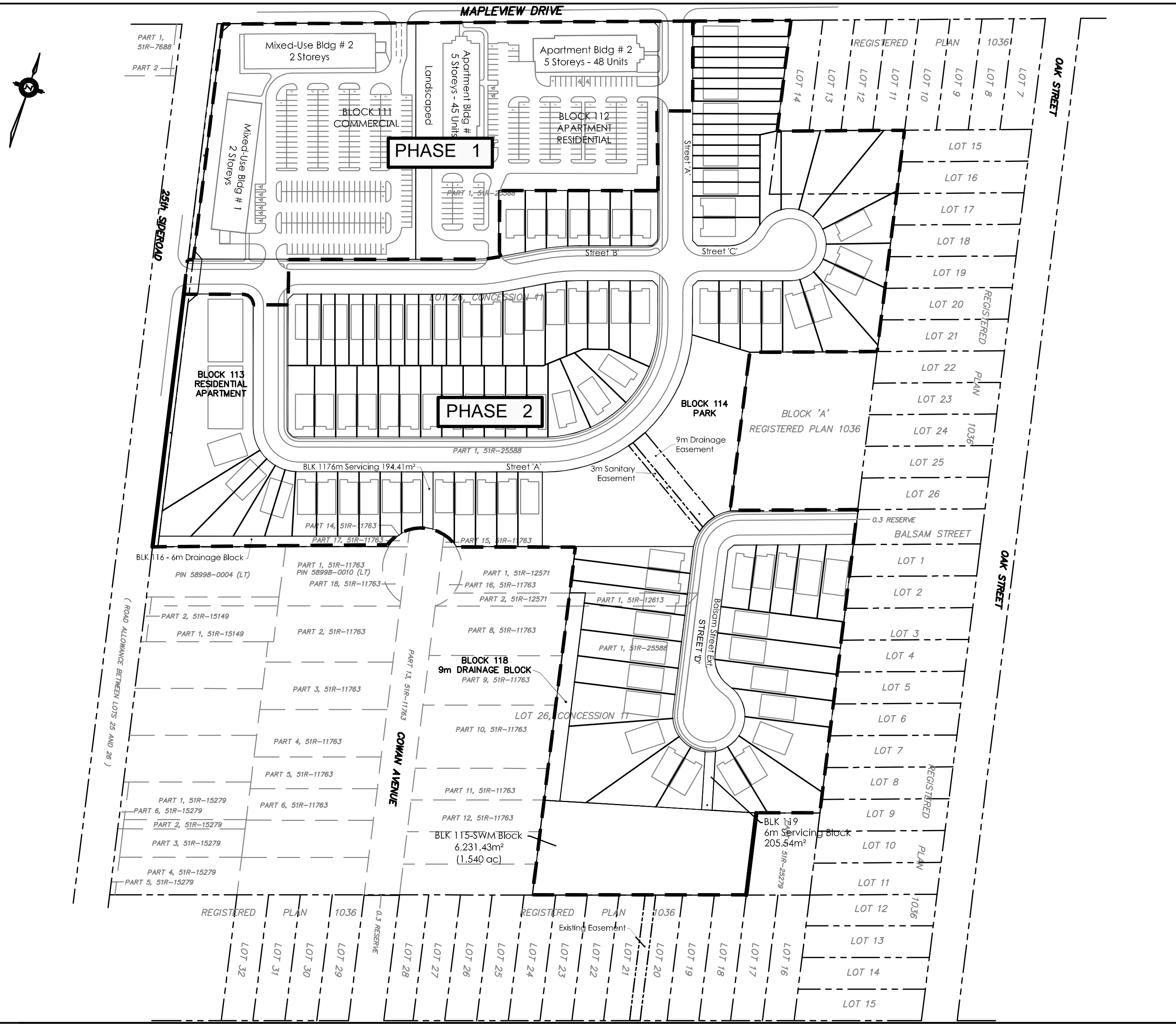
TITLE:

LOCATION PLAN

JFIVE
DEVELOPMENTS LTD.

1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.fosterjfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	N.T.S.	FIG. 1.1	007
CHECKED: J.F.	DATE: MAY 2017		



PROJECT:

TEROMI SITE

TOWN OF INNISFIL

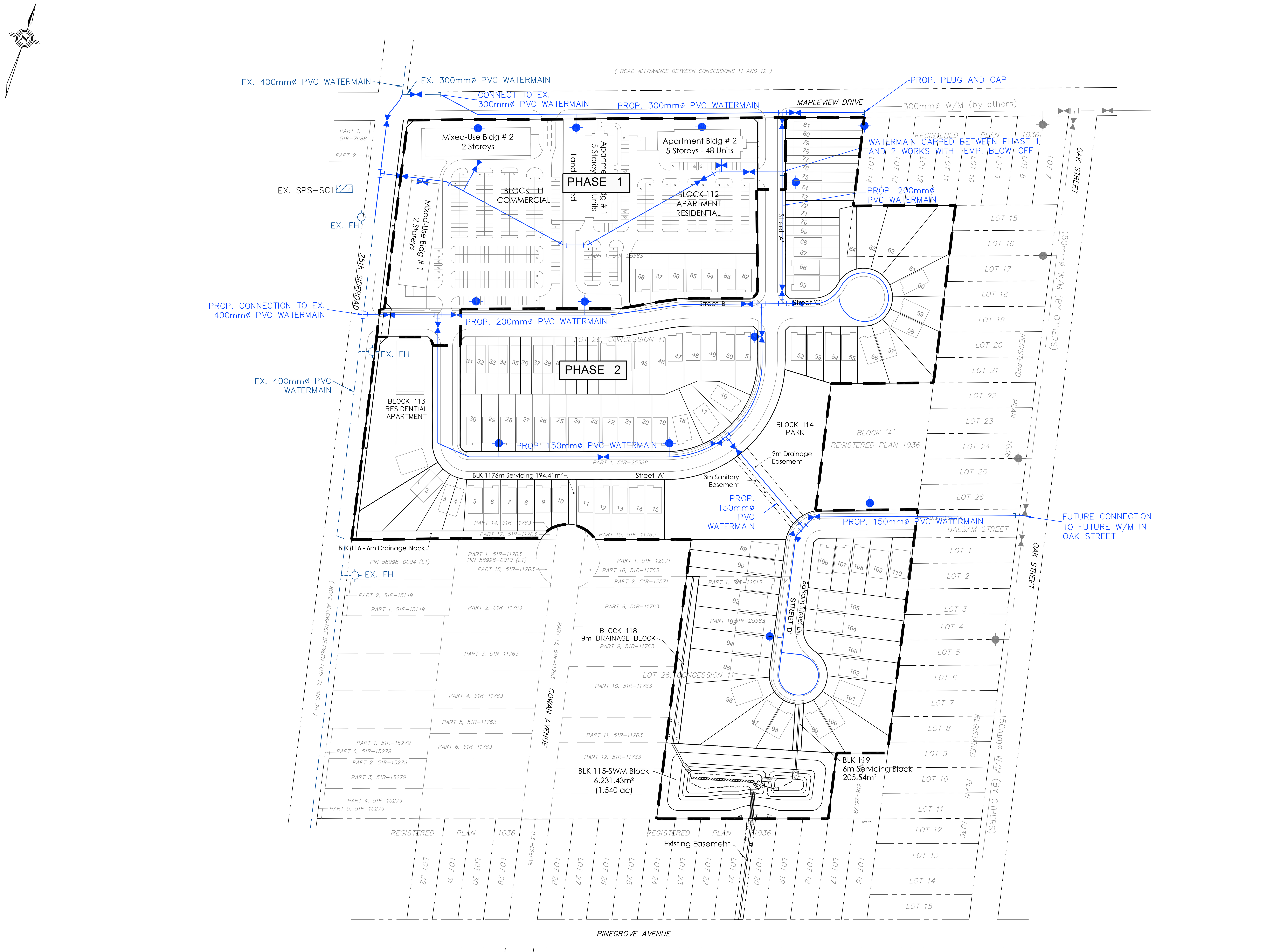
TITLE:

PHASE LIMITS

JFIVE
DEVELOPMENTS LTD.

1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.foster.jfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	N.T.S.	FIG. 2.1	007
CHECKED: J.F.	DATE: MAR. 2018		



LEGEND:

— — —	EX. WATERMAIN
———	PROP. WATERMAIN
▶◀	PROP. VALVE & BOX
——⊏	PROP. TEE CONNECTION
-·-◇	EX. FIRE HYDRANT
—●	PROP. FIRE HYDRANT
—·—·—	FUTURE WATERMAIN (BY OTHERS)

PROJECT:

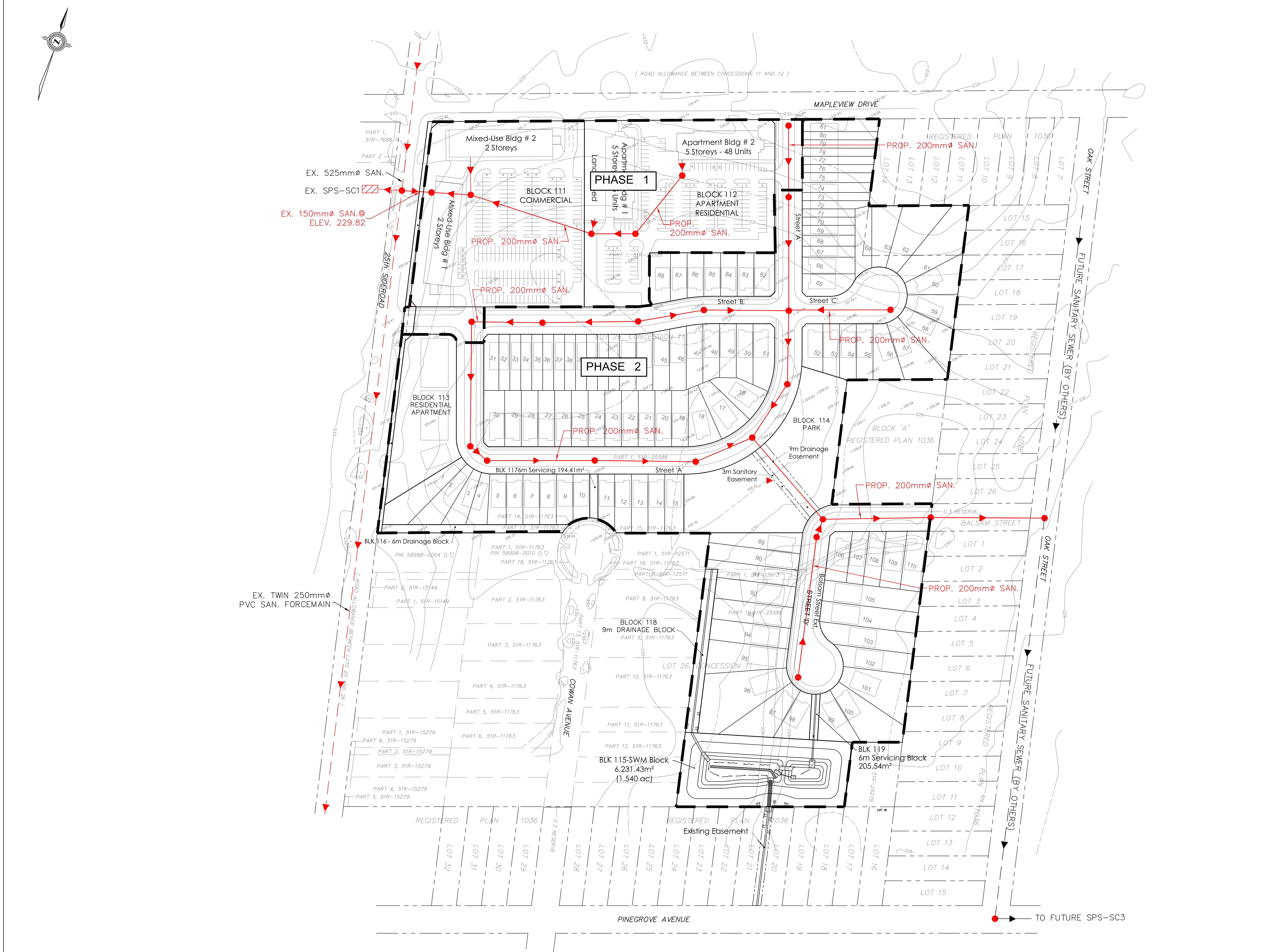
TEROMI SITE
TOWN OF INNISFIL

TITLE:

CONCEPTUAL WATER SERVICING SYSTEM

JFIVE DEVELOPMENTS LTD.
1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.fosterjfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:3000	FIG. 3.1	007
CHECKED: J.F.	DATE: MAR. 2018		



LEGEND:

- EX. SANITARY
- PROP. SANITARY
- EX. SANITARY MANHOLE
- PROP. SANITARY MANHOLE
- PROP. SAN. SEWER AND DIRECTION OF FLOW
- FUTURE SANITARY SEWER (BY OTHERS)

PROJECT:

TEROMI SITE

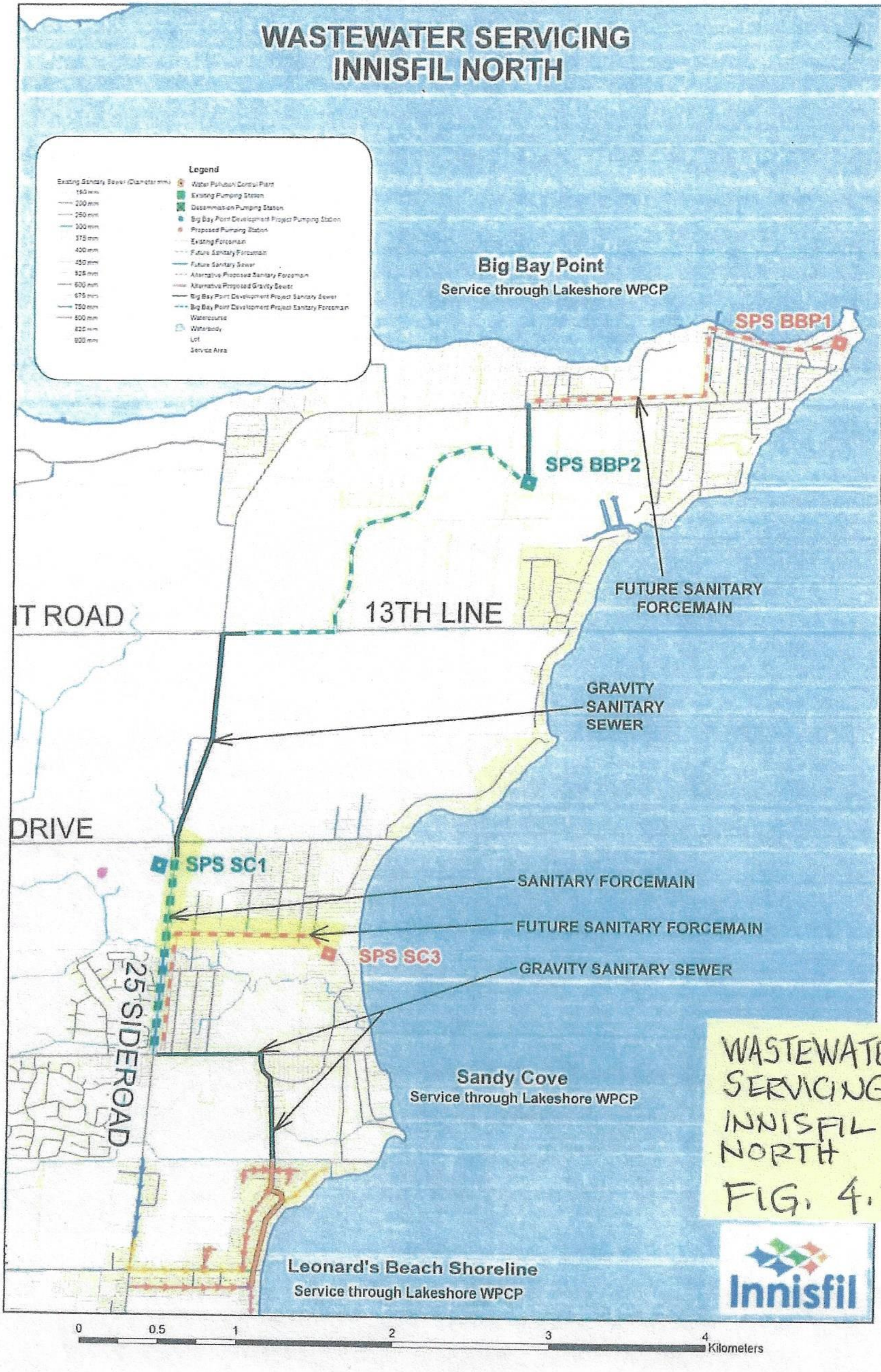
TOWN OF INNISFIL

TITLE:

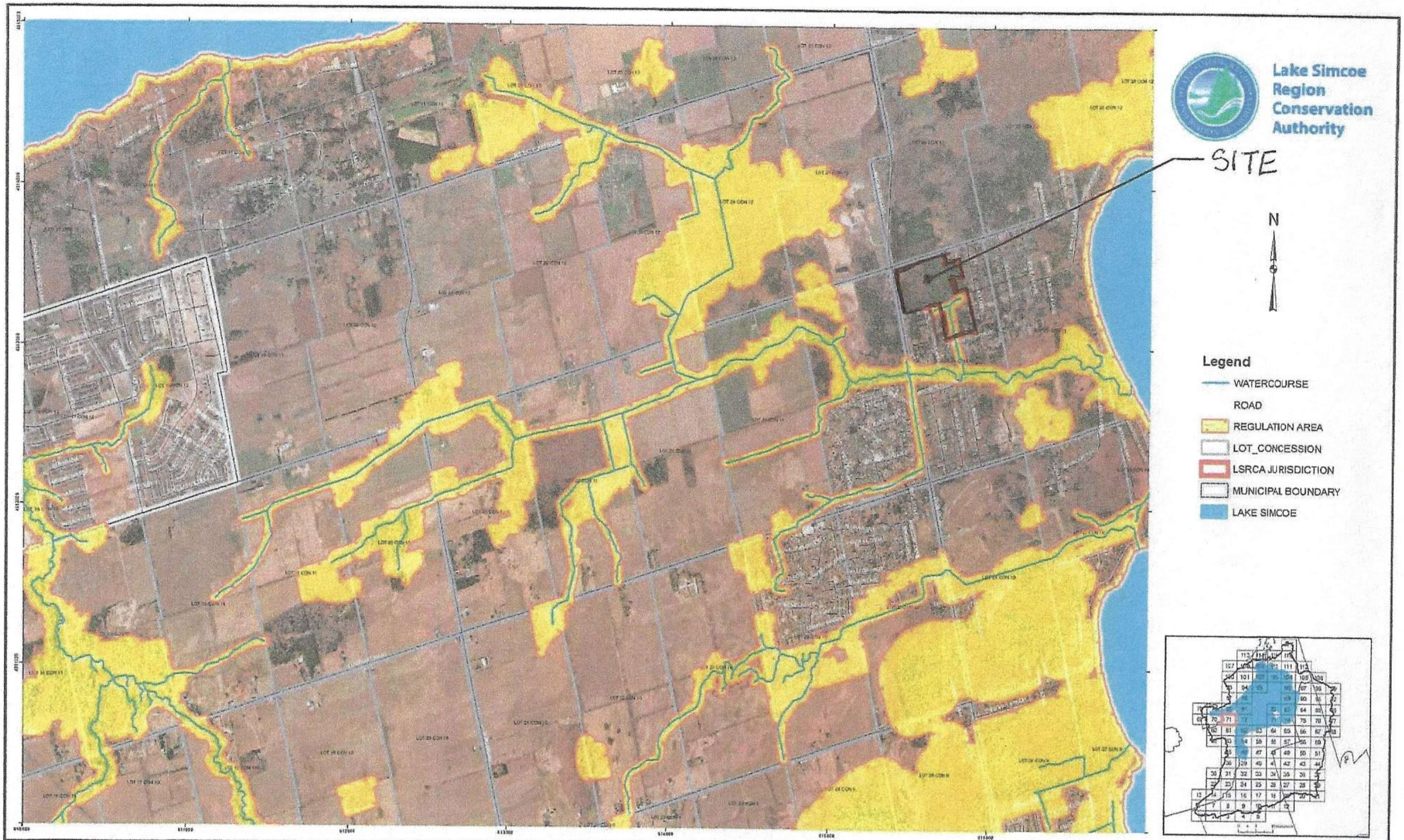
CONCEPTUAL SANITARY SERVICING PLAN

JFIVE
DEVELOPMENTS LTD.
1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.foster.jfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:3000	FIG. 4.1	007
CHECKED: J.F.	DATE: MAR. 2018		



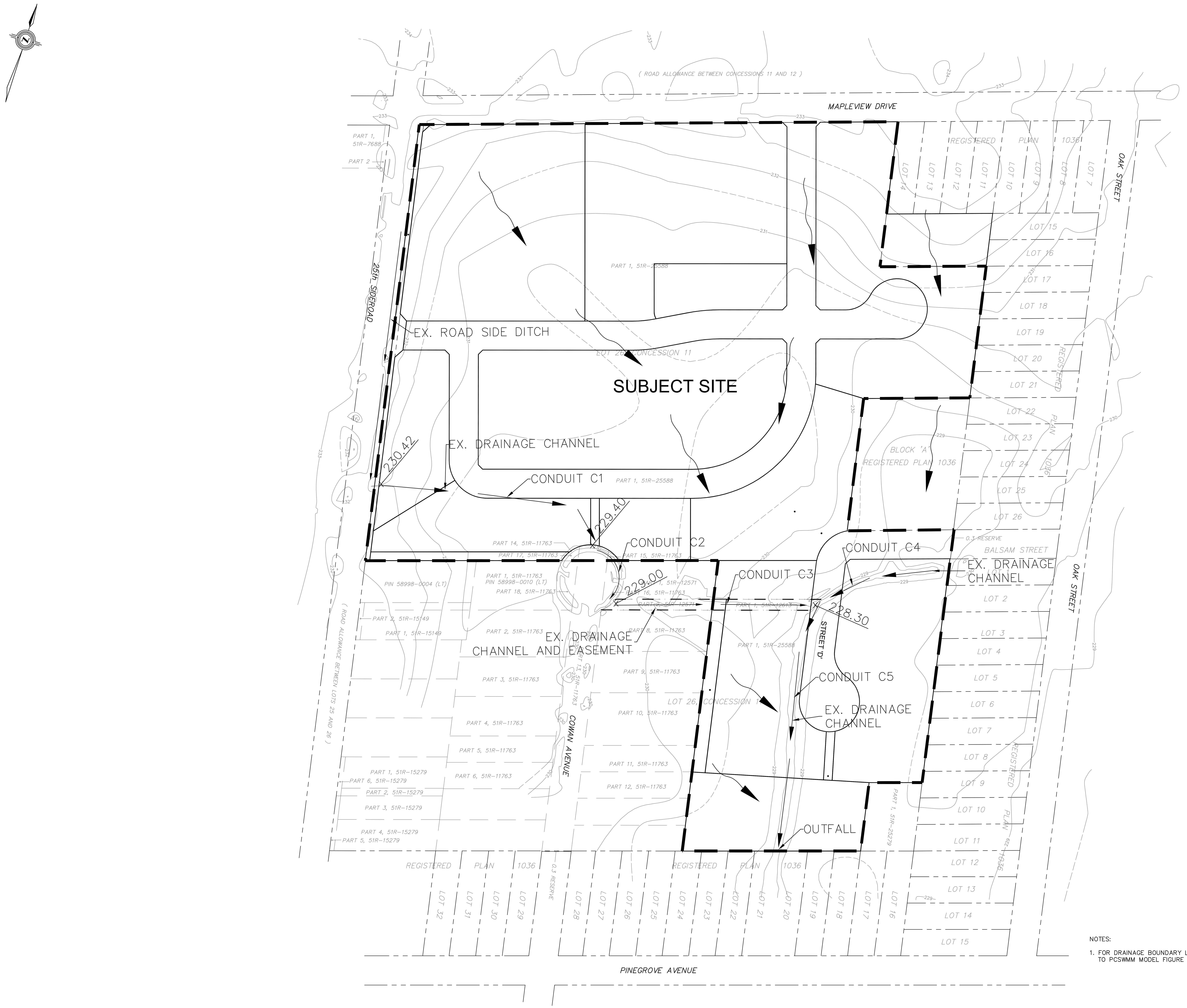
WASTEWATER SERVICING INNISFIL NORTH FIG. 4.2



1:10,000	(ONTARIO REGULATION 97/04)	SHEET NO. 71
0 0.25 0.5 1 1.5 2 Kilometers	REGULATION OF DEVELOPMENT, INTERFERENCE WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES. ONTARIO REGULATION 179/06	OF 117
	PLOT DATE: APRIL 2008 FILE LOCATION:	

NO.	REVISIONS	DATE
0	ONTARIO REGULATION 179/06 APPROVED	MAY 1, 2006
1		SEPTEMBER 26, 2007
2		APRIL 24, 2008
		JANUARY 2006

FIG. 5.1



LEGEND:

- EX. DRAINAGE CHANNEL
- EX. DRAINAGE CHANNEL/EASEMENT
- GENERAL DIRECTION OF SURFACE WATER FLOW
- SITE BOUNDARY

NOTES:

1. FOR DRAINAGE BOUNDARY LIMITS FOR EXISTING CONDITIONS, REFER TO PCSWMM MODEL FIGURE 4.2, PRE-DEVELOPMENT CONDITIONS.

PROJECT:

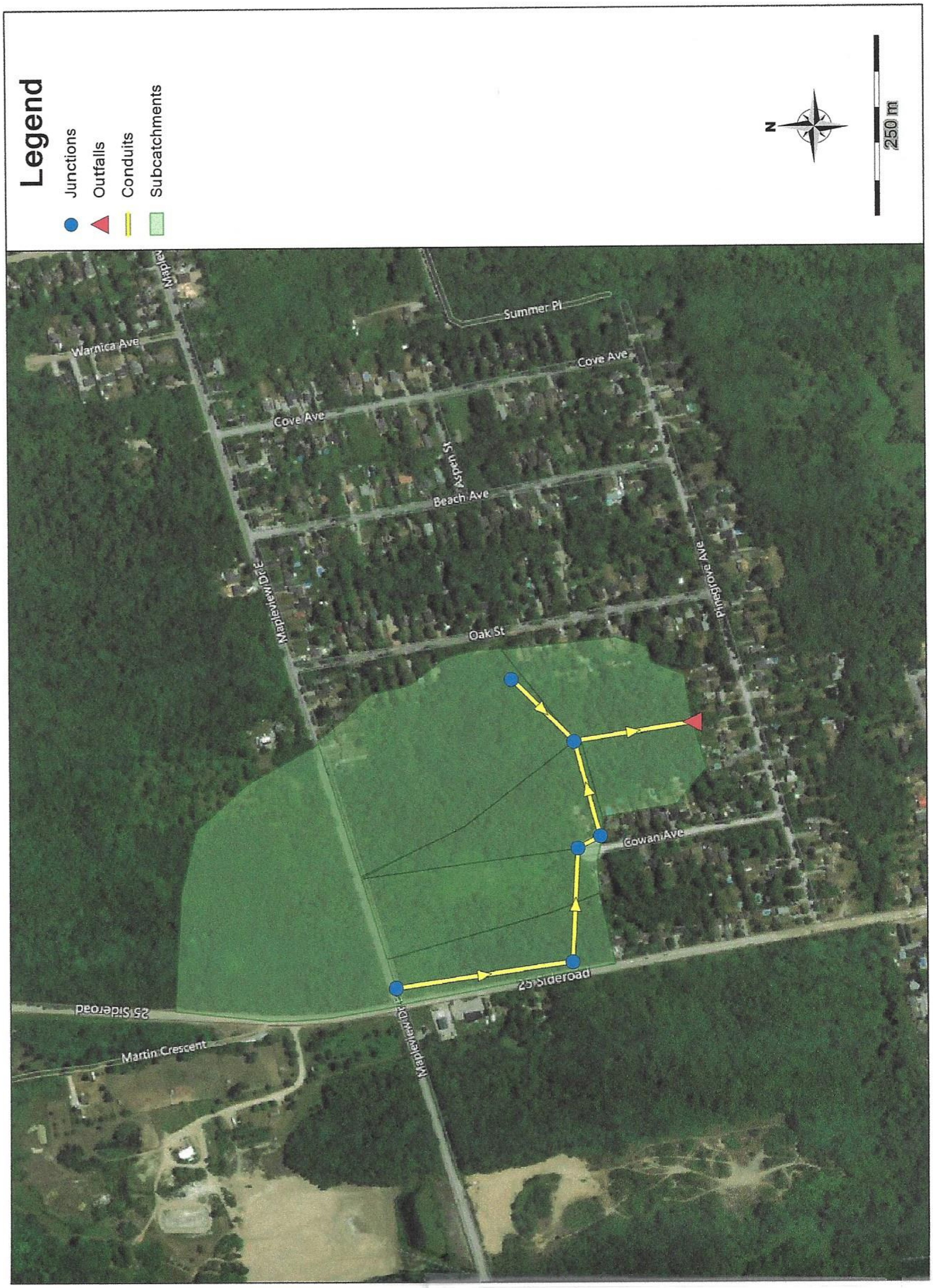
TEROMI SITE
TOWN OF INNISFIL

TITLE:

EXISTING DRAINAGE CONDITIONS PLAN

JFIVE DEVELOPMENTS LTD.
1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.foster.jfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:3000	FIG. 5.2	007
CHECKED: J.F.	DATE: MAR. 2018		

