



989 Yonge Street, Barrie

**Functional Servicing and Stormwater
Management Report**

February 2020

Submitted by:

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Project Number: 2095

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1 st	February 2020	ZBA	City of Barrie

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by ASA Development Inc. to prepare a Functional Servicing Report for a proposed mixed-use development located at Yonge Street and Lockhart Road in the City of Barrie.

1.1 Purpose of the Report

The Functional Servicing and SWM Report has been prepared in support of the Zoning By-law Amendment application for the proposed development. The Site Plan is provided in **Appendix A**.

The purpose of this report is to demonstrate that the proposed development can be graded and serviced in accordance with the City of Barrie, Lake Simcoe Region Conservation Authority (LSRCA), the Ontario Building Code, and the Ministry of Environment, Conservation and Parks (MECP) development criteria.

1.2 Study Area

The existing 10.15 hectare site is comprised of agricultural land and open space areas, and is located within Phase 2 of the Hewitt's Secondary Plan Area. As shown on **Figure 1.1**, the study area is bound by:

- ➔ Existing residential use to the north;
- ➔ Lockhart Road to the south;
- ➔ Yonge Street and future development areas to the west; and,
- ➔ Existing Metrolinx rail corridor, Natural Heritage Area, and future development areas to the east.

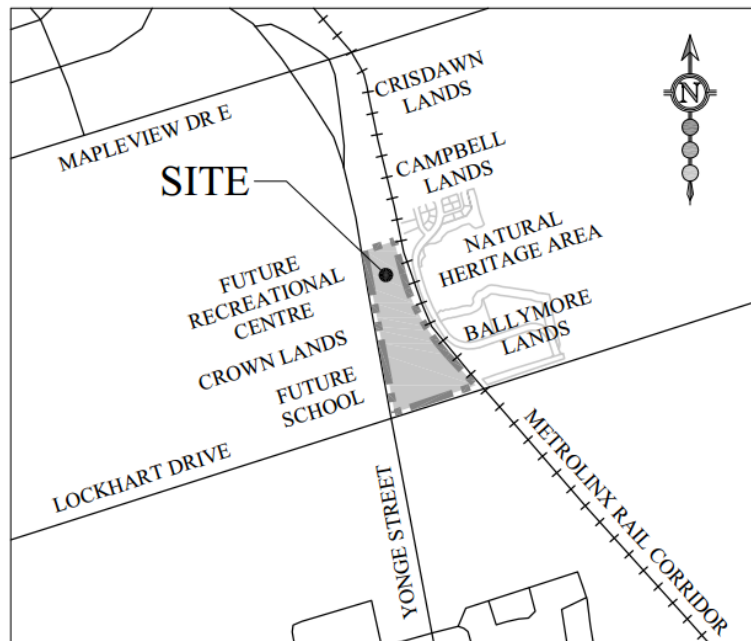


Figure 1.1: Site Location Plan

The proposed development consists of private townhouses, private high density residential with associated commercial/retail spaces and proposed private roads. Parking will be provided through a combination of underground and surface parking. Two driveway accesses to the development are proposed off of Yonge Street. Please refer to the Site Plan in **Appendix A** for further details.

1.3 Background Servicing Information

In preparation of the servicing and SWM strategies, the following design guidelines and standards were used:

- ➔ City of Barrie design guidelines and standards, including:
 - Storm Drainage & Stormwater Management Policies & Design Guidelines
 - Sanitary Sewerage Collection System Policies and Design Guidelines
 - Water Transmission and Distribution Policies and Design Guidelines
 - Low Impact Development, Interim Guidance Document
- ➔ LSRCA Technical Guidelines for Stormwater Management (2016);
- ➔ LSRCA Phosphorus Offsetting Policy (September 2017);
- ➔ Lake Simcoe Protection Plan (July 2009);
- ➔ Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (March 2003);
- ➔ Ministry of Transportation (MTO) Drainage Management Manual (1997); and
- ➔ Guidelines for New Development in Proximity to Railway Operations, May 2013.

The site servicing and SWM strategies in this report are based on the following reports:

- ➔ Hewitt's Secondary Plan Area, Subwatershed Impact Study (SIS), Lover's, Hewitt's and Sandy Cove Creeks, R.J. Burnside & Associates, September 2016 (and latest amendments and associated responses to comments);
- ➔ Yonge Street Design, City Project #117121, Ainley Group
- ➔ Ballymore, 750 Lockhart Road Barrie, Functional Servicing Report, SCS Consulting Group, March 2019 (Ballymore FSR);
- ➔ Crisdawn Construction Inc. – Hewitt's Gate Subdivision, Functional Servicing Report, Jones Consulting Group, February 2017 (Crisdawn FSR); and,
- ➔ Campbell Subdivision, Functional Servicing Report, Jones Consulting Group, February 2017 (Campbell FSR).

Relevant excerpts of the above listed reports have been included in **Appendix B**.

2.0 STORM SERVICING

2.1 Existing/Future Storm Sewer System

There are currently no existing storm sewers surrounding the site. As indicated in the Ballymore FSR and the SIS (**Appendix B**), the sizes and locations of the future storm sewers surrounding the site are:

- ➔ A 100-year conveyance storm sewer in a municipal servicing easement through the subject site, flowing east ultimately to SWMF #5;
- ➔ A 5-year conveyance storm sewer on Yonge Street flowing south;
- ➔ A 5-year conveyance storm sewer on Yonge Street flowing north; and,
- ➔ A 5-year conveyance storm sewer on Lockhart Drive flowing west.

The proposed development and upstream external areas were accounted for in the design of SWMF#5. Refer to **Section 3.3** for further details.

2.2 Proposed Storm Sewer System

The proposed storm sewer system for the proposed development is illustrated on **Figure 2.1**. As shown, the proposed works will include the construction of the 100-year conveyance storm sewer in a municipal servicing easement. The proposed municipal sewer will extend from the west property line, cross underneath the existing Metrolinx rail corridor, and connect to the future Kneeshaw Drive storm sewer and outlet to SWMF #5.

The condo blocks within the proposed development are proposed to be serviced from the municipal storm sewer in the easement via individual service connections. The townhouse block at the north end of the development is proposed to be serviced from the future 5-year conveyance storm sewer on Yonge Street. Overland flow routes will be provided for safe conveyance of the major system. The future municipal sewers will have sufficient depth to service the proposed development.

The storm sewer system will be designed in accordance with the City of Barrie, Ontario Building Code and MECP criteria, including but not limited to:

- ➔ Minimum Pipe Size: 300 mm
- ➔ Minimum Slope: 0.50%
- ➔ Minimum Velocity: 0.75 m/s
- ➔ Maximum Velocity: 4.0 m/s
- ➔ Minimum Pipe Cover: 1.20 m (frost cover)

The exact size and location of the proposed storm sewer systems will be determined at the detailed design stage. Please refer to **Section 3.0** for details of the proposed Stormwater Management systems.

3.0 STORMWATER MANAGEMENT

3.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the design guidelines and standards listed in **Section 1.3**. The stormwater runoff criteria are summarized below in **Table 3.1**.

Table 3.1: Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	No peak flow controls are required on-site, provided by downstream SWMF #5. Proposed runoff volume controls require capture and treatment of runoff from a 25 mm rainfall event over all new impervious areas. The targets for the SWMF #5 catchment, per the SIS, are 5 mm of infiltration and 20 mm of filtration over all new impervious areas. Emergency Flow conveyance for upstream lands in addition to proposed development to be provided through the site.
Quality Control	No quality controls are required on-site, MECP Enhanced Level Protection (80% TSS Removal) is provided by downstream SWMF #5.
Erosion Control	No erosion controls are required on-site, detention of the 25 mm rainfall runoff for a minimum of 24 hours is provided by downstream SWMF #5.
Water Budget	Maintain existing groundwater recharge rates and appropriate distribution, ensuring the protection of related hydrology ecologic functions.
Phosphorus Budget	A best effort shall be employed such that any increase in loading is kept to a minimum with the target of “zero” increase in loading. Regardless of existing loading, the removal of 80% of the proposed annual Total Phosphorus load is required. The remaining proposed phosphorus loading conveyed offsite (if any) is to be offset per the LSRCA Phosphorus Offsetting Policy.

3.2 Existing Drainage

The majority of the existing lands (7.88 ha) drain northeast via overland flow to an existing 740 mm diameter culvert under the existing Metrolinx tracks (Catchment 101 on **Figure 3.1**). The existing culvert outlets to the downstream NHS area and ultimately to Hewitt’s Creek to the east.

The remainder of the existing lands (1.86 ha, Catchment 102) drain south to Lockhart Road via overland flow. Lockhart Road drainage is currently directed east via roadside ditches and ultimately to Hewitt’s Creek through the Ballymore Barrie property to the east of the Metrolinx Corridor.

As identified in the SIS, external drainage from the existing Yonge Street right-of-way (ROW), and lands west of Yonge Street (Rainsong Phase 1 & 2 lands, Crown Corporation lands) are also conveyed through the existing lands to the existing Metrolinx culvert.

3.3 Allowable Release Rate

The allowable release rate for the proposed development has been established based on the SIS and subsequent Ballymore FSR. As noted in the Ballymore FSR the proposed development has been allowed for in the downstream SWMF #5. Therefore the allowable release rate is predicated on the assumed percent imperviousness for the proposed development. As shown on Figure 2.2 from the Ballymore FSR (**Appendix B**), the site has been provided for at an imperviousness of 75%.

3.4 Stormwater Best Management Practices

In accordance with the Ministry of Environment Stormwater Management Planning and Design Manual (2003), stormwater management best practices are to be utilized using a treatment train approach. Potential best management practices are to be evaluated based on the stormwater management objectives listed in **Table 3.1**.

The following study area characteristics are to be taken into consideration:

- ➔ The site has existing slopes of approximately one to four percent and predominantly slopes towards the existing culvert under the existing Metrolinx rail corridor located in the northeast portion of the site;
- ➔ Based on the Hydrogeological Study, site soils consisted of sandy silts and clayey silt soils with hydraulic conductivities ranging from 1.4×10^{-4} to 4.8×10^{-6} ;
- ➔ Within the installed site wells, groundwater was observed at depths ranging between 1 and 5.5 m below existing grade;
- ➔ The proposed development is approximately 10.15 ha and consists of private townhouses, high density residential and associated commercial/retail space; and
- ➔ The proposed development provides groundwater contributions to the existing environmental feature to the east.

The following are examples of low impact development (LID) measures that will be evaluated for use in the proposed development. While evaluating the following controls, cost (both installation and long term maintenance), feasibility, groundwater and grading constraints will be taken into consideration.

- ➔ Increased topsoil depth;
- ➔ Roof leaders to grassed areas;
- ➔ Bioretention;
- ➔ Biofiltration;
- ➔ Pervious pavements;
- ➔ Infiltration trenches/soak-away pits; and
- ➔ Manufactured treatment devices.

A comprehensive assessment of LID practices will be provided in support of the Draft Plan of Subdivision application. It is noted that as the development consists of private residential and commercial/retail development which provides flexibility in the application of LID's as they will be operated and maintained by the associated condominium corporation(s) and not the municipality.

At the detailed design stage, a detailed water balance evaluation will be incorporated into the detailed stormwater management report that discusses the selection of LIDs and quantifies the proposed rainwater retention volume.

3.5 Proposed Storm Drainage

As previous noted, the majority of the runoff from the proposed development is to be conveyed to the downstream SWMF #5 per the SIS and Ballymore FSR. The proposed major and minor system flow patterns and drainage areas are shown on **Figure 3.2**. As illustrated, the proposed development will convey runoff to the proposed 100 year storm sewer and ultimately to SWMF #5.

Minor system flows from the proposed townhouse block within the proposed development will be captured via a proposed internal storm sewer system and be conveyed to the future storm sewer on Yonge Street (Catchment 201, 1.33 ha, **Figure 3.2**). Major system flows from Catchment 201 will be conveyed south through the proposed development and captured and conveyed via the proposed 100 year municipal storm sewer.

Major and minor system flows from Catchments 202 and 203 (2.96 ha and 4.87 ha respectively, **Figure 3.2**) will be conveyed internally to the proposed 100 year municipal storm sewer. The proposed rail berm west of the existing Metrolinx corridor will result in 0.58 ha (Catchment 301, **Figure 3.2**) of uncontrolled drainage being conveyed to the Metrolinx corridor.

Per Figure 2.2 from the Ballymore FSR (**Appendix B**) all external drainage will be captured via a 100 year capture low point on Yonge Street prior to entering the proposed development via the proposed 100 year municipal storm sewer. The final location of the 100 year capture point on Yonge Street and the associated sizing of the proposed 100 year municipal storm sewer will be coordinated with Ainley Group and the City of Barrie in support of the Yonge Street design.

As noted in **Table 3.1**, emergency overland flow for all external drainage areas is to be provided through the site to ensure positive drainage downstream.

3.5.1 Quantity Control

As noted in **Table 3.1** no quantity controls are required on-site as the downstream SWMF #5 provides quantity control for the proposed development. Should the proposed development overall weighted imperviousness exceed 75%, on-site controls may be required and would be further assessed through the Site Plan Application process. As shown on **Figure 3.2**, the current site plan for the proposed development contemplates an overall weighted imperviousness of 75%.