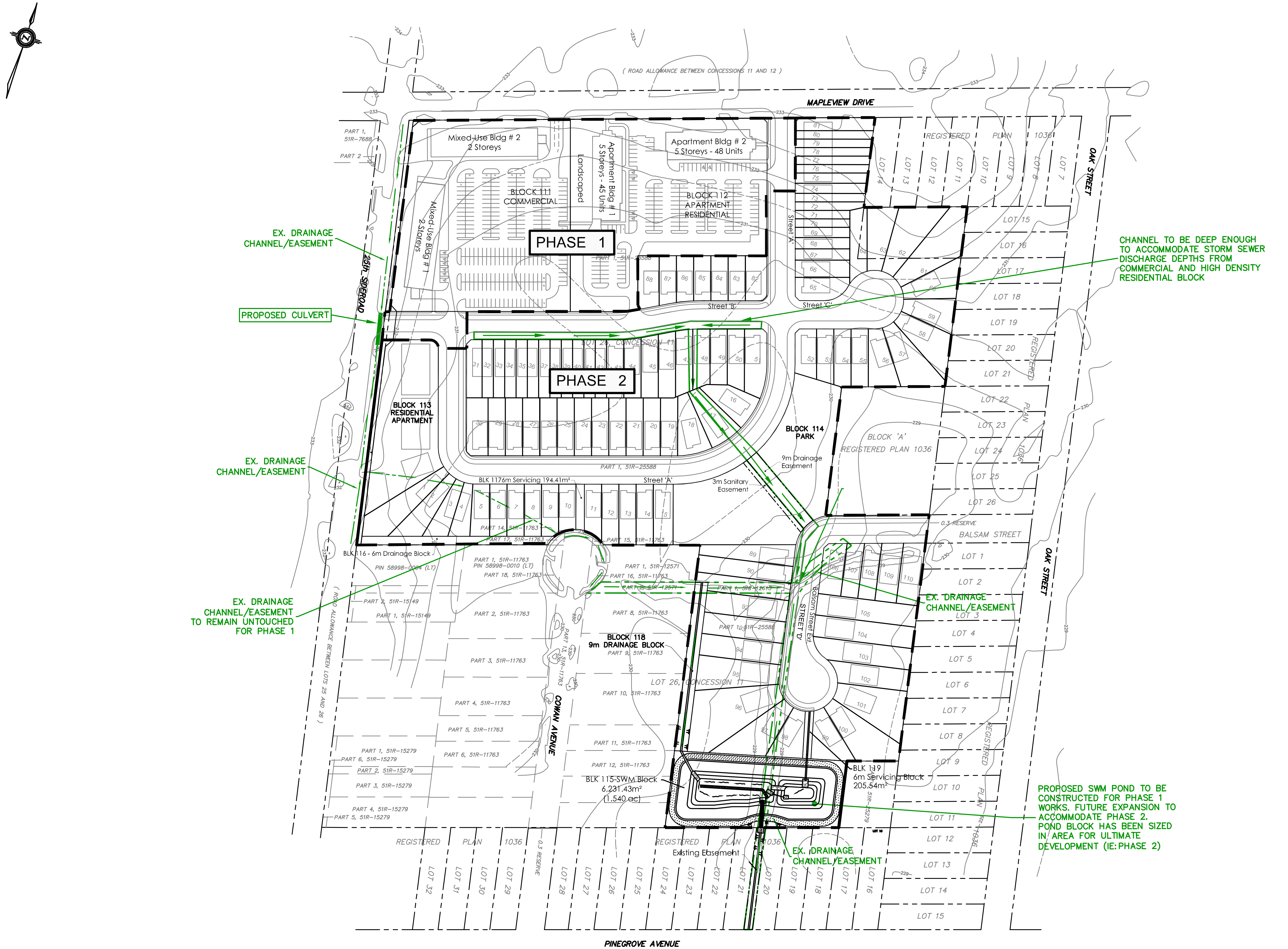


PRE-DEVELOPMENT CONDITIONS

PCSWMM **FIG. 5.3**

POST DEVELOPMENT CONDITIONS

PCSWMM **FIG. 5.4**



LEGEND:

EX. DRAINAGE CHANNEL/EASEMENT

PROP. DRAINAGE CHANNEL/EASEMENT

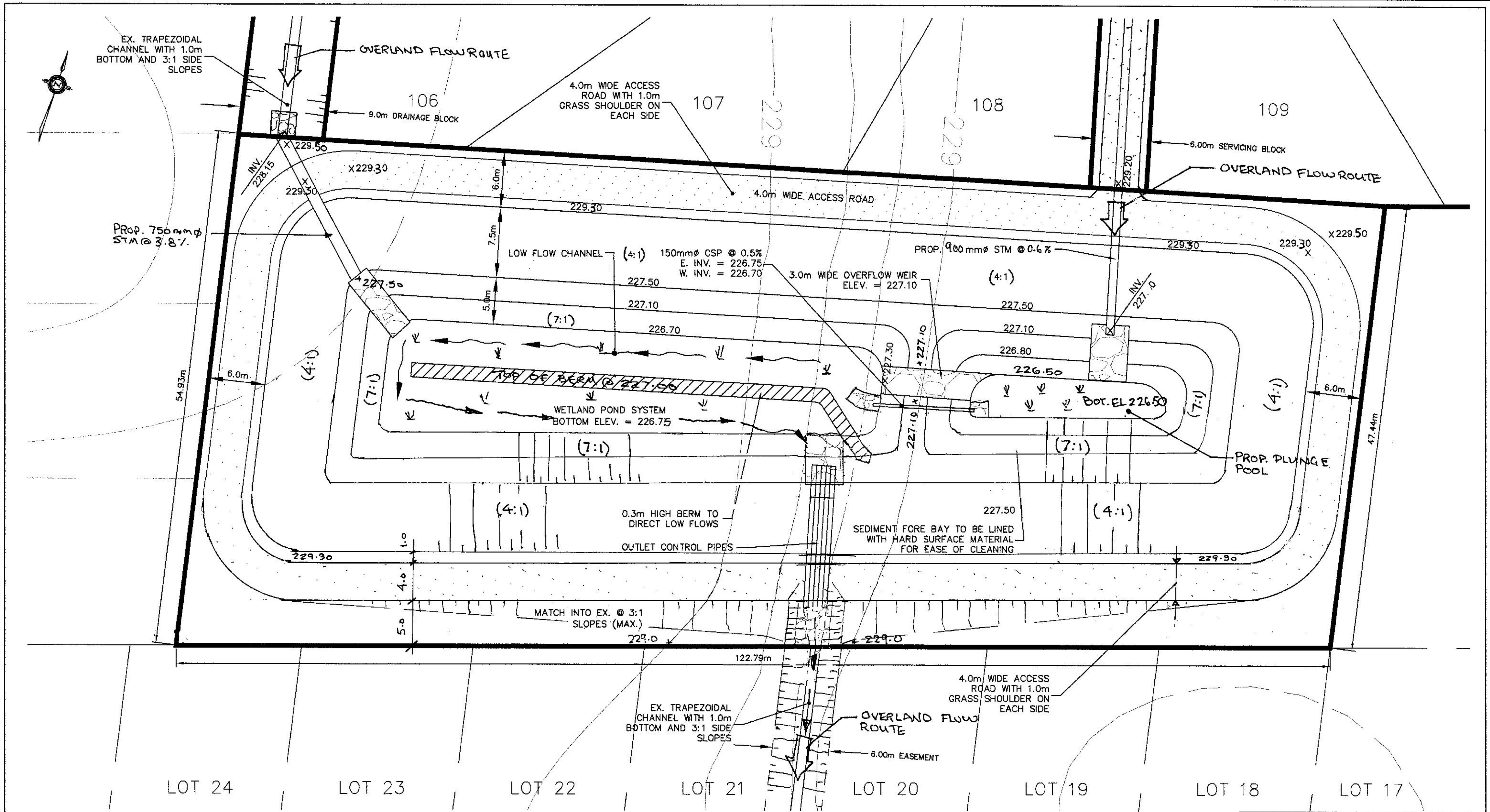
PROP. CULVERT

PROJECT: TEROMI SITE
TOWN OF INNISFIL

TITLE: PROPOSED PHASE 1 DRAINAGE SYSTEM

JFIVE DEVELOPMENTS LTD.
1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.fosterjfive@rogers.com

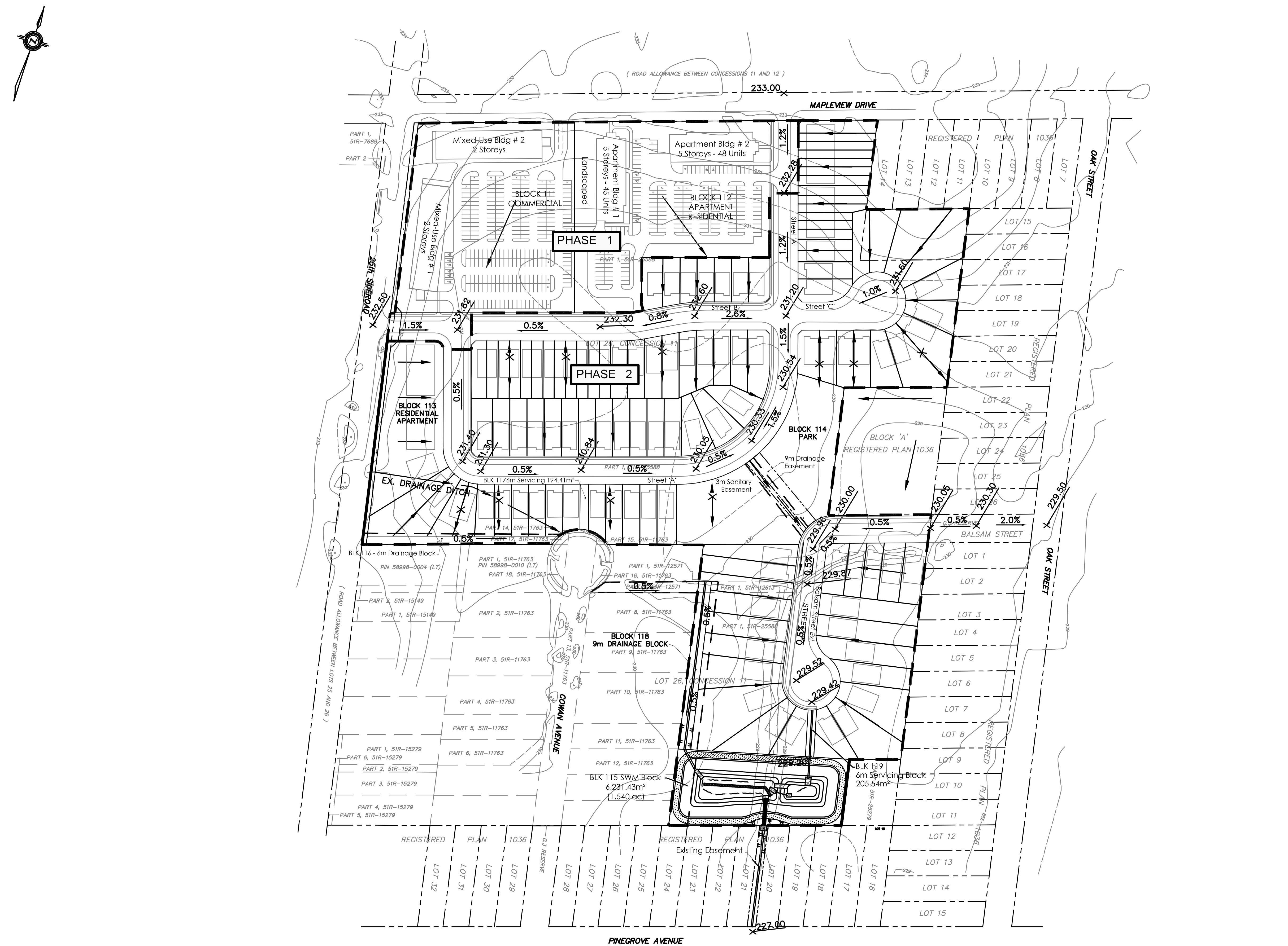
DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:3000	FIG. 5.5	007
CHECKED: J.F.	DATE: MAR. 2018		



PROJECT:	TEROMI SITE TOWN OF INNISFIL
TITLE:	CONCEPTUAL STORMWATER MANAGEMENT POND

JFIVE DEVELOPMENTS LTD.
1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.fosterjfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:400	FIG. 5.6	007
CHECKED: J.F.	DATE: SEPT 2017		



LEGEND:

233.00	PROP. CL ELEVATION
0.5%	PROP. SLOPE AND DIRECTION OF SLOPE
	PROP. DRAINAGE EASEMEN
H.P.	HIGH POINT
	PHASE 1 DITCH SYSTEM

PROJECT:

TEROMI SITE

TOWN OF INNISFIL

TITLE:

CONCEPTUAL GRADING PLAN

JFIVE
DEVELOPMENTS LTD.

1 Parker Crt., Barrie, On L4N 2A6
Cell: 705-794-0301 Email: john.fosterjfive@rogers.com

DRAWN: GEMCAD INC.	SCALE:	DWG. No.	PROJECT No.
DESIGNED: J.F.	HOR: 1:3000	FIG. 7.1	007
CHECKED: J.F.	DATE: MAR. 2018		

APPENDIX 'A'

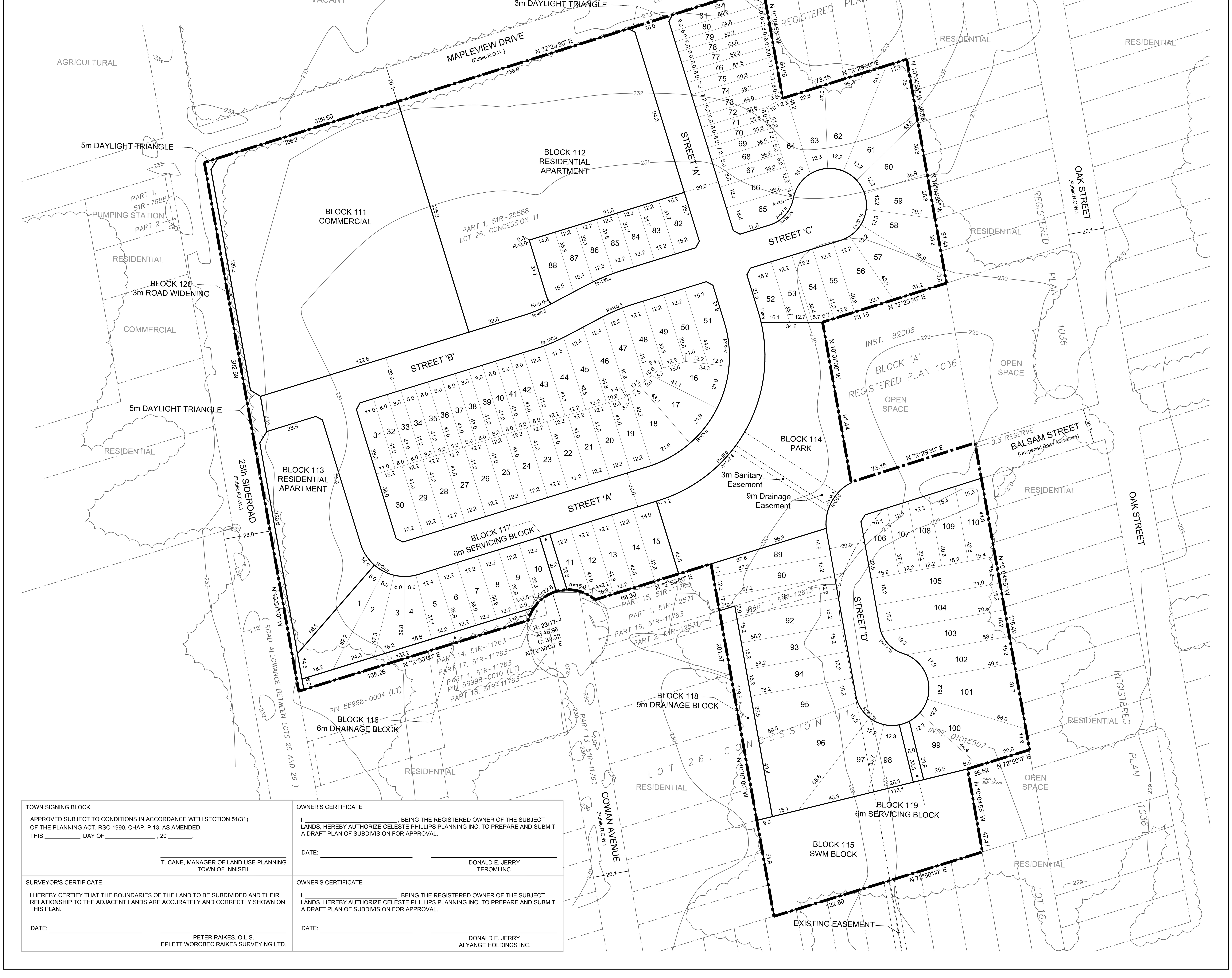
PROPOSED TEROMI DRAFT PLAN OF SUBDIVISION

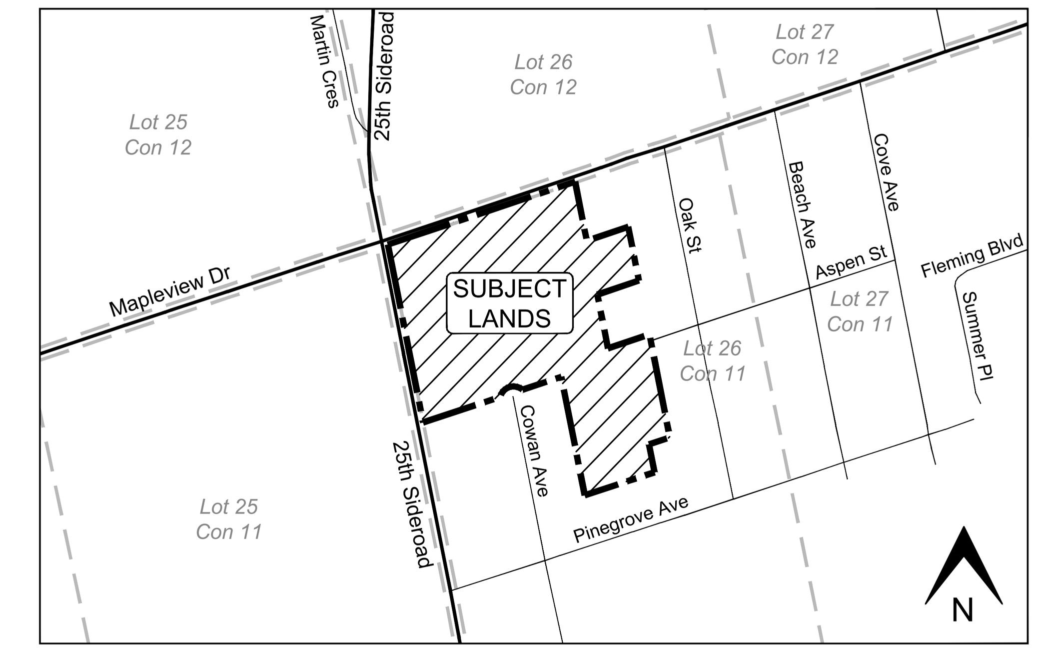
BY CELESTE PHILLIPS PLANNING.
DATED FEBRUARY 26, 2018

DATE: **MARCH, 2018**
PROJECT NO.: **#007**

PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301

FIGURE 3
Draft Plan of Subdivision





KEY MAP

Scale 1 : 10,000

LAND USE SCHEDULE

USE	LOTS/BLOCKS	UNITS	AREA		
			ha	ac	%
Single Detached Lots (15.2m)	92-96, 101-105, 109, 110	12	1.236	3.05	8.84
Single Detached Lots (12.2m)	5-30, 43-66, 82-91, 97-100, 106-108	67	3.933	9.72	28.12
Semi-Detached Lots (8m)	1-4, 31-42, 67, 68	18	0.727	1.80	5.20
Townhouse Lots (6m)	69-81	13	0.415	1.03	2.97
Residential Apartment	112, 113	121	2.005	4.96	14.34
Commercial	111		1.617	4.00	11.56
Park	114		0.802	1.98	5.74
SWM Pond	115		0.624	1.54	4.46
Drainage/Servicing Blocks	116-119		0.228	0.56	1.63
Road Widening	120		0.105	0.26	0.75
Streets	Street 'A' - Street 'D'		2.292	5.66	16.39
TOTAL		**231**	**13.984**	**34.55**	**100**

LEGEND

Subject Lands — Watercourse

Blocks — Wooded Area

ADDITIONAL INFORMATION
REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a)	As Shown	g)	As Shown
b)	As Shown	h)	Full Municipal Services
c)	As Shown	i)	Gravelly Sand Loam with trace of some Silt.
d)	As Shown	j)	As Shown
e)	As Shown	k)	All Municipal Services to be Provided
f)	As Shown	l)	As Shown

No.	DATE	REVISION	BY

DRAFT PLAN OF SUBDIVISION

PART OF LOT 26, CONCESSION 11,
(GEOGRAPHIC TOWNSHIP OF INNISFIL)
TOWN OF INNISFIL,
COUNTY OF SIMCOE

Stamp

N

0 25 50m

celeste PHILLIPS PLANNING INC.
85 Bayfield Street, Suite 300,
Barrie, ON L4M 3A7
T: 705 797 8977
F: 705 730 8850
celeste@cplan.ca

Scale: 1 : 1,000

Date: February 26, 2018

Drawn By: AM

Checked By: CP

APPENDIX 'B'

1. CCTA letter dated August 28, 2015,
2. TOISD 201, 20m ROW/8.5m Asphalt,
3. TOISD 211, Permanent Cul-da-sac,
4. Dwg 408, 25th Sideroad Plan and Profile Dwg, Sta 1+210 to 1+500,
   As Record drawing, Sept.,2017
5. Dwg 409, 25th Sideroad Plan and Profile Dwg, Sta 1+500 to 1+800,
   Dec 19, 2014,
6. Appendix A, Record of Borehole sheets,
   External Pumping Station, Friday Harbour Resort,
   By Golder Associates, Dec, 2014.

Date: **March, 2018**
Project No.: **#007**

Prepared by:

JFIVE Developments Ltd.

Consulting Engineer, Barrie, Ontario (705) 794-0301

ITEM 1

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

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Collingwood, Ontario L9Y 5A6
Tel: (705) 444-2565
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August 28, 2015

via e-mail and mail
CCTA File 115034

Carolyn Ali
Manager of Development Engineering
Town of Innisfil
2101 Innisfil Beach Road
Innisfil, ON L9S 1A1

Re: Teromi Property, Town of Innisfil
WaterCAD and SewerCAD Modelling

Dear Carolyn:

We are reporting on the WaterCAD and SewerCAD modelling completed to confirm the required external water and sanitary sewer servicing for the development of the Teromi property.

The conceptual plan for the Teromi property, located at the south east corner of 25th Sideroad and Mapleview Drive, includes a 123-unit residential development and a 1 ha commercial block (April 22, 2015). There is also a possible additional 30 residential units for future development on Street F of the concept plan.

We updated the SewerCAD model of the sewage collection system and the WaterCAD model of the Lakeshore water distribution system, which incorporate the proposed Innisfil Mapleview development, existing and proposed developments at Sandy Cove, and the proposed infrastructure for Friday Harbour Resort, to include the calculated design sanitary flows and water demands associated with the current concept plan for the Teromi property. Design flows were derived using the flow criteria outlined in the Innisfil Master Servicing Plan (MSP).

The findings of the SewerCAD and WaterCAD modelling as they relate to servicing the Teromi property, are summarized below.

External Sanitary Servicing

- As requested in Scott MacKenzie's email of May 14, 2015, we have considered servicing the commercial block via the proposed SPS-SC1 on the 25th Sideroad, and servicing the remainder of the development via the proposed SPS-SC3 on the east end of Pinegrove Avenue as per the MSP.

- The commercial block can be serviced by gravity to the proposed SPS-SC1, without deepening the wet well. The concept plan shows a 1 ha commercial block, however the size of the block could be maximized through site grading, site design, building location and layout. A 3.6 ha block is shown on the attached plan, as an example of a potential site and building envelope using the proposed street layout and grades that could be serviced by gravity to SPS-SC1. The site plan is only an example, subject to engineering design by the developer and approval by the Town; the size of this block might be increased with site grading and fill. The estimated peak sanitary flow from a 3.6 ha commercial block is 1.7 L/s, calculated using design flows of 20,000 L/ha/day for ICI areas and 20,000 L/ha/day for peak inflow and infiltration, in accordance with the MSP.

- The sanitary flow from a commercial block of this approximate size (1 ha to 5 ha) would have a small impact (1% - 2%) on the pump selection and sizing of the proposed SPS-SC1 and forcemain, which will serve the Friday Harbour development with a peak design flow of approximately 121 L/s.

- The proposed 153 residential units, if this number is not reduced as a result of upsizing the commercial block, with an estimated population of 405 persons assuming 2.65 ppu, will be serviced by gravity sewers and discharge to the proposed SPS-SC3, as per the MSP. The estimated peak sewage flow from 153 residential units is 7.5 L/s, calculated using a domestic flow of 300 L/cap/day and a peaking factor of 4, and 400 L/cap/day for peak inflow and infiltration, in accordance with the MSP.

- The total peak design flows for SPS-SC3, which will also service some of the Sandy Cove lands, are estimated at 20 L/s. SPS-SC3's forcemain will discharge to the proposed 525 mm diameter trunk sewer on Lockhart Road.

- The Teromi development, as per the current concept plan, will contribute total peak flows of 8.2 L/s to the proposed trunk sanitary sewers on Lockhart Road and through Innis Village to the existing sewers. For reference and cost sharing purposes, the total peak design flows for the proposed twinning of the existing sewers at Ireton Street are 245 L/s.

External Water Servicing

- The maximum day water demand from the Teromi property is estimated at 3 L/s, using 300 L/cap/day for the residential units and 20,000 L/ha/day for the commercial block, and a maximum day factor of 1.8, in accordance with the MSP. The estimated peak hour water demand is 5 L/s, using a peak hour factor of 3.

- These water demands, at the required minimum pressures, can be supplied by the proposed 400 mm diameter trunk watermain on 25th Sideroad. Minimum available fire flows of 90 L/s will be available at the 25th Sideroad. Internal servicing plans, when developed, will determine the available pressures and fire flows within the development.

In summary, currently proposed trunk infrastructure for the water and sanitary servicing of Friday Harbour Resort and Sandy Cove/Innis Village provides sufficient capacity to also service the Teromi property. Proposed sanitary pump station SPS-SC1 can accommodate a commercial block at the corner of 25th Sideroad and Mapleview Drive without deepening the wet well.

Please do not hesitate to contact us if you need clarifications on this report.

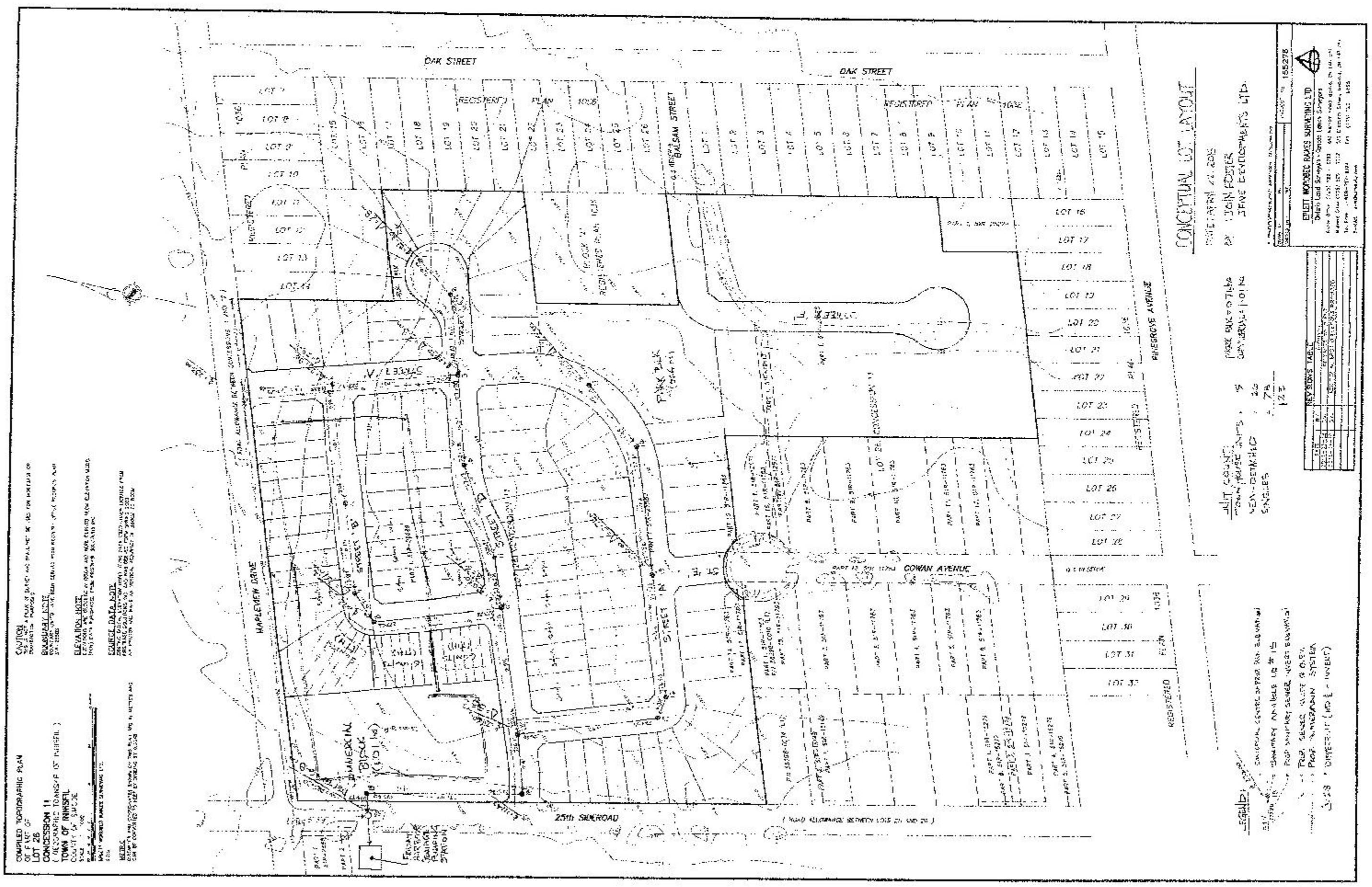
Yours truly,
C.C. Tatham & Associates Ltd.