3.5.2 Quality Control

As noted in **Table 3.1** no quality controls are required on-site as the downstream SWMF #5 provides the required quality control for the proposed development. Should the proposed development overall weighted imperviousness exceed 75%, on-site controls may be required and would be further assessed through the Site Plan Application process. As shown on **Figure 3.2**, the current site plan for the proposed development contemplates an overall weighted imperviousness of 75%.

3.5.3 Erosion Control

As noted in **Table 3.1** no erosion controls are required on-site as the downstream SWMF #5 provides the required erosion control for the proposed development. Should the proposed development overall weighted imperviousness exceed 75%, on-site controls may be required and would be further assessed through the Site Plan Application process. As shown on **Figure 3.2**, the current site plan for the proposed development contemplates an overall weighted imperviousness of 75%.

3.5.4 Volume Control

As detailed in the SIS, the target filtration and infiltration rates have been set based on site soils and LSRCA guidelines. More specifically, the site lies within SIS Catchment 5 and is directed to SWMF #5. The infiltration recommendation for Catchment 5 is 5 mm from the impervious areas and the filtration target is 20 mm from the impervious areas.

As shown in the calculations included in **Appendix C**, the 5 mm infiltration target for the proposed development corresponds to a volume of 346 m³ with a 20 mm target filtration volume of 1,383 m³.

As detailed in **Section 3.4**, LIDs, in addition to the downstream SWMF #5, will be explored to maximize infiltration and to utilize filtration as a best efforts approach.

3.5.5 Water Balance

Where feasible, measures to minimize impacts on the water budget will be incorporated into the development design.

In the proposed condition, the introduction of the proposed development diminishes the existing annual infiltration when considered without any mitigation. Without mitigation the proposed development annual infiltration volume is approximately 22,600 m³ or an overall reduction of 55%.

As recommended in the Hydrogeological Study, low impact development measures, such as those described previously in **Section 3.4** and as noted in **Section 3.5.4** will be implemented, as feasible, to maintain or increase existing infiltration rates.

3.5.6 Phosphorus Budget

Under the Lake Simcoe Protection Plan (LSPP), a stormwater management plan must demonstrate how phosphorus loadings are minimized between existing and proposed conditions. The LSPP states that:

“Best efforts shall be employed such that any increase in loading (proposed compared to pre development) is kept to a minimum. The target is “zero” increase in loading.”

In addition to the LSPP, the LSRCA SWM Guidelines state that regardless of existing loading, the removal of 80% of the proposed annual Total Phosphorus load is required.

The remaining proposed phosphorus loading conveyed offsite (if any) is to be offset per the LSRCA Phosphorus Offsetting Policy.

The MECP database application *Lake Simcoe Phosphorus Loading Development Tool* (v2, 01-April-2012 update) was used to complete the phosphorus budget for the proposed development.

Existing Phosphorus Loadings

The existing phosphorus loading is based on the land uses based on aerial photography. Based on the Phosphorus Loading Development Tool, the existing annual phosphorus loadings were calculated to be 1.56 kg/year. Refer to **Appendix C** for the phosphorus loading tool output.

Proposed Phosphorus Loadings

The proposed phosphorus loading with no BMPs was calculated to be 12.86 kg/yr (refer to **Appendix C**).

Table 3.2: Phosphorus Budget Summary

Phosphorus Loading (kg/yr)		
Existing	Proposed without BMPs	Proposed 80% Reduction
1.56	12.86	2.57

To meet the target minimum removal loading of 1.56 kg/yr, LIDs will be selected through the site plan application process as mentioned in **Section 3.4**. It is noted that the downstream SWMF #5 is proposed to be a wetland facility and will therefore provide 77% removal efficiency for the proposed development.

As mentioned previously, any downstream phosphorus loading will be offset per LSRCA Phosphorus Offsetting Policy at a rate of \$100,625/kg (\$35,000 x 2.5 offset + 15% admin fee).

4.0 SANITARY SERVICING

4.1 Existing/Future Sanitary Sewer System

There are currently no existing sanitary sewers surrounding the site. As indicated in the Ballymore Barrie FSR and the Hewitt's Creek SIS (**Appendix B**), the sizes and locations of the future sanitary sewers surrounding the site are:

- A 300 mm diameter sanitary sewer on Yonge Street flowing south;
- A 300 mm diameter sanitary sewer in a municipal servicing easement through the subject site, flowing east; and,
- A 375 mm diameter sanitary trunk sewer on future Kneeshaw Drive flowing north.

From the Kneeshaw Drive trunk sewer, the sanitary system will flow north through the Campbell and Crisdawn subdivisions and eventually discharge to the Hewitt's Creek trunk sanitary sewer.

A sanitary analysis of the downstream system was completed as part of the Ballymore Barrie FSR, and subsequently the detailed design of the portion of the sanitary trunk sewer within Mapleview Drive has been approved and is under construction at the time of this report. Downstream sewers will have capacity to service the lands at the assumed population densities as set out in the current zoning within the Official Plan. For further details please refer to **Appendix B**.

4.2 Proposed Sanitary Sewer System

The proposed sanitary sewer system for the proposed development is illustrated on **Figure 2.1**. As shown, the proposed works will include the construction of the previously-noted 300 mm diameter sanitary sewer in a municipal servicing easement. The proposed municipal sewer will extend from the west property line, cross underneath the existing Metrolinx rail corridor, and connect to the future Kneeshaw Drive trunk sewer.

The condo blocks of the proposed development are proposed to be serviced from the 300 mm municipal sanitary sewer via individual service connections. The townhouse block at the north end of the development is proposed to be serviced from the future 300 mm sanitary sewer on Yonge Street. The future municipal sewers will have sufficient depth to service the proposed development.

The sanitary sewer system will be designed in accordance with the City of Barrie, Ontario Building Code and MECP criteria, including but not limited to:

- Residential Sanitary Generation Rate: 225 L/cap/day
- Residential Population Density:
 - Medium density: 2.34 persons/unit
 - High density: 1.67 persons/unit
- Residential Peaking Factor: Harmon's Equation, or Babbit's Equation where flow depth is less than 30% of pipe diameter
- Commercial Sanitary Generation Rate (min.): 28,000 L/ha/day

- Commercial Peaking Factor (min.): 2.0
- Inflow/Infiltration Rate: 0.1 L/s/ha
- Minimum Pipe Size:
 - Residential uses: 200 mm
 - Commercial/Mixed uses: 250 mm
- Minimum Pipe Cover: 2.5 m (between finished ground and sewer obvert)
- Minimum Full Flowing Velocity: 0.60 m/s
- Maximum Velocity: 3.00 m/s

The size and location of the proposed municipal sanitary sewer system and associated sanitary service connections for the proposed development will be determined at the detailed design stage.

Based on the site statistics provided in **Appendix A**, the proposed development will consist of 60 medium density residential units, 1158 high density residential units, and 3,000 m² of commercial space. The peak flow rate from the development will therefore be 20.8 L/s. Please refer to the Sanitary Flow Calculations and Sanitary Design Sheet provided in **Appendix D** for further details.

5.0 WATER SUPPLY AND DISTRIBUTION

5.1 Existing/Future Water Distribution

There are currently no existing watermains surrounding the site. As indicated in the Hewitt's Creek SIS (**Appendix B**), the following future watermains are planned to surround the site:

- ➔ A 300 mm diameter local trunk watermain on Yonge Street;
- ➔ A 300 mm diameter local trunk watermain on Kneeshaw Drive; and,
- ➔ A 300 mm diameter local trunk watermain on Lockhart Road.

Ultimately, it is planned to loop the Yonge Street and Kneeshaw Drive watermains with a future 300 mm diameter watermain on Lockhart Drive.

5.2 Proposed Water System

Water supply for the proposed development is proposed to be provided from the future 300 mm diameter watermain on Yonge St via a number of individual service connections. Please refer to the preliminary layout shown on **Figure 2.1**.

The proposed water distribution system will be designed in accordance with the City of Barrie, Ontario Building Code and MECP criteria, including but not limited to the following:

- ➔ Domestic Water Consumption Rate: 225 L/cap/day
- ➔ Residential Population Density:
 - Medium density: 2.34 persons/unit
 - High density: 1.67 persons/unit
- ➔ Domestic Peaking Factors:
 - Maximum Day = 2.50
 - Maximum Hour = 3.75
 - Minimum Hour = 0.45
- ➔ Commercial Water Consumption Rate: 28,000 L/ha/day
- ➔ Minimum Pipe Size: 150 mm diameter
- ➔ Minimum Pipe Cover: 1.7 m

Once design information of the Yonge Street watermain is available, a water distribution analysis will be completed to ensure that the proposed development can be provided with adequate flow and pressure to meet daily and fire demands.

6.0 GRADING

6.1 Existing Grading Conditions

The existing topography of the site generally slopes from west to east towards the existing Natural Heritage Area. There is also a smaller portion of the site that slopes south-east towards the Lockhart Drive right-of-way. The sloping on-site ranges from 0.5% to 7.0%. The elevations range from approximately 269.00 m in the southwest corner of the site to 263.00 m near the north east corner of the site.

6.2 Proposed Grading Concept

In general, the proposed development will be graded in a manner which will satisfy the following goals:

- Minimum/Maximum road grade: 0.7% / 6.0%
- Minimum/Maximum lot grade: 2.0% / 5.0%
- Minimum/Maximum driveway grade: 2.0% / 8.0%
- Provide an emergency overland flow route;
- Minimize the need for retaining walls;
- Minimize the volume of earth to be moved and minimize cut/fill differential;
- Create the required depth for the proposed sewer systems; and,
- Achieve the stormwater management objectives for the proposed development.

Please refer to the preliminary grading plan illustrated on **Figure 6.1**. At the detailed design stage, the preliminary grading will be subject to a more in-depth analysis to minimize slopes and retaining walls.

7.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

To ensure stormwater runoff during the construction phase does not transport sediment to the surrounding areas and municipal infrastructure, erosion and sediment control measures will be proposed in accordance with the “Erosion and Sediment Control Guideline for Urban Construction” document (December 2006). The proposed measures may include:

- Catchbasin sediment control devices;
- Sediment control fence around the perimeter of the site;
- A mud mat at the construction entrance;
- Cut-off swales and check dams; and,
- Other temporary sediment control facilities where required.

The detailed erosion and sediment control plan will be approved by the Municipality prior to any site alteration being undertaken. The plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses is minimized both during and following construction.

8.0 SUMMARY

This Functional Servicing Report has been prepared in support of the OPA and ZBA applications for the proposed mixed-use development located at 989 Yonge Street, Barrie. This report has outlined the means by which the proposed development can be graded and serviced in accordance with the City of Barrie, LSRCA, Ontario Building Code, and MECP criteria. The conclusions of the report are summarized below:

Stormwater Management

Quantity Control

- Provided downstream in SWMF #5.

Quality Control

- Provided downstream in SWMF #5.

Water Balance

- As recommended in the Hydrogeological Study, low impact development measures will be implemented, as feasible, to maintain or increase existing infiltration rates.

Erosion Control

- Provided downstream in SWMF #5.

Volume Control

- The proposed development is within Catchment 5 and required to provide 5 mm of infiltration and 20 mm of filtration over all impervious areas via LIDs.

Erosion Control

- A phosphorus budget analysis was completed using the MECP phosphorus budget tool, which shows that on-site LIDs are required to meet the minimum criteria as set by the LSRCA.

Storm and Sanitary Servicing

- Municipal storm and sanitary sewers will be constructed in a municipal servicing easement traversing the site to service the proposed development; and
- The proposed development can be serviced from the future municipal sewers in the servicing easement and from the future Yonge Street sanitary and storm sewer extensions.

Water Supply and Distribution

- The proposed development can be serviced from the future local transmission watermain on Yonge Street.

Grading

- The proposed development can be graded in a manner which satisfies the grading criteria and the stormwater management requirements.

Erosion and Sediment Control During Construction

- Erosion and sediment during construction will be controlled in accordance with the Erosion and Sediment Control Guideline for Urban Construction” document (December 2006).

Respectfully Submitted:

SCS Consulting Group Ltd.