STroxler

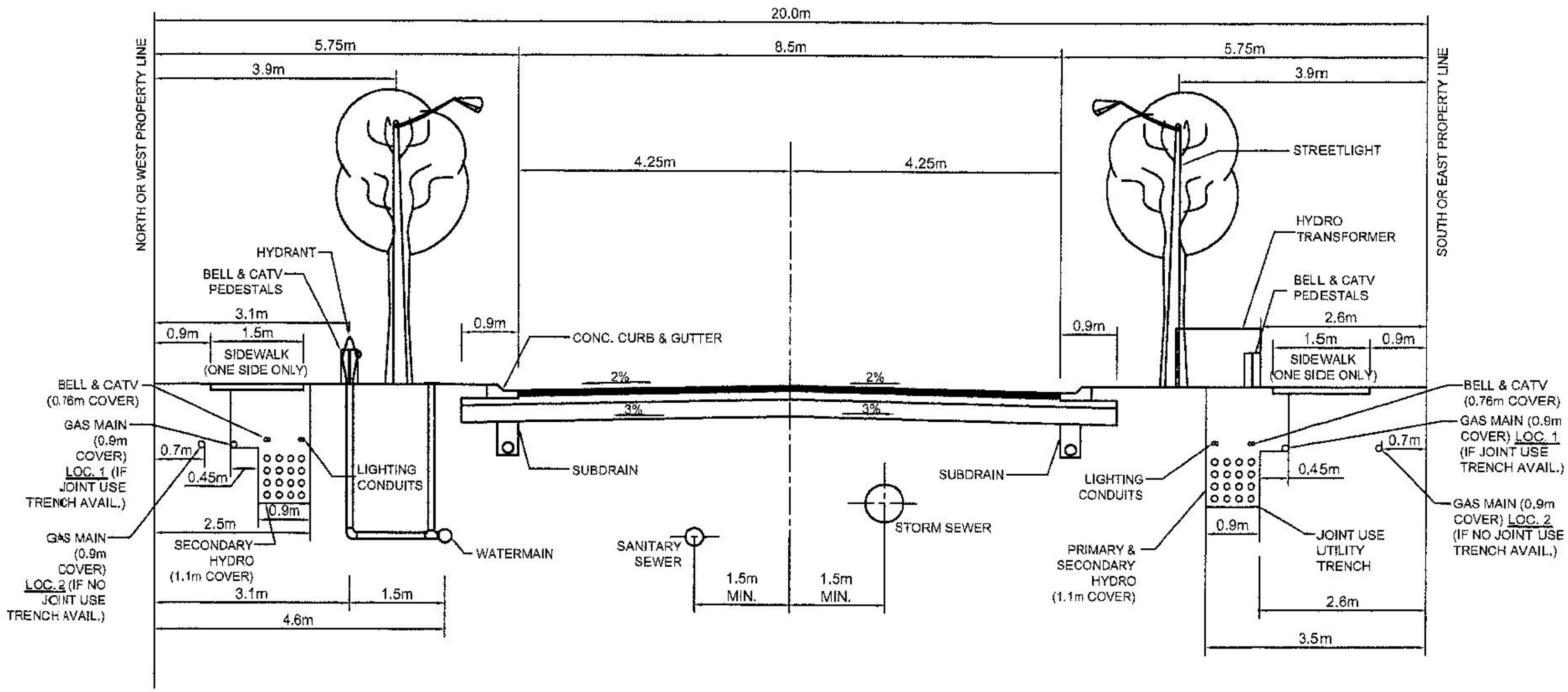
Suzanne Troxler, B. Eng., M. Sc., P.Eng.
Director, Manager – Environmental Engineering
ST:df
Encl.

copy: Scott MacKenzie, Town of Innisfil (via email smackenzie@innisfil.ca)
Derek Wantuch, Town of Innisfil (via email dwantuch@innisfil.ca)

I:\2015 Projects\115034 - Teromi Lands Modelling\Documents\Letters\L-Ali-Teromi.doc


OAK STREET
BALSAM STREET
MAPLEVIEW DRIVE
25th SIDEROAD
COWAN AVENUE
CONCEPTUAL LOT LAYOUT

ITEM 2



NOTES

1. DEPTH OF WATERMAIN & SEWERS AS PER TOWN STANDARD DESIGN CRITERIA.
2. WHEN POWER AND COMMUNICATION DUCTS AND CABLES ENCOUNTER HYDRANTS AND VALVES, THE CABLE IS TO LOOP BEHIND THE HYDRANT AWAY FROM THE WATERMAIN.
3. THE FOLLOWING IS A MINIMUM PAVEMENT STRUCTURE AND MAY BE GREATER IN ACCORDANCE WITH GEOTECHNICAL REPORT:
   50mm HL 3 SURFACE COURSE ASPHALT.
   50mm HL 4 BASE COURSE ASPHALT.
   150mm GRANULAR "A"
   400mm GRANULAR "B"
4. THE BOULEVARDS REQUIRE A MINIMUM OF 300mm OF TOPSOIL & NURSERY SOD.
5. TREES TO BE PLACED IN LOCATIONS APPROVED BY THE TOWN.
6. LOCALIZED GRADING AROUND TRANSFORMER TO MAINTAIN A LEVEL TRANSFORMER PLATFORM
7. TELECOMMUNICATIONS PEDESTALS ARE TO BE LOCATED ON THE NON-OPENING SIDE OF A TRANSFORMER OR SWITCH GEAR..

Town of Innisfil
Infinite Opportunities

URBAN LOCAL ROAD
20.0m ROAD ALLOWANCE
8.5m PAVEMENT WIDTH

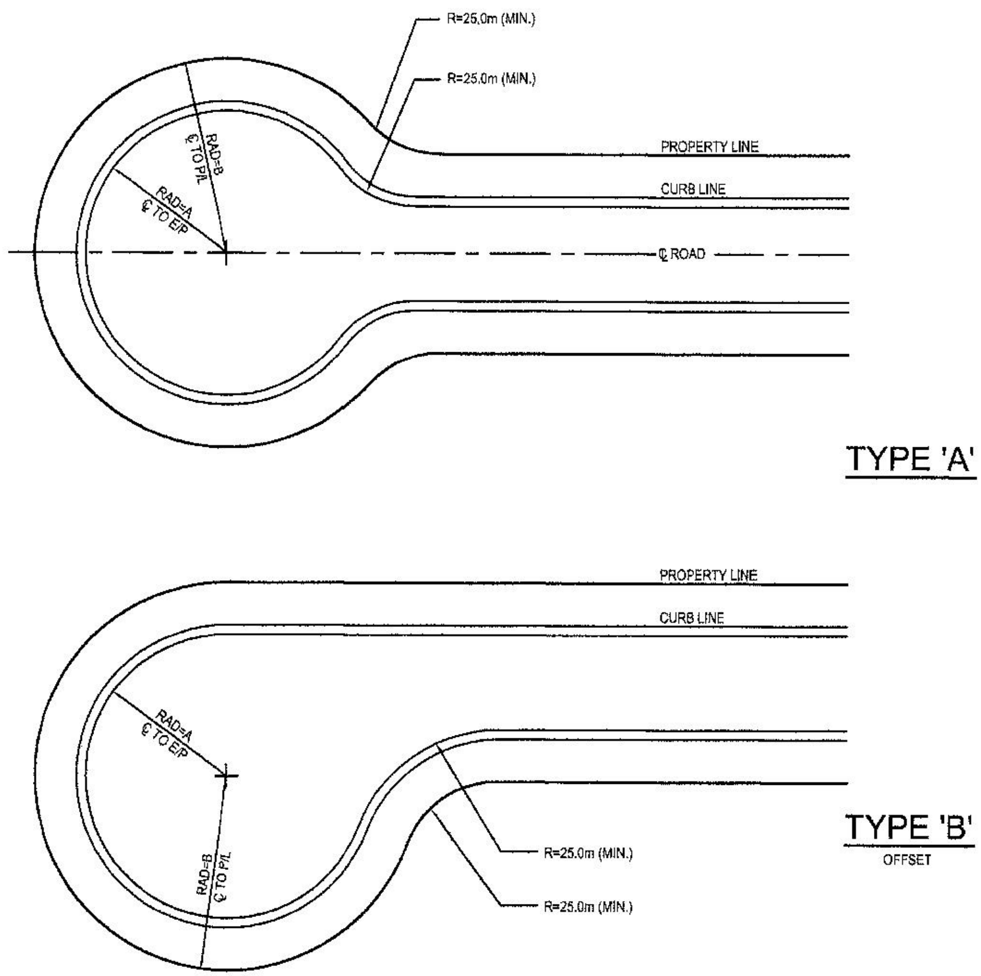
DRAWN: A&A	APR'D:			
SCALE: N.T.S.	DATE: JUNE 2011			

NO.	REVISIONS	APR'D	DATE

METRIC
ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TOISD
201

ITEM 3



ROAD TYPE	MINIMUM RADIUS A	MINIMUM RADIUS B
RESIDENTIAL	15.0m	20.75m
INDUSTRIAL	15.0m	20.75m

Town of Innisfil
Infinite Opportunities

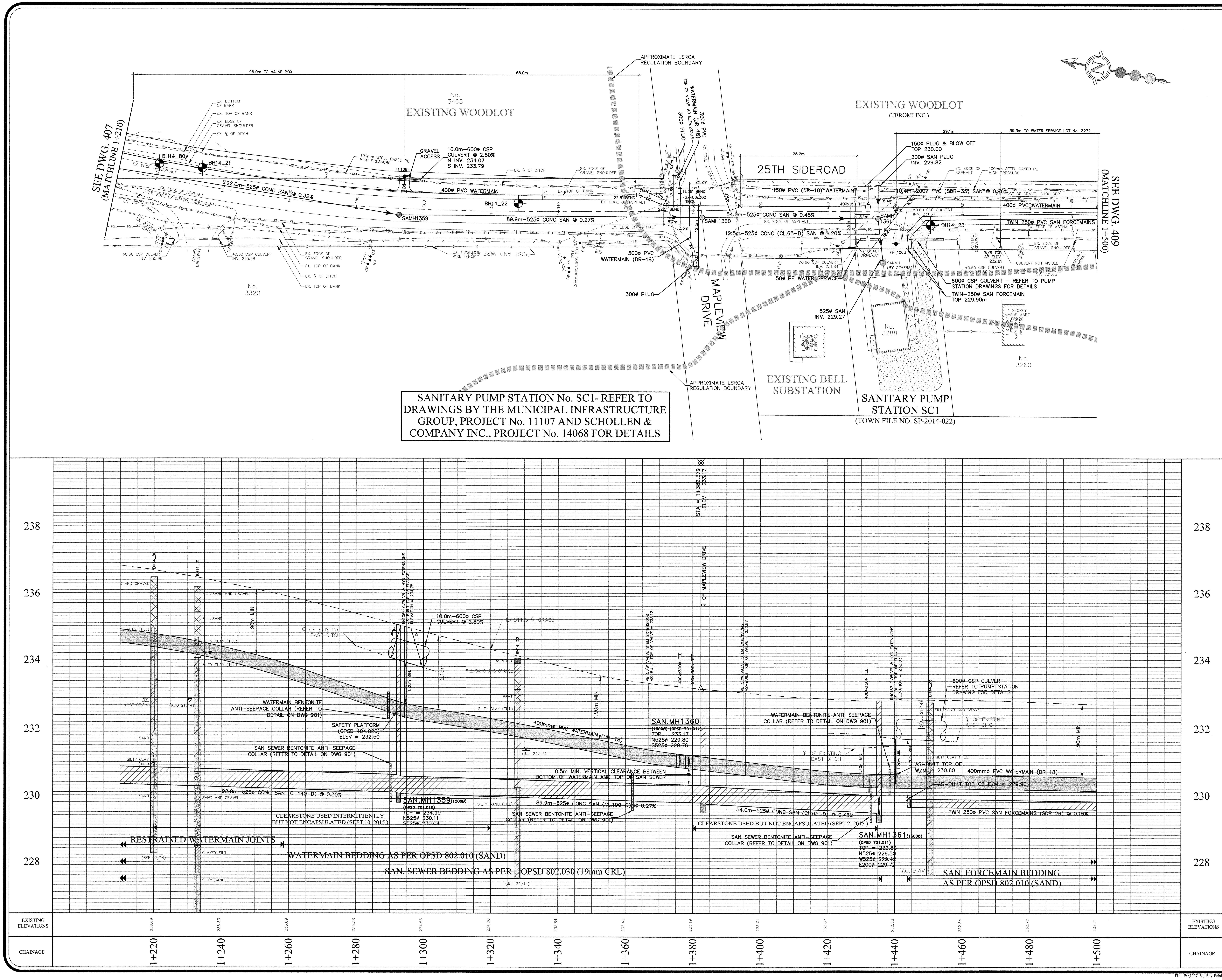
PERMANENT CUL-DE-SAC

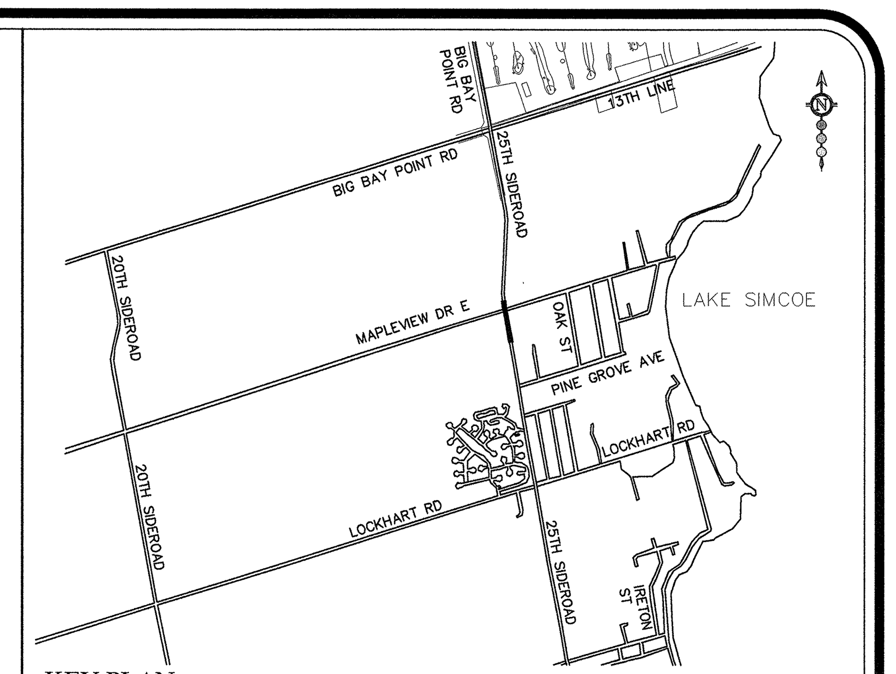
DRAWN: A&A | APR'D:
SCALE: N.T.S. | DATE: JUNE 2011

NO.	REVISIONS	APR'D	DATE

METRIC
ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

TOISD 211





KEY PLAN
N.T.S.

BENCHMARK: 00819688107 ELEV. 283.564

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE MINISTRY OF TRANSPORTATION AND HIGHWAYS FIRST ORDER BENCHMARK No. 00819688107 HAVING AN ELEVATION OF 283.564 METRES. LOCATED AT TWO AND ON-HALF STOREY STUCCO HOUSE ON EAST SIDE OF HIGHWAY 11, 14.1km NORTH OF HIGHWAY 400 AND HIGHWAY 90 (DUNLOP STREET) INTERCHANGE, 279.8m SOUTH OF ORIGINAL TOWNSHIP LINE 4 AND 43.1m EAST OF CENTRELINE OF HIGHWAY 11. TABLET IS SET HORIZONTALLY IN WEST FACE OF STONE FOUNDATION, 4.72m NORTH OF SOUTHWEST CORNER AND 27cm BELOW STUCCO WORK.

LEGEND:

LIMIT OF DEVELOPMENT/PHASE
SANITARY SEWER AND MAINTENANCE HOLE (AUTO STABLE LIDS UNLESS OTHERWISE SPECIFIED)
SANITARY FORCEMAIN
WATERMAIN AND VALVE (DR-18)
HYDRANT AND VALVE - PLUGGED
POLYETHYLENE WATER SERVICE (19mm UNLESS OTHERWISE SPECIFIED) AS PER DETAIL ON DWG NO. 902
125mm DIAMETER SANITARY SERVICE
TEMPORARY DOUBLE EROSION AND SEDIMENTATION CONTROL FENCE (REFER TO DWG. 701 FOR DETAILS)
SEDIMENT CONTROL AND TREE PROTECTION FENCE (REFER TO DRAWING 701 FOR DETAILS)
FILTREXX® CHECK DAM (REFER TO DRAWINGS 701 FOR DETAILS)
MH EXISTING SEWER / MAINTENANCE HOLE
EXISTING CATCHBASIN
EXISTING WATERMAIN AND VALVE
WV FH EXISTING HYDRANT AND VALVE
UP EXISTING HYDRO POLE
GW EXISTING GUY WIRE
GAS EXISTING GASMAIN
CBL EXISTING BURIED TV CABLE
BELL EXISTING BURIED TELEPHONE CABLE
UH EXISTING BURIED HYDRO
EXISTING OVERHEAD WIRE(S)
GV EXISTING GAS VALVE
GLM EXISTING GAS MARKER
BX BELLPED EXISTING UTILITY BOX
SIGN EXISTING ROAD SIGN
EXISTING MONITORING WELL
EXISTING WELL
EXISTING TREES
EXISTING VEGETATION DRIP LINE
EXISTING GUIDERAIL

AS-RECORDED

SUBSURFACE UTILITY MAPPING INFORMATION PROVIDED BY T2 UTILITY ENGINEERS, PLANS DATED MAY 8 & 15, 2015

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK AND EDWARD SURVEYING LTD., PLAN DATED APRIL 2011

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR CONSTRUCTION	AUG 10/15	P.R.S.	
2.	AS-RECORDED SUBMISSION	DEC 2016	B.L.	
3.	SECOND AS-RECORDED SUBMISSION	SEP 2017	B.L.	

Innisfil
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO L9S 1A1
TEL: (705) 436-3710
FAX: (705) 436-7120

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

FRIDAY HARBOUR RESORT INC.

25TH SIDEROAD
STA. 1+210 TO 1+500

EXTERNAL SERVICING - WATERMAIN & SANITARY SEWER: 13TH LINE - LOCKHART ROAD CONTRACT No. 3

DATE: SEPTEMBER 2017	DESIGNED BY: P.R.S.	CHECKED BY: M.R.C.
SCALE: H=1:500 V=1:50	DRAWN BY: S.F./M.J.O	CHECKED BY:

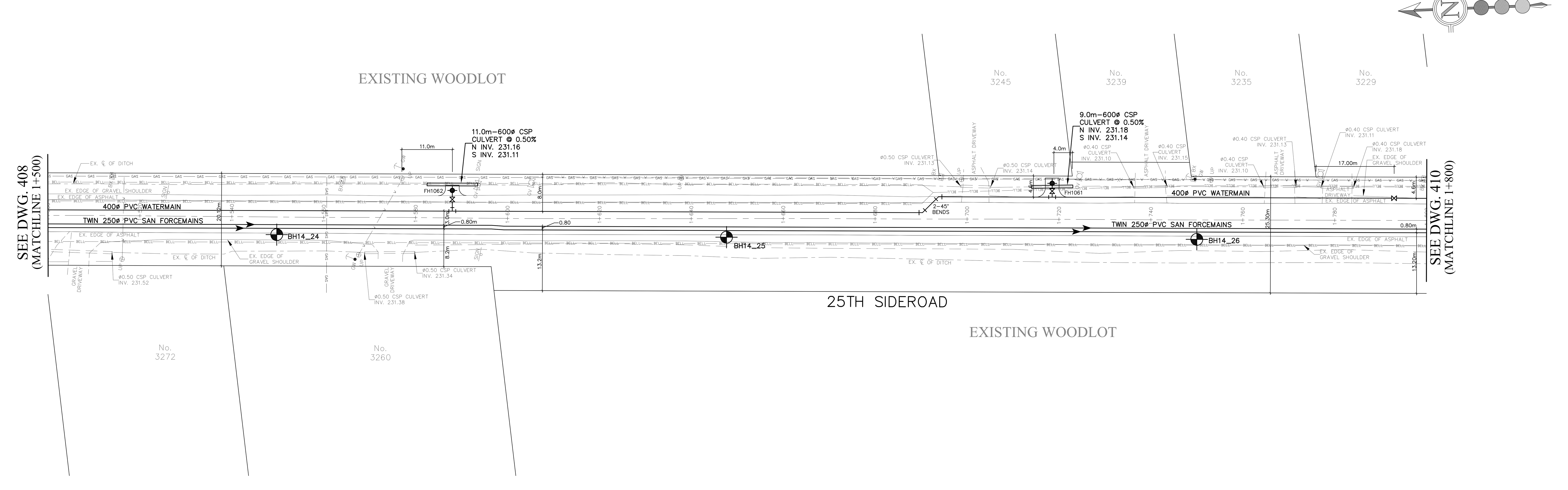
APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF SCS CONSULTING GROUP LTD. CONSULTING ENGINEERS AS TO DESIGN AND SPECIFICATION.

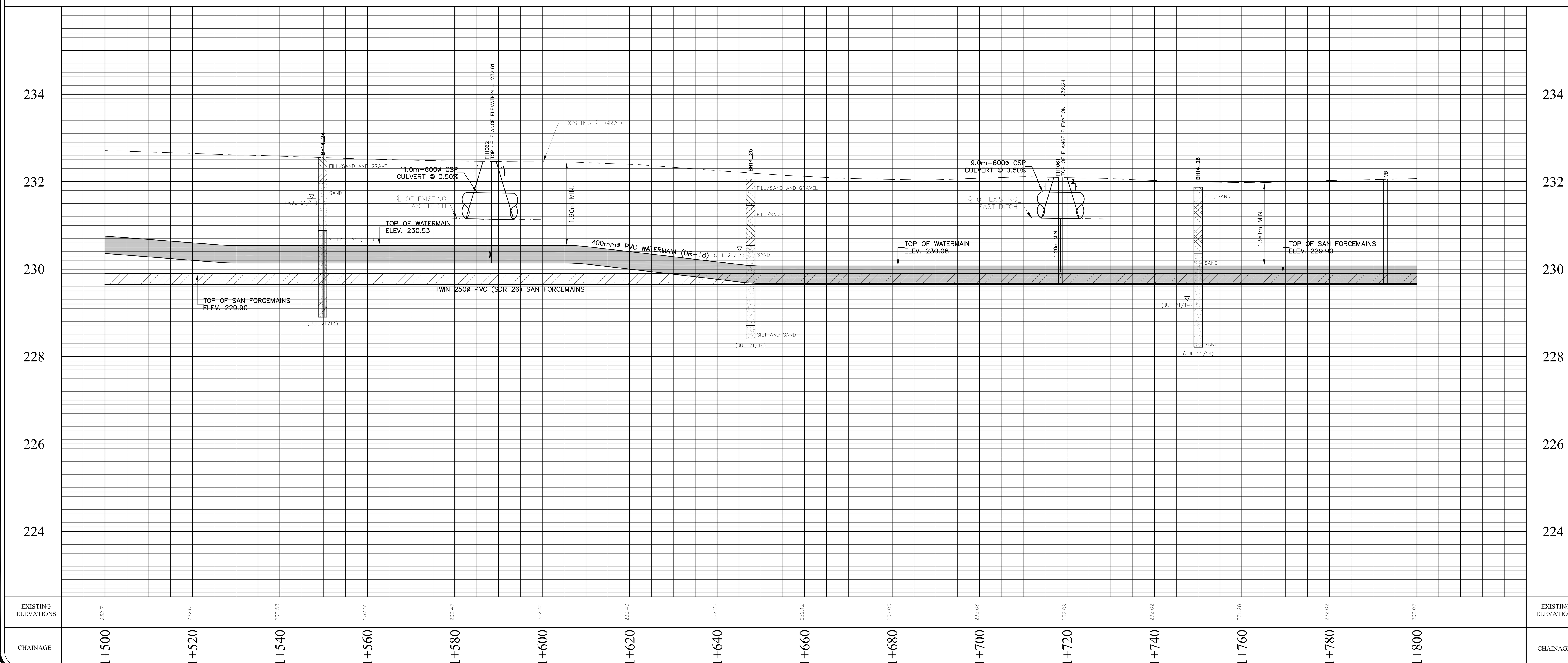
ORIGINALLY SIGNED BY: CAROYLN ALI — Manager Of Development Engineering
AUGUST 10, 2015 — Date

PROJECT No: 1097
DRAWING No: 408

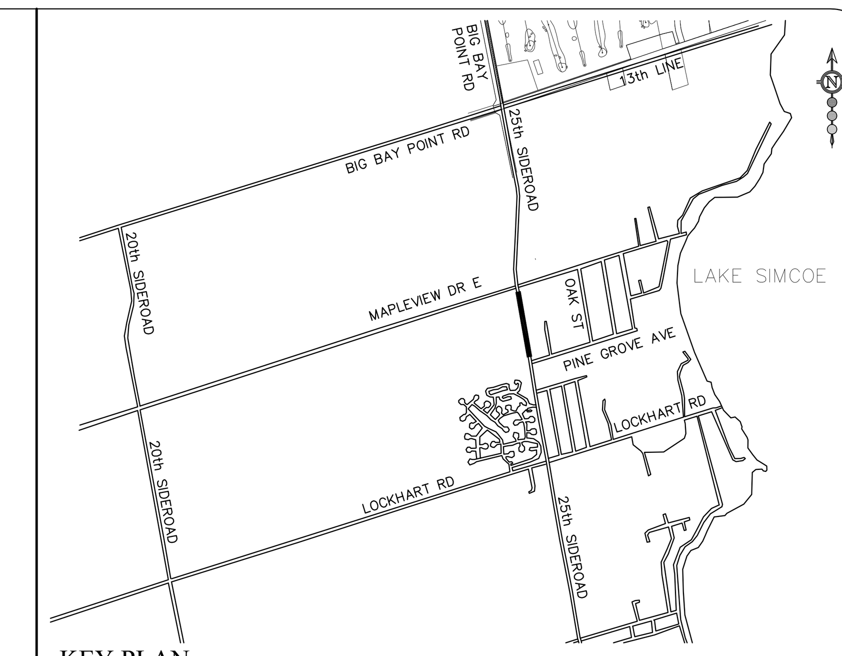
File: P:\1097 Big Bay Point\Drawings\External Servicing\As-builts\Pnp\1097AB-EXT-PROF-408.dwg – Revised by <MORECCHIA> : Fri, Sep 15 2017 – 8:06am

TOWN FILE No. D12-2007-002





KEY PLAN
N.T.S.



BENCHMARK: 00819688107 ELEV. 283.564

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LEGEND:

- LIMIT OF DEVELOPMENT/PHASE
- SANITARY SEWER AND MAINTENANCE HOLE
- SANITARY FORCEMAIN
- WATERMAIN AND VALVE
- HYDRANT AND VALVE
- POLYETHYLENE WATER SERVICE AS PER TOISD 705 (19mm UNLESS OTHERWISE SPECIFIED)
- EXISTING SEWER / MAINTENANCE HOLE
- EXISTING CATCHBASIN
- EXISTING WATERMAIN AND VALVE
- EXISTING HYDRANT AND VALVE
- EXISTING HYDRO POLE
- EXISTING GUY WIRE
- EXISTING GASMAIN
- EXISTING UNDERGROUND TV CABLE
- EXISTING UNDERGROUND TELEPHONE CABLE
- EXISTING OVERHEAD WIRE(S)
- EXISTING GAS VALVE
- EXISTING GAS MARKER
- EXISTING UTILITY BOX
- EXISTING ROAD SIGN
- EXISTING MONITORING WELL
- EXISTING TREE

TOPOGRAPHIC INFORMATION PROVIDED BY RADY-PENTEK AND EDWARD SURVEYING LTD., APRIL 2011

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	CONCEPTUAL SUBMISSION TO TOWN OF INNISFIL	JULY 14/14	P.R.S.	
2.	FIRST SUBMISSION TO TOWN OF INNISFIL	DEC 15/14	P.R.S.	

Innisfil
2101 INNISFIL BEACH ROAD
INNISFIL, ONTARIO L9S 1A1
TEL: (705) 436-3710
FAX: (705) 436-7120

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

FRIDAY HARBOUR
RESORT INC.

25TH SIDEROAD
STA. 1+500 TO 1+800

EXTERNAL SERVICING - WATERMAIN &
SANITARY SEWER: 13TH LINE - LOCKHART ROAD
CONTRACT No. 3

DATE: DECEMBER 2014	DESIGNED BY: P.R.S.	CHECKED BY: M.R.C.	
SCALE: H=1:500 V=1:50	DRAWN BY: S.F./M.J.O	CHECKED BY:	

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF SCS CONSULTING GROUP LTD. CONSULTING ENGINEERS AS TO DESIGN AND SPECIFICATION.

PROJECT No: 1097

DRAWING No: 409

Manager Of Development Engineering ______ Date ______

ITEM 6

APPENDIX A

Record of Borehole Sheets

PROJECT: 08-1170-5050

RECORD OF BOREHOLE: PS14-1

SHEET 1 OF 1

LOCATION: See Figure 1

BORING DATE: May 6, 2014

DATUM: Geodetic

SPT Hammer: Mass, 140lbs.; DROP, 30in.

BORING METHOD: CME 55- Track; 6 1/4" Solid Stem Auger/5/6/2014

DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
GROUND SURFACE	233.28				
FILL-(SW) SAND and GRAVEL; brown; moist; loose	0.05				
FILL-(ML) CLAYEY SILT; brown to grey; trace organics noted; w~PL; stiff		1	DO	9	
TOPSOIL	232.29 / 0.94				
(SW) SAND, trace to some silt; orange brown; wet; loose		2	DO	8	Metals, Inorganics
		3	DO	8	VOCs, PHC F1-F4
(CL) Sandy SILTY CLAY, some gravel; grey; (TILL); cohesive; w~PL; firm	230.91 / 2.29	4	DO	5	MH
(SW) SAND, trace silt; orange brown; wet; compact	230.15 / 3.05	5	DO	17	VOCs, PHC F1-F4, metals, inorganics
(CL) Sandy SILTY CLAY, some gravel to gravelly; grey; (TILL); cohesive; w~PL; stiff to hard	229.69 / 3.51	6	DO	12	MH
		7	DO	31	VOCs, PHC F1-F4, metals, inorganics
End of Borehole.	226.49 / 6.71				

Note: Groundwater measured at a depth of 0.6 m below existing grade upon completion of drilling

PIEZOMETER OR STANDPIPE INSTALLATION: May. 06/14

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; Pocket Pen - ■; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl; NP - Non-Plastic; 10 20 30 40

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: SMF

CHECKED: NLP

PROJECT: 08-1170-5050

RECORD OF BOREHOLE: PS14-2

SHEET 1 OF 2

LOCATION: See Figure 1

BORING DATE: May 6, 2014

DATUM: Geodetic

SPT Hammer: Mass, 140lbs.; DROP, 30in.

Boring method: CME 55 Track; 10 1/4" Hollow Stem Auger-5/6/2014

DEPTH SCALE METRES	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	GROUND SURFACE	233.91						
	TOPSOIL	0.00	1	DO	9			Concrete Casing
	FILL-(SW) SAND and GRAVEL, some silt; brown and black; moist; loose to FILL-(SW) SAND, some gravel, some silt; brown; wet; loose	233.45 0.46						Bentonite; May. 06/14; May. 18/14
1			2	DO	7	○		
2			3	DO	8			
	(CL) Sandy SILTY CLAY; grey; cohesive; w>PL; firm to stiff	231.62 2.29	4	DO	4	○	MH, VOCs, PHC F1-F4, metals, inorganics	
3			5	DO	9			
4	(ML) CLAYEY SILT, some sand, some gravel; grey; (TILL); cohesive; w~PL to w<PL; stiff to hard to (CL) SILTY CLAY and SAND, some gravel; grey; (TILL); cohesive; w<PL; stiff to hard	229.80 4.11						
5			6	DO	14	○		Grout
6			7	DO	32		VOCs, PHC F1-F4, metals, inorganics	
7								
8			8	DO	40	Wp ├─○─┤	MH	
								Bentonite
								#1 Silica Sand
9			9	DO	50/50mm			10 Slot PVC Screen
10								

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: SMF

CHECKED: NLP

PROJECT: 08-1170-5050

RECORD OF BOREHOLE: PS14-2

LOCATION: See Figure 1

BORING DATE: May 6, 2014

DATUM: Geodetic

SPT Hammer: Mass, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q- ●; rem V. ⊕ U- ○; Pocket Pen - ■) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp ⊢—○W—⊣ Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		— CONTINUED FROM PREVIOUS PAGE —									
10	CME 55- Track; 10 1/4" Hollow Stem Augers/6/2014			223.70							
		(ML) SILT, trace sand; grey; sand and clay lensing noted; wet; stiff to very dense		10.21							
11					10	DO	38				10 Slot PVC Screen
12		0.15 m Sand Seams Noted between 12.19 m to 12.80 m			11	DO	24				
				221.11 / 12.80							
13		End of Borehole.									
		Note: Groundwater measured at a depth of 0.6 m below existing grade upon completion of drilling									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SMF
CHECKED: NLP

APPENDIX 'C'

Stormwater Design Calculations

- PSCWMM OUTPUT FILES FOR PRE-DEVELOPMENT CONDITIONS
- PCSWMM OUTPUT FILES FOR POST DEVELOPMENT CONDITIONS

DATE: **MARCH, 2018**
PROJECT NO.: **#007**

PREPARED BY:

JFIVE Developments Ltd.

Consulting Engineer, Barrie, Ontario (705) 794-0301

JFIVE Developments Ltd. Consulting Engineer	Project No.: TERUMI	File: 007
	Date: MARCH /18	Sheet No. 1 of 36
	Design By: JF	Checked By: -
	Subject: SWM Calculations	

1.0 PRE-DEVELOPMENT CONDITIONS
(SEE FIG. 1.0)

1.1 AREA S1 TOTAL A $= 2.45$ ha

Mapleview Dr. Area $= \frac{80 \times 10}{100 \times 100} = 0.08$ ha

25^{th} S.R. A $= \frac{300 \times 10}{100 \times 100} = 0.30$ ha

R value for ex street $= \frac{(5.0 \times 0.9) + (1.25 \times 0.65) + 3.75 \times 0.25}{10} = 0.63$

Remainder of Area $= 2.45 - 0.38 = 2.07$ ha

Soil type for site is Loam or Silty Sandy Loam
From table Chart 1.07 RUNOFF COEFFICIENTS

woodland or cutover, Flat to 5% $R = 0.08$

From Simcoe County Soil Map, this site is located on StSl soil type, gravelly Sandy Loam

with high watertable on area of site, we shall assume an 'R' value of — $R = 0.15$

$\therefore$ Comp $R_1 = \frac{(0.38 \times 0.63) + (2.07 \times 0.15)}{2.45} = 0.22$

1.2 AREA S2 TOTAL A $= 3.1208$ ha

Mapleview Dre $= \frac{10 \times 100}{100 \times 100} \times 0.63 = 0.063$

Cowan Ave $= (2000 \times 0.75) + (50 \times 10 \times 0.45) = 0.1725$
cul-de-sac lots

Remainder $(3.1208 - 0.2 - 005 - 0.1) \times 0.15 = 0.41562$
0.6511

Comp $R_2 = \frac{0.6511}{3.1208} = 0.21$

1 Parker Court, Barrie, On. L4N 2A6
Cell (705) 794-0301
Email john.fosterjfive@rogers.co

JFIVE Developments Ltd. Consulting Engineer	Project No.: TEPOMI	File: 007
	Date: Oct, 2017	Sheet No. 2 of 36
	Design By: JF	Checked By:
	Subject: SWM CALCULATION	

1.3 AREA S3 TOTAL A = 2.4221 ha

Ex Residential $= \frac{60 \times 40}{100 \times 100} \times 0.45 = 0.108$

Remainder $= (2.4221 - 0.24) \times 0.15 = 0.3273$

0.4353

Comp $R_3 = \frac{0.4353}{2.4221} = 0.18$

1.4 AREA S4 TOTAL A = 6.5223 ha

Ex Maplaview Dr $= \frac{10 \times 180}{100 \times 100} \times 0.63 = 0.1134$

Ex Res. Area $= \frac{(3153 + 8580)}{100 \times 100} \times 0.45 = 0.528$

Remaining Area $= (6.5223 - 0.18 - 1.1733) \times 0.15 = 0.775$

1.41168

Comp $R_4 = \frac{\Sigma AR}{\Sigma A} = \frac{1.4168}{6.5223} = 0.22$

1.5 AREA S5 TOTAL A = 1.6439 ha

Ex Res Area $= .4320 \times 0.45 = 0.1944$

Remainder Area $= (1.6439 - 0.432) \times 0.15 = 0.1818$

0.376

Comp $R_5 = \frac{0.376}{1.6439} = 0.23$

1.6 AREA S6 TOTAL A = 2.5444 ha

Ex. Res. Area $= 0.6000 \times 0.45 = 0.2700$

Remainder Area $= (2.544 - 0.6) \times 0.15 = 0.2916$

0.5616

Comp $R_6 = \frac{0.5616}{2.5444} = 0.22$

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1.7 AREA S7 TOTAL A = 6.0 ha

Ex treed and shrub/bush area, woodland, flat to 5% ——— R = 0.08

Soil is located on St SL, soil type with high water table area, as such we shall assume ——— R = 0.15

Input into PCSWM Model

Area = 6.0 ha
impervious = 0.15 (15)
Slope = 0.97%
N Imperv = 0.013
N Perv = 0.2
outlet = J5
Flow length = 275 m
Dep. Sto. imp = 2
Dep. Sto. Perv = 10
Suction head = 100
Conductivity = 25
Initial Dep = 0.34
C33 IN. INV = 232.00 Rim = 233.10
C33 OUT. INV = 231.47 Rim = 232.50

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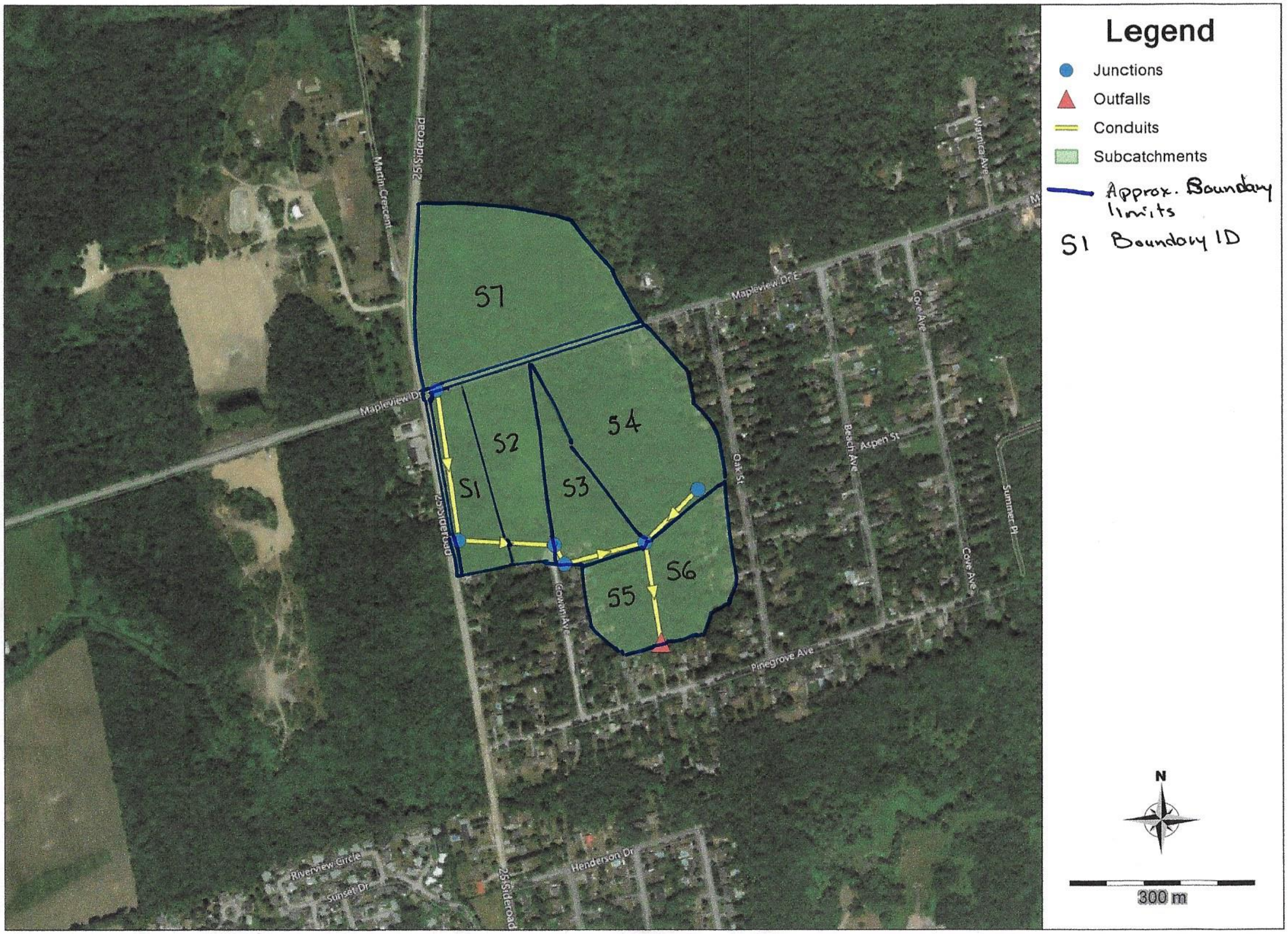

EXISTING DRAINAGE BOUNDARIES
PCSWMM

FIG. 1.0

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SIMULATION FLOW RATES FOR PRE-DEVELOPMENT

(File: Teromi Pre D test4)

Storm events to analize are

SCS 24 hr. Type II	For	2yr,	5yr,	25yr	and	100yr	events
SCS 6 hr. Type II	"	"	"	"	"	"	"
Chicago 4 hr.	"	"	"	"	"	"	"

SUMMARY OF PEAK FLOWS @ OUTLET

RAINFALL TYPE	EVENT (YR)	FLOW RATE (cms)
SCS 24hr. TYPE II	2	0.893
	5	1.216
	25	1.962
	100	2.984
SCS 6hr. TYPE II	2	0.572
	5	0.761
	25	1.072
	100	1.488
CHICAGO 4 hr.	2	1.007
	5	1.393
	25	2.044
	100	2.661

USE MTO webb site for IDF curve Look up
http://www.mto.gov.on.ca/IDF-Curves/terms.shtml/

Rainfall amount for site area 2 yr = 56.2 mm
5 " = 74.4 "
25 " = 101.5 "
100 " = 123.9 "

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DESIGN PARAMETERS

Sources : LSRCA Watershed Development Guideline April 2005
CITY OF BARRIE Storm Drainage ... Guidelines
MTO Drainage Management Manual Part 4

Stormevents: SCS 24 Hr Type II - 24 hr/12hr/6hr
Chicago Method - 4 hr

Select MTO IDF's for area of site

2yr total rain fall = 56.2 mm
5yr " " " = 74.4 mm
50yr " " " = 112.7 mm
100yr " " " = 123.9 mm

From Table 7.8 Typical Parameter Values for Green-Ampt Method

- suction head @ HSG A soil type = 100 mm
- Saturated hydraulic Conductivity = 25 mm/hr
- initial moisture deficit = 0.34 mm/mm

From Table 7.5

- depression storage initial Lawns = 5
- " " " Imperv. = 2
- " " " Woods = 10

(also see Table 14.0 on page 6)

N impervious = 0.013
N pervious = 0.2

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Table 7.7: Typical Parameter Values for Horton Infiltration Method

Parameter	HSG A	HSG B	HSG C	HSG D
f_o (mm/hr) (dry soil conditions)	250	200	125	75
f_∞ (mm/hr)	25	13	5	3
k (1/hr)	2	2	2	2

Source: M.L. Terstriep and J.B. Stall, Illinois Urban Drainage Area Simulator (ILLUDAS) Illinois State Water Survey Urbana, 1979.

Green-Ampt Infiltration Method

The Green-Ampt Infiltration Method has been used in Canada for both agricultural and urban watersheds.

When $F < F_s$, $f = i$

When $F > F_s$

$$f_p = K_s\left[1+\frac{(S_u)(IMD)}{F}\right]$$

where,

F = cumulative infiltration volume (mm)
F_s = cumulative infiltration volume required to cause surface saturation (mm)

$$F_s = \frac{(S_u)(IMD)}{i/K_s - 1} \quad \text{when } i > K_s$$

F_s = no calculation when $i < K_s$
f = infiltration rate (mm/hr)
f_p = infiltration capacity (mm/hr)
i = rainfall intensity (mm/hr)
K_s = saturated hydraulic conductivity (mm/hr)
S_u = average capillary suction at the wetting front (mm)
IMD = initial moisture deficit for the event (mm/mm)

Soil Type For Site

The following table provides typical parameter values used in the Green-Ampt Method.

Table 7.8: Typical Parameter Values for Green-Ampt Infiltration Method
Various Hydrologic Soil Groups (HSG)

Parameter	HSG A	HSG B	HSG C	HSG D
IMD (mm/mm)	0.34	0.32	0.26	0.21
S_u (mm)	100	300	250	180
K_s (mm/hr)	25	13	5	3

Source: Design Chart 1.13, MTO Drainage Management Manual, 1997

2 – Includes row crops such as soybeans, corn, sorghum hay, peanut, potato, etc.
3 – Includes agricultural best management practices (BMPs) such as contouring and terracing.
4 – Includes small grain crops such as winter wheat, spring wheat, durham wheat, barley, oats, rye, etc.
5 – Includes close-seeded legumes such as alfalfa, timothy grass, grass hay, etc.
6 – Poor condition is defined as heavily grazed, no mulch, or has plant cover on less than 50% of the area.
7 – Good condition is defined as lightly grazed, more than 75% of the area has plant cover.
8 – Poor cover is defined as heavily grazed or regularly burned so that litter, small trees and brush are regularly destroyed.
9 – Good cover is defined as protected from grazing so that litter and shrubs cover the soil.
10 – Curve numbers are calculated assuming that roof leaders are connected to the driveway and/or road with a minimum of additional infiltration.
11 – When a number of water bodies within a large multi-land use catchment is modeled, a CN value of 50 may be applied to the water bodies in calculating the area-weighted CN value. When isolating a water body and modeling as a separate catchment, then a CN value of 100 should be used and the catchment is typically routed through a reservoir.

Table 7.5: Initial Abstraction / Depression Storage

Cover	Depth (mm)
Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious areas	2

Adapted from UNESCO, Manual on Drainage in Urbanized Areas, 1987

Total Imperviousness (TIMP) and Directly Connected Imperviousness (XIMP)

Table 7.6 outlines typical parameter values that should be applied at the preliminary/conceptual design stage. The TIMP and XIMP values at the high end of the range given in **Table 7.6** shall be used at the preliminary/conceptual design stage. Adjustment of parameter values will be considered and accepted by the City at the functional and detailed design stage subject to the submission of relevant engineering calculations from the consulting engineer to justify the revision of these parameters.

Table 7.6: Typical Impervious Values by Land Use

Land Use	Total Impervious Percentage (TIMP)	Directly Connected Impervious Percentage (XIMP)
Estate Residential (> ¾ acre lot);	11% - 30%	8% - 20%
Low Density Residential (1/3 to ¾ acre lot)	18% - 50%	15% - 35%
Medium Density Residential (1/10 to ¼ acre lot)	35% - 60%	20% - 45%
High Density Residential (<1/10 acre lot)	60% - 75%	35% - 60%
Institutional (e.g. school, religious centre)	45% - 75%	40% - 60%
Industrial	70% - 85%	65% - 80%
Commercial / Business	80% - 95%	80% - 95%
Park	0% - 5%	0% - 3%

Adapted from *Stormwater Management Pond Requirements*, City of London, 2005; Visual OTTHYMO Reference Manual, 2001; and review of typical site plans.

An approximation of the total impervious fraction (TIMP) can be calculated using the following formula:

$$TIMP = \frac{C - 0.2}{0.7}$$

where,

14.0 Typical Initial Abstraction (Ia) Values

The following table includes a selection of land cover types and their typical abstraction values which are commonly accepted. The best available information should be utilized in the design, modelling and calculations.

Land Cover Type	Initial Abstraction (mm)
Impervious areas	2
Pervious areas – i.e. lawns	5
Pervious areas – i.e. meadow lands	8 ← Pro D Ex. rear lots
Pervious areas – i.e. wood lands	10 ← Pro D

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Consulting Engineer

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STORM EVENTS MODELLED:

Based on LSRCA criteria, the following storm events are to be modelled

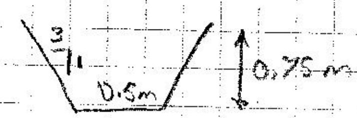
SCS 24 hr. Type II
SCS 12 hr. Type II
SCS 6 hr. Type II
Chicago 4 hr.
} For all events, ie. 2yr. 5yr. 25 yr. and 100 yr.

See page 8 which is exerpt from the MTO Chart 1.05 and provides the typical 12 hr. SCS Type II distribution of the mass of the storm.

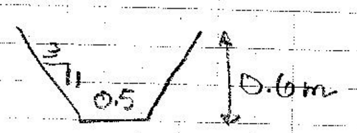
also, see page 9, which is Table 14.3.1 for SCS rainfall distributions for all types of events for 6 hr. and 24 hr. storm event.

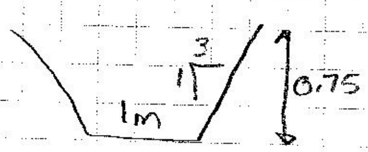
CONDUIT DIMENSIONS:

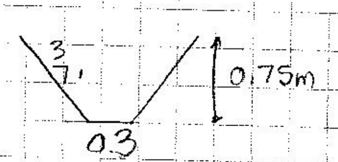
C1 =


C3 =


C2 =


C4 =


C5 =


C6 =


Also see the attached photos of the section locations on page and

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Junction of Conduit 3 (C3) coming in from the west, C4 coming in from the east and C5 draining south.
North is tom the top of the picture . Photo No. 1

Conduit 5 (C5) looking south from photo No. 1 above Photo No. 2

Looking upstream (west) at Conduit 3 (C3) from intersection of C3, C4 and C5 Photo No. 3

Looking upstream (east) at Conduit 4 (C4) from intersection of C3, C4 and C5. Photo No. 4

The following exerpt from MTO Chart 1.05 provides the typical SCS II distributions for the 12 hour mass storm.

12 hour		
Time end' g, hour	F_{inc} (%)	F_{cum} (%)
0	0	0
2	5	5
3	3	8
3.5	2	10
4	2	12
4.5	3	15
5	4	19
5.5	6	25
5.75	12	37
6	33	70
6.5	9	79
7	4	83
7.5	3	86
8	3	89
10	7	96
12	4	100

Source: Ministry of Transportation Ontario, MTO Drainage Management Manual, (1997).

10.0 Natural Resource Conservation Service formerly Soil Conservation Service (SCS) Type II Mass Storm Distributions

The following table presents the typical SCS Type II 6 hour and 24 hour storm distributions.

TABLE 14.3.1
SCS rainfall distributions

24-hour storm							6-hour storm		
		P_t/P_{24}							
Hour t	$t/24$	Type I	Type IA	Type II	Type III		Hour t	$t/6$	P_t/P_6
0	0	0	0	0	0		0	0	0
2.0	0.083	0.035	0.050	0.022	0.020		0.60	0.10	0.04
4.0	0.167	0.076	0.116	0.048	0.043		1.20	0.20	0.10
6.0	0.250	0.125	0.206	0.080	0.072		1.50	0.25	0.14
7.0	0.292	0.156	0.268	0.098	0.089		1.80	0.30	0.19
8.0	0.333	0.194	0.425	0.120	0.115		2.10	0.35	0.31
8.5	0.354	0.219	0.480	0.133	0.130		2.28	0.38	0.44
9.0	0.375	0.254	0.520	0.147	0.148		2.40	0.40	0.53
9.5	0.396	0.303	0.550	0.163	0.167		2.52	0.42	0.60
9.75	0.406	0.362	0.564	0.172	0.178		2.64	0.44	0.63
10.0	0.417	0.515	0.577	0.181	0.189		2.76	0.46	0.66
10.5	0.438	0.583	0.601	0.204	0.216		3.00	0.50	0.70
11.0	0.459	0.624	0.624	0.235	0.250		3.30	0.55	0.75
11.5	0.479	0.654	0.645	0.283	0.298		3.60	0.60	0.79
11.75	0.489	0.669	0.655	0.357	0.339		3.90	0.65	0.83
12.0	0.500	0.682	0.664	0.663	0.500		4.20	0.70	0.86
12.5	0.521	0.706	0.683	0.735	0.702		4.50	0.75	0.89
13.0	0.542	0.727	0.701	0.772	0.751		4.80	0.80	0.91
13.5	0.563	0.748	0.719	0.799	0.785		5.40	0.90	0.96
14.0	0.583	0.767	0.736	0.820	0.811		6.00	1.0	1.00
16.0	0.667	0.830	0.800	0.880	0.886				
20.0	0.833	0.926	0.906	0.952	0.957				
24.0	1.000	1.000	1.000	1.000	1.000				

Source: U. S. Dept. of Agriculture, Soil Conservation Service, 1973, 1986.

Source: Chow, V.T., D. R. Maidment and L. W. Mays, Applied Hydrology, (1988).

7.0 GUIDELINES FOR HYDROLOGIC AND HYDRAULIC ANALYSES

The guidelines in this section provide some direction for completing hydrologic and hydraulic studies for submission to and review by the City of Barrie. Prior to undertaking hydrology and hydraulic modeling work, the City of Barrie Engineering Department shall be contacted to confirm the use of an approved and appropriate software package. A number of relevant sample problems and calculations are provided in **Appendix C**.

7.1 Rainfall Data

7.1.1 City of Barrie IDF Curves

Until the Regional Intensity-Duration-Frequency (IDF) curves are available, stormwater management facilities should be designed based on the most current IDF tables developed by Environment Canada for Barrie including a 15% increase in rainfall intensity data to account for impacts due to climate change. The Chicago distribution parameters for different return periods provided in **Table 7.1** should be used for modeling purposes.

Table 7.1: Barrie WPCC IDF Curve Parameters - Adjusted to Account for Climate Change

Parameter	Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
A	678.085	853.608	975.865	1146.275	1236.152	1426.408
B	4.699	4.699	4.699	4.922	4.699	5.273
C	0.781	0.766	0.760	0.757	0.751	0.759

Rainfall Intensity, I (mm/hr) = $A/(t+B)^C$, where t is time duration in minutes
Parameters based on rain gauge data for the period 1979 – 2003 for the Barrie WPCC Station #6110557
Based on a review of the literature, the IDF intensity values for Barrie WPCC Station were increased by 15% before calculating a, b, c values to account for climate change.

7.1.2 Return Period Design Storms and Regional Storm

1: 2 year, 1:5 year, 1:10 year, 1:25 year, 1:50 year, 1:100 year and the Regional Storms shall be applied for quantity control and the 25 mm 4-hour Chicago storm shall be applied for erosion control as required. In order to determine the critical design storms, the SCS Type II (6-hr, 12-hr and 24-hr durations) and the 4-hour Chicago storm distributions for the 1:2 year through 1:100 year return period shall be applied.

Unless otherwise directed by the City, Hurricane Hazel shall be applied throughout the City as the Regional storm for the sizing of municipal infrastructure associated with storm drainage and stormwater management. It should be noted, however, that either the Timmins storm or Hurricane Hazel shall be used as the Regional storm within the respective jurisdictions of the NVCA and the LSRCA for the preparation of floodplain mapping where applicable. In addition, watershed and subwatershed hydrology models within the City that lie within the NVCA jurisdiction must include the Timmins storm such that appropriate peak flow information is available as required (*e.g.* for either floodplain mapping or culvert/bridge designs on a watercourse where applicable.

City approved design storm hyetographs for computer modeling (adjusted to account for climate change) are provided in **Appendix B** and on CD in **Appendix I**. An analysis of design storm durations for use within the City of Barrie is provided in **Appendix H**. A map delineating the flood hazard criteria zone boundaries (*i.e.* where to apply Hurricane Hazel and the Timmins storm) within the City of Barrie is provided in **Appendix B**.

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2.0 POST DEVELOPMENT
(SEE FIGURE 2.0, PCSWMM-POST-D)

2.1 RUN-OFF COEF.
Calculate typical areas and apply to similar areas throughout

Use Pages 43 and 44 from Town Criteria to set the various runoff coefficients

($R_{5\text{-yr}}$)

ie Commerical Site and Apt bldg sites — R = 0.75
Residential Areas — R = 0.45
Sodded Areas (Park) — R = 0.25
Block Town House — R = 0.55

NOTE increases in R values for storm events > 5-yr, see page 44 in Town's criteria

ie $R = C$
$C_{10} = 0.8C_5 + 0.2$
$C_{25} = 0.7C_5 + 0.3$
$C_{100} = 0.5C_5 + 0.5$
(Table 6 of Town Criteria)

2.2 Pipe slopes not to be less than 0.3%
(section 4.4.5 of Town criteria)

2.3 R value for Mapleview Drive East and 25th SR

10 m total width
5.0 asphalt @ 0.9
1.2 shoulder @ 0.65
3.8 ditch @ 0.25

$R = \frac{\Sigma AR}{\Sigma A} = 62\%$

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Source: adapted from the Ministry of Transportation Drainage Management Manual, 1997, Equation 8.10.

The higher of the arithmetic composite runoff coefficient or the minimum required runoff coefficient by land use, provided in the following table, shall be used to compute design flows.