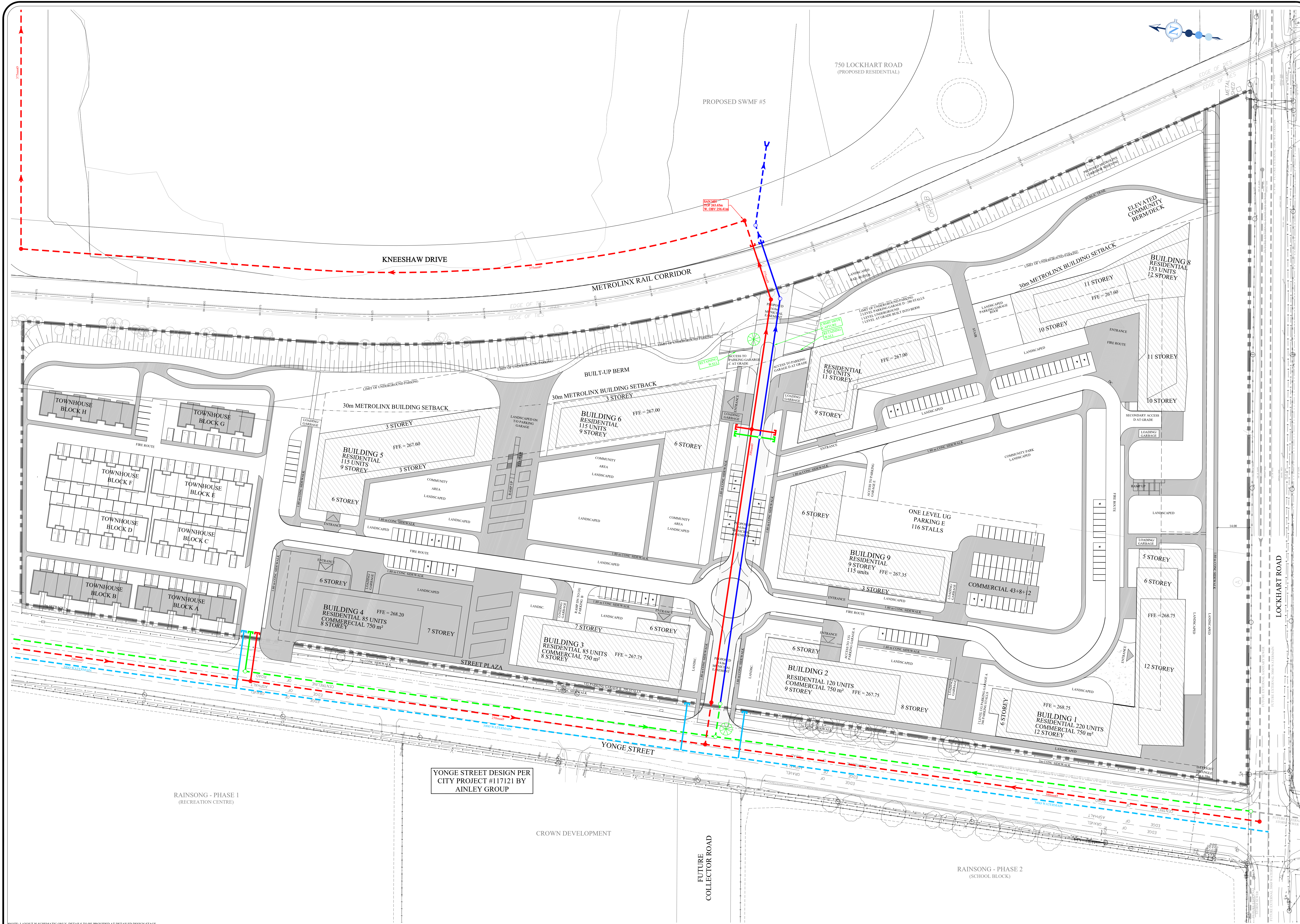


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YONGE STREET DESIGN PER CITY PROJECT #117121 BY AINLEY GROUP

RAINSONG - PHASE 1 (RECREATION CENTRE)

CROWN DEVELOPMENT

FUTURE COLLECTOR ROAD

RAINSONG - PHASE 2 (SCHOOL BLOCK)

ASA DEVELOPMENT INC.
 30 CENTURIAN DRIVE, SUITE 100
 MARKHAM, ONTARIO L3R 9H8
 TEL: (905) 475-7000
 FAX: (905) 475-8335

LEGEND:
 - - - - - LIMIT OF PROPERTY
 - - - - - EXISTING CONTOUR
 (Symbol) 100 YEAR CAPTURE LOCATION

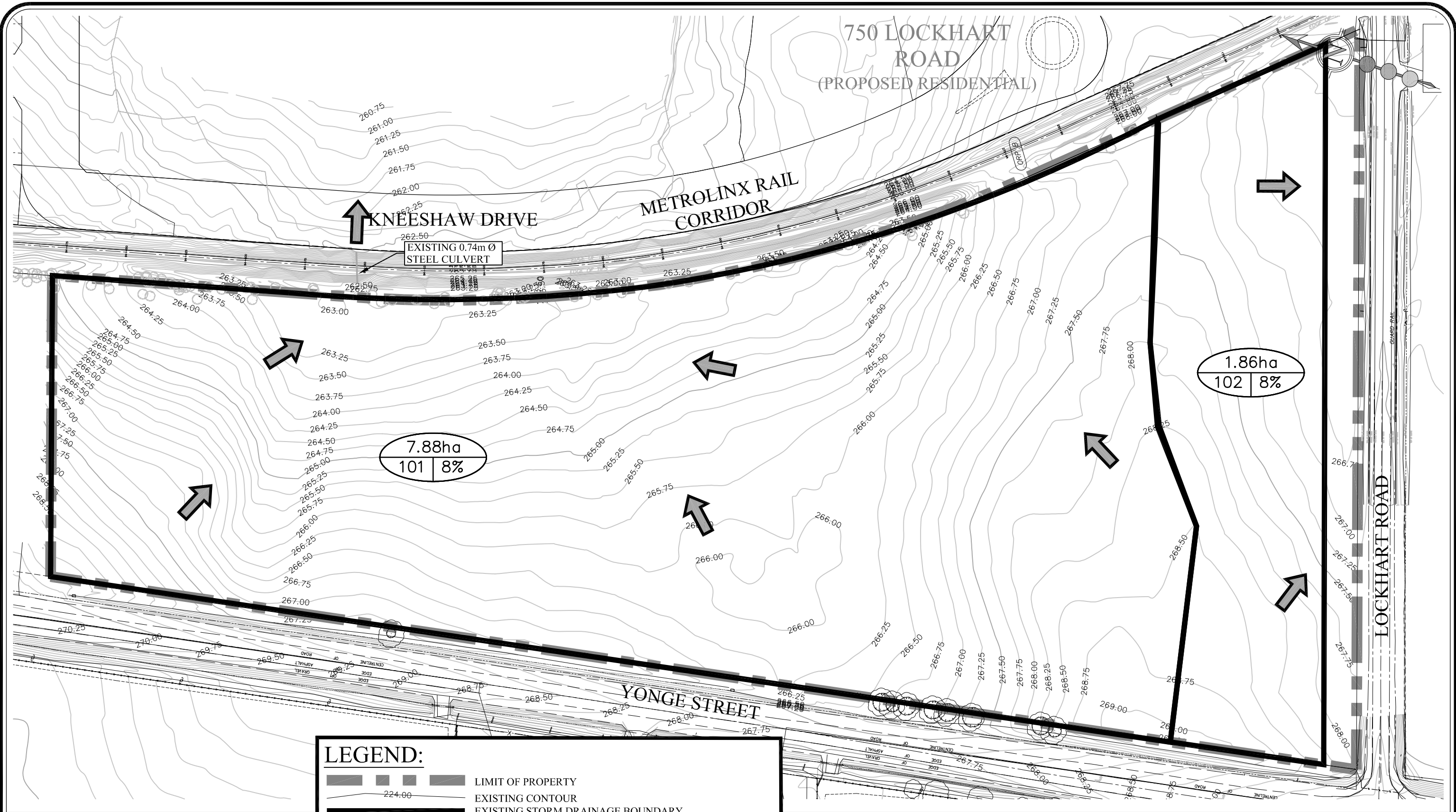
(Green dashed line) STORM SEWER AND MANHOLE - 1 YEAR CONVEYANCE
 (Green dashed line) EXTERNAL STORM SEWER AND MANHOLE - 5 YEAR CONVEYANCE (BY OTHERS)
 (Green dashed line) STORM SEWER AND MANHOLE - 10 YEAR CONVEYANCE
 (Green dashed line) EXTERNAL STORM SEWER AND MANHOLE - 10 YEAR CONVEYANCE (BY OTHERS)
 (Green dashed line) FUTURE / EXTERNAL STORM SEWER AND MANHOLE (BY OTHERS)

(Red dashed line) PROPOSED SANITARY SEWER AND MANHOLE
 (Red dashed line) EXTERNAL SANITARY SEWER AND MANHOLE (BY OTHERS)
 (Red dashed line) FUTURE / EXTERNAL SANITARY SEWER AND MANHOLE (BY OTHERS)

(Blue dashed line) PROPOSED WATERMAIN
 (Blue dashed line) EXTERNAL WATERMAIN (BY OTHERS)
 (Blue dashed line) FUTURE / EXTERNAL WATERMAIN (BY OTHERS)

989 YONGE STREET (BARRIE)		PRELIMINARY SERVING FIGURE	
DESIGNED BY: V.A.S.	CHECKED BY: P.G.	PROJECT No:	FIGURE No:
SCALE: 1:500	DATE: FEBRUARY 2020	2095	2.1

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LEGEND:

- LIMIT OF PROPERTY
- EXISTING CONTOUR
- EXISTING STORM DRAINAGE BOUNDARY
- MAJOR SYSTEM - OVERLAND FLOW
- DRAINAGE AREA (HECTARES)
- PERCENT IMPERVIOUS
- CATCHMENT ID

ASA DEVELOPMENT INC.

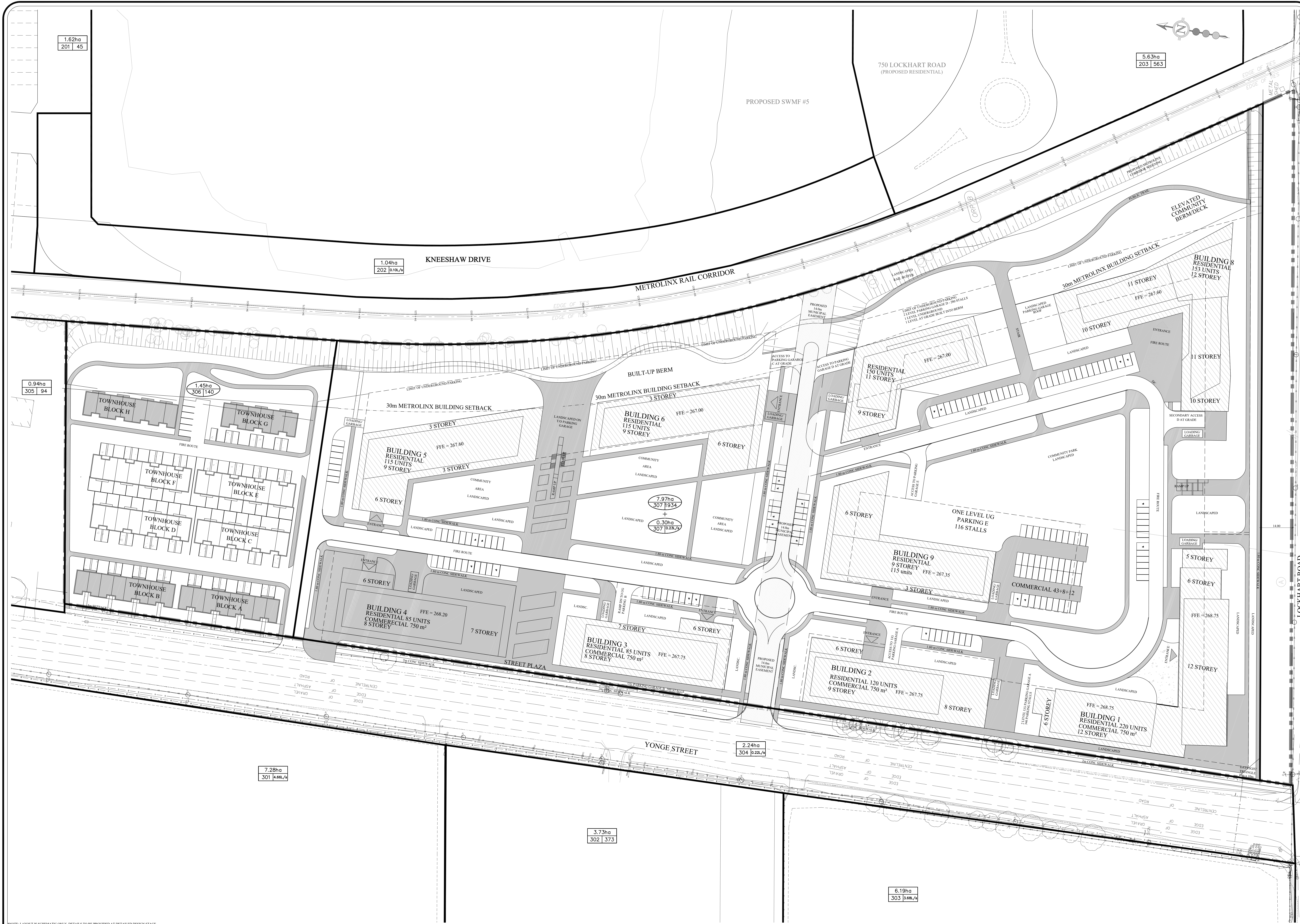
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 FAX: (905) 475-8335