TABLE 6
Minimum Runoff Coefficients

COMPOSITE CALCULATIONS

LAND USE DESCRIPTIONS	C
Sodded area under 7% slope	0.25
Sodded area over 7% slope	0.30
Impervious areas	0.95
Bricked/Paver Stone areas	0.85
Gravel road and shoulders	0.60
Roof areas	0.70-0.95
Flat roof area with detention hoppers	0.10
Foundation connection (to be applied with no time of concentration	0.075L/s/unit

MINIMUM REQUIRED COEFFICIENTS

LAND USE DESCRIPTIONS	C
Single Family, Semi-Detached, Duplex, Triplex, Quad, Small Lot Single (9m), Small Lot Semi (7.5m)	0.45
Block Townhousing, Street Townhousing (6, 7.5 m)	0.55
Stack Townhousing, Apartments	0.65
Neighbourhood Commercial, Institutional, Schools, Churches	0.75
Commercial Centre, Industrial	0.90
Park, Recreation Area, Cemetery with any roof leaders or pavement to sodded areas	0.25

COMPOSITE CALCULATIONS	
Unimproved Open Space under 7% slope	0.25
Unimproved Open Space over 7% slope	0.30

Source: adapted from the Ministry of Transportation Drainage Management Manual, 1997, Design Chart 1.07.

For runoff coefficients not listed above, refer to the MTO Design Chart 1.07.

On a project specific basis, a detailed calculation of the run-off coefficient may be requested by the Town.

For estimating flows from storms larger than the 5-year event, the runoff coefficients should be increased to account for the increase in runoff due to saturation of the soil, with the estimate becoming less accurate for larger storms. Coefficients for the larger storms can be derived as follows:

$$C_{10} = 0.8\,C_5 + 0.2$$
$$C_{25} = 0.7\,C_5 + 0.3$$
$$C_{50} = 0.6\,C_5 + 0.4$$
$$C_{100} = 0.5\,C_5 + 0.5$$

The average rainfall intensity for major storms (100-yr event) is to be derived from the IDF curve from the Atmospheric Environment Service Branch of Environment Canada for the Barrie WPCC station, as follows:

$$i = (a)(t^b)$$

where:
- i = average rainfall intensity (mm/hr)
- a = 47.0 (coefficient from Station data)
- t = time (hours)
- b = -0.677 (exponent from Station data)

4.4.3 Pipe Capacity

Manning's Formula is to be used in calculating the full flow capacity of the storm sewer.

The roughness coefficients to be used in the calculation are as follows:

Concrete pipe, n = 0.013
PVC and Smooth walled PE pipe, n = 0.013
Corrugated pipe (for culvert use only), n = 0.024

Storm sewers are to be designed such that individual pipes only reach a maximum of 80% of their total capacity. On an individual as-needed basis, the Town will review designs where pipes reach a greater percentage of their total capacity.

SUMMARY OF CATCHMENTS

NAME	AREA	% OF IMPERVOIUS	AxR
S1	0.07	62	0.0434
S10	0.79	45	0.3555
S11	0.42	45	0.189
S12	0.19	45	0.0855
S13	0.11	45	0.0495
S14	1.17	45	0.5265
S15	0.9	45	0.405
S16	0.17	45	0.0765
S17	0.8	45	0.36
S18	0.44	45	0.198
S19	0.42	45	0.189
S2	0.39	62	0.2418
S20	0.12	45	0.054
S21	0.23	45	0.1035
S22	0.91	35	0.3185
S23	0.34	45	0.153
S24	1.11	35	0.3885
S25	0.27	25	0.0675
S26	1.66	45	0.747
S27	0.53	35	0.1855
S28	0.54	35	0.189
S29	0.63	45	0.2835
S3	0.16	62	0.0992
S30	0.13	35	0.0455
S31	0.89	25	0.2225
S32	0.14	25	0.035
S33	0.13	45	0.0585
S34	0.15	45	0.0675
S4	0.2	50	0.1
S5	1.66	70	1.162
S6	1.53	70	1.071
S7	0.35	45	0.1575
S8	0.11	45	0.0495
S9	0.51	45	0.2295
TOTAL AREA =	18.17		8.5074

COMPOSITE R = sum of (A x R) / sum of A

= 0.47

SWM Pond Stage/Storage Calculations

Elevation	Depth plunge pool	Depth main pool	Area plunge pool	Area main pond	Volume plunge pool perm. storage	Volume main pood perm. storage	Volume main pond active storage	Controls
m	m	m	sq.m	sq.m	cu.m	cu.m	cu.m	
226.50	0		95		0.0			
226.75	0.25		175		33.8	0.0		
227.00	0.5		425		108.8	155.0		
227.30	0.8		650		270.0	455.0		
227.50	1.00	0.00	800	1850	415.0	675.0	0.0	1st pipe at 227.5
227.75		0.25		2130			497.5	2nd pipe at 227.8
228.00		0.50		2375			1060.6	3rd pipe at 228.0
228.25		0.75		2630			1686.3	
228.50		1.00		2885			2375.6	
228.75		1.25		3060			3118.8	
229.00		1.50		3235			3905.6	weir at 229.00
229.30		1.80		3820			4963.9	

(see Figure 5.6, CONCEPTUAL STORMWATER MANAGEMENT POND

Control Structure Configuration:

Low Flow Constriction
(Used for On-Line Structures)

L =	0	m
Invert=	0	m
C =	0.62	

Orifice 1 (Round Only)

Invert =	227.5	m
Size =	0.2	m
C=	0.62	
Obvert =	227.7	m

Orifice 2 (Round Only)

Invert =	227.8	m
Size =	0.6	m
C =	0.62	
Obvert =	228.4	m

Orifice 3 (Round Only)

Invert =	228	m
Size =	0.6	m
C =	0.62	
Obvert =	228.6	m

Weir 1

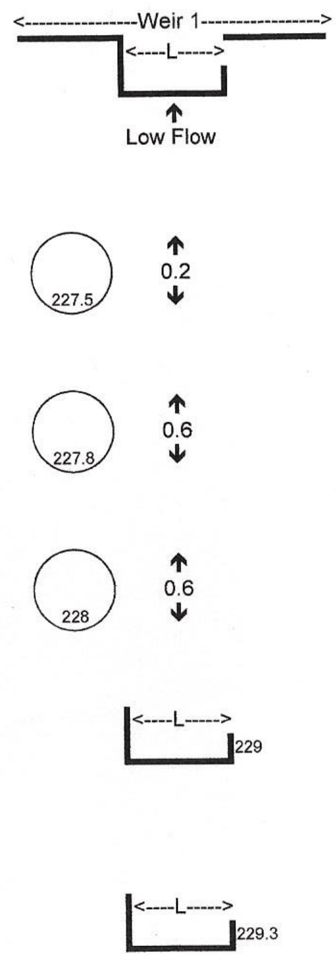
Length =	1	m
Elevation =	229	m
Side Slp =	1	

(0 = vertical, 1 = 1H to 1V, 3 = 3H to 1 v)

Weir 2

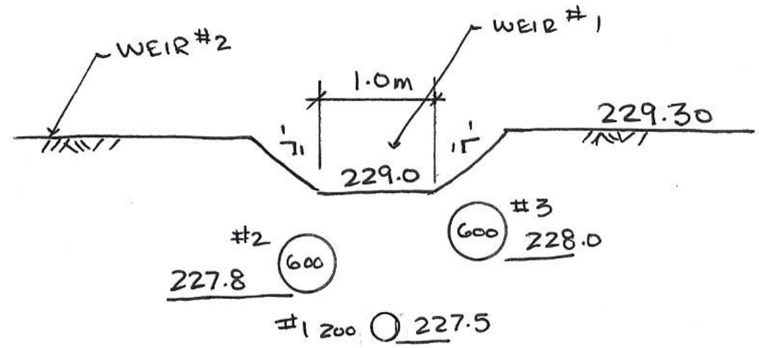
Length =	150	m
Elevation =	229.3	m
Side Slp =	0	

(0 = vertical, 1 = 1H to 1V, 3 = 3H to 1 v)



Flow through Low Flow Component:

$Q = 0.62 * 2/3 * L * (2g)^{0.5} * h^{1.5}$
(if depth of flow is above weir 1 elevation and above low flow elevation)
$Q = C*A*(2gh)^{0.5}$
(if depth of flow is below weir 1 elevation)



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Sizing of Flow Control Structures

(ie. up to 3 orifii and 2 weirs - allows for low flow constriction if structure in channel)

Project Description: Teromi
Job Number: 7
Date: 23-Mar-17

C:\Users\John\Desktop\PROJECT FILES JFIVE\001 - 039\007 - Teromi Development, Innisfil\Reports\SWM Design\[(007) Teromi swmp for test 6-Oct, 2017.xls]Outflow

Start Elevation (m) 227.5
Increment (m) 0.05

Upstream Elevation (m)	Low Flow Constriction (cms)	Orifice 1 Outflow (cms)	Orifice 2 Outflow (cms)	Orifice 3 Outflow (cms)	Weir 1 Outflow (cms)	Weir 2 Outflow (cms)	Backwater Elevation (m)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)
227.50	0.000	0.00	0.00	0.00	0.000	0.000	227.30	227.50	0.0000	0	0.00
227.55	0.000	0.00	0.00	0.00	0.000	0.000	227.30	227.55	0.0034	99.5	16.21
227.60	0.000	0.01	0.00	0.00	0.000	0.000	227.31	227.60	0.0096	199	20.44
227.65	0.000	0.02	0.00	0.00	0.000	0.000	227.33	227.65	0.0177	298.5	22.46
227.70	0.000	0.03	0.00	0.00	0.000	0.000	227.37	227.70	0.0273	398	23.69
227.75	0.000	0.03	0.00	0.00	0.000	0.000	227.40	227.75	0.0334	497.5	24.60
227.80	0.000	0.04	0.00	0.00	0.000	0.000	227.43	227.80	0.0386	610.12	25.47
227.85	0.000	0.04	0.01	0.00	0.000	0.000	227.45	227.85	0.0534	722.74	26.15
227.90	0.000	0.05	0.03	0.00	0.000	0.000	227.51	227.90	0.0760	835.36	26.63
227.95	0.000	0.05	0.05	0.00	0.000	0.000	227.55	227.95	0.1023	947.98	26.99
228.00	0.000	0.05	0.08	0.00	0.000	0.000	227.60	228.00	0.1329	1060.6	27.25
228.05	0.000	0.05	0.11	0.01	0.000	0.000	227.67	228.05	0.1769	1192.1	27.49
228.10	0.000	0.05	0.15	0.03	0.000	0.000	227.73	228.10	0.2321	1323.6	27.67
228.15	0.000	0.05	0.19	0.05	0.000	0.000	227.78	228.15	0.2951	1455.1	27.80
228.20	0.000	0.05	0.23	0.08	0.000	0.000	227.82	228.20	0.3607	1586.6	27.92
228.25	0.000	0.05	0.26	0.11	0.000	0.000	227.86	228.25	0.4274	1718.1	28.01
228.30	0.000	0.06	0.29	0.15	0.000	0.000	227.88	228.30	0.5007	1849.6	28.09
228.35	0.000	0.06	0.33	0.19	0.000	0.000	227.92	228.35	0.5738	1981.1	28.16
228.40	0.000	0.06	0.36	0.23	0.000	0.000	227.96	228.40	0.6529	2112.6	28.21
228.45	0.000	0.06	0.39	0.28	0.000	0.000	228.00	228.45	0.7224	2244.1	28.27
228.50	0.000	0.06	0.43	0.32	0.000	0.000	228.00	228.50	0.8098	2375.6	28.32
228.55	0.000	0.06	0.46	0.37	0.000	0.000	228.00	228.55	0.8966	2524.2	28.36
228.60	0.000	0.07	0.49	0.43	0.000	0.000	228.00	228.60	0.9832	2672.8	28.41
228.65	0.000	0.07	0.52	0.46	0.000	0.000	228.00	228.65	1.0498	2821.4	28.45
228.70	0.000	0.07	0.55	0.49	0.000	0.000	228.00	228.70	1.1123	2970	28.49
228.75	0.000	0.07	0.58	0.52	0.000	0.000	228.00	228.75	1.1715	3118.6	28.52
228.80	0.000	0.08	0.60	0.55	0.000	0.000	228.00	228.80	1.2277	3276	28.56
228.85	0.000	0.08	0.63	0.58	0.000	0.000	228.00	228.85	1.2814	3433.4	28.59
228.90	0.000	0.08	0.65	0.60	0.000	0.000	228.00	228.90	1.3330	3590.8	28.63
228.95	0.000	0.08	0.67	0.63	0.000	0.000	228.00	228.95	1.3826	3748.2	28.66
229.00	0.000	0.09	0.69	0.65	0.000	0.000	228.00	229.00	1.4304	3905.6	28.69
229.05	0.000	0.09	0.72	0.67	0.000	0.000	228.00	229.05	1.4767	4064.345	28.72
229.10	0.000	0.09	0.74	0.69	0.051	0.000	228.00	229.10	1.5724	4223.09	28.75
229.15	0.000	0.09	0.76	0.72	0.098	0.000	228.00	229.15	1.6629	4434.75	28.79
229.20	0.000	0.09	0.78	0.74	0.158	0.000	228.00	229.20	1.7652	4593.495	28.81
229.25	0.000	0.10	0.80	0.76	0.236	0.000	228.00	229.25	1.8850	4752.24	28.84
229.30	0.000	0.10	0.81	0.78	0.321	0.000	228.00	229.30	2.0098	4963.9	28.87

Outflow from control structure (cms) vs. Elevation of Backwater (m) (both for same return

Flow (cms)	Elevation (m)
0.00	227.30
0.05	227.50
0.10	227.60
0.15	227.70
0.25	227.80
0.45	227.90
0.65	228.00

* Input numbers in red

Expanded Flow/Stage Table for Backwater:

Flow (cms)	Elevation (m)
0.00	227.30
0.00	227.31
0.01	227.32
0.01	227.33
0.01	227.34
0.01	227.35
0.02	227.36
0.02	227.37
0.02	227.38
0.02	227.39
0.03	227.40
0.03	227.41
0.03	227.42
0.03	227.43
0.04	227.44
0.04	227.45
0.04	227.46
0.04	227.47
0.05	227.48
0.05	227.49
0.05	227.50
0.05	227.51
0.06	227.51
0.06	227.52
0.06	227.52
0.06	227.53
0.07	227.53
0.07	227.54
0.07	227.54
0.07	227.55
0.08	227.55
0.08	227.56

	0.08	227.56						
	0.08	227.57						
	0.09	227.57						
	0.09	227.58						
	0.09	227.58						
	0.09	227.59						
	0.10	227.59						
	0.10	227.60						
	0.10	227.60						
	0.10	227.61						
	0.11	227.61						
	0.11	227.62						
	0.11	227.62						
	0.11	227.63						
	0.12	227.63						
	0.12	227.64						
	0.12	227.64						
	0.12	227.65						
	0.13	227.65						
	0.13	227.66						
	0.13	227.66						
	0.13	227.67						
	0.14	227.67						
	0.14	227.68						
	0.14	227.68						
	0.14	227.69						
	0.15	227.69						
	0.15	227.70						
	0.15	227.70						
	0.16	227.71						
	0.16	227.71						
	0.17	227.72						
	0.17	227.72						
	0.18	227.73						
	0.18	227.73						
	0.19	227.74						
	0.19	227.74						
	0.20	227.75						
	0.20	227.75						
	0.21	227.76						
	0.21	227.76						
	0.22	227.77						
	0.22	227.77						
	0.23	227.78						
	0.23	227.78						
	0.24	227.79						
	0.24	227.79						
	0.25	227.80						
	0.25	227.80						
	0.26	227.81						
	0.27	227.81						
	0.28	227.82						

	0.29	227.82						
	0.30	227.83						
	0.31	227.83						
	0.32	227.84						
	0.33	227.84						
	0.34	227.85						
	0.35	227.85						
	0.36	227.86						
	0.37	227.86						
	0.38	227.86						
	0.39	227.87						
	0.40	227.87						
	0.41	227.88						
	0.42	227.88						
	0.43	227.89						
	0.44	227.89						
	0.45	227.90						
	0.46	227.90						
	0.47	227.91						
	0.48	227.91						
	0.49	227.92						
	0.50	227.92						
	0.51	227.93						
	0.52	227.93						
	0.53	227.94						
	0.54	227.94						
	0.55	227.95						
	0.56	227.95						
	0.57	227.96						
	0.58	227.96						
	0.59	227.97						
	0.60	227.97						
	0.61	227.98						
	0.62	227.98						
	0.63	227.99						
	0.64	227.99						
	0.65	228.00						

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Submerged Weir (ie. Backwater):

Rectangular/V-notched Sharp Crested Weir:

$(H_2/H_1)^n$	Q/Q_1
0	1
0.05	0.975
0.1	0.96
0.15	0.94
0.2	0.92
0.25	0.885
0.3	0.87
0.35	0.84
0.4	0.82
0.45	0.785
0.5	0.76
0.55	0.73
0.6	0.7
0.65	0.66
0.7	0.62
0.75	0.58
0.8	0.53
0.85	0.47
0.9	0.38
0.95	0.25
1	0

where:

n = exponent that H is raised to in weir equation

H_2 = downstream head (m)

H_1 = upstream head (m)

Q = adjusted flow from backwater (cms)

Q_1 = flow calculated with no backwater (free discharge (cms)

This submerged weir calculation is based on Figure 5-5, page 5-18, Handbo of Hydraulics

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Coefficient for weirs with approximate 1ft (0.3048 m) breadth:

Head* (ft)	Coefficient* ($ft^{0.5}$)		Convert to Metric: Head (m)	Coefficient ($m^{0.5}$)
			0	0
0.2	2.69		0.061	1.485
0.4	2.72		0.122	1.502
0.6	2.75		0.183	1.518
0.8	2.85		0.244	1.573
1	2.98		0.305	1.645
1.2	3.08		0.366	1.700
1.4	3.2		0.427	1.767
1.6	3.28		0.488	1.811
1.8	3.31		0.549	1.827
2	3.3		0.610	1.822
2.5	3.31		0.762	1.827
3	3.32		0.914	1.833
3.5	3.32		1.067	1.833
4	3.32		1.219	1.833
4.5	3.32		1.372	1.833
5	3.32		1.524	1.833
5.5	3.32		1.676	1.833
			5	1.833

* Table 5-3: Values of C in the Formula $Q=CLH^{1.5}$ for Sharp Crested Weirs

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STORMWATER WETLAND POND DESIGN

1. Total areas (see page)

SUMMARY OF TOTAL AREA RELATED TO EX. DEVELOPMENT & PROPERTY = 18.17 ha

COMP. $R = \Sigma AR / \Sigma A$ ———— = 0.47

2. RECQUIRED STORAGE "ENHANED" LEVEL FROM CRITERIA OF MOE GUIDELINES TABLE 3.2

a) REQUIRED DETENTION @ R = 47%

$= (47/55) \times (105 - 40) \times 18.17$ ha = 1009 cu.m.

PROVIDED @ EL = 227.50 m
= 270 + 455 + 295 ———— = 1020 cu.m.

b) EXTENDED DETENTION
REQUIRED = 40 × 18.17 ha ———— = 726.8 cu.m

PROVIDED @ EL = 227.8 ———— > 792.5 cu.m

c) Drainage Area is > than min of 5 ha.

d) Active Storage Detention time is > 12 hr.

e) Forebay (sump pool) depth 227.50 − 226.50 = 1.0 m

f) Area of Permanent Pool ≈ $\frac{450}{1800} \times 100\% = 25\%$

g) Length to Width Ratio
req'd Forebay 2:1 − provide = 30:15 = 2:1
req'd Overall 110:34 ———— = 3.2:1

h) Active Storage depth
for Storm < 10yr =

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i) Side slopes are proposed @ 7:1
min. requid 5:1

j) Avoid clogging / freezing and clogging
Min. Extended detention Ø = 150mm
(Town criteria)

k) Inlet min to be 450 m
provided is 900 mm

l) Outlet min. other than extended detention pipe – min: 450 mm
provided – = 600 mm

m) Maintenance – 4.0 m wide access road around entire pond

n) Buffer to from permanent water level @ 7:1 slope = 8.0 m
required = 7.0 m

Detailed design of entire system to be provided at detail design of entire subdivision

Water Balance:

This shall be achieved via implementation of Bio-retention basins in the phase 1 area to ensure ground water recharge meet post to pre.
(See attached sample of a typical basin.

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SIMULATION FLOW RATE FOR POST DEVELOPMENT
(File: Teromi Post D with SWMP and dual system test 6)

SUMMARY OF PEAK FLOWS @ OUTLET

RAINFALL TYPE	EVENT (YR.)	FLOW RATE (cms)
SCS 24 hr. TYPE II	2	0.333
	5	0.532
	25	0.881
	100	1.252
SCS 6 hr. TYPE II	2	0.334
	5	0.517
	25	0.798
	100	1.088
CHICAGO 4 hr.	2	0.244
	5	0.414
	25	0.700
	100	0.961

COMPARISON OF STORM EVENT IDENTIFY ALL POST PEAK FLOW RATES ARE LESS THEN THE PRE DEVELOPMENT PEAK FLOW RATES BY A CONSIDERABLE AMOUNT.

THEREFORE LOTS OF ROOM IN SWMPOND BLOCK TO ACCOMODATE THE DETAILED DESIGN SIZING

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BIORETENTION

CVC/TRCA LOW IMPACT DEVELOPMENT PLANNING AND DESIGN GUIDE - FACT SHEET

GENERAL DESCRIPTION

As a stormwater filter and infiltration practice, bioretention temporarily stores, treats and infiltrates runoff. Depending on native soil infiltration rate and physical constraints, the system may be designed without an underdrain for full infiltration, with an underdrain for partial infiltration, or with an impermeable liner and underdrain for filtration only (i.e., a biofilter). The primary component of the practice is the filter bed which is a mixture of sand, fines and organic material. Other elements include a mulch ground cover and plants adapted to the conditions of a stormwater practice. Bioretention is designed to capture small storm events or the water quality storage requirement. An overflow or bypass is necessary to pass large storm event flows. Bioretention can be adapted to fit into many different development contexts and provide a convenient area for snow storage and treatment.

DESIGN GUIDANCE

SOIL CHARACTERISTICS

Bioretention can be constructed over any soil type, but hydrologic soil group A and B are best for achieving water balance goals. If possible, bioretention should be sited in the areas of the development with the highest native soil infiltration rates. Bioretention in soils with infiltration rates less than 15 mm/hr will require an underdrain. Designers should verify the native soil infiltration rate at the proposed location and depth through measurement of hydraulic conductivity under field saturated conditions.

GEOMETRY & SITE LAYOUT

Key geometry and site layout factors include:

- The minimum footprint of the filter bed area is based on the drainage area. Typical drainage areas to bioretention are between 100 m2 to 0.5 hectares. The maximum recommended drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.
- Bioretention can be configured to fit into many locations and shapes. However, cells that are narrow may concentrate flow as it spreads throughout the cell and result in erosion.
- The filter bed surface should be level to encourage stormwater to spread out evenly over the surface.

PRE-TREATMENT

Pretreatment prevents premature clogging by capturing coarse sediment particles before they reach the filter bed. Where the runoff source area produces little sediment, such as roofs, bioretention can function effectively without pretreatment. To treat parking area or road runoff, a two-cell design that incorporates a forebay is recommended. Pretreatment practices that may be feasible, depending on the method of conveyance and the availability of space include:

- *Two-cell design (channel flow):* Forebay ponding volume should account for 25% of the water quality storage requirement and be designed with a 2:1 length to width ratio.
- *Vegetated filter strip (sheet flow):* Should be a minimum of three (3) metres in width. If smaller strips are used, more frequent maintenance of the filter bed can be anticipated.
- *Gravel diaphragm (sheet flow):* A small trench filled with pea gravel, which is perpendicular to the flow path between the edge of the pavement and the bioretention practice will promote settling out of sediment and maintain sheet flow into the facility. A drop of 50-150 mm into the gravel diaphragm can be used to dissipate energy and promote settling.
- *Rip rap and/or dense vegetation (channel flow):* Suitable for small bioretention cells with drainage areas less than 100 square metres.

GRAVEL STORAGE LAYER

- DEPTH: Should be a minimum of 300 mm deep and sized to provide the required storage volume. Granular material should be 50 mm diameter clear stone.
- PEA GRAVEL CHOKING LAYER: A 100 mm deep layer of pea gravel (3 to 10 mm diameter clear stone) should be placed on top of the coarse gravel storage layer as a choking layer separating it from the overlying filter media bed.

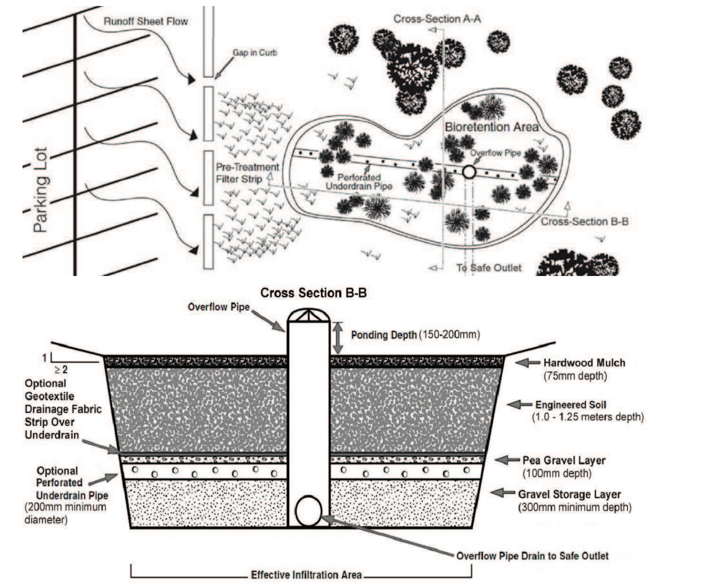
FILTER MEDIA

- COMPOSITION: To ensure a consistent and homogeneous bed, filter media should come pre-mixed from an approved vendor.
- DEPTH: Recommended depth is between 1.0 and 1.25 m. However in constrained applications, pollutant removal benefits may be achieved in beds as shallow as 500 mm. If trees are to be included in the design, bed depth must be at least 1.0 m.
- MULCH: A 75 mm layer of mulch on the surface of the filter bed enhances plant survival, suppresses weed growth and pretreats runoff before it reaches the filter bed.

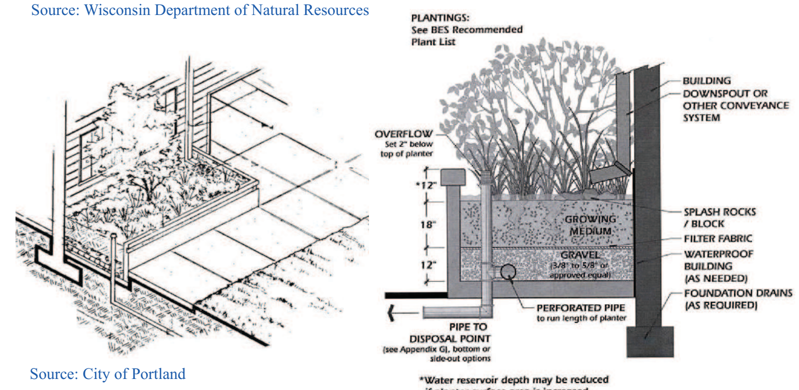
CONVEYANCE AND OVERFLOW

Bioretention can be designed to be inline or offline from the drainage system. Inline bioretention accepts all flow from a drainage area and conveys larger event flows through an overflow outlet. Overflow structures must be sized to safely convey larger storm events out of the facility. The invert of the overflow should be placed at the maximum water surface elevation of the bioretention area, which is typically 150-250 mm above the filter bed surface.

Offline bioretention practices use flow splitters or bypass channels that only allow the required water quality storage volume to enter the facility. This may be achieved with a pipe, weir, or curb opening sized for the target flow, but in conjunction, create a bypass channel so that higher flows do not pass over the surface of the filter bed. Using a weir or curb opening minimizes clogging and reduces maintenance frequency.



Source: Wisconsin Department of Natural Resources



Source: City of Portland

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefits
Bioretention with no underdrain	Yes	Yes - size for water quality storage requirement	Partial - based on available storage volume and infiltration rates
Bioretention with underdrain	Partial - based on available storage volume beneath the underdrain and soil infiltration rate	Yes - size for water quality storage requirement	Partial - based on available storage volume beneath the underdrain and soil infiltration rate
Bioretention with underdrain and impermeable liner	Partial - some volume reduction through evapo-transpiration	Yes - size for water quality storage requirement	Partial - some volume reduction through evapotranspiration

UNDERDRAIN

- Only needed where native soil infiltration rate is less than 15 mm/hr (hydraulic conductivity of less than 1×10^{-6} cm/s).
- Should consist of a perforated pipe embedded in the coarse gravel storage layer at least 100 mm above the bottom.
- A strip of geotextile filter fabric placed between the filter media and pea gravel choking layer over the perforated pipe is optional to help prevent fine soil particles from entering the underdrain.
- A vertical standpipe connected to the underdrain can be used as a cleanout and monitoring well.

MONITORING WELLS

A capped vertical stand pipe consisting of an anchored 100 to 150 mm diameter perforated pipe with a lockable cap installed to the bottom of the facility is recommended for monitoring drainage time between storms.

GENERAL SPECIFICATIONS

Material	Specification	Quantity
Filter Media Composition	Filter Media Soil Mixture to contain: • 85 to 88% sand • 8 to 12% soil fines • 3 to 5% organic matter (leaf compost) Other Criteria: • Phosphorus soil test index (P-Index) value between 10 to 30 ppm • Cationic exchange capacity (CEC) greater than 10 meq/100 g • Free of stones, stumps, roots and other large debris • pH between 5.5 to 7.5 • Infiltration rate greater than 25 mm/hr	Recommended depth is between 1.0 and 1.25 metres.
Mulch Layer	Shredded hardwood bark mulch	A 75 mm layer on the surface of the filter bed
Geotextile	Material specifications should conform to Ontario Provincial Standard Specification (OPSS) 1860 for Class II geotextile fabrics. Should be woven monofilament or non-woven needle punched fabrics. Woven slit film and non-woven heat bonded fabrics should not be used as they are prone to clogging. For further guidance see CVC/TRCA LID SWM Planning and Design Guide, Table 4.5.5.	Strip over the perforated pipe underdrain (if present) between the filter media bed and gravel storage layer (stone reservoir)
Gravel	Washed 50 mm diameter clear stone should be used to surround the underdrain and for the gravel storage layer Washed 3 to 10 mm diameter clear stone should be used for pea gravel choking layer.	Volume based on dimensions, assuming a void space ratio of 0.4.
Underdrain	Perforated HDPE or equivalent, minimum 100 mm diameter, 200 mm recommended.	• Perforated pipe for length of cell. • Non-perforated pipe as needed to connect with storm drain system. • One or more caps. • T's for underdrain configuration

CONSTRUCTION CONSIDERATIONS

Ideally, bioretention sites should remain outside the limit of disturbance until construction of the bioretention begins to prevent soil compaction by heavy equipment. Locations should not be used as sediment basins during construction, as the concentration of fines will prevent post-construction infiltration. To prevent sediment from clogging the surface of a bioretention cell, stormwater should be diverted away from the bioretention until the drainage area is fully stabilized.

For further guidance regarding key steps during construction, see the CVC/TRCA LID SWM Planning and Design Guide, Section 4.5.2 - Construction Considerations)

OPERATION AND MAINTENANCE

Bioretention requires routine inspection and maintenance of the landscaping as well as periodic inspection for less frequent maintenance needs or remedial maintenance. Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Regular watering may be required during the first two years until vegetation is established.

For the first two years following construction the facility should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, channelization, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices, the bioretention area surface and inlet and outlets at least twice annually. Other maintenance activities include reapplying mulch, pruning, weeding replacing dead vegetation and repairing eroded areas as needed. Remove accumulated sediment on the bioretention area surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Wellhead Protection
Facilities receiving road or parking lot runoff should not be located within two (2) year time-of-travel wellhead protection areas.

Available Space
Reserve open areas of about 10 to 20% of the size of the contributing drainage area.

Site Topography
Contributing slopes should be between 1 to 5%. The surface of the filter bed should be flat to allow flow to spread out. A stepped multi-cell design can also be used.

Available Head
If an underdrain is used, then 1 to 1.5 metres elevation difference is needed between the inflow point and the downstream storm drain invert.

Water Table
A minimum of one (1) metre separating the seasonally high water table or top of bedrock elevation and the bottom of the practice is necessary.

Soils
Bioretention can be located over any soil type, but hydrologic soil group A and B soils are best for achieving water balance benefits. Facilities should be located in portions of the site with the highest native soil infiltration rates. Where infiltration rates are less than 15 mm/hr (hydraulic conductivity less than 1×10^{-6} cm/s) an underdrain is required. Native soil infiltration rate at the proposed facility location and depth should be confirmed through measurement of hydraulic conductivity under field saturated conditions.

Drainage Area & Runoff Volume
Typical contributing drainage areas are between 100 m2 to 0.5 hectares. The maximum recommended contributing drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, runoff from pollution hot spots should not be treated by bioretention facilities designed for full or partial infiltration. Facilities designed with an impermeable liner (filtration only facilities) can be used to treat runoff from pollution hot spots.

Proximity to Underground Utilities
Designers should consult local utility design guidance for the horizontal and vertical clearances required between storm drains, ditches, and surface water bodies.

Overhead Wires
Check whether the future tree canopy height in the bioretention area will interfere with existing overhead phone and power lines.

Setback from Buildings
If an impermeable liner is used, no setback is needed. If not, a four (4) metre setback from building foundations should be applied.

TORONTO AND REGION Conservation for The Living City

CVC CREDIT VALLEY CONSERVATION

Updated : Sept 2014

Development Export Summary

Development :Teromi Subdivision, Innisfill

Updated : Sept 2014

Pre-Development Phosphorus Export

DEVELOPMENT : Teromi Subdivision, Innisfill

Landuse		Area (ha)	P coeff (kg/ha)	Pload (kg/yr)
Natural Heritage				
Transition		13.72	0.07	0.96
	Natural Heritage Land use Class Total :	**13.72**		**0.96**
	Development Total :	**13.72**		**0.96**

10/24/2017

Updated : Sept 2014

Cropland Site Sediment & Phosphorus Pre-Development Export

DEVELOPMENT : Teromi Subdivision, Innisfill

COLOUR KEY : Site Specific Input | Constant / Lookup | Calculation

SubArea :

Slope Area (ha)
Surface Slope Gradient (%)
Length of Slope (m)

Cropt Type Factor)
Tillage Type Factor

R (rainfall / runoff for Lake Simcoe)
K (soil errodability factor)
NN (determined by slope)

LS (slope length gradient factor)
C (crop management factor)
P (prevention + capture)
Soil Loss (kg/year)
Phosphorus export (kg/ha/yr)
Phosphorus load (kg/yr)

PRE Developed Area (ha) :
Phosphorus export (kg/ha/yr) :
Phosphorus load (kg/yr) :

10/24/2017

10/24/2017

Development :Teromi Subdivision, Innisfill

Updated : Sept 2014

Post-Development Phosphorus Export

DEVELOPMENT : Teromi Subdivision, Innisfill

Landuse		Area (ha)	P coeff (kg/ha)	Pload (kg/yr)
Natural Heritage				
Open Water		0.62	0.26	0.16
Turf/Sod		0.98	0.11	0.11
	Natural Heritage Land use Class Total :	**1.60**		**0.27**
Urban				
Commercial		1.62	0.20	1,071.05
Residential		0.11	0.41	99.72
Residential		1.54	0.41	2,087.22
Residential		6.46	0.41	1,445.10
Transportation		2.40	0.50	3,336.31
	Urban Land use Class Total :	**12.13**		**8,039.40**
	Development Total :	**13.73**		**8,039.67**

Updated : Sept 2014

Cropland Site Sediment & Phosphorus Post-Development Export

DEVELOPMENT : Teromi Subdivision, Innisfill

COLOUR KEY : Site Specific Input | Constant / Lookup | Calculation

SubArea :

Slope Area (ha)
Surface Slope Gradient (%)
Length of Slope (m)

Cropt Type Factor)
Tillage Type Factor

R (rainfall / runoff for Lake Simcoe)
K (soil errodability factor)
NN (determined by slope)

LS (slope length gradient factor)
C (crop management factor)
P (prevention + capture)
Soil Loss (kg/year)
Phosphorus export (kg/ha/yr)
Phosphorus load (kg/yr)

PRE Developed Area (ha) :
Phosphorus export (kg/ha/yr) :
Phosphorus load (kg/yr) :

Development :Teromi Subdivision, Innisfill

Updated : Sept 2014

Post Dev BMP

Area (ha)	Treated Area %	P coefficient	P coefficient	P Load Reduction (kg/yr)	Rationale
Best Management Practices (BMP) Applied (and Rationale)					
Commercial					
1.62	70	661.14	100 %	749.27	provision of bio-retention basins within the development area between parking areas to control the roof top areas and parking lot areas
Bioretention Systems					
Turf/Sod					
0.38	75	0.11	100 %	0.03	provision of enhanced grass swales throughout the park area to promote ground water infiltration for approx 50% of the park area
Enhanced Grass/Water Quality Swales					
Open Water					
0.31	100	0.26	77 %	0.06	area of the wet land surface of the stormwater management pond, at approx 50% of the block area
Wet Detention Ponds					
Residential					
6.56	45	1,355.34	60 %	2,401.31	provision of dry wells when possible for house to infiltrate roof tops into the ground for single, semis, townhouse and future residentail blocks
Soakaways - Infiltration Trenches					
Turf/Sod					
0.92	100	0.11	100 %	0.10	provisions of filter strips within the channel systems, along the edges of the swmp slopes
Vegetated Filter Strips/Stream Buffers					
Residential					
1.54	70	1,355.34	100 %	1,456.31	provision of bio-retention basins within the development area between parking areas to control the roof top areas and the parking lot areas
Bioretention Systems					
Turf/Sod					
0.31	100	0.11	65 %	0.02	berms and slopes of the SWM pond facility
Vegetated Filter Strips/Stream Buffers					
Transportation					
2.31	47	1,390.13	65 %	981.02	provision of filter strip along the streets if the opportunities premits
Vegetated Filter Strips/Stream Buffers					

Development Area P and BMP Summary

Total PreDevelopment Area (ha):	13.72
PreDevelopment Area excluding Wetlands (ha):	13.72
Total PostDevelopment Area (ha):	13.73
Total Area treated by BMP's (ha):	8.07
Treated Area total:	13.94
Total PreDevelopment Load (kg/yr):	0.96
Total PostDevelopment Load (kg/yr):	8,039.67
Total P Load Reduction with BMP's (kg/yr):	5,588.12
Minimum P Load Reduction Required:	8,038.71
Total PostDevelopment Load with BMP's (kg/yr)	2,451.55

Conclusion : No Net Increase in P Load.

Post Dev Construction

Edge Saver	siltation control fences
Ditch/Swale Sediment Trap	temporary settling basins at strategic locations throughout the development phase limits
Buffer/Riparian Zone Preservation	buffer stripes between the abutting properties
Channel Soxx	rip rap check dams along the drainage channels at strategic locations throughout the site development

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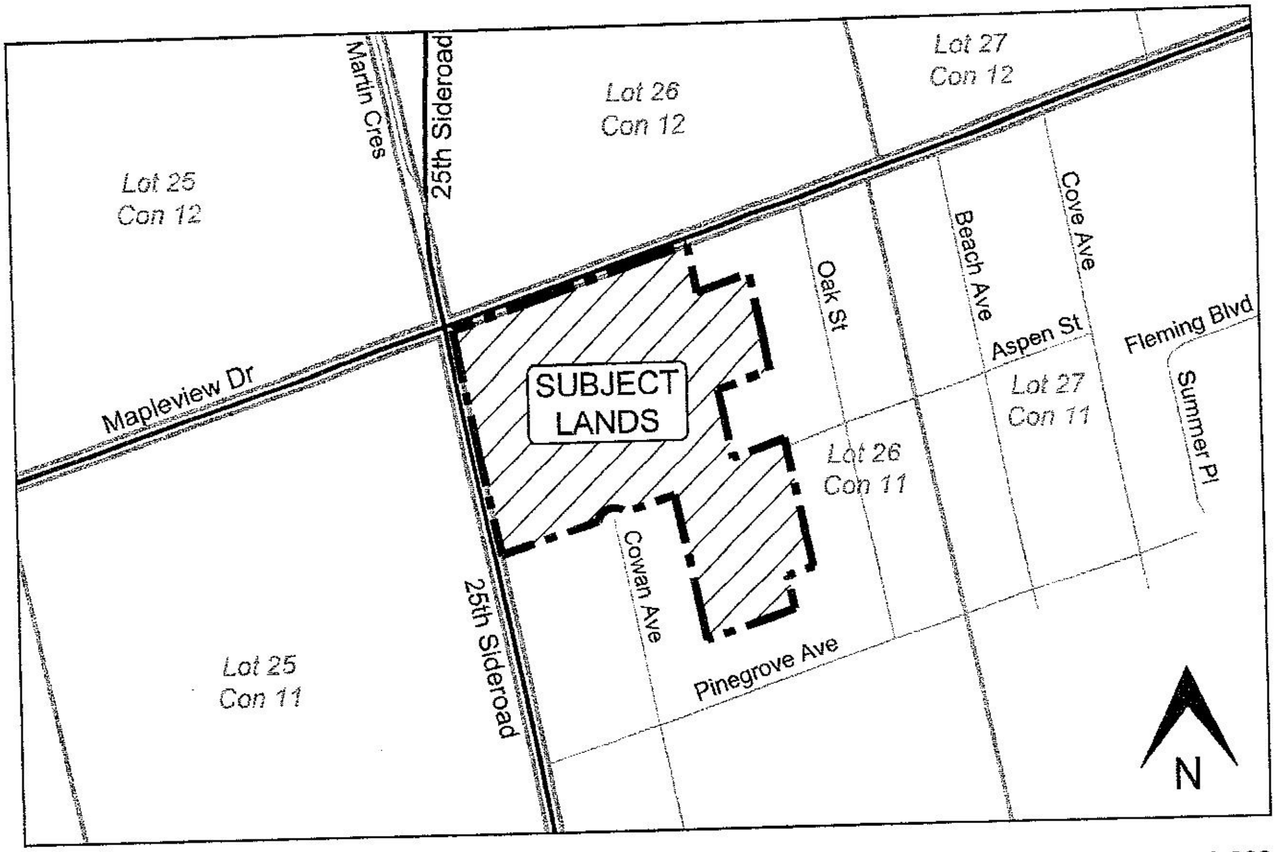

KEY MAP

Scale 1 : 10,000

LAND USE SCHEDULE

USE	LOTS/BLOCKS	UNITS	AREA ha	AREA ac	AREA %	BMP's
Single Detached Lots (15.24m)	28-29, 102-106, 111-115, 119, 120	14	1.377	3.40	10.0	
Single Detached Lots (12.19m)	19-27, 30-44, 57-76, 92-101, 107-110, 116-118	61	3.462	8.55	25.2	
Semi-Detached Lots (8m)	13-18, 45-56, 77, 78	20	0.873	2.16	6.4	
Townhouse Lots (6m)	1-12, 79-91	25	0.743	1.84	5.4	
Apartment	122	93	1.535	3.79	11.2	
Commercial	121		1.619	4.00	11.8	
Park	123		0.756	1.87	5.5	50%
SWM Pond	124		0.623	1.54	4.5	50%
Drainage/Servicing Blocks	125-128		0.228	0.56	1.7	
Road Widenings	129, 130		0.085	0.21	0.6	
Future Development	131-134		0.107	0.26	0.8	
Streets	Street 'A' - Street 'D'		2.313	5.71	16.9	
TOTAL		213	13.719	33.90	100	

LEGEND

Subject Lands

Watercourse

PSCWMM OUTPUT FILES

FOR

PRE-DEVELOPMENT CONDITIONS

FILE: TEROMI PRE D TEST 4

CHICAGO STORM EVENT ONLY

- 2 YR
- 5 YR
- 25 YR
- 100 YR

ALL OTHER STORM EVENTS ARE AVAILABLE UPON REQUEST

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage Chicago_4hr_1(
WARNING 02: maximum depth increased for Node J2
WARNING 02: maximum depth increased for Node J3

****
Element Count
****

CH. 2yr.

Number of rain gages 13
Number of subcatchments ... 9
Number of nodes 7
Number of links 6
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4hr_100yr	Chicago_4hr_100yr	INTENSITY	1 min.
Chicago_4hr_25yr	Chicago_4hr_25yr	INTENSITY	1 min.
Chicago_4hr_5yr	Chicago_4hr_5yr	INTENSITY	1 min.
Chicago_4hr-2yr	Chicago_4hr-2yr	INTENSITY	1 min.
SCS_24h_Type_I_1mm	SCS_24h_Type_I_1mm	INTENSITY	15 min.
SCS_24h_Type_II_101.5mm_25yr	SCS_24h_Type_II_101.5mm_25yr	INTENSITY	15 min.
SCS_24h_Type_II_123.9mm_100yr	SCS_24h_Type_II_123.9mm_100yr	INTENSITY	15 min.
SCS_24h_Type_II_56.2mm_2yr	SCS_24h_Type_II_56.2mm_2yr	INTENSITY	15 min.
SCS_24h_Type_II_74.4mm_5yr	SCS_24h_Type_II_74.4mm_5yr	INTENSITY	15 min.
SCS_6hr_101.5mm_25yr	SCS_6hr_101.5mm_25yr	INTENSITY	5 min.
SCS_6hr_123.9mm_100yr	SCS_6hr_123.9mm_100yr	INTENSITY	5 min.
SCS_6hr_56.2mm_2yr	SCS_6hr_56.2mm_2yr	INTENSITY	5 min.
SCS_6hr_74.4mm_5yr	SCS_6hr_74.4mm_5yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.45	102.10	22.00	1.2000	Chicago_4hr-2yr	J1
S1_2	0.00	0.00	25.00	0.5000	Chicago_4hr-2yr	J5
S2	3.12	120.03	21.00	1.2000	Chicago_4hr-2yr	J2
S3	2.42	138.41	18.00	1.0000	Chicago_4hr-2yr	J3
S4	6.52	217.41	22.00	1.2000	Chicago_4hr-2yr	J5
S5	1.64	173.04	23.00	1.6000	Chicago_4hr-2yr	J4
S5_2	0.00	0.00	25.00	0.5000	Chicago_4hr-2yr	OutFall
S6	2.54	254.44	22.00	1.4000	Chicago_4hr-2yr	J4
S7	6.00	266.67	15.00	0.9000	Chicago_4hr-2yr	J6

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	230.42	1.00	0.0	
J2	JUNCTION	229.40	0.75	0.0	

J3	JUNCTION	229.00	0.75	0.0
J4	JUNCTION	228.30	1.00	0.0
J5	JUNCTION	228.50	0.75	0.0
J6	JUNCTION	232.00	1.10	0.0
OutFall	OUTFALL	227.20	0.75	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughnes
C1	J1	J2	CONDUIT	158.9	0.6418	0.025
C2	J2	J3	CONDUIT	36.2	1.1060	0.020
C3	J3	J4	CONDUIT	136.2	0.5139	0.025
C4	J5	J4	CONDUIT	123.7	0.1617	0.025
C5	J4	OutFall	CONDUIT	167.9	0.6551	0.025
C6	J6	J1	CONDUIT	249.8	0.6326	0.025

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	2.08
C2	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	5.27
C3	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	3.18
C4	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	1.04
C5	TRAPEZOIDAL	0.75	2.44	0.42	5.50	1	4.46
C6	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	3.19

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

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Starting Date ............ 03/26/2017 00:00:00
Ending Date .............. 03/27/2017 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
```

```
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.913        36.968
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.732        29.630
Surface Runoff ...........         0.174         7.045
Final Storage ............         0.007         0.298
Continuity Error (%) .....        -0.016


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.174         1.740
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.174         1.741
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.013


***************************
Time-Step Critical Elements
***************************
None


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


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :      4.50 sec
Average Time Step           :      5.00 sec
Maximum Time Step           :      5.00 sec
Percent in Steady State     :      0.00
Average Iterations per Step :      2.00
Percent Not Converging      :      0.00


***************************
Subcatchment Runoff Summary
***************************

---------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total        Total   Ru
                           Precip      Runon       Evap      Infil     Runoff       Runoff
Subcatchment                   mm         mm         mm         mm         mm     10^6 ltr
---------------------------------------------------------------------------------------------
```

9/20

S1	36.97	0.00	0.00	28.83	7.81	0.19
S2	36.97	0.00	0.00	29.20	7.45	0.23
S3	36.97	0.00	0.00	30.31	6.39	0.15
S4	36.97	0.00	0.00	28.83	7.81	0.51
S5	36.97	0.00	0.00	28.47	8.17	0.13
S6	36.97	0.00	0.00	28.83	7.81	0.20
S7	36.97	0.00	0.00	31.42	5.32	0.32

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.01	0.27	230.69	0 01:29	0.27
J2	JUNCTION	0.01	0.27	229.67	0 01:29	0.27
J3	JUNCTION	0.02	0.35	229.35	0 01:29	0.35
J4	JUNCTION	0.02	0.39	228.69	0 01:29	0.39
J5	JUNCTION	0.02	0.40	228.90	0 01:27	0.40
J6	JUNCTION	0.01	0.27	232.27	0 01:27	0.27
OutFall	OUTFALL	0.01	0.34	227.54	0 01:29	0.34

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Ba Pe
J1	JUNCTION	0.166	0.399	0 01:27	0.191	0.513	
J2	JUNCTION	0.200	0.463	0 01:28	0.233	0.743	-
J3	JUNCTION	0.152	0.541	0 01:28	0.155	0.898	-
J4	JUNCTION	0.367	1.094	0 01:27	0.333	1.74	
J5	JUNCTION	0.420	0.420	0 01:26	0.509	0.509	-
J6	JUNCTION	0.303	0.303	0 01:25	0.319	0.319	-
OutFall	OUTFALL	0.000	1.007	0 01:29	0	1.74	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OutFall	50.88	0.040	1.007	1.741
System	50.88	0.040	1.007	1.741

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.326	0 01:29	0.92	0.16	0.45
C2	CONDUIT	0.455	0 01:29	1.19	0.09	0.41
C3	CONDUIT	0.529	0 01:29	0.89	0.17	0.49
C4	CONDUIT	0.390	0 01:27	0.63	0.37	0.64
C5	CONDUIT	1.007	0 01:29	1.33	0.23	0.48
C6	CONDUIT	0.256	0 01:27	0.91	0.08	0.35

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 20 15:36:48 2017
Analysis ended on: Fri Oct 20 15:36:48 2017
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage Chicago_4hr_1(
WARNING 02: maximum depth increased for Node J2
WARNING 02: maximum depth increased for Node J3

****
Element Count
****

Number of rain gages 13
Number of subcatchments ... 9
Number of nodes 7
Number of links 6
Number of pollutants 0
Number of land uses 0

CH 5yr.

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4hr_100yr	Chicago_4hr_100yr	INTENSITY	1 min.
Chicago_4hr_25yr	Chicago_4hr_25yr	INTENSITY	1 min.
Chicago_4hr_5yr	Chicago_4hr_5yr	INTENSITY	1 min.
Chicago_4hr-2yr	Chicago_4hr-2yr	INTENSITY	1 min.
SCS_24h_Type_I_1mm	SCS_24h_Type_I_1mm	INTENSITY	15 min.
SCS_24h_Type_II_101.5mm_25yr	SCS_24h_Type_II_101.5mm_25yr	INTENSITY	15 min.
SCS_24h_Type_II_123.9mm_100yr	SCS_24h_Type_II_123.9mm_100yr	INTENSITY	15 min.
SCS_24h_Type_II_56.2mm_2yr	SCS_24h_Type_II_56.2mm_2yr	INTENSITY	15 min.
SCS_24h_Type_II_74.4mm_5yr	SCS_24h_Type_II_74.4mm_5yr	INTENSITY	15 min.
SCS_6hr_101.5mm_25yr	SCS_6hr_101.5mm_25yr	INTENSITY	5 min.
SCS_6hr_123.9mm_100yr	SCS_6hr_123.9mm_100yr	INTENSITY	5 min.
SCS_6hr_56.2mm_2yr	SCS_6hr_56.2mm_2yr	INTENSITY	5 min.
SCS_6hr_74.4mm_5yr	SCS_6hr_74.4mm_5yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.45	102.10	22.00	1.2000	Chicago_4hr_5yr	J1
S1_2	0.00	0.00	25.00	0.5000	Chicago_4hr_5yr	J5
S2	3.12	120.03	21.00	1.2000	Chicago_4hr_5yr	J2
S3	2.42	138.41	18.00	1.0000	Chicago_4hr_5yr	J3
S4	6.52	217.41	22.00	1.2000	Chicago_4hr_5yr	J5
S5	1.64	173.04	23.00	1.6000	Chicago_4hr_5yr	J4
S5_2	0.00	0.00	25.00	0.5000	Chicago_4hr_5yr	OutFall
S6	2.54	254.44	22.00	1.4000	Chicago_4hr_5yr	J4
S7	6.00	266.67	15.00	0.9000	Chicago_4hr_5yr	J6

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	230.42	1.00	0.0	
J2	JUNCTION	229.40	0.75	0.0	

J3	JUNCTION	229.00	0.75	0.0
J4	JUNCTION	228.30	1.00	0.0
J5	JUNCTION	228.50	0.75	0.0
J6	JUNCTION	232.00	1.10	0.0
OutFall	OUTFALL	227.20	0.75	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughnes
C1	J1	J2	CONDUIT	158.9	0.6418	0.025
C2	J2	J3	CONDUIT	36.2	1.1060	0.020
C3	J3	J4	CONDUIT	136.2	0.5139	0.025
C4	J5	J4	CONDUIT	123.7	0.1617	0.025
C5	J4	OutFall	CONDUIT	167.9	0.6551	0.025
C6	J6	J1	CONDUIT	249.8	0.6326	0.025

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	2.08
C2	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	5.27
C3	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	3.18
C4	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	1.04
C5	TRAPEZOIDAL	0.75	2.44	0.42	5.50	1	4.46
C6	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	3.19

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

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Starting Date ............ 03/26/2017 00:00:00
Ending Date .............. 03/27/2017 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
```

```
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity      hectare-m            mm
**************************      ---------       -------
Total Precipitation ......          1.249        50.539
Evaporation Loss .........          0.000         0.000
Infiltration Loss ........          1.001        40.508
Surface Runoff ...........          0.241         9.741
Final Storage ............          0.007         0.298
Continuity Error (%) .....         -0.016

**************************        Volume        Volume
Flow Routing Continuity         hectare-m     10^6 ltr
**************************      ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          0.241         2.406
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........          0.000         0.000
External Outflow .........          0.241         2.407
Flooding Loss ............          0.000         0.000
Evaporation Loss .........          0.000         0.000
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.000         0.000
Continuity Error (%) .....         -0.014

***************************
Time-Step Critical Elements
***************************
None

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

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :      4.50 sec
Average Time Step           :      5.00 sec
Maximum Time Step           :      5.00 sec
Percent in Steady State     :      0.00
Average Iterations per Step :      2.00
Percent Not Converging      :      0.00

***************************
Subcatchment Runoff Summary
***************************

---------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total        Total   Ru
                           Precip      Runon       Evap     Infil      Runoff       Runoff
Subcatchment                   mm         mm         mm        mm          mm     10^6 ltr
---------------------------------------------------------------------------------------------
```

S1	50.54	0.00	0.00	39.42	10.80	0.26
S2	50.54	0.00	0.00	39.93	10.31	0.32
S3	50.54	0.00	0.00	41.44	8.83	0.21
S4	50.54	0.00	0.00	39.42	10.80	0.70
S5	50.54	0.00	0.00	38.91	11.29	0.19
S6	50.54	0.00	0.00	39.42	10.80	0.27
S7	50.54	0.00	0.00	42.96	7.36	0.44

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.02	0.31	230.73	0 01:29	0.31
J2	JUNCTION	0.02	0.31	229.71	0 01:28	0.31
J3	JUNCTION	0.02	0.40	229.40	0 01:29	0.40
J4	JUNCTION	0.03	0.45	228.75	0 01:29	0.45
J5	JUNCTION	0.02	0.45	228.95	0 01:26	0.45
J6	JUNCTION	0.01	0.31	232.31	0 01:26	0.31
OutFall	OUTFALL	0.02	0.40	227.60	0 01:29	0.40

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Ba Pe
J1	JUNCTION	0.228	0.545	0 01:26	0.265	0.709	
J2	JUNCTION	0.274	0.637	0 01:28	0.322	1.03	-
J3	JUNCTION	0.206	0.746	0 01:28	0.214	1.24	-
J4	JUNCTION	0.490	1.509	0 01:27	0.46	2.41	
J5	JUNCTION	0.570	0.570	0 01:26	0.704	0.704	-
J6	JUNCTION	0.412	0.412	0 01:25	0.442	0.442	-
OutFall	OUTFALL	0.000	1.393	0 01:29	0	2.41	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OutFall	51.22	0.054	1.393	2.407
System	51.22	0.054	1.393	2.407

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.448	0	01:29	1.01	0.22	0.52
C2	CONDUIT	0.627	0	01:28	1.28	0.12	0.48
C3	CONDUIT	0.730	0	01:29	0.96	0.23	0.57
C4	CONDUIT	0.536	0	01:27	0.68	0.51	0.74
C5	CONDUIT	1.393	0	01:29	1.44	0.31	0.57
C6	CONDUIT	0.350	0	01:27	0.98	0.11	0.40

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.95	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 20 15:41:09 2017
Analysis ended on: Fri Oct 20 15:41:09 2017
Total elapsed time: < 1 sec

11/20

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage Chicago_4hr_1(
WARNING 02: maximum depth increased for Node J2
WARNING 02: maximum depth increased for Node J3

****
Element Count
****

Number of rain gages 13
Number of subcatchments ... 9
Number of nodes 7
Number of links 6
Number of pollutants 0
Number of land uses 0

CH 25yr.