989 YONGE STREET (BARRIE)

DESIGNED BY: P.A.T	CHECKED BY: J.M.P.
SCALE: 1:1500	DATE: FEBRUARY 2020

EXISTING STORM DRAINAGE PLAN

PROJECT No:	FIGURE No:
2095	3.1

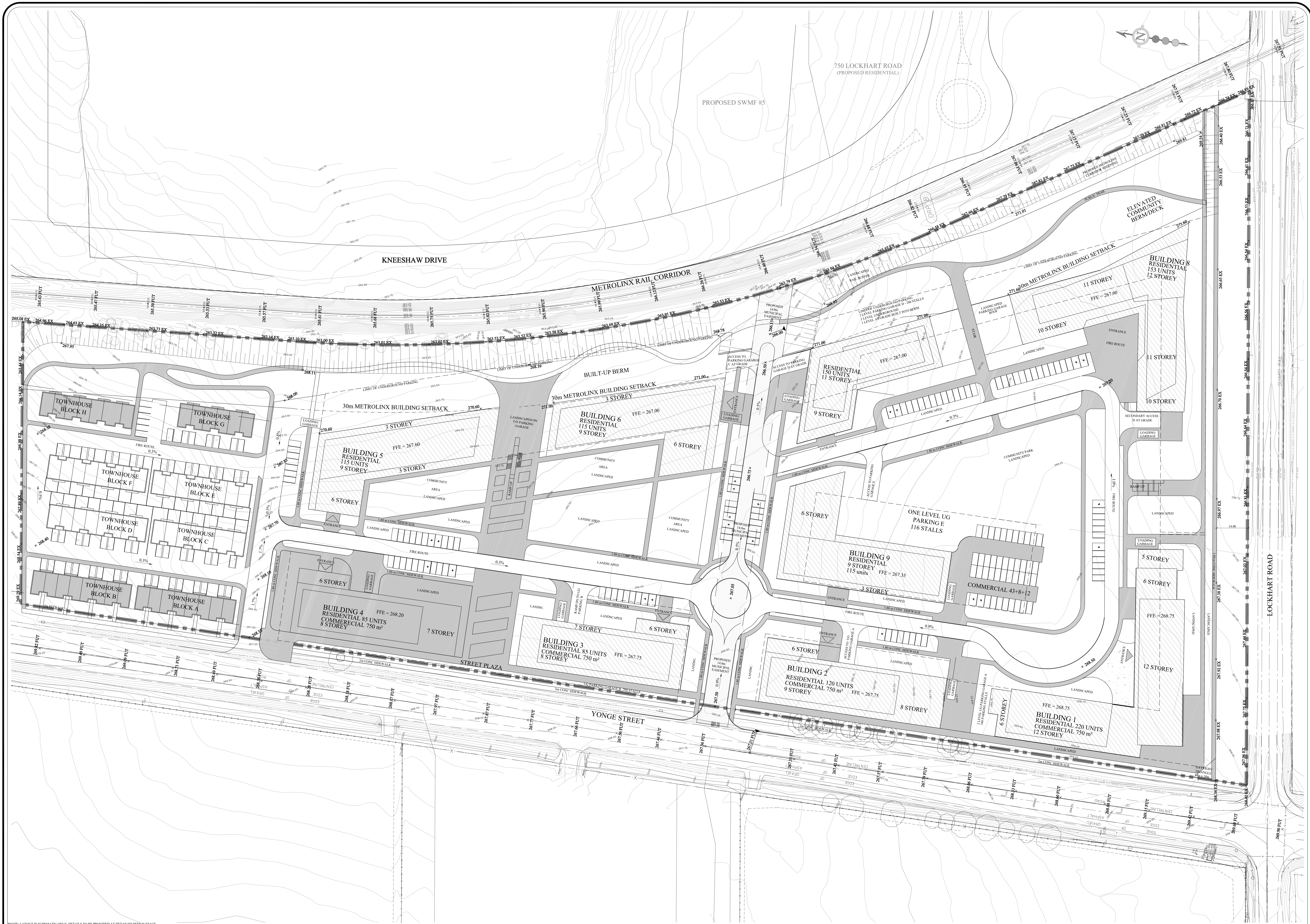


ASA DEVELOPMENT INC.
 30 CENTURIAN DRIVE, SUITE 100
 MARKHAM, ONTARIO L3R 9H8
 TEL: (905) 475-7000
 FAX: (905) 475-8335

LEGEND:		1.43ha 303 1934		3.37ha 302 377		1.04ha 202 1010/A		7.28ha 301 466/A		2.24ha 304 221/A	
	LIMIT OF PROPERTY		DRAINAGE AREA (HECTARES)		EXTERNAL SANITARY DRAINAGE AREA (HECTARES)		DRAINAGE AREA (HECTARES)		EXTERNAL SANITARY DRAINAGE AREA (HECTARES)		DRAINAGE AREA (HECTARES)
	SANITARY DRAINAGE BOUNDARY		POPULATION		# OF UNITS		FLOW (L/S)		FLOW (L/S)		FLOW (L/S)
			CATCHMENT ID		CATCHMENT ID		CATCHMENT ID		CATCHMENT ID		CATCHMENT ID

989 YONGE STREET (BARRIE)		PRELIMINARY SANITARY DRAINAGE FIGURE	
DESIGNED BY: V.A.S.	CHECKED BY: P.G.	PROJECT No:	FIGURE No:
SCALE: 1:500	DATE: FEBRUARY 2020	2095	4.1

File: P:\2020\989 Yonge Street (Barrie)\Drawings\2020\Fig\Pre11\FigNo.2095-046-4.1.dwg - Revised by: V.A.S. - 15 Feb 20 20:00 - 10:20am



NOTE: LAYOUT IS SCHEMATIC ONLY. DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

ASA DEVELOPMENT INC.
 30 CENTURIAN DRIVE, SUITE 100
 MARKHAM, ONTARIO L3R 9H8
 TEL: (905) 475-7000
 FAX: (905) 475-8335

LEGEND:

—	EXISTING CONTOUR
✕ 223.91	PROPOSED ELEVATION
✕ 224.35 EX	EXISTING ELEVATION
✕ 224.35 FUT	FUTURE ELEVATION

989 YONGE STREET (BARRIE)		PRELIMINARY GRADING FIGURE	
DESIGNED BY: V.A.S.	CHECKED BY: P.G.	PROJECT No:	FIGURE No:
SCALE: 1:500	DATE: FEBRUARY 2020	2095	6.1

File: P:\2020\989 Yonge Street (Barrée)\Grading\Figures\2095-040-6.1.dwg - Revised by: V.A.S. - 01 Feb 2020 - 10:16 AM

APPENDIX A

SITE PLAN

SITE DATA		
989 Yonge Street, Innisfil, Ontario		
DATA	PERMITTED	PROPOSED
ZONING	R5 AND NMU	
LOT AREA (m ²)	N/A	10.15 ha (site area) 0.43 ha (Lockhart road widening) 9.72 ha (developable area)

BUILDING DATA		
DATA	PERMITTED	PROPOSED
TOTAL DENSITY (# of units)	120 units/ha 120 x 10.15 ha = 1218 (units)	BUILDING 1 = 220 (units) BUILDING 2 = 120 (units) BUILDING 3 = 85 (units) BUILDING 4 = 85 (units) BUILDING 5 = 115 (units) BUILDING 6 = 115 (units) BUILDING 7 = 150 (units) BUILDING 8 = 153 (units) BUILDING 9 = 115 (units) TOWNHOUSE = 60 (towns) TOTAL = 1218 (units) DENSITY = 120 units/ha
TOTAL RESIDENTIAL GFA (m ²)	N/A	177,020 m ²
TOTAL COMMERCIAL GFA (m ²)	N/A	3,000 m ²
BUILDING AREA (m ²)	N/A	22,900 m ² TOTAL PROJECT
GROSS FLOOR AREA (m ²)	N/A	180,020 m ² TOTAL PROJECT

LANDSCAPING DATA		
DATA	REQUIRED	PROVIDED
LANDSCAPE AREA (percentage)	25 %	61 %
LANDSCAPE AREA (m ²)	25,350 m ²	59,770 m ²
includes pathways		

VEHICLE PARKING DATA		
DATA	REQUIRED	PROPOSED
APARTMENT RESIDENTIAL PARKING	1.0 / units	1204
TOWNHOUSE PARKING	1.0 / units	60
BARRIER FREE PARKING	3% (0.03 x 1398 = 42)	42
COMMERCIAL PARKING	1 / 24 m ² (3,000/24 = 125)	126
MAXIMUM COMMERCIAL PARKING	1 / 18 m ² (3,000/18 = 167)	
TOTAL		1,390

PARKING BREAKDOWN		
DATA	REQUIRED	PROPOSED
TOTAL SURFACE APARTMENT PARKING		37
TOTAL APARTMENT UNDERGROUND PARKING		1167
TOTAL SURFACE COMMERCIAL PARKING		104
TOTAL UNDERGROUND COMMERCIAL PARKING		22
TOTAL SURFACE PARKING TOWNHOUSES		60
TOTAL PARKING		1,390

BICYCLE PARKING		
DATA	REQUIRED	PROPOSED
RESIDENTIAL BICYCLE PARKING	0.2 / unit	244
COMMERCIAL BICYCLE PARKING	1/ each 7% of 167 stalls = 15	15

* C = COMMERCIAL PARKING
** V = VISITOR PARKING

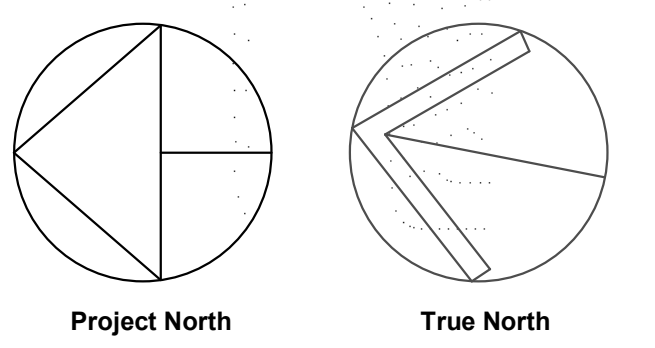
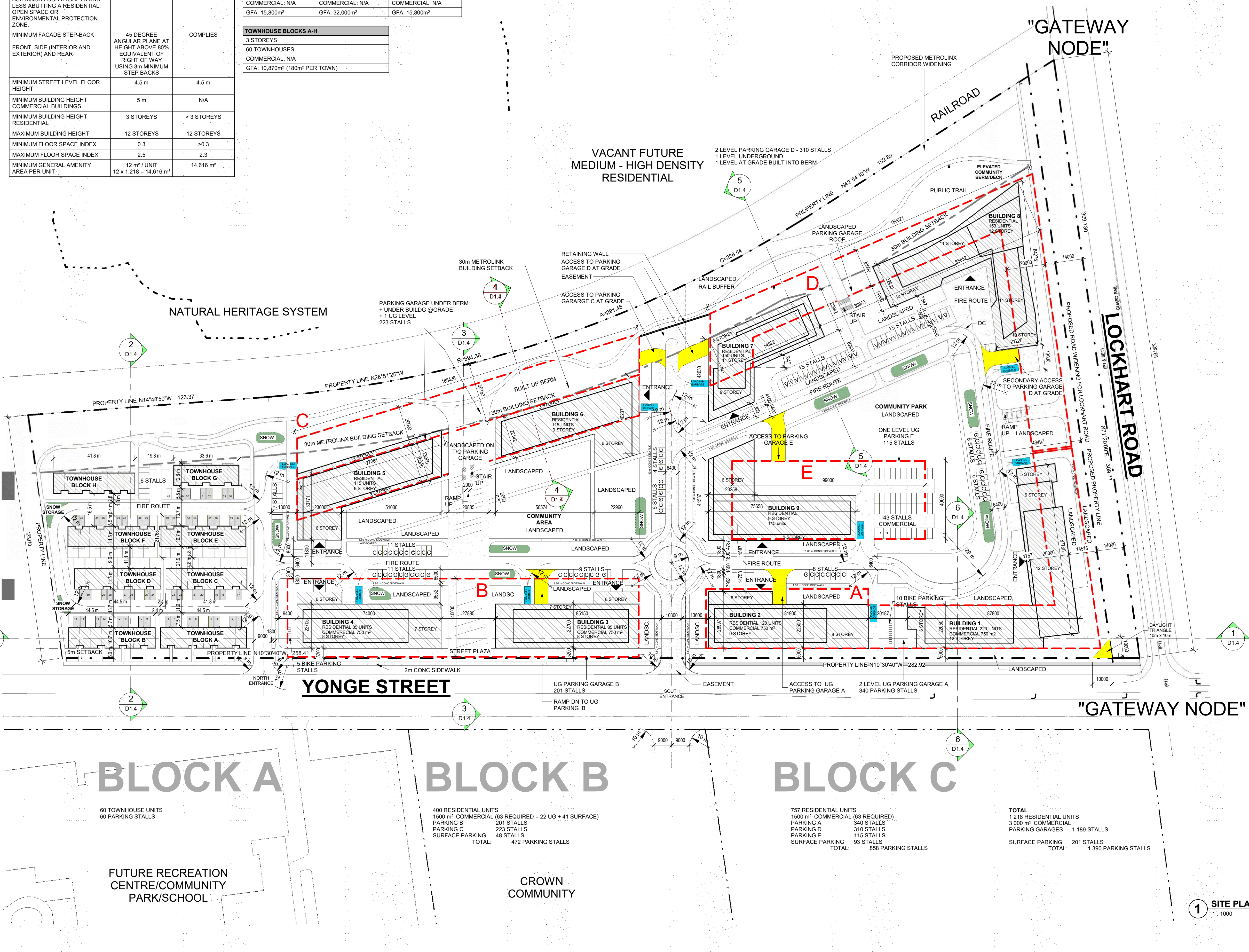
MIXED USE NMU - COMMERCIAL AND APARTMENTS	PERMITTED	PROPOSED
FRONT YARD (MIN) Lockhart Rd. used as frontage as part of zoning application.	0m	5 m
FRONT YARD (MIN)	Max. 50% of frontage within 5m	44%
SIDE OR REAR YARD SETBACK ABUTTING STREET (MIN)	1.5 m	1.5 m
SIDE OR REAR YARD (MIN)	5 m	5 m
NON-RESIDENTIAL BUILDINGS AND RESIDENTIAL BUILDINGS MORE THAN FOUR STOREYS ABUTTING A RESIDENTIAL OPEN SPACE OR ENVIRONMENTAL PROTECTION ZONE	5 m	33 m
MINIMUM SIDE OR REAR YARD SETBACK RESIDENTIAL BUILDINGS FOUR STOREYS AND LESS ABUTTING A RESIDENTIAL OPEN SPACE OR ENVIRONMENTAL PROTECTION ZONE	1.2 m	30 m
MINIMUM FACADE STEP-BACK	45 DEGREE ANGULAR PLANE AT HEIGHT ABOVE 80% EQUIVALENT OF RIGHT OF WAY USING 3m MINIMUM STEP BACKS	COMPLIES
FRONT, SIDE (INTERIOR AND EXTERIOR) AND REAR		
MINIMUM STREET LEVEL FLOOR HEIGHT	4.5 m	4.5 m
MINIMUM BUILDING HEIGHT COMMERCIAL BUILDINGS	5 m	N/A
MINIMUM BUILDING HEIGHT RESIDENTIAL	3 STOREYS	> 3 STOREYS
MAXIMUM BUILDING HEIGHT	12 STOREYS	12 STOREYS
MINIMUM FLOOR SPACE INDEX	0.3	>0.3
MAXIMUM FLOOR SPACE INDEX	2.5	2.3
MINIMUM GENERAL AMENITY AREA PER UNIT	12 m ² / UNIT	14,616 m ²

BUILDING 1	BUILDING 2	BUILDING 3
5+6+12 STOREYS	6+8+9 STOREYS	6+7+8 STOREYS
220 UNITS	120 UNITS	85 UNITS
COMMERCIAL: 750m ²	COMMERCIAL: 750m ²	COMMERCIAL: 750m ²
GFA: 32,400m ²	GFA: 17,000m ²	GFA: 13,500m ²

BUILDING 4	BUILDING 5	BUILDING 6
6+7+8 STOREYS	3+6+9 STOREYS	3+6+9 STOREYS
85 UNITS	115 UNITS	115 UNITS
COMMERCIAL: 750m ²	COMMERCIAL: N/A	COMMERCIAL: N/A
GFA: 13,500m ²	GFA: 14,350m ²	GFA: 14,800m ²

BUILDING 7	BUILDING 8	BUILDING 9
6+9+11 STOREYS	10+11+12 STOREYS	3+6+9 STOREYS
150 UNITS	153 UNITS	115 UNITS
COMMERCIAL: N/A	COMMERCIAL: N/A	COMMERCIAL: N/A
GFA: 15,800m ²	GFA: 32,000m ²	GFA: 15,800m ²

TOWNHOUSE BLOCKS A-H
3 STOREYS
60 TOWNHOUSES
COMMERCIAL: N/A
GFA: 10,870m ² (180m ² PER TOWN)



- GENERAL NOTES**
- DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS.
 - ALL WORK SHALL COMPLY WITH THE 2012 ONTARIO BUILDING CODE AND AMENDMENTS.
 - CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND SPECIFICATIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
 - ALL CONTRACTORS AND SUB-CONTRACTORS SHALL HAVE A SET OF APPROVED CONSTRUCTION DOCUMENTS ON SITE AT ALL TIMES.
 - ALL DOCUMENTS REMAIN THE PROPERTY OF THE ARCHITECT. UNAUTHORIZED USE, MODIFICATION AND/OR REPRODUCTION OF THESE DOCUMENTS IS PROHIBITED WITHOUT WRITTEN PERMISSION. THE CONTRACT DOCUMENTS WERE PREPARED BY THE CONSULTANT FOR THE ACCOUNT OF THE OWNER.
 - THE MATERIAL CONTAINED HEREIN REFLECTS THE CONSULTANT'S BEST JUDGMENT IN LIGHT OF THE INFORMATION AVAILABLE TO HIM AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THE CONTRACT DOCUMENTS, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON THEM ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES.
 - THE CONSULTANT ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THE CONTRACT DOCUMENTS.

No.	Date	Revision

Project No. 19006
 Project Date 2019-06-14
 Drawn by Author
 Checked by MB
 Plot Date / Time 2020-02-04 11:43:44 AM

srm
ARCHITECTS INC.

989 YONGE STREET, BARRIE

OVERALL SITE PLAN

Drawing Scale As indicated
 Status
 PRELIMINARY
 Drawing No. Revision No.
D1.1

Do not scale drawings. Contractors must check and verify all dimensions and report any discrepancies to the Architect. Unapproved use, modification, or reproduction of these documents is prohibited without the written permission of the Architect. The Consultant is not responsible for any errors or omissions made or actions based on the Consultant's account of the Owner. The material contained herein reflects the Consultant's best judgment in light of the information available to him at the time of preparation and is not intended to constitute a contract. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on the Consultant's account of the Owner. C:\Users\cdicu\Documents\19006_989 Yonge Street_2019-02-19_V7_Full Project_cdicu@srmarchitects.ca.rvt

APPENDIX B

RECORD DRAWINGS AND BACKGROUND INFORMATION



BURNSIDE

**Hewitt's Secondary Plan Area
Subwatershed Impact Study
Lover's, Hewitt's and
Sandy Cove Creeks**

**Hewitt's Landowner's Group
c/o Bratty and Partners
7501 Keele Street, Suite 200
Vaughan ON L4K 1Y2**

**R.J. Burnside & Associates Limited
128 Wellington Street West, Suite 301
Barrie ON L4N 8J6 CANADA**

in partnership with:



**Azimuth Environmental Consulting Inc.
642 Welham Road
Barrie ON L4N 9A1 CANADA**

**September 2016
300032860.0000**

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

5.5.5 Hewitt's Creek LID Recommendations

Catchment 5/5-EXT

Catchment ID	5	5-EXT
Catchment Area	32.74	1.65
Impervious %	76%	50%
Dominant Soil Type	Loam	Loam
Effective Soil Type	Loam	Loam
Hydraulic Conductivity	13.2 mm/hr	13.2 mm/hr
LSRCA Hydraulic Conductivity ^A	5.28 mm/hr	5.28 mm/hr
25 mm Runoff Volume (m ³)	6068	206
Required Infiltration Storage Volume^B		
25 mm Runoff (m ³)	26000	N/C
12.5 mm Runoff (m ³)	16000	N/C
5 mm Runoff (m ³)	5500	N/C
Recommended Infiltration Target		
	5 mm	N/C
Recommended Filtration Target		
	20 mm	N/C
LID Opportunities		
Park Block (m ²)	None	None
School/Community Centre (m ²)	32600	None
Accessible NHS Buffer (Linear m)	541	None
ROW (Linear m)	679	85
Pervious Area available for Additional Topsoil (m ²)	78576	8250
SWM Control	LID/SWMF 5	LID/ SWMF 5
Discharge Point	Hewitt's Creek	Hewitt's Creek
Notes		
^A LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)		
^B Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 void ratio		

The majority of Catchment 5 includes non-participating land owners and as such this report does not provide full recommendations for this area. The soils in Catchment 5 are a loam with a low infiltration rate and although infiltration LIDs within this catchment are possible, it is not likely that the 25 mm target can be achieved. We have provided a breakdown for the required infiltration targets and options for Catchment 5 in Appendix G based on the information available.

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

The large school block within Rainsong owned lands at the NW corner of Lockhart Road and Yonge Street provides an opportunity to implement infiltration/filtration LID.

Catchment 6

A summary of LID considerations and recommendations for the catchment are outlined below.

Table 16 LID Considerations – Catchment 6

Catchment ID	6
Catchment Area	14.56
Impervious %	53%
Dominant Soil Type	Loam
Effective Soil Type	Loam
Hydraulic Conductivity	13.2 mm/hr
LSRCA Hydraulic Conductivity ^A	5.28 mm/hr
25 mm Runoff Volume (m ³)	16602
Required Infiltration Storage Volume^B	
25 mm Runoff (m ³)	8000
12.5 mm Runoff (m ³)	5000
5 mm Runoff (m ³)	2000
Recommended Infiltration Target	
	Best Effort
Recommended Filtration Target	
	25 mm
LID Opportunities	
Park Block (m ²)	3400
School/Community Centre (m ²)	None
Accessible NHS Buffer (Linear m)	661
ROW (Linear m)	2036
Pervious Area available for Additional Topsoil (m ²)	68432
SWM Control	LID/SWMP 6
Discharge Point	Hewitt's Creek
Notes	
^A LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)	
^B Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 void ratio	

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

6.3 Sanitary Servicing

There are 11 existing gravity sanitary sewer connections identified in the Sanitary Servicing Master Plan. We provide Table 8.2A of the Wastewater Collection Master Plan which details the potential connection locations below for ease of reference.

Wastewater Collection Master Plan
City of Barrie
October 2013 Final



Table 8.2A Summary of Available Connection Points				
Connection Point	Location Description	Manhole Identification	Downstream Pipe Size (mm)	Invert Elev. (m)
Hewitt's Land				
E1	Fenchurch Manor and Bartor Boulevard	SAP09044	250	251.00 ¹
E2	Thicketwood Ave. and Bartor Boulevard	SAP09067	300	241.70
E3	Patrick Dr. & Seline Cres.	SAP090006A	450	243.97
E4C	Mapleview Drive East and Dean Ave.	SAP25121	250	265.227
E4B	Mapleview Drive East and Goodwin Drive	SAP25122	250	263.18
E4A	Mapleview Drive East and St. Crescent	6940	250	259.793
E5	Royal Jubilee & Mapleview Drive	SAH08044 ²	825	237.86
E6	End of current Unicorn Lane	SAH09043	375	256.80
E7	End of current Regina Road	SAH08021	250	257.00
E8	Winchester Terrace and Empire Drive	SAH08063	300	253.87
E9	Winchester Terrace and Sovereigns Gate	SAH08066	250	255.40

Note 1: No invert elevation information available, an invert elevation of 251.00 was assumed in the models.

Note 2: Through the proposed manhole SAH09099 on the Annexed Area northern boundary, SAH09099 and SAH08044 were used in Annexed Area models and pre-2010 City boundary models respectively.

Please note there appears to be several discrepancies between the inverts and sizes of the sanitary shown in the above Table. We have utilized the information from the as-constructed drawing sets (where available) for the purposes of this Report, however we recommend that the developer confirm the sizes and inverts prior to completing draft plan design.

- Connection Point E1 – The as-constructed drawings indicate the sanitary sewer invert is 253.66, significantly higher than the assumed elevation of 251.00
- Connection Point E2 – The information available in the as-constructed record drawings. The record drawings indicate an invert of 241.86 and a 375 mm dia. pipe size for the stub that extends east into the Hewitt's SPA. The downstream pipe is a 375 mm dia. at an elevation of 241.70.
- Connection Point E3 – The as-constructed drawings indicate a slight difference in the invert elevation of 244.00 vs the above table showing 243.97
- Connection Point E4C – The as-constructed drawings indicate the north invert for this connection to be at an elevation of 265.13 not 265.227 as indicated in the Table
- Connection Point E4A – The SAMH at the intersection of St. Paul's Crescent and Mapleview Drive was installed with an 11 m long stub extending south towards the edge of the ROW. The invert of the 250 mm dia. stub is listed as 260.20 and the invert of the outlet pipe to the north is listed as 259.793 as indicated in the Table above.

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

There are a number of sanitary works described in Section 8.2 of the Master Plan which are required to be constructed primarily in Phase 1 of SPA which will also service Phases 2, 3 and in part post-2031 as follows;

- 550 m of 825 mm Hewitt's Trunk sanitary sewer north from Mapleview Drive East along the pre-2010 City boundary
- A proposed extension of the Hewitt's Trunk sanitary sewer on Mapleview Drive East to the current City boundary
- A proposed trunk sewer to connect to the Hewitt's Trunk along Mapleview Drive East to covey Phase 1, Phase 3 and Post 2031 wastewater flows
- Construction of new sewage pumping station in Phase 3 at the intersection of 20th Sideroad and Mapleview Drive. A second phase would be implemented to accommodate post-2031 sewage flows.

The Master Plan for sanitary servicing for the Hewitt's SPA identifies the preferred servicing alternative for the Preferred (future) Land Use Concept to be a combination of a pumping station (Option E1) and deep gravity sewers (Option E3).

The updated sewer design criteria for the City identified the following key design components:

- Design capacity not to exceed 85% full flow
- A peaking factor from 1.5 to 4
- A minimum slope of 0.4% for local sewer
- A minimum cleansing velocity of 0.75 m/s when flowing full

In addition the City of Barrie Sanitary Sewage Collection System Policies and Design Guidelines 2012 are to be used including the following;

- Average Daily Residential Demand of 225 l/cap/day
- Institutional/Commercial Demand of 28 m³/ha
- Industrial Demand of 35 m³/ha (select lands only)

The sanitary tributary areas and associated flows calculated by the Master Plan have been updated and adjusted to reflect the current conceptual land use plan compiled from information available from the Hewitt's Landowner's Group. Please refer to Figure 13 for the updated sanitary catchment area plan.