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4hr_100yr	Chicago_4hr_100yr	INTENSITY	1 min.
Chicago_4hr_25yr	Chicago_4hr_25yr	INTENSITY	1 min.
Chicago_4hr_5yr	Chicago_4hr_5yr	INTENSITY	1 min.
Chicago_4hr-2yr	Chicago_4hr-2yr	INTENSITY	1 min.
SCS_24h_Type_I_1mm	SCS_24h_Type_I_1mm	INTENSITY	15 min.
SCS_24h_Type_II_101.5mm_25yr	SCS_24h_Type_II_101.5mm_25yr	INTENSITY	15 min.
SCS_24h_Type_II_123.9mm_100yr	SCS_24h_Type_II_123.9mm_100yr	INTENSITY	15 min.
SCS_24h_Type_II_56.2mm_2yr	SCS_24h_Type_II_56.2mm_2yr	INTENSITY	15 min.
SCS_24h_Type_II_74.4mm_5yr	SCS_24h_Type_II_74.4mm_5yr	INTENSITY	15 min.
SCS_6hr_101.5mm_25yr	SCS_6hr_101.5mm_25yr	INTENSITY	5 min.
SCS_6hr_123.9mm_100yr	SCS_6hr_123.9mm_100yr	INTENSITY	5 min.
SCS_6hr_56.2mm_2yr	SCS_6hr_56.2mm_2yr	INTENSITY	5 min.
SCS_6hr_74.4mm_5yr	SCS_6hr_74.4mm_5yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.45	102.10	22.00	1.2000	Chicago_4hr_25yr	J1
S1_2	0.00	0.00	25.00	0.5000	Chicago_4hr_25yr	J5
S2	3.12	120.03	21.00	1.2000	Chicago_4hr_25yr	J2
S3	2.42	138.41	18.00	1.0000	Chicago_4hr_25yr	J3
S4	6.52	217.41	22.00	1.2000	Chicago_4hr_25yr	J5
S5	1.64	173.04	23.00	1.6000	Chicago_4hr_25yr	J4
S5_2	0.00	0.00	25.00	0.5000	Chicago_4hr_25yr	OutFall
S6	2.54	254.44	22.00	1.4000	Chicago_4hr_25yr	J4
S7	6.00	266.67	15.00	0.9000	Chicago_4hr_25yr	J6

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	230.42	1.00	0.0	
J2	JUNCTION	229.40	0.75	0.0	

J3	JUNCTION	229.00	0.75	0.0
J4	JUNCTION	228.30	1.00	0.0
J5	JUNCTION	228.50	0.75	0.0
J6	JUNCTION	232.00	1.10	0.0
OutFall	OUTFALL	227.20	0.75	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughnes
C1	J1	J2	CONDUIT	158.9	0.6418	0.025
C2	J2	J3	CONDUIT	36.2	1.1060	0.020
C3	J3	J4	CONDUIT	136.2	0.5139	0.025
C4	J5	J4	CONDUIT	123.7	0.1617	0.025
C5	J4	OutFall	CONDUIT	167.9	0.6551	0.025
C6	J6	J1	CONDUIT	249.8	0.6326	0.025

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	2.08
C2	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	5.27
C3	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	3.18
C4	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	1.04
C5	TRAPEZOIDAL	0.75	2.44	0.42	5.50	1	4.46
C6	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	3.19

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

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Starting Date ............ 03/26/2017 00:00:00
Ending Date .............. 03/27/2017 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
```

```
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.760        71.261
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         1.405        56.869
Surface Runoff ...........         0.348        14.107
Final Storage ............         0.007         0.298
Continuity Error (%) .....        -0.017

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.348         3.485
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.349         3.485
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.015

***************************
Time-Step Critical Elements
***************************
None

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

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :      4.50 sec
Average Time Step           :      5.00 sec
Maximum Time Step           :      5.00 sec
Percent in Steady State     :      0.00
Average Iterations per Step :      2.00
Percent Not Converging      :      0.00

***************************
Subcatchment Runoff Summary
***************************

----------------------------------------------------------------------------------------------------
                             Total      Total      Total      Total      Total       Total     Ru
                            Precip     Runon       Evap      Infil     Runoff      Runoff
Subcatchment                    mm        mm         mm         mm         mm    10^6 ltr
----------------------------------------------------------------------------------------------------
```

S1	71.26	0.00	0.00	55.54	15.40	0.38
S2	71.26	0.00	0.00	56.26	14.70	0.46
S3	71.26	0.00	0.00	58.38	12.62	0.31
S4	71.26	0.00	0.00	55.55	15.39	1.00
S5	71.26	0.00	0.00	53.54	17.39	0.29
S6	71.26	0.00	0.00	54.36	16.59	0.42
S7	71.26	0.00	0.00	60.53	10.51	0.63

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.02	0.36	230.78	0 01:28	0.36
J2	JUNCTION	0.02	0.36	229.76	0 01:28	0.36
J3	JUNCTION	0.03	0.47	229.47	0 01:28	0.47
J4	JUNCTION	0.03	0.54	228.84	0 01:28	0.54
J5	JUNCTION	0.03	0.52	229.02	0 01:26	0.52
J6	JUNCTION	0.02	0.35	232.35	0 01:26	0.35
OutFall	OUTFALL	0.02	0.48	227.68	0 01:29	0.48

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Ba Pe
J1	JUNCTION	0.322	0.771	0 01:26	0.377	1.01	
J2	JUNCTION	0.389	0.911	0 01:27	0.459	1.47	-
J3	JUNCTION	0.286	1.070	0 01:27	0.306	1.77	-
J4	JUNCTION	0.677	2.193	0 01:26	0.708	3.49	
J5	JUNCTION	0.808	0.808	0 01:25	1	1	-
J6	JUNCTION	0.577	0.577	0 01:25	0.631	0.631	-
OutFall	OUTFALL	0.000	2.044	0 01:29	0	3.49	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OutFall	51.52	0.078	2.044	3.485
System	51.52	0.078	2.044	3.485

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.637	0 01:28	1.11	0.31	0.60
C2	CONDUIT	0.897	0 01:28	1.39	0.17	0.56
C3	CONDUIT	1.048	0 01:28	1.03	0.33	0.67
C4	CONDUIT	0.761	0 01:26	0.73	0.73	0.87
C5	CONDUIT	2.044	0 01:29	1.58	0.46	0.68
C6	CONDUIT	0.494	0 01:27	1.06	0.16	0.47

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.95	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 20 15:43:28 2017
Analysis ended on: Fri Oct 20 15:43:28 2017
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage Chicago_4hr_1(
WARNING 02: maximum depth increased for Node J2
WARNING 02: maximum depth increased for Node J3

****
Element Count
****

CH 100-yr

Number of rain gages 13
Number of subcatchments ... 9
Number of nodes 7
Number of links 6
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4hr_100yr	Chicago_4hr_100yr	INTENSITY	1 min.
Chicago_4hr_25yr	Chicago_4hr_25yr	INTENSITY	1 min.
Chicago_4hr_5yr	Chicago_4hr_5yr	INTENSITY	1 min.
Chicago_4hr-2yr	Chicago_4hr-2yr	INTENSITY	1 min.
SCS_24h_Type_I_1mm	SCS_24h_Type_I_1mm	INTENSITY	15 min.
SCS_24h_Type_II_101.5mm_25yr	SCS_24h_Type_II_101.5mm_25yr	INTENSITY	15 min.
SCS_24h_Type_II_123.9mm_100yr	SCS_24h_Type_II_123.9mm_100yr	INTENSITY	15 min.
SCS_24h_Type_II_56.2mm_2yr	SCS_24h_Type_II_56.2mm_2yr	INTENSITY	15 min.
SCS_24h_Type_II_74.4mm_5yr	SCS_24h_Type_II_74.4mm_5yr	INTENSITY	15 min.
SCS_6hr_101.5mm_25yr	SCS_6hr_101.5mm_25yr	INTENSITY	5 min.
SCS_6hr_123.9mm_100yr	SCS_6hr_123.9mm_100yr	INTENSITY	5 min.
SCS_6hr_56.2mm_2yr	SCS_6hr_56.2mm_2yr	INTENSITY	5 min.
SCS_6hr_74.4mm_5yr	SCS_6hr_74.4mm_5yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.45	102.10	22.00	1.2000	Chicago_4hr_100yr	J1
S1_2	0.00	0.00	25.00	0.5000	Chicago_4hr_100yr	J5
S2	3.12	120.03	21.00	1.2000	Chicago_4hr_100yr	J2
S3	2.42	138.41	18.00	1.0000	Chicago_4hr_100yr	J3
S4	6.52	217.41	22.00	1.2000	Chicago_4hr_100yr	J5
S5	1.64	173.04	23.00	1.6000	Chicago_4hr_100yr	J4
S5_2	0.00	0.00	25.00	0.5000	Chicago_4hr_100yr	OutFall
S6	2.54	254.44	22.00	1.4000	Chicago_4hr_100yr	J4
S7	6.00	266.67	15.00	0.9000	Chicago_4hr_100yr	J6

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	230.42	1.00	0.0	
J2	JUNCTION	229.40	0.75	0.0	

J3	JUNCTION	229.00	0.75	0.0
J4	JUNCTION	228.30	1.00	0.0
J5	JUNCTION	228.50	0.75	0.0
J6	JUNCTION	232.00	1.10	0.0
OutFall	OUTFALL	227.20	0.75	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughnes
C1	J1	J2	CONDUIT	158.9	0.6418	0.025
C2	J2	J3	CONDUIT	36.2	1.1060	0.020
C3	J3	J4	CONDUIT	136.2	0.5139	0.025
C4	J5	J4	CONDUIT	123.7	0.1617	0.025
C5	J4	OutFall	CONDUIT	167.9	0.6551	0.025
C6	J6	J1	CONDUIT	249.8	0.6326	0.025

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	2.08
C2	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	5.27
C3	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	3.18
C4	TRAPEZOIDAL	0.60	1.38	0.32	4.10	1	1.04
C5	TRAPEZOIDAL	0.75	2.44	0.42	5.50	1	4.46
C6	TRAPEZOIDAL	0.75	1.91	0.38	4.80	1	3.19

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

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Starting Date ............ 03/26/2017 00:00:00
Ending Date .............. 03/27/2017 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
```

```
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         2.164        87.611
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         1.690        68.397
Surface Runoff ...........         0.468        18.932
Final Storage ............         0.007         0.298
Continuity Error (%) .....        -0.018


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.468         4.677
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.468         4.678
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.014


***************************
Time-Step Critical Elements
***************************
None


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


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


***************************
Subcatchment Runoff Summary
***************************

------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total        Total
                        Precip     Runon       Evap      Infil     Runoff       Runoff   Ru
Subcatchment                mm        mm         mm         mm         mm     10^6 ltr
------------------------------------------------------------------------------------------
```

S1	87.61	0.00	0.00	67.12	20.18	0.49
S2	87.61	0.00	0.00	68.07	19.24	0.60
S3	87.61	0.00	0.00	70.37	16.99	0.41
S4	87.61	0.00	0.00	67.32	19.97	1.30
S5	87.61	0.00	0.00	62.18	25.11	0.41
S6	87.61	0.00	0.00	63.34	23.97	0.61
S7	87.61	0.00	0.00	73.31	14.09	0.85

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.02	0.40	230.82	0 01:28	0.40
J2	JUNCTION	0.02	0.40	229.80	0 01:28	0.40
J3	JUNCTION	0.03	0.52	229.52	0 01:28	0.52
J4	JUNCTION	0.03	0.60	228.90	0 01:28	0.60
J5	JUNCTION	0.03	0.57	229.07	0 01:26	0.57
J6	JUNCTION	0.02	0.39	232.39	0 01:26	0.39
OutFall	OUTFALL	0.03	0.55	227.75	0 01:29	0.55

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Ba Pe
J1	JUNCTION	0.399	0.965	0 01:26	0.495	1.34	
J2	JUNCTION	0.481	1.157	0 01:27	0.601	1.94	-
J3	JUNCTION	0.350	1.367	0 01:27	0.412	2.35	-
J4	JUNCTION	0.852	2.813	0 01:26	1.02	4.68	
J5	JUNCTION	1.004	1.004	0 01:25	1.3	1.3	-
J6	JUNCTION	0.708	0.708	0 01:25	0.845	0.845	-
OutFall	OUTFALL	0.000	2.661	0 01:29	0	4.68	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OutFall	51.65	0.105	2.661	4.678
System	51.65	0.105	2.661	4.678

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.809	0 01:28	1.18	0.39	0.67
C2	CONDUIT	1.141	0 01:28	1.46	0.22	0.62
C3	CONDUIT	1.342	0 01:28	1.09	0.42	0.75
C4	CONDUIT	0.951	0 01:26	0.77	0.91	0.96
C5	CONDUIT	2.661	0 01:29	1.69	0.60	0.77
C6	CONDUIT	0.619	0 01:27	1.11	0.19	0.52

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ----------								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C4	0.01	0.01	0.03	0.01	0.01

Analysis begun on: Fri Oct 20 15:44:31 2017
Analysis ended on: Fri Oct 20 15:44:31 2017
Total elapsed time: < 1 sec

PSCWMM OUTPUT FILES

FOR

POST DEVELOPMENT CONDITIONS

FILE: TEROMI POST D WITH SWMP AND DUAL SYSTEM TEST 6

CHICAGO STORM EVENT ONLY

. 2 YR

ALL OTHER STORM EVENTS ARE AVAILABLE UPON REQUEST

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)

WARNING 04: minimum elevation drop used for Conduit C17-S
WARNING 04: minimum elevation drop used for Conduit C18-S
WARNING 04: minimum elevation drop used for Conduit C29
WARNING 04: minimum elevation drop used for Conduit C3
WARNING 04: minimum elevation drop used for Conduit C3-S
WARNING 08: elevation drop exceeds length for Conduit C4
WARNING 08: elevation drop exceeds length for Conduit C4-S
WARNING 02: maximum depth increased for Node J25
WARNING 02: maximum depth increased for Node J26
WARNING 02: maximum depth increased for Node J27
WARNING 02: maximum depth increased for Node J4-S
WARNING 02: maximum depth increased for Node J5-S

****
Element Count
****

Chicago 4hr. 2yr Event

Number of rain gages 12
Number of subcatchments ... 35
Number of nodes 63
Number of links 86
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4hr_100yr	Chicago_4hr_100yr	INTENSITY	5 min.
Chicago_4hr_25yr	Chicago_4hr_25yr	INTENSITY	5 min.
Chicago_4hr_2yr	Chicago_4hr_2yr	INTENSITY	5 min.
Chicago_4hr_5yr	Chicago_4hr_5yr	INTENSITY	5 min.
SCS_24h_Type_II_101.5mm_25yr	SCS_24h_Type_II_101.5mm_25yr	INTENSITY	15 min.
SCS_24h_Type_II_123.9mm_100yr	SCS_24h_Type_II_123.9mm_100yr	INTENSITY	15 min.
SCS_24h_Type_II_56.2mm_2yr	SCS_24h_Type_II_56.2mm_2yr	INTENSITY	15 min.
SCS_24h_Type_II_74.4mm_5yr	SCS_24h_Type_II_74.4mm_5yr	INTENSITY	15 min.
SCS_6h_101.5mm_25yr	SCS_6h_101.5mm_25yr	INTENSITY	5 min.
SCS_6h_123.9mm_100yr	SCS_6h_123.9mm_100yr	INTENSITY	5 min.
SCS_6h_56.2mm_2yr	SCS_6h_56.2mm_2yr	INTENSITY	5 min.
SCS_6h_74.4mm_5yr	SCS_6h_74.4mm_5yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.07	9.72	62.00	1.0000	Chicago_4hr_2yr	J22-S
S10	0.57	57.48	55.00	0.5000	Chicago_4hr_2yr	J15-S
S11	0.26	26.21	25.00	0.5000	Chicago_4hr_2yr	J16-S
S12	0.19	19.07	45.00	0.5000	Chicago_4hr_2yr	J26
S13	0.11	10.94	45.00	0.5000	Chicago_4hr_2yr	J10-S
S14	1.17	116.89	45.00	0.5000	Chicago_4hr_2yr	J11-S
S15	0.90	89.93	45.00	0.5000	Chicago_4hr_2yr	J1-S
S16	0.17	16.73	45.00	0.5000	Chicago_4hr_2yr	J10-S
S17	0.80	79.63	45.00	0.5000	Chicago_4hr_2yr	J18-S
S18	0.44	43.75	45.00	0.5000	Chicago_4hr_2yr	J29
S19	0.42	42.29	45.00	0.5000	Chicago_4hr_2yr	J18-S

S2	0.39	9.71	62.00	0.2000	Chicago_4hr_2yr	J35
S20	0.12	11.54	45.00	0.5000	Chicago_4hr_2yr	J3-S
S21	0.23	23.41	45.00	0.5000	Chicago_4hr_2yr	J3-S
S22	0.94	94.34	35.00	0.5000	Chicago_4hr_2yr	J34-S
S23	0.34	33.53	45.00	0.5000	Chicago_4hr_2yr	J12-S
S24	1.13	112.86	25.00	0.5000	Chicago_4hr_2yr	J5-S
S25	0.27	26.84	25.00	0.5000	Chicago_4hr_2yr	J5-S
S26	1.66	165.69	45.00	0.5000	Chicago_4hr_2yr	J6-S
S27	0.53	53.45	35.00	0.5000	Chicago_4hr_2yr	J32-S
S28	0.54	54.14	35.00	0.5000	Chicago_4hr_2yr	J30
S29	0.63	62.69	45.00	0.5000	Chicago_4hr_2yr	J7-S
S3	0.16	11.59	62.00	0.5000	Chicago_4hr_2yr	J24
S30	0.13	13.16	35.00	0.5000	Chicago_4hr_2yr	J32-S
S31	0.89	89.34	25.00	0.5000	Chicago_4hr_2yr	J33-S
S32	0.14	10.32	25.00	1.1000	Chicago_4hr_2yr	J25
S33	0.13	13.26	45.00	0.5000	Chicago_4hr_2yr	J9-S
S34	0.15	14.98	45.00	0.5000	Chicago_4hr_2yr	J10-S
S35	6.00	266.67	15.00	0.9000	Chicago_4hr_2yr	J35
S4	0.20	31.22	50.00	0.2500	Chicago_4hr_2yr	J28
S5	1.66	138.06	70.00	0.5000	Chicago_4hr_2yr	J19-S
S6	1.53	153.30	70.00	0.5000	Chicago_4hr_2yr	J8-S
S7	0.35	34.72	45.00	0.5000	Chicago_4hr_2yr	J13-S
S8	0.11	10.58	45.00	0.5000	Chicago_4hr_2yr	J14-S
S9	0.88	87.98	45.00	0.5000	Chicago_4hr_2yr	J17-S

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	230.62	1.66	0.0	
J10	JUNCTION	230.10	2.30	0.0	
J10-S	JUNCTION	232.40	0.23	0.0	
J11	JUNCTION	230.50	1.10	0.0	
J11-S	JUNCTION	231.60	0.23	0.0	
J12	JUNCTION	229.57	0.68	0.0	
J12-S	JUNCTION	230.25	0.23	0.0	
J13	JUNCTION	231.02	1.28	0.0	
J13-S	JUNCTION	232.30	0.23	0.0	
J14	JUNCTION	230.46	1.36	0.0	
J14-S	JUNCTION	231.82	0.23	0.0	
J15	JUNCTION	229.97	1.44	0.0	
J15-S	JUNCTION	231.40	0.23	0.0	
J16	JUNCTION	229.86	1.44	0.0	
J16-S	JUNCTION	231.30	0.23	0.0	
J17	JUNCTION	229.40	1.44	0.0	
J17-S	JUNCTION	230.84	0.23	0.0	
J18	JUNCTION	228.95	1.55	0.0	
J18-S	JUNCTION	230.50	0.23	0.0	
J19	JUNCTION	230.64	1.36	0.0	
J19-S	JUNCTION	232.00	0.23	0.0	
J1-S	JUNCTION	232.28	0.23	0.0	
J2	JUNCTION	229.78	1.43	0.0	
J20	JUNCTION	231.47	1.03	0.0	
J20-S	JUNCTION	232.50	0.23	0.0	
J21	JUNCTION	231.25	1.25	0.0	
J21-S	JUNCTION	232.50	0.23	0.0	
J22	JUNCTION	232.45	0.55	0.0	
J22-S	JUNCTION	233.00	0.23	0.0	
J23	JUNCTION	232.25	0.75	0.0	
J23-S	JUNCTION	233.00	0.23	0.0	
J24	JUNCTION	230.85	1.15	0.0	

J25	JUNCTION	229.00	0.75	0.0
J26	JUNCTION	228.95	0.75	0.0
J27	JUNCTION	228.91	0.75	0.0
J28	JUNCTION	228.80	0.81	0.0
J29	JUNCTION	228.75	0.85	0.0
J2-S	JUNCTION	231.20	0.23	0.0
J3	JUNCTION	229.12	1.42	0.0
J30	JUNCTION	228.75	0.75	0.0
J31	JUNCTION	228.15	1.35	0.0
J32	JUNCTION	228.44	1.31	0.0
J32-S	JUNCTION	229.75	0.23	0.0
J33	JUNCTION	227.50	2.00	0.0
J33-S	JUNCTION	229.50	0.23	0.0
J34	JUNCTION	229.00	1.05	0.0
J34-S	JUNCTION	230.05	0.23	0.0
J35	JUNCTION	232.00	1.10	0.0
J3-S	JUNCTION	230.54	0.23	0.0
J4	JUNCTION	228.70	1.63	0.0
J4-S	JUNCTION	230.33	0.50	0.0
J5	JUNCTION	228.21	1.79	0.0
J5-S	JUNCTION	230.00	0.50	0.0
J6	JUNCTION	228.18	1.79	0.0
J6-S	JUNCTION	229.96	0.23	0.0
J7	JUNCTION	227.60	2.05	0.0
J7-S	JUNCTION	229.65	0.23	0.0
J8	JUNCTION	0.00	1.00	0.0
J8-S	JUNCTION	0.00	0.23	0.0
J9	JUNCTION	0.00	1.00	0.0
J9-S	JUNCTION	0.00	0.23	0.0
Outfall	OUTFALL	227.00	0.00	0.0
Pond	STORAGE	227.50	2.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughnes
C1	J1	J2	CONDUIT	86.9	0.7270	0.013
C10	J13	J14	CONDUIT	96.8	0.4848	0.013
C10-S	J13-S	J14-S	CONDUIT	96.8	0.4961	0.014
C11	J19	J14	CONDUIT	21.9	0.4695	0.013
C11-S	J19-S	J14-S	CONDUIT	21.9	0.8204	0.014
C12	J14	J15	CONDUIT	85.3	0.4562	0.013
C12-S	J14-S	J15-S	CONDUIT	85.3	0.4926	0.014
C13	J15	J16	CONDUIT	22.2	0.6529	0.013
C13-S	J15-S	J16-S	CONDUIT	22.2	0.4503	0.014
C14	J16	J17	CONDUIT	78.7	0.4040	0.013
C14-S	J16-S	J17-S	CONDUIT	78.7	0.5844	0.014
C15	J17	J18	CONDUIT	75.6	0.4443	0.013
C15-S	J17-S	J18-S	CONDUIT	75.6	0.4496	0.014
C16	J18	J4	CONDUIT	44.7	0.4851	0.013
C16-S	J18-S	J4-S	CONDUIT	44.7	0.3801	0.014
C17	J20	J21	CONDUIT	24.9	0.8822	0.013
C17-S	J20-S	J21-S	CONDUIT	24.9	0.0012	0.014
C18	J22	J23	CONDUIT	29.1	0.6864	0.013
C18-S	J22-S	J23-S	CONDUIT	29.1	0.0010	0.014
C19	J30	J31	CONDUIT	119.6	0.4902	0.010
C1-S	J1-S	J2-S	CONDUIT	86.9	1.2423	0.014
C2	J11	J2	CONDUIT	74.3	0.6472	0.013
C20	J31	J33	CONDUIT	69.9	0.5423	0.010
C21	J33	Pond	CONDUIT	58.0	0.1156	0.013
C21-S	J33-S	Pond	CONDUIT	48.5	4.1272	0.014
C22	J6	J7	CONDUIT	102.5	0.2870	0.013

C22-S	J6-S	J7-S	CONDUIT	102.5	0.3026	0.014
C23	J32	J7	CONDUIT	76.2	0.3215	0.013
C23-S	J32-S	J7-S	CONDUIT	76.2	0.1312	0.014
C24	J24	J25	CONDUIT	143.1	1.2927	0.022
C25	J25	J26	CONDUIT	19.1	0.2611	0.022
C26	J26	J27	CONDUIT	16.9	0.2372	0.022
C27	J27	J28	CONDUIT	16.9	0.6528	0.022
C28	J28	J29	CONDUIT	15.8	0.3159	0.022
C29	J29	J30	CONDUIT	76.3	0.0004	0.022
C2-S	J11-S	J2-S	CONDUIT	74.3	0.5382	0.014
C3	J8	J9	CONDUIT	19.5	0.0016	0.010
C30	J7	J33	CONDUIT	39.7	0.3326	0.013
C30-S	J7-S	J33-S	CONDUIT	39.7	0.3779	0.014
C31	J12	J3	CONDUIT	43.2	0.2406	0.013
C31-S	J12-S	J3-S	CONDUIT	43.2	-0.6708	0.014
C32	J34	J5	CONDUIT	73.3	0.3041	0.013
C32-S	J34-S	J5-S	CONDUIT	73.3	0.0682	0.014
C33	J35	J20	CONDUIT	137.7	0.3850	0.013
C34	J21	J24	CONDUIT	141.4	0.2829	0.013
C35	J23	J35	CONDUIT	248.9	0.1004	0.013
C3-S	J8-S	J9-S	CONDUIT	19.5	0.0016	0.014
C4	J9	J10	CONDUIT	48.0	-479.1753	0.010
C4-S	J9-S	J10-S	CONDUIT	48.0	-483.9650	0.014
C5	J10	J2	CONDUIT	62.7	0.6639	0.013
C5-S	J10-S	J2-S	CONDUIT	62.7	1.9154	0.014
C6	J2	J3	CONDUIT	53.5	1.1027	0.013
C6-S	J2-S	J3-S	CONDUIT	53.5	1.2335	0.014
C7	J3	J4	CONDUIT	41.8	0.6316	0.013
C7-S	J3-S	J4-S	CONDUIT	41.8	0.5024	0.014
C8	J4	J5	CONDUIT	83.4	0.4375	0.013
C8-S	J4-S	J5-S	CONDUIT	83.4	0.3956	0.010
C9	J5	J6	CONDUIT	15.4	0.6234	0.013
C9-S	J5-S	J6-S	CONDUIT	15.4	0.2597	0.014
J10-IC	J10-S	J10	OUTLET			
J11-IC	J11-S	J11	OUTLET			
J12-IC	J12-S	J12	OUTLET			
J13-IC	J13-S	J13	OUTLET			
J14-IC	J14-S	J14	OUTLET			
J15-IC	J15-S	J15	OUTLET			
J16-IC	J16-S	J16	OUTLET			
J17-IC	J17-S	J17	OUTLET			
J18-IC	J18-S	J18	OUTLET			
J19-IC	J19-S	J19	OUTLET			
J1-IC	J1-S	J1	OUTLET			
J20-IC	J20-S	J20	OUTLET			
J21-IC	J21-S	J21	OUTLET			
J22-IC	J22-S	J22	OUTLET			
J23-IC	J23-S	J23	OUTLET			
J2-IC	J2-S	J2	OUTLET			
J32-IC	J32-S	J32	OUTLET			
J33-IC	J33-S	J33	OUTLET			
J34-IC	J34-S	J34	OUTLET			
J3-IC	J3-S	J3	OUTLET			
J4-IC	J4-S	J4	OUTLET			
J5-IC	J5-S	J5	OUTLET			
J6-IC	J6-S	J6	OUTLET			
J7-IC	J7-S	J7	OUTLET			
J8-IC	J8-S	J8	OUTLET			
J9-IC	J9-S	J9	OUTLET			
PondOutlet	Pond	Outfall	OUTLET			

****
Cross Section Summary

****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.08
C10	CIRCULAR	0.30	0.07	0.07	0.30	1	0.07
C10-S	Street1	0.23	1.89	0.15	16.50	1	2.63
C11	CIRCULAR	0.45	0.16	0.11	0.45	1	0.20
C11-S	Street1	0.23	1.89	0.15	16.50	1	3.39
C12	CIRCULAR	0.53	0.22	0.13	0.53	1	0.29
C12-S	Street1	0.23	1.89	0.15	16.50	1	2.63
C13	CIRCULAR	0.53	0.22	0.13	0.53	1	0.35
C13-S	Street1	0.23	1.89	0.15	16.50	1	2.51
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.27
C14-S	Street1	0.23	1.89	0.15	16.50	1	2.86
C15	CIRCULAR	0.53	0.22	0.13	0.53	1	0.29
C15-S	Street1	0.23	1.89	0.15	16.50	1	2.51
C16	CIRCULAR	0.60	0.28	0.15	0.60	1	0.43
C16-S	Street1	0.23	1.89	0.15	16.50	1	2.31
C17	CIRCULAR	0.75	0.44	0.19	0.75	1	1.05
C17-S	Street1	0.23	1.89	0.15	16.50	1	0.13
C18	CIRCULAR	0.53	0.22	0.13	0.53	1	0.36
C18-S	Street1	0.23	1.89	0.15	16.50	1	0.12
C19	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	7.75
C1-S	Street1	0.23	1.89	0.15	16.50	1	4.17
C2	CIRCULAR	0.30	0.07	0.07	0.30	1	0.08
C20	TRAPEZOIDAL	0.75	9.19	0.62	14.50	1	49.37
C21	CIRCULAR	0.90	0.64	0.23	0.90	1	0.62
C21-S	Street1	0.23	1.89	0.15	16.50	1	7.60
C22	CIRCULAR	0.75	0.44	0.19	0.75	1	0.60
C22-S	Street1	0.23	1.89	0.15	16.50	1	2.06
C23	CIRCULAR	0.30	0.07	0.07	0.30	1	0.05
C23-S	Street1	0.23	1.89	0.15	16.50	1	1.36
C24	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	5.72
C25	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	2.57
C26	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	2.45
C27	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	4.07
C28	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	2.83
C29	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	0.10
C2-S	Street1	0.23	1.89	0.15	16.50	1	2.74
C3	CIRCULAR	1.00	0.79	0.25	1.00	1	0.12
C30	CIRCULAR	0.82	0.53	0.21	0.82	1	0.83
C30-S	Street1	0.23	1.89	0.15	16.50	1	2.30
C31	CIRCULAR	0.30	0.07	0.07	0.30	1	0.05
C31-S	Street1	0.23	1.89	0.15	16.50	1	3.06
C32	CIRCULAR	0.38	0.11	0.09	0.38	1	0.10
C32-S	Street1	0.23	1.89	0.15	16.50	1	0.98
C33	CIRCULAR	0.75	0.44	0.19	0.75	1	0.69
C34	CIRCULAR	0.75	0.44	0.19	0.75	1	0.59
C35	CIRCULAR	0.53	0.22	0.13	0.53	1	0.14
C3-S	Street1	0.23	1.89	0.15	16.50	1	0.15
C4	CIRCULAR	1.00	0.79	0.25	1.00	1	68.24
C4-S	Street1	0.23	1.89	0.15	16.50	1	82.29
C5	CIRCULAR	0.45	0.16	0.11	0.45	1	0.23
C5-S	Street1	0.23	1.89	0.15	16.50	1	5.18
C6	CIRCULAR	0.50	0.20	0.12	0.50	1	0.40
C6-S	Street1	0.23	1.89	0.15	16.50	1	4.15
C7	CIRCULAR	0.57	0.26	0.14	0.57	1	0.44
C7-S	Street1	0.23	1.89	0.15	16.50	1	2.65
C8	CIRCULAR	0.68	0.36	0.17	0.68	1	0.56
C8-S	TRAPEZOIDAL	0.50	3.25	0.36	9.00	1	10.29
C9	CIRCULAR	0.75	0.44	0.19	0.75	1	0.88
C9-S	Street1	0.23	1.89	0.15	16.50	1	1.91