The calculated peak sewage flows to the 11 connection points are reproduced from Table 8.4 from the Master Plan below along with the updated flows based on the revised conceptual plan. Please note that we have not extended the calculation beyond 2031 as that is beyond the scope of this Report.

Table 39 Calculated Sewage Flows to Existing Connection Points

Connection	Manhole	2031	2031	Receiving
------------	---------	------	------	-----------

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

Point	Identification	Master Plan	SIS	Pipe Capacity
		Discharge Flow (L/s)	Discharge Flow (L/s)	(L/s)
E1	SAP09044	5	7.3	59.5
E2	SAP09067	77	20.8	96.0
E3	SAP09006A	66	79.8	156.2
E4A	6940	24	34.5	40.3
E4B	SAP25122	11	n/a	n/a
E4C	SAP25121	1	n/a	n/a
E5	SAH08044	129	157.7	1435.4
E6	SAH09043	2	2.3	229.3
E7	SAH08021	8	1.0	40.8
E8	SAH08063	16	14.6	53.0
E9	SAH08066	14	15.5	37.6

The proposed sanitary flows and areas based on the revised conceptual plan vary (in some cases significantly) from the proposed Master Plan flows, however the proposed flows are less than the capacity of the receiving pipe. The full downstream pipe network should be reviewed with the City to confirm capacity to the discharge point.

In the case of connection point E4A, which includes the sanitary discharge from the Sobey's lands, the downstream pipe capacity may limit development. At detailed design, the pipe discharge should not exceed 85% capacity of the receiving pipe, which may limit the number of units within this parcel. Additional detailed analysis will be required to confirm pipe sizing and the distribution of the proposed units within the development area.

6.4 Water Distribution

6.4.1 External Water Supply

The municipal water supply for the City of Barrie is currently obtained from twelve groundwater wells as well as several surface water sources, with a total combined capacity of 81.3 million liters per day (MLD), with an additional two wells at design stage. The City is divided into five major pressure zones, with the two southern zones (2S and 3S) being serviced by surface water sources, and the remaining three northern zones (1, 2N and 3N) being serviced by groundwater sources.

The Hewitt's SPA lies within pressure zone 2S, which is serviced by a surface water treatment plant (SWTP) located on the shore of Kempenfelt Bay. The ultimate capacity of the plant is 240 MLD, however it is being implemented in phases, with the initial capacity at 60 MLD.

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

The Master Plan identified that the overall existing water supply for the City of Barrie is sufficient for the projected demand, to the 2031 projected demand, however the Hewitt's SPA lies within southern pressure zone 2S, and it is anticipated that if the five pressure zones remain distinct, then the Phase 1 surface water treatment plant capacity will be exceeded by 2.0 MLD by 2029.

The identified solutions to resolve the projected shortfall in capacity is to implement water efficiency measures and through the optimization of existing unit processes in the surface water treatment plant, including upgrading one of the low-lift pumps, increasing the primary membrane operation temperature and several other minor upgrades.

The Master Plan identified additional external trunk watermain upgrades to meet Maximum Day (potable water) and fire flow demands for the Hewitt's SPA (Section 5.2, Water Storage and Distribution Master Plan). The main upgrades include the following;

- 400 mm dia. trunk main on Big Bay Point Road between 20th Sideroad and Versailles Crescent.
- 600 mm dia. trunk main connecting Mapleview Drive East to Big Bay Point Road west of Royal Jubilee Drive.
- 750 mm dia. trunk main connecting Mapleview Drive East to Big Bay Point Road at Madeline Drive.
- 600 mm dia. trunk main on Mapleview Drive East between Madeline Drive and Royal Jubilee Drive.
- 750 mm dia. trunk main connecting Lockhart Road to Mapleview Drive along Huronia Road.
- 200 mm & 300 mm dia. mains on 20th Sideroad and Lockhart Road.

6.4.2 Internal Water Distribution

The internal water distribution network as proposed within the secondary plan is shown on "Drawing 2". The internal network consists of 200 mm and 300 mm dia. watermain pipes connecting the external network on Lockhart, 20th Sideroad, Mapleview Drive East and Big Bay Point Road.

The network as proposed in the Secondary Plan has been modified to reflect the current conceptual plan developed by the Owner's Group. Please refer to Figure 12 for a revised version of the watermain network. Efforts have been made to maintain the same number of connections and approximate routing configurations that was presented in the Secondary Plan.

6.5 Storm Sewer Network

The storm sewer network is to be designed for the 1 in 5 year storm event without surcharge as per the City of Barrie engineering standards. There are several notable

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks
September 2016

exceptions where proposed grading requires the implementation of 100 year capture storm sewers. The areas requiring larger storm sewer pipes are as follows;

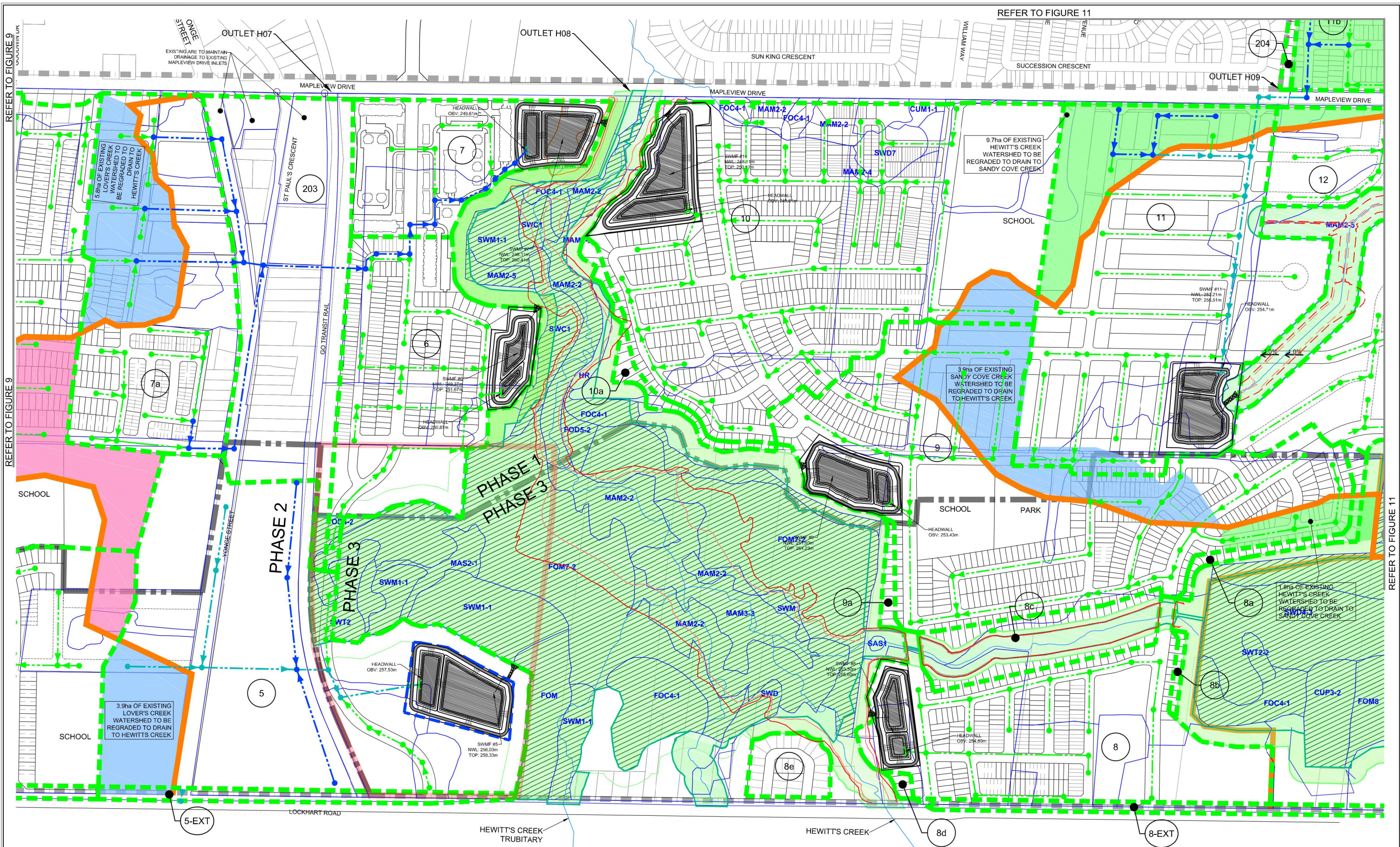
- A 100 year capture pipe is required in the south west corner of the study area to service a portion of the Van Der Heyden and BEMP 1 lands. The 100 year capture pipe will service 3.8 ha of residential area and extend north from Lockhart Road to SWMF#2.
- A 100 year capture pipe is required to convey runoff from the LM Barrie Development south under Mapleview Drive, through the Bulut Lands to SWMF#11

Please refer to Figures 9 to 11 for the storm sewer design plans as well as to Section 5.5 of this Report for additional information on routing within each catchment.

7.0 Future Study Requirements

A number of site specific studies will be required for Draft Plan approval and/or Detailed Design approvals as follows;

1. Additional geotechnical information will be required for each development, including additional boreholes and test pits to confirm the dominant soil type, in-situ soil permeability tests to confirm saturated hydraulic conductivity, groundwater monitoring to confirm groundwater levels with respect to proposed grading, and recommendations for construction. A slope stability study is also required for a single area identified within the Crisdawn Construction Lands. Assumptions within the SIS are based on preliminary geotechnical work and there may be areas of higher (or lower) infiltration rates that may allow (or hinder) the implementation of LID. All areas within the Hewitt's SPA will require additional geotechnical work to confirm recommendations within this report.
2. A detailed floodplain analysis should be completed for the southern tributary of Sandy Cove Creek to confirm the floodplain extents adjacent to Phase 4 development lands within the Dorsay Development.
3. All lands owned by entities that are non-participating in the Hewitt's Landowners Group may need to provide additional details and information to the satisfaction of the City of Barrie and LSRCA in conformance with the guidelines for a subwatershed impact study.
4. All lands not specifically identified within this SIS report which are within Post 2031 development phases may need to provide additional details and information to the satisfaction of the City of Barrie and LSRCA in conformance with the guidelines for a subwatershed impact study.



REFER TO FIGURE 9

REFER TO FIGURE 9

REFER TO FIGURE 11

REFER TO FIGURE 11

LEGEND

- NHS LIMITS
- NHS BUFFER LIMITS
- 100 YEAR CAPTURE AREA
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY
- ORIGINAL WATERSHED BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

FLOW DIRECTION

STORM SEWER SYSTEM

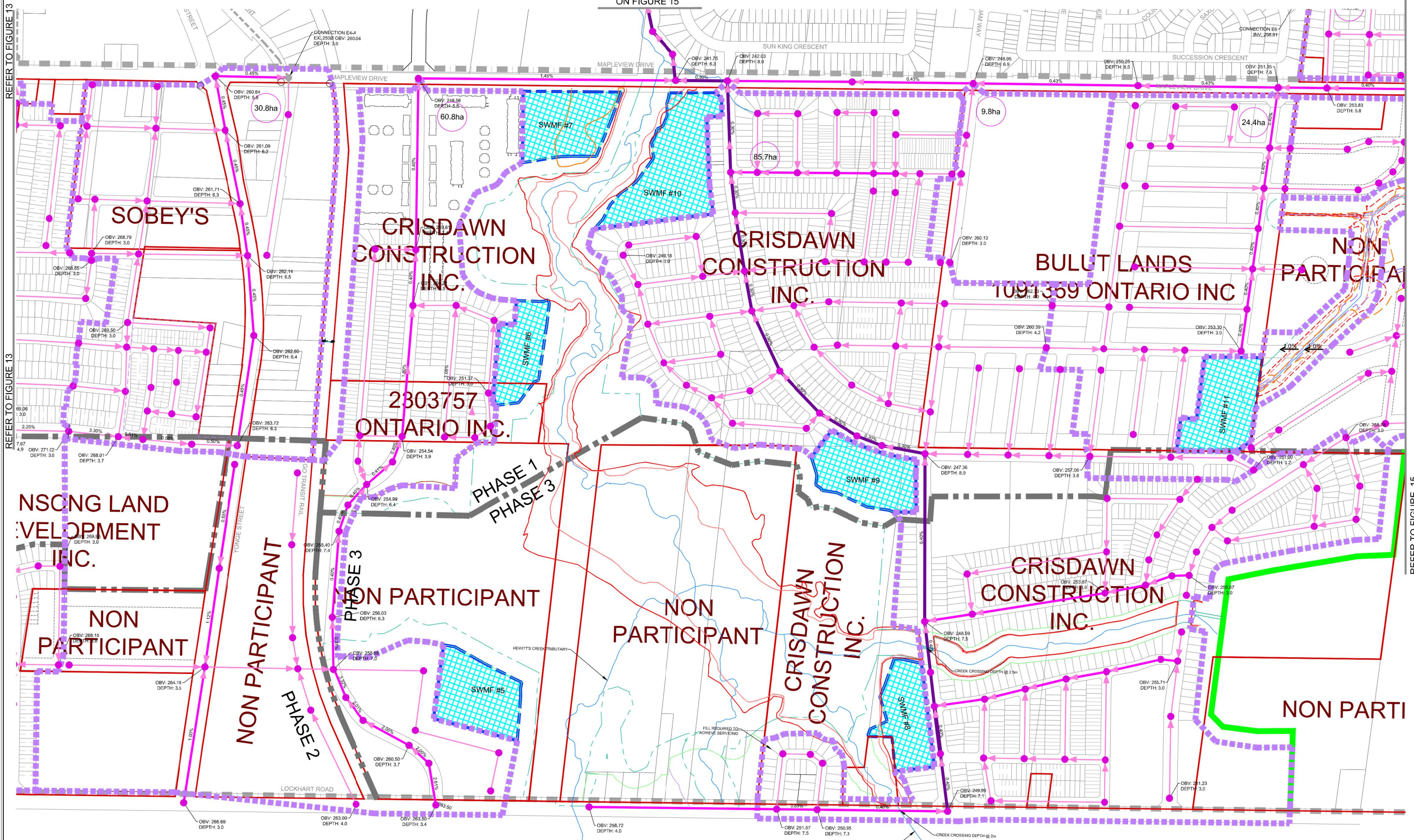
- 100 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
- 100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
- 5 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
- EXISTING STORM SEWER, MANHOLE