****
Transect Summary
****

Transect overland_flow_route

Area:

0.0055	0.0117	0.0185	0.0259	0.0339
0.0426	0.0519	0.0618	0.0723	0.0835
0.0953	0.1077	0.1207	0.1344	0.1487
0.1636	0.1792	0.1953	0.2121	0.2296
0.2476	0.2663	0.2856	0.3055	0.3261
0.3473	0.3691	0.3915	0.4146	0.4383
0.4626	0.4875	0.5131	0.5392	0.5657
0.5924	0.6195	0.6469	0.6746	0.7026
0.7309	0.7596	0.7885	0.8178	0.8474
0.8773	0.9075	0.9380	0.9689	1.0000

Hrad:

0.0298	0.0569	0.0819	0.1054	0.1278
0.1492	0.1698	0.1899	0.2094	0.2286
0.2473	0.2658	0.2840	0.3019	0.3197
0.3373	0.3548	0.3721	0.3893	0.4064
0.4234	0.4403	0.4571	0.4738	0.4905
0.5072	0.5237	0.5403	0.5568	0.5732
0.5896	0.6060	0.6223	0.6435	0.6670
0.6903	0.7135	0.7364	0.7592	0.7818
0.8043	0.8266	0.8487	0.8707	0.8926
0.9143	0.9359	0.9574	0.9788	1.0000

Width:

0.1867	0.2067	0.2267	0.2467	0.2667
0.2867	0.3067	0.3267	0.3467	0.3667
0.3867	0.4067	0.4267	0.4467	0.4667
0.4867	0.5067	0.5267	0.5467	0.5667
0.5867	0.6067	0.6267	0.6467	0.6667
0.6867	0.7067	0.7267	0.7467	0.7667
0.7867	0.8067	0.8267	0.8400	0.8500
0.8600	0.8700	0.8800	0.8900	0.9000
0.9100	0.9200	0.9300	0.9400	0.9500
0.9600	0.9700	0.9800	0.9900	1.0000

Transect Street1

Area:

0.0005	0.0021	0.0048	0.0084	0.0132
0.0190	0.0259	0.0338	0.0428	0.0528
0.0639	0.0760	0.0892	0.1035	0.1188
0.1352	0.1526	0.1711	0.1906	0.2111
0.2318	0.2524	0.2731	0.2937	0.3144
0.3351	0.3557	0.3764	0.3970	0.4177
0.4384	0.4590	0.4798	0.5014	0.5242
0.5481	0.5731	0.5992	0.6265	0.6548
0.6843	0.7149	0.7467	0.7795	0.8134
0.8485	0.8847	0.9220	0.9605	1.0000

Hrad:

0.0154	0.0308	0.0462	0.0616	0.0771
0.0925	0.1079	0.1233	0.1387	0.1541
0.1695	0.1849	0.2003	0.2158	0.2312
0.2466	0.2620	0.2774	0.2928	0.3148
0.3452	0.3756	0.4059	0.4362	0.4664
0.4965	0.5265	0.5565	0.5865	0.6163
0.6462	0.6759	0.7057	0.7340	0.7603
0.7847	0.8073	0.8284	0.8480	0.8663
0.8834	0.8994	0.9145	0.9287	0.9421
0.9548	0.9669	0.9784	0.9894	1.0000

Width:

0.0263	0.0527	0.0790	0.1053	0.1316
0.1580	0.1843	0.2106	0.2370	0.2633
0.2896	0.3160	0.3423	0.3686	0.3949
0.4213	0.4476	0.4739	0.5003	0.5152
0.5152	0.5152	0.5152	0.5152	0.5152
0.5152	0.5152	0.5152	0.5152	0.5152
0.5152	0.5152	0.5261	0.5539	0.5818
0.6097	0.6376	0.6655	0.6933	0.7212
0.7491	0.7770	0.8048	0.8327	0.8606
0.8885	0.9164	0.9442	0.9721	1.0000

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

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Starting Date ............ 03/26/2017 00:00:00
Ending Date .............. 03/28/2017 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.895        36.968
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.551        22.750
Surface Runoff ...........         0.333        13.752
Final Storage ............         0.014         0.573
Continuity Error (%) .....        -0.291

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.333         3.328
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
```

```
External Inflow .........          0.000          0.000
External Outflow ........          0.200          2.002
Flooding Loss ...........          0.038          0.384
Evaporation Loss ........          0.000          0.000
Exfiltration Loss .......          0.094          0.936
Initial Stored Volume ...          0.000          0.000
Final Stored Volume .....          0.009          0.091
Continuity Error (%) ....         -2.568
```

```
*************************
Highest Continuity Errors
*************************
Node J9 (38.40%)
Node J9-S (16.26%)
Node J8 (13.09%)
Node J16-S (-5.37%)
Node J17-S (-5.13%)
```

```
***************************
Time-Step Critical Elements
***************************
Link C9 (2.59%)
```

```
********************************
Highest Flow Instability Indexes
********************************
Link J19-IC (52)
Link J6-IC (22)
Link J18-IC (21)
Link J11-IC (20)
Link J15-IC (20)
```

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.86 sec
Average Time Step           :     4.96 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     4.06
Percent Not Converging      :     0.24
```

```
***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Ru
S1	36.97	0.00	0.00	14.05	22.17	0.02	
S10	36.97	0.00	0.00	16.64	19.67	0.11	
S11	36.97	0.00	0.00	27.73	9.29	0.02	
S12	36.97	0.00	0.00	20.33	16.09	0.03	
S13	36.97	0.00	0.00	20.33	16.09	0.02	
S14	36.97	0.00	0.00	20.33	16.09	0.19	
S15	36.97	0.00	0.00	20.33	16.09	0.14	
S16	36.97	0.00	0.00	20.33	16.09	0.03	

S17	36.97	0.00	0.00	20.33	16.09	0.13
S18	36.97	0.00	0.00	20.33	16.09	0.07
S19	36.97	0.00	0.00	20.33	16.09	0.07
S2	36.97	0.00	0.00	14.05	22.05	0.09
S20	36.97	0.00	0.00	20.33	16.09	0.02
S21	36.97	0.00	0.00	20.33	16.09	0.04
S22	36.97	0.00	0.00	24.03	12.52	0.12
S23	36.97	0.00	0.00	20.33	16.09	0.05
S24	36.97	0.00	0.00	27.73	8.93	0.10
S25	36.97	0.00	0.00	27.73	8.93	0.02
S26	36.97	0.00	0.00	20.33	16.09	0.27
S27	36.97	0.00	0.00	24.03	12.52	0.07
S28	36.97	0.00	0.00	24.03	12.52	0.07
S29	36.97	0.00	0.00	20.33	16.09	0.10
S3	36.97	0.00	0.00	14.05	22.15	0.04
S30	36.97	0.00	0.00	24.03	12.52	0.02
S31	36.97	0.00	0.00	27.73	8.93	0.08
S32	36.97	0.00	0.00	27.73	8.93	0.01
S33	36.97	0.00	0.00	20.33	16.09	0.02
S34	36.97	0.00	0.00	20.33	16.09	0.02
S35	36.97	0.00	0.00	31.42	5.36	0.32
S4	36.97	0.00	0.00	18.48	17.88	0.04
S5	36.97	0.00	0.00	11.09	25.01	0.41
S6	36.97	0.00	0.00	11.09	25.02	0.38
S7	36.97	0.00	0.00	20.33	16.09	0.06
S8	36.97	0.00	0.00	20.33	16.09	0.02
S9	36.97	0.00	0.00	20.33	16.09	0.14

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
J1	JUNCTION	0.01	0.17	230.79	0	01:35	0.17
J10	JUNCTION	0.00	0.02	230.12	0	01:25	0.02
J10-S	JUNCTION	0.00	0.01	232.41	0	01:25	0.01
J11	JUNCTION	0.01	0.18	230.68	0	01:38	0.18
J11-S	JUNCTION	0.00	0.06	231.66	0	01:26	0.06
J12	JUNCTION	0.03	0.20	229.77	0	01:26	0.20
J12-S	JUNCTION	0.00	0.01	230.26	0	01:25	0.01
J13	JUNCTION	0.10	0.24	231.26	0	01:28	0.24
J13-S	JUNCTION	0.00	0.01	232.31	0	01:25	0.01
J14	JUNCTION	0.02	0.25	230.71	0	01:28	0.25
J14-S	JUNCTION	0.00	0.07	231.89	0	01:30	0.07
J15	JUNCTION	0.11	0.38	230.34	0	01:29	0.38
J15-S	JUNCTION	0.00	0.08	231.48	0	01:30	0.08
J16	JUNCTION	0.02	0.37	230.23	0	01:30	0.37
J16-S	JUNCTION	0.00	0.06	231.36	0	01:32	0.06
J17	JUNCTION	0.13	0.52	229.93	0	01:31	0.52
J17-S	JUNCTION	0.00	0.06	230.90	0	01:33	0.06
J18	JUNCTION	0.16	0.57	229.52	0	01:34	0.57
J18-S	JUNCTION	0.00	0.08	230.58	0	01:33	0.08
J19	JUNCTION	0.01	0.16	230.80	0	01:29	0.16
J19-S	JUNCTION	0.00	0.07	232.07	0	01:25	0.07
J1-S	JUNCTION	0.00	0.04	232.32	0	01:26	0.04
J2	JUNCTION	0.02	0.23	230.00	0	01:25	0.23
J20	JUNCTION	0.01	0.26	231.73	0	01:28	0.26
J20-S	JUNCTION	0.00	0.00	232.50	0	00:00	0.00
J21	JUNCTION	0.01	0.33	231.58	0	01:28	0.33

J21-S	JUNCTION	0.00	0.00	232.50	0	00:00	0.00
J22	JUNCTION	0.00	0.06	232.51	0	01:25	0.06
J22-S	JUNCTION	0.00	0.00	233.00	0	01:25	0.00
J23	JUNCTION	0.00	0.09	232.34	0	01:31	0.09
J23-S	JUNCTION	0.00	0.00	233.00	0	01:21	0.00
J24	JUNCTION	0.01	0.19	231.04	0	01:30	0.19
J25	JUNCTION	0.01	0.27	229.27	0	01:32	0.27
J26	JUNCTION	0.01	0.28	229.23	0	01:32	0.28
J27	JUNCTION	0.01	0.27	229.18	0	01:33	0.27
J28	JUNCTION	0.01	0.37	229.17	0	01:33	0.37
J29	JUNCTION	0.02	0.42	229.17	0	01:33	0.42
J2-S	JUNCTION	0.00	0.04	231.24	0	01:31	0.04
J3	JUNCTION	0.02	0.32	229.44	0	01:34	0.32
J30	JUNCTION	0.01	0.18	228.93	0	01:34	0.18
J31	JUNCTION	0.02	0.29	228.44	0	01:39	0.28
J32	JUNCTION	0.23	0.45	228.89	0	01:30	0.45
J32-S	JUNCTION	0.00	0.01	229.76	0	01:27	0.01
J33	JUNCTION	0.21	0.94	228.44	0	01:40	0.93
J33-S	JUNCTION	0.00	0.04	229.54	0	01:33	0.04
J34	JUNCTION	0.11	0.29	229.30	0	01:36	0.29
J34-S	JUNCTION	0.00	0.05	230.10	0	01:29	0.05
J35	JUNCTION	0.01	0.30	232.30	0	01:27	0.30
J3-S	JUNCTION	0.00	0.02	230.56	0	01:32	0.02
J4	JUNCTION	0.09	0.71	229.42	0	01:34	0.71
J4-S	JUNCTION	0.00	0.03	230.36	0	01:34	0.03
J5	JUNCTION	0.14	0.83	229.04	0	01:35	0.83
J5-S	JUNCTION	0.00	0.06	230.06	0	01:34	0.06
J6	JUNCTION	0.08	0.82	228.99	0	01:35	0.82
J6-S	JUNCTION	0.00	0.08	230.04	0	01:30	0.08
J7	JUNCTION	0.28	0.94	228.54	0	01:37	0.93
J7-S	JUNCTION	0.00	0.08	229.73	0	01:33	0.08
J8	JUNCTION	0.22	0.23	0.23	0	01:42	0.23
J8-S	JUNCTION	0.23	0.23	0.23	0	01:23	0.23
J9	JUNCTION	0.22	0.23	0.23	0	01:43	0.23
J9-S	JUNCTION	0.23	0.23	0.23	0	01:23	0.23
Outfall	OUTFALL	0.00	0.00	227.00	0	00:00	0.00
Pond	STORAGE	0.05	0.59	228.09	0	02:01	0.59

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Ba Pe
J1	JUNCTION	0.000	0.050	0	01:22	0	0.136	
J10	JUNCTION	0.000	0.034	0	01:25	0	0.0636	-
J10-S	JUNCTION	0.042	0.042	0	01:25	0.0686	0.0686	-
J11	JUNCTION	0.000	0.050	0	01:21	0	0.16	
J11-S	JUNCTION	0.116	0.116	0	01:25	0.188	0.188	-
J12	JUNCTION	0.000	0.034	0	01:25	0	0.0576	
J12-S	JUNCTION	0.033	0.034	0	01:25	0.0539	0.0549	-
J13	JUNCTION	0.000	0.034	0	01:25	0	0.0608	
J13-S	JUNCTION	0.034	0.034	0	01:25	0.0559	0.0558	-
J14	JUNCTION	0.000	0.133	0	01:28	0	0.434	-
J14-S	JUNCTION	0.011	0.185	0	01:30	0.017	0.165	-
J15	JUNCTION	0.000	0.183	0	01:28	0	0.562	
J15-S	JUNCTION	0.066	0.187	0	01:30	0.113	0.195	-
J16	JUNCTION	0.000	0.233	0	01:29	0	0.628	
J16-S	JUNCTION	0.016	0.146	0	01:31	0.0243	0.0997	-

J17	JUNCTION	0.000	0.282	0	01:30	0	0.769	-
J17-S	JUNCTION	0.087	0.153	0	01:31	0.142	0.18	-
J18	JUNCTION	0.000	0.332	0	01:31	0	0.942	-
J18-S	JUNCTION	0.121	0.168	0	01:32	0.196	0.243	-
J19	JUNCTION	0.000	0.050	0	01:20	0	0.29	
J19-S	JUNCTION	0.225	0.225	0	01:30	0.414	0.414	-
J1-S	JUNCTION	0.089	0.089	0	01:25	0.145	0.145	-
J2	JUNCTION	0.000	0.150	0	01:35	0	0.334	-
J20	JUNCTION	0.000	0.235	0	01:27	0	0.429	
J20-S	JUNCTION	0.000	0.000	0	00:00	0	0	
J21	JUNCTION	0.000	0.234	0	01:28	0	0.429	-
J21-S	JUNCTION	0.000	0.000	0	00:00	0	0	
J22	JUNCTION	0.000	0.020	0	01:21	0	0.0218	
J22-S	JUNCTION	0.011	0.011	0	01:25	0.0162	0.0161	-2
J23	JUNCTION	0.000	0.011	0	01:25	0	0.0218	-
J23-S	JUNCTION	0.000	0.000	0	01:21	0	4.51e-007	-
J24	JUNCTION	0.019	0.253	0	01:29	0.0359	0.465	-
J25	JUNCTION	0.009	0.255	0	01:30	0.0129	0.478	
J26	JUNCTION	0.019	0.259	0	01:32	0.0307	0.508	-
J27	JUNCTION	0.000	0.258	0	01:32	0	0.508	
J28	JUNCTION	0.022	0.272	0	01:32	0.0363	0.544	
J29	JUNCTION	0.043	0.300	0	01:32	0.0704	0.615	
J2-S	JUNCTION	0.000	0.106	0	01:27	0	0.055	
J3	JUNCTION	0.000	0.232	0	01:28	0	0.462	
J30	JUNCTION	0.044	0.324	0	01:33	0.0677	0.682	
J31	JUNCTION	0.000	0.362	0	01:30	0	0.691	-
J32	JUNCTION	0.000	0.050	0	01:24	0	0.0854	
J32-S	JUNCTION	0.054	0.054	0	01:25	0.0833	0.0833	-
J33	JUNCTION	0.000	1.231	0	01:34	0	2.89	
J33-S	JUNCTION	0.055	0.155	0	01:32	0.0798	0.167	-
J34	JUNCTION	0.000	0.050	0	01:23	0	0.113	
J34-S	JUNCTION	0.077	0.077	0	01:25	0.118	0.118	-
J35	JUNCTION	0.240	0.245	0	01:25	0.407	0.429	-
J3-S	JUNCTION	0.035	0.063	0	01:30	0.0562	0.0692	-
J4	JUNCTION	0.000	0.612	0	01:30	0	1.45	
J4-S	JUNCTION	0.000	0.119	0	01:33	0	0.0825	
J5	JUNCTION	0.000	0.705	0	01:30	0	1.69	-
J5-S	JUNCTION	0.086	0.122	0	01:31	0.125	0.167	
J6	JUNCTION	0.000	0.753	0	01:34	0	1.89	
J6-S	JUNCTION	0.165	0.196	0	01:30	0.267	0.305	-
J7	JUNCTION	0.000	0.844	0	01:31	0	2.08	
J7-S	JUNCTION	0.062	0.195	0	01:30	0.101	0.212	
J8	JUNCTION	0.000	0.049	0	00:04	0	0.022	1
J8-S	JUNCTION	0.212	0.237	0	01:29	0.383	0.412	
J9	JUNCTION	0.000	0.065	0	01:23	0	0.0851	6
J9-S	JUNCTION	0.013	0.186	0	01:23	0.0213	0.22	1
Outfall	OUTFALL	0.000	0.244	0	02:01	0	2	
Pond	STORAGE	0.000	1.065	0	01:38	0	2.93	-

****
Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J6	JUNCTION	0.08	0.016	0.968
J8-S	JUNCTION	46.59	0.000	0.000
J9-S	JUNCTION	17.40	0.000	0.000

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Node Flooding Summary
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Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J8-S	15.07	0.148	0 01:30	0.231	0.000
J9-S	1.15	0.161	0 01:24	0.153	0.000

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*********************
Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	M C
Pond	0.104	2	0	32	1.289	22	0 02:01	

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**********************
Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
Outfall	21.77	0.055	0.244	2.002
System	21.77	0.055	0.244	2.002

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.050	0 01:35	1.23	0.61	0.56
C10	CONDUIT	0.033	0 01:28	0.98	0.49	0.48
C10-S	CHANNEL	0.000	0 01:25	0.04	0.00	0.17
C11	CONDUIT	0.050	0 01:20	1.04	0.26	0.36
C11-S	CHANNEL	0.175	0 01:30	1.09	0.05	0.31
C12	CONDUIT	0.133	0 01:28	1.27	0.46	0.50
C12-S	CHANNEL	0.126	0 01:30	0.51	0.05	0.32
C13	CONDUIT	0.183	0 01:29	1.58	0.53	0.57
C13-S	CHANNEL	0.135	0 01:31	0.87	0.05	0.29
C14	CONDUIT	0.232	0 01:30	1.41	0.85	0.72
C14-S	CHANNEL	0.069	0 01:32	0.52	0.03	0.27
C15	CONDUIT	0.282	0 01:31	1.65	0.98	0.74
C15-S	CHANNEL	0.087	0 01:33	0.37	0.03	0.31

C16	CONDUIT	0.331	0	01:32	1.71	0.77	0.81
C16-S	CHANNEL	0.115	0	01:33	0.93	0.05	0.23
C17	CONDUIT	0.234	0	01:28	1.47	0.22	0.39
C17-S	CHANNEL	0.000	0	00:00	0.00	0.00	0.00
C18	CONDUIT	0.010	0	01:25	0.64	0.03	0.14
C18-S	CHANNEL	0.000	0	01:21	0.00	0.00	0.00
C19	CONDUIT	0.320	0	01:34	1.62	0.04	0.29
C1-S	CHANNEL	0.040	0	01:27	0.87	0.01	0.17
C2	CONDUIT	0.050	0	01:38	1.18	0.64	0.58
C20	CONDUIT	0.399	0	01:48	0.10	0.01	0.60
C21	CONDUIT	1.016	0	01:40	1.96	1.65	0.76
C21-S	CHANNEL	0.103	0	01:33	0.20	0.01	0.59
C22	CONDUIT	0.754	0	01:34	1.86	1.26	0.90
C22-S	CHANNEL	0.144	0	01:31	0.57	0.07	0.35
C23	CONDUIT	0.050	0	01:30	0.98	0.91	0.68
C23-S	CHANNEL	0.001	0	01:27	0.04	0.00	0.18
C24	CONDUIT	0.248	0	01:30	0.97	0.04	0.31
C25	CONDUIT	0.245	0	01:32	0.67	0.10	0.37
C26	CONDUIT	0.258	0	01:32	0.74	0.11	0.37
C27	CONDUIT	0.256	0	01:33	0.55	0.06	0.43
C28	CONDUIT	0.271	0	01:33	0.40	0.10	0.53
C29	CONDUIT	0.298	0	01:33	0.71	2.96	0.40
C2-S	CHANNEL	0.066	0	01:27	0.85	0.02	0.21
C3	CONDUIT	0.009	0	01:30	0.54	0.07	0.23
C30	CONDUIT	0.844	0	01:33	2.06	1.02	0.85
C30-S	CHANNEL	0.124	0	01:33	0.70	0.05	0.27
C31	CONDUIT	0.033	0	01:26	0.85	0.69	0.54
C31-S	CHANNEL	0.004	0	01:32	0.44	0.00	0.06
C32	CONDUIT	0.050	0	01:35	0.97	0.52	0.48
C32-S	CHANNEL	0.019	0	01:29	0.16	0.02	0.23
C33	CONDUIT	0.235	0	01:27	1.58	0.34	0.37
C34	CONDUIT	0.234	0	01:29	1.75	0.39	0.34
C35	CONDUIT	0.008	0	01:31	0.15	0.06	0.37
C3-S	CHANNEL	0.121	0	01:23	0.09	0.82	1.00
C4	CONDUIT	0.034	0	01:25	0.61	0.00	0.13
C4-S	CHANNEL	0.008	0	01:25	0.01	0.00	0.51
C5	CONDUIT	0.000	0	00:00	0.00	0.00	0.17
C5-S	CHANNEL	0.000	0	01:25	0.27	0.00	0.10
C6	CONDUIT	0.151	0	01:26	1.88	0.38	0.46
C6-S	CHANNEL	0.035	0	01:31	0.86	0.01	0.13
C7	CONDUIT	0.232	0	01:29	1.35	0.53	0.76
C7-S	CHANNEL	0.005	0	01:32	0.19	0.00	0.10
C8	CONDUIT	0.605	0	01:30	1.87	1.09	0.96
C8-S	CONDUIT	0.065	0	01:34	0.34	0.01	0.09
C9	CONDUIT	0.703	0	01:34	1.69	0.80	0.98
C9-S	CHANNEL	0.063	0	01:34	0.28	0.03	0.31
J10-IC	DUMMY	0.034	0	01:25			
J11-IC	DUMMY	0.050	0	01:21			
J12-IC	DUMMY	0.034	0	01:25			
J13-IC	DUMMY	0.034	0	01:25			
J14-IC	DUMMY	0.050	0	01:22			
J15-IC	DUMMY	0.050	0	01:23			
J16-IC	DUMMY	0.050	0	01:26			
J17-IC	DUMMY	0.050	0	01:22			
J18-IC	DUMMY	0.050	0	01:21			
J19-IC	DUMMY	0.050	0	01:20			
J1-IC	DUMMY	0.050	0	01:22			
J20-IC	DUMMY	0.000	0	00:00			
J21-IC	DUMMY	0.000	0	00:00			
J22-IC	DUMMY	0.020	0	01:21			
J23-IC	DUMMY	0.000	0	01:21			
J2-IC	DUMMY	0.050	0	01:25			
J32-IC	DUMMY	0.050	0	01:24			
J33-IC	DUMMY	0.050	0	01:24			

J34-IC	DUMMY	0.050	0	01:23
J3-IC	DUMMY	0.050	0	01:28
J4-IC	DUMMY	0.050	0	01:27
J5-IC	DUMMY	0.050	0	01:23
J6-IC	DUMMY	0.050	0	01:20
J7-IC	DUMMY	0.050	0	01:23
J8-IC	DUMMY	0.049	0	00:04
J9-IC	DUMMY	0.050	0	01:22
PondOutlet	DUMMY	0.244	0	02:01

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Flow Classification Summary
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	Adjusted	---------- Fraction of Time in Flow Class ----------								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10-S	1.00	0.84	0.02	0.00	0.13	0.01	0.00	0.00	0.01	0.00
C11	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C11-S	1.00	0.71	0.04	0.00	0.19	0.06	0.00	0.00	0.01	0.00
C12	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.01	0.00
C12-S	1.00	0.81	0.08	0.00	0.11	0.00	0.00	0.00	0.99	0.00
C13	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
C13-S	1.00	0.82	0.00	0.00	0.13	0.05	0.00	0.00	0.01	0.00
C14	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.01	0.00
C14-S	1.00	0.82	0.08	0.00	0.10	0.00	0.00	0.00	0.99	0.00
C15	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C15-S	1.00	0.75	0.07	0.00	0.17	0.01	0.00	0.00	0.99	0.00
C16	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C16-S	1.00	0.81	0.00	0.00	0.12	0.07	0.00	0.00	0.00	0.00
C17	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.98	0.00
C17-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.94	0.00
C18-S	1.00	0.89	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.89	0.01	0.00	0.11	0.89	0.00
C1-S	1.00	0.82	0.00	0.00	0.13	0.05	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C20	1.00	0.20	0.00	0.00	0.11	0.00	0.00	0.69	0.09	0.00
C21	1.00	0.00	0.00	0.00	0.13	0.00	0.00	0.87	0.03	0.00
C21-S	1.00	0.76	0.12	0.00	0.12	0.00	0.00	0.00	0.98	0.00
C22	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C22-S	1.00	0.77	0.02	0.00	0.16	0.05	0.00	0.00	0.02	0.00
C23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C23-S	1.00	0.80	0.05	0.00	0.15	0.00	0.00	0.00	0.99	0.00
C24	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C26	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C28	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.92	0.00
C29	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C2-S	1.00	0.81	0.00	0.00	0.13	0.06	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.00
C30	1.00	0.00	0.00	0.00	0.09	0.00	0.00	0.90	0.05	0.00
C30-S	1.00	0.82	0.01	0.00	0.13	0.04	0.00	0.00	0.02	0.00
C31	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C31-S	1.00	0.83	0.03	0.00	0.12	0.03	0.00	0.00	0.91	0.00
C32	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C32-S	1.00	0.82	0.02	0.00	0.16	0.00	0.00	0.00	0.98	0.00
C33	1.00	0.00	0.00	0.00	0.93	0.07	0.00	0.00	0.00	0.00

C34	1.00	0.00	0.00	0.00	0.87	0.12	0.00	0.00	0.00	0.00
C35	1.00	0.00	0.09	0.00	0.91	0.00	0.00	0.00	0.98	0.00
C3-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.83	0.00	0.17	0.00	0.00	0.00	1.00	0.00
C4-S	1.00	0.00	0.88	0.00	0.12	0.00	0.00	0.00	1.00	0.00
C5	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5-S	1.00	0.88	0.00	0.00	0.10	0.02	0.00	0.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.99	0.00	0.00
C6-S	1.00	0.85	0.12	0.00	0.01	0.01	0.00	0.00	0.99	0.00
C7	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.01	0.00
C7-S	1.00	0.85	0.00	0.00	0.14	0.01	0.00	0.00	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
C8-S	1.00	0.85	0.13	0.00	0.02	0.00	0.00	0.00	0.99	0.00
C9	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
C9-S	1.00	0.76	0.09	0.00	0.15	0.00	0.00	0.00	1.00	0.00

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Conduit Surcharge Summary
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Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C21	0.01	0.01	0.01	0.41	0.01
C21-S	0.01	0.01	4.49	0.01	0.01
C22	0.01	0.08	0.01	0.25	0.01
C29	0.01	0.01	0.01	0.44	0.01
C30	0.01	0.01	0.01	0.06	0.01
C3-S	0.32	0.32	0.60	0.01	0.01
C4-S	0.01	0.01	0.60	0.01	0.01
C8	0.01	0.01	0.01	0.17	0.01
C9	0.01	0.01	0.08	0.01	0.01

Analysis begun on: Thu Mar 15 16:09:27 2018
Analysis ended on: Thu Mar 15 16:09:30 2018
Total elapsed time: 00:00:03