NOTE: *SCALE ONLY VALID FOR 24"x 36" SIZED PLOTS*

<p>BURNSIDE</p> <p>HEWITT'S CREEK LANDOWNERS GROUP INC.</p>	<p>HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY PROPOSED STORM SEWER PLAN (2 OF 3)</p>			<p>FIG 10</p>
	<p>Client</p>	<p>Drawn</p>	<p>Checked</p>	
	<p>BH</p>	<p>CC</p>	<p>16/09/07</p>	<p>Project No.</p>
	<p>Scale</p>	<p>H 1:3,000</p>	<p>300032860</p>	

REFER TO DETAIL A
ON FIGURE 15

REFER TO FIGURE 15



REFER TO FIGURE 13

REFER TO FIGURE 13

REFER TO FIGURE 15

LEGEND

- SURVEYED NHS LIMIT (2015)
- NHS BUFFER LIMIT
- 2031 PHASE LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- DEV. LIMITS
- PHASING LIMITS
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA, FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

FLOW DIRECTION ARROW
 SANITARY DC TRUNK SEWER
 SANITARY LOCAL TRUNK SEWER
 SANITARY LOCAL COLLECTOR SEWER
 SANITARY FOREMAIN
 SANITARY MAN-OLE
 EXISTING SANITARY SEWER
 PUMP STATION
 FLOW DIRECTION ARROW DEPICTS SEWER CONTINUES ON IN ARROW DIRECTION

NOTE: *SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS*

 BURNSIDE	HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY PROPOSED SANITARY SEWER PLAN (2 OF 3)		
	Client HEWITT'S CREEK LANDOWNERS GROUP INC.	Drawn BH	Checked CC
Scale H 1:3,000		Project No. 300032860	
			Figure No. FIG 14



Ballymore
750 Lockhart Road, Barrie

Functional Servicing Report

March 2019

Submitted by:

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Project Number: 1964

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 Appendix C Stormwater Management Calculations
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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1 st	March 2019	Draft Plan Approval	City of Barrie, Lake Simcoe Region Conservation Authority, Metrolinx

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Ballymore Barrie (Building) Corp. to prepare a Functional Servicing Report for a proposed development within the Hewitt's Secondary Plan, located in the City of Barrie.

1.1 Purpose

The Functional Servicing Report (FSR) has been prepared in support of the Draft Plan of Subdivision application for the proposed development. The Draft Plan of Subdivision is provided in **Appendix A**. The subject lands are located within two phases of the Hewitt's Secondary Plan, as shown in **Appendix B**. A large Natural Heritage Area is located in the centre of the site. The study area within Phase 1 of the Secondary Plan are located north of the natural heritage area and consists of low density residential with associated roads. The study area within Phase 3 of the Secondary Plan is located south of the natural heritage area and is composed of the following land uses:

- medium density residential,
- high density residential,
- SWM block, and
- proposed roads.

The purpose of this report is to demonstrate that the proposed development can be graded and serviced in accordance with the City of Barrie, Lake Simcoe Region Conservation Authority (LSRCA) and the Ministry of Environment Conservation and Parks (MECP) design criteria.

1.2 Study Area

The study area is approximately 25.66 ha in size and is bound by a natural heritage area to the east, a future residential subdivision to the north, Lockhart Road to the south and the existing Metrolinx rail corridor and future mixed use residential development to the west as shown in **Figure 1.1**. Per the Hewitts Secondary Plan, the study area is comprised of Phase 1 and Phase 3 lands. As all the lands are assessed as part of this application, the two development phases are hereafter referred to as north lands and south lands.

1.3 Background Servicing Information

In preparation of the site servicing and SWM strategies, the following design guidelines and standards were used:

- Stormwater Management Policies and Design Guidelines, City of Barrie (November 2009);
- Sanitary Sewer Collection System Policies and Design Guidelines, City of Barrie (September 2012);
- Water Transmission and Distribution Policies and Design Guidelines, City of Barrie (May 2015);
- Low Impact Development, Interim Guidance Document, City of Barrie (September 2017);

- Lot Grading and Drainage Standards and Design Manual, City of Barrie (June 2016);
- LSRCA Technical Guidelines for Stormwater Management Submissions (September 2016);
- Lake Simcoe Protection Plan (July 2009);
- LSRCA Phosphorus Offsetting Policy (September 2017);
- MECP Stormwater Management Planning and Design Manual (March 2003); and
- Ministry of Transportation (MTO) Drainage Management Manual (1997).
- Guidelines for New Development in Proximity to Railway Operations, May 2013

The site servicing and SWM strategies in this report are based on the following reports:

- A Geotechnical Investigation for Proposed Residential Development, 750 Lockhart Road, Soil Engineers Ltd., March 2019
- Hydrogeological Study in Support of Draft Plan Ballymore Building (Barrie) Corp., Barrie Ontario, RJ Burnside, dated January 2019;
- Water Distribution Analysis, Laughlen Municipal Consulting, dated March 2019,
- Environmental Noise Feasibility Study, Valcoustics Canada Ltd., February 2019
- Functional Servicing Report, Campbell Subdivision, The Jones Consulting Group, February 2017,
- Functional Servicing Report, Crisdawn Construction Inc. – Hewitt’s Gate Subdivision, The Jones Consulting Group, February 2017,
- Preliminary Stormwater Management Report, Campbell Subdivision, The Jones Consulting Group, February 2017,
- Preliminary Stormwater Management Report, Crisdawn Construction Inc. – Hewitt’s Gate Subdivision, The Jones Consulting Group, February 2017,
- Hewitt’s Secondary Plan Transportation Improvements Municipal Class Environmental Assessment, Phases 3&4;
- Traffic Impact Study in Support of Draft Plan Ballymore Building (Barrie) Corp., Barrie Ontario, TMIG, dated March 2019; and
- Hewitt’s Secondary Plan Area Subwatershed Impact Study (SIS) Lover’s, Hewitt’s, and Sandy Cove Creeks prepared by R.J. Burnside November 2017.

Excerpts from the above listed documents are included in **Appendix B** or as noted in the following sections.

2.0 STORMWATER MANAGEMENT

2.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the design guidelines and standards listed in **Section 1.3**, predominantly in reference to the approved SIS. The stormwater runoff criteria are summarized below in **Table 2.1**:

Table 2.1 – Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Proposed peak flow controls are to match approved unitary discharge rates as determined through the SIS. Proposed runoff volume controls require capture and treatment of runoff from a 25 mm rainfall event over all new impervious areas. For the North lands the targets are best efforts infiltration and 25 mm of filtration over all new impervious areas. For the South lands the targets are 5 mm of infiltration and 20 mm of filtration over all new impervious areas.
Quality Control	MECP Enhanced Level Protection (80% TSS Removal).
Erosion Control	Detention of the runoff volume from a 25 mm 4-hour Chicago storm for a minimum of 24 hours.
Water Balance	Maintain existing groundwater recharge rates and appropriate distribution, to the extent feasible, ensuring the protection of related hydrology ecologic functions.
Phosphorus Budget	A best effort shall be employed such that any increase in loading is kept to a minimum with the target of “zero” increase in loading. Regardless of existing loading, the removal of 80% of the proposed annual Total Phosphorus load is required. The remaining proposed phosphorus loading conveyed offsite (if any) is to be offset per the LSRCA Phosphorus Offsetting Policy.

2.2 Existing Drainage

As shown on **Figure 2.1**, the existing site generally drains primarily to the existing natural heritage feature (NHS) located in the center of the property via overland flow. Additional external flows from the west are conveyed to the existing NHS via an existing 750 mm diameter culvert crossing under the existing Metrolinx track running along the west property limit.

2.3 Hewitt’s Secondary Plan SWM Catchments

As outlined in the SIS (**Appendix B**), the proposed development is within proposed SWM Catchments 5 and 6 which convey runoff to proposed SWMF #5 and SWMF #6 respectively.

The proposed SWMF #6 is located partially within each of the external Campbell and Crisdawn lands as identified in the respective SWM reports (**Appendix B**). The North lands convey runoff to SWMF #6.

The proposed SWMF #5 is located within the proposed development within the South lands and provides stormwater treatment for the South lands as well as external lands adjacent to Yonge Street as shown on Figure 10 in the SIS (**Appendix B**).

2.3.1 Allowable Release Rate – SWMF #6

The allowable release rates from SWMF #6 are per the approved unitary discharge rates as determined as part of the design of SWMF #6 to the north (by others). The North lands will convey minor system drainage uncontrolled to the north while conveying overland flow via the proposed municipal ROW's. The proposed drainage condition is discussed further in **Section 2.4** below.

2.3.2 Allowable Release Rate – SWMF #5

The allowable release rate from the proposed SWMF #5 is established based on the allowable unitary discharge rates as defined in the SIS. As shown on **Figure 2.2**, the proposed SWMF#5 receives internal drainage from the south lands as well as external flows for a total drainage area of approximately 37.26 ha.

The allowable release rate calculation based on the total drainage area is shown in **Appendix C-2**, and summarized on **Table 2.2**.

Table 2.2 – SWMF #5 Allowable Unit Release Rate Summary

Storm Event	Unit Release Rate (m ³ /s/ha)	Allowable Release Rate (m ³ /s)
2 Year	0.006	0.224
5 Year	0.011	0.410
10 Year	0.016	0.596
25 Year	0.023	0.857
50 Year	0.029	1.081
100 Year	0.036	1.341

2.4 Best Management Practices

In accordance with the Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (2003), a review of stormwater management best practices was completed for the subdivision components of the proposed development using a treatment train approach, which evaluated lot level, conveyance system and end-of-pipe alternatives. Best Management Practices for external lands and internal future development blocks will be assessed as part of future applications.

The following site characteristics were taken into consideration:

- The site has existing slopes of approximately one to four percent and slopes towards the existing NHS located in the centre of the site;
- Based on the Hydrogeological Study, site soils consisted of silty and sandy soils with percolation rates ranging from 54 to 79 mm/hr;
- Within the installed site wells, groundwater was observed at depths ranging between 0 and 4 m below existing grade;
- The proposed development is approximately 25.66 ha and consists of a proposed SWM facility (SWMF #5), townhouses, open space, future residential development and municipal roads; and
- The proposed development provides groundwater contributions to three wetland areas, Wetland #3, Wetland #4 and Wetland #5.

2.4.1 Lot Level Controls

Lot-level controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system. These controls are proposed on private properties. Incorporating controls that do not require frequent maintenance can be an effective method in the treatment train approach to SWM.. The following lot level controls have been evaluated for use in the study area:

Increased Topsoil Depth – An increase in the restored topsoil depth on lots can be used to promote lot level infiltration and evapotranspiration. Increased topsoil depth will contribute to lot level quality and water balance control. A minimum depth of 0.30 m is proposed in all landscaped areas.

Passive Landscaping – Planting of gardens and other vegetation designed to minimize local runoff or use rainwater as a watering source can be used to reduce rainwater runoff by increasing evaporation, transpiration, and infiltration. By promoting infiltration through passive landscaping, water quality and quantity control is provided for the volume of water retained. Passive landscaping can provide significant SWM benefits as part of the overall treatment train approach for the proposed development. While encouraged, benefits are not quantified as part of the design.

Roof Runoff to Soak-away Pits – Directing roof runoff to subsurface soak-away pits can be used to promote infiltration. By promoting infiltration, water quality and quantity control is provided for the volume of water retained. Infiltration of roof runoff can provide a significant SWM benefit as part of the overall treatment train approach. The feasibility of this practice can be explored for use on the future development blocks. Feasibility should be further assessed should groundwater elevations permit based on the detailed evaluation to be undertaken at the detail design stage.

Roof Runoff to Retention Cisterns – Directing roof runoff to rainwater retention cisterns (i.e. rain barrels or greywater re-use) can contribute to water quality and water balance control. The retained rainwater can be harvested for re-use such as irrigation and/or greywater use. A typical rain barrel ranges in size from 190 to 400 liters. Feasibility of retention cisterns will be determined by the home builder and while encouraged, is not quantified as part of the design.

Green Roofs – Best suited for flat roofs, green roofs provide rainwater retention in the growing medium where water is evaporated, evapotranspired, or slowly drains away after the rainfall event. The proposed development initially consists of ground related townhouse product with sloped roofs and therefore is not suitable for implementing Green Roofs. The built form for the future development blocks may be more amenable to green roofs, and would be recommended should the opportunity become available.

Rooftop and/or Parking Lot Detention Storage – Often utilized with large rooftop or parking lot footprints, flow attenuation for quantity or extended detention control can be provided via a flow restriction with stormwater storage provided via ponding either on rooftops or parking lots. The proposed development does not have any large flat rooftops or parking lots and therefore this is not suitable.

Roof overflow to Grassed Areas – Directing roof leaders to grassed areas will contribute to water quality and water balance control by encouraging stormwater retention. Roof leaders can be directed to grassed areas where there is grass, however, if there is no or very limited grassed areas, roof leaders should be connected to the storm sewer to eliminate the hazard of ice accumulation. It is recommended to direct roof leaders to the front and/or rear yards where possible to promote infiltration and to avoid discharging to impervious areas directly connected to the storm sewer per City of Barrie guidelines.

Pervious Pavement – By encouraging infiltration and filtration, pervious pavement within the proposed driveways can contribute to water quality, balance and erosion control. Due to potential of removal by homeowners, permeable pavers are not recommended for the residential portion of the site and are not generally accepted by the City of Barrie within the municipal ROWs.

Vegetated Filter Strip – At source filtration and infiltration may be encouraged through the use of vegetated filter strips by directing sheet flow from impermeable areas to the strip prior to being collected via the storm system. Vegetated filter strips are best suited to parking lot areas with landscaped borders or islands or within buffer areas.

A summary of the suitability of potential lot level controls for the proposed developments is provided in **Table 2.3**.

2.4.2 Conveyance Controls

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility and present opportunities to distribute stormwater management techniques throughout a development. The following conveyance controls have been evaluated for use in the study area:

Grassed Swales – A grassed swale will promote infiltration, filtration, and evapotranspiration, contributing to water quality and quantity control. It is noted that smaller grassed swales will potentially be used at the individual lot grading level.

Exfiltration at Rear Lot Catchbasins – Where rear lot catchbasins are required due to grading constraints, a perforated pipe system can be incorporated into the rear lot catchbasin design to promote infiltration of stormwater runoff from the rear lots and roof areas. By promoting

infiltration, water quality and quantity control is provided for the volume of water retained. As it is preferred by the City of Barrie that municipal lands be utilized to promote infiltration over rear lot catch basins, this is not recommended.

Bioretention – Whether through bioswales, rain gardens, tree pits, etc. bioretention promotes infiltration, filtration, plant uptake and evapotranspiration, contributing to water quality, quantity and erosion control. These practices are feasible and therefore proposed throughout the development.

A summary of the suitability of potential conveyance controls for the proposed developments is provided in **Table 2.3**.

2.4.3 End-of-Pipe Controls

Stormwater management facilities at the end of pipe receive stormwater flows from a conveyance system and provide treatment of stormwater prior to discharging flows to the receiving watercourse. While lot level and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the proposed development. The following end of pipe controls have been evaluated for use in the study area:

Wet Ponds, Wetlands, Dry Ponds – Sized in accordance with the MECP criteria, these end of pipe facilities can provide water quality, quantity, and erosion control treatment. As outlined in the SIS, an end of pipe wet pond is proposed to provide water quality, quantity, and erosion control treatment for the proposed development. The SIS also notes that the wet pond facility could be designed as a constructed wetland should the block accommodate it as discussed further in **Section 2.5**.

Manufactured Treatment Device – A properly sized Manufactured Treatment Device (MTD) can provide MECP Enhanced (Level 1) treatment and contribute to the treatment train approach for water quality control. Any MTD specified is required to have New Jersey Department of Environmental Protection (NJDEP) and/or Environmental Testing Verification program (ETV) certification. However, as SWMF #5 is proposed to provide MECP “Enhanced” level protection, MTD units are not required. MTD units may be proposed in future development blocks or external to the proposed development but within the SWM #5 catchment boundary.

2.4.4 Selection of Low Impact Development Practices

Table 2.3 summarizes the suitability of the various stormwater management controls identified for the proposed development.

Table 2.3 - Recommended Stormwater LID Practices

Stormwater Management Practice	Feasible	Recommended
Increased Topsoil Depth	Yes	Yes
Passive Landscaping	Yes	Yes
Roof Leader to Soak-away Pits	Yes (groundwater dependent)	Yes (groundwater dependent)
Roof Runoff to Retention Cisterns	Yes	Yes
Green Roofs	No	No
Rooftop and/or Parking Lot Detention Storage	No	No
Roof Overflow to Grassed Areas	Yes	Yes
Pervious Pavement	No	No
Vegetated Filter Strips	Yes	Yes
Grassed Swales	Yes	Yes
Exfiltration at Rear Lot Catchbasins	Yes	No
Bioretention	Yes	Yes
Wet Ponds, Wetlands, Dry Ponds	Yes	Yes
Manufactured Treatment Device	Yes	No

To ensure the BMP's selected were amenable to all applicable agencies, a design charrette was completed as outlined in the following section.

2.5 Design Charrette

A design charrette was completed on December 13, 2018 at the City of Barrie in conjunction with the conformity review process. Meeting minutes from the design charrette are included in **Appendix D** and the following LID measures were discussed and agreed to in principle at the meeting.

As confirmed through the design charrette, centralized LID facilities, while preferred by the City, are not practical for the proposed development aside from the SWM facility as shown on **Figure 2.4**. Necessary to achieve the volume control criteria, ROW based LIDs have been explored and their potential locations are shown on **Figure 2.4**.

2.5.1 Catchbasin Exfiltration Trenches in ROW

Catchbasin exfiltration trenches are feasible within a portion of the proposed 18 m municipal ROWs in areas with a sufficient depth of groundwater. The potential locations are limited to

the north lands and are shown on **Figure 2.4**. Runoff captured by the street catchbasins will be conveyed to the exfiltration trench located in the boulevard. Catchbasins will be provided with a deep sump and pre-treatment device (Goss Trap, CB Shield, etc.) to prevent floatables and sediment from entering the exfiltration trench. Runoff in excess of the capacity of the exfiltration trench will overflow to the mainline storm sewer. A preliminary detail of the potential catchbasin exfiltration system contemplated within an 18 m ROW is shown on **Figure C-4** in **Appendix C-3**.

2.5.2 Rain Gardens in Roundabouts

Rain gardens are feasible in the centre portion of the proposed roundabouts within municipal ROWs. The potential locations are shown on **Figure 2.4**. The standard roundabout grading would be modified to direct the majority of the runoff to the centre where a raingarden with overflow catchbasin would be located. Major system flows would still be directed downstream to SWMF #5.

When runoff enters the rain garden, it will filter through an engineered soil media sized to achieve water filtration targets. An underdrain, located at the bottom of the rain garden will collect the filtered water and convey the water to the proposed storm sewer. In areas with sufficiently deep groundwater, the rain gardens are to be unlined and equipped with a raised discharge pipe to the proposed storm sewer to promote infiltration. In areas of high groundwater, the potential rain gardens would be lined and equipped with a discharge pipe at the subdrain to allow for filtration and discharge to the proposed storm sewer. A preliminary detail of the potential rain garden layout within the roundabout is shown on **Figure C-5** in **Appendix C-3**.

2.5.3 Tree Box LID in ROW

While City of Barrie criteria does not encourage LID's on Collector Roads, the proposed development has over 500 m of Collector Road that is adjacent to an NHS area with no residential development on either side of the ROW. In addition there is over 200 m of single loaded ROW, and long segments of Collector Road without driveways in which Tree Box based LID's could be implemented. The potential locations are shown on **Figure 2.4**.

Tree Box based LIDs consist of a bioretention system below the standard street trees in the boulevard. The bioretention system has a number of benefits including quality control via infiltration and/or filtration, promotes healthy root growth for street trees and therefore also adds to the aesthetic of the ROW. Runoff enters the system via the street catchbasins which provide pre-treatment via the catchbasin sump. If placed in an area where infiltration is possible, an overflow system is included to ensure the trees to do not become oversaturated. Where groundwater levels to not permit infiltration, a bottom draw would convey filtered water to the storm sewer system. A preliminary detail of the potential tree pit LID layout within the 24 m ROW is shown on **Figure C-6** in **Appendix C-3**.

2.5.4 Hybrid Bioswales in Rear Yards/Buffer

As shown on **Figure 2.4**, bioswales are proposed adjacent to rear lots within the first 15 m of the 30 m Environmental Protection (EP) buffer along the northeast limit of the site along the

buffer from Block 16 to Block 13 adjacent to Street 2 ultimately outletting to the external future storm sewer to the north.

The proposed bioswale is required to be lined as groundwater levels in this area are near surface. It is noted that the proposed bioswale could be incorporated into a future trail network that connects the external development to the north down to SWMF #5 via Kneeshaw Drive.

A preliminary detail of the proposed bioswale is shown on **Figure C-7** in **Appendix C-3**. It is noted that this measure contributes to SWMF #6 and the requirement for this measure would be determined through the detailed design of the future SWM facility.

2.6 Proposed Storm Drainage

As shown on **Figure 2.2**, minor system (storm events up to and including the 5 year storm) and major system (storms greater than the 5 year event up to and including the 100 year storm event) runoff from Catchment 401 (north lands), will be conveyed north to the future SWMF #6 (to be designed by others). Per Drawing SWM-2 from the Preliminary SWM Report for the lands to the north (**Appendix B**), a drainage area of 3.29 ha at a runoff coefficient of 0.70 (72% impervious) was contemplated for the proposed development. Per **Figure 2.2**, the proposed drainage area to SWMF #6 is 2.53 ha at an imperviousness of 73%. Therefore the proposed development is in compliance with the functional design of external storm infrastructure.

Minor and major system runoff from Catchment 203 will be conveyed to the proposed SWM facility (Catchment 204) via the internal storm sewers and overland flow.

Minor and major system runoff from Catchment 501 will continue to be conveyed via overland flow through the Metrolinx corridor to the existing 750 mm diameter CSP culvert to the north which is to be extended in the proposed condition.

Minor system runoff from Catchment 304 will be captured at the south end of the proposed Kneeshaw Drive storm sewer adjacent to Lockhart Road and conveyed to the proposed SWMF #5. Major system runoff from Catchment 304 will continue to be conveyed to Hewitt's Creek via the existing ditch system as it is not feasible to direct overland flow to the proposed SWMF #5.

Minor and major system runoff from external lands including Catchments 301, 302 and 303 will be captured and conveyed to the proposed SWMF #5 via the proposed servicing easement and proposed 100 year storm sewer which crosses the Metrolinx corridor and enters the proposed development west of the proposed SMWF #5.

2.7 Proposed Stormwater Management Plan

2.7.1 Quantity Control

The proposed end-of-pipe SWMF #5 will control proposed flows from the majority of proposed development, west and south of the NHS as well as the external lands to the west to the allowable release rates outlined in **Section 2.1.2** above. The preliminary design requirements of the end-of-pipe SWM facility are discussed further in the following sections.

Runoff from the north lands will be conveyed to the external SWMF #6 which will control flows to the allowable unit release rates as defined in the SIS and subsequent Preliminary SWM Reports for the two properties to the north.

2.7.2 Quality Control

As outlined in the SIS and associated FSRs, SWMF #6 and SWMF #5 will provide 80% TSS removal per MECP criteria. In addition, the proposed LID's, as discussed in **Section 2.8**, will provide additional quality control via a treatment train approach. While not contemplated in the calculations provided in **Appendix C-3**, the proposed LID's will increase the TSS removal capabilities of the proposed SWM system in comparison to what was assumed in the previous reports.

2.7.3 Erosion Control

As noted in **Table 2.1** the erosion control criteria is to provide a minimum of 24 hour extended detention of the runoff from a 25 mm rainfall event and will be provided in SWMF #6 and SWMF #5 for the proposed development. As noted previously, the drainage conveyed from the proposed development to SWMF #6 has been adequately accounted for downstream.

In addition, the proposed LID's, as discussed in **Section 2.8**, will provide additional erosion control. While not contemplated in the calculations provided in **Appendix C-3**, the proposed LID's will further mitigate the impacts of erosion in addition to the proposed SWM facilities.

2.7.4 Volume Control

As detailed in the SIS, the target filtration and infiltration rates have been set based on site soils and LSRCA guidelines. More specifically, the site lies within SIS Catchments 5 and 6 directed to SWMF#5 and SWMF#6, respectively. The infiltration recommendation for the North lands is best efforts infiltration and 20 mm of filtration. The infiltration recommendation for the South land is 5 mm from the impervious areas and the filtration target is 20 mm from the impervious areas.

As shown in the calculations included in **Appendix C-3**, the 25 mm filtration target for the North lands corresponds to a volume of 460 m³ while the 5 mm infiltration target for the South lands corresponds to a volume of 287 m³ with a 20 mm target filtration volume of 1150 m³.

As detailed in **Section 2.8**, LIDs have been explored to maximize filtration and to utilize infiltration as a best efforts approach.

2.7.5 Water Budget

Where feasible, measures to minimize impacts on the water budget will be incorporated into the development design. As noted in the Hydrogeological Study (R.J. Burnside, January 2019), the estimated existing infiltration volume on the site is providing groundwater to three wetland communities referred to as Catchments 3, 4 and 6. In the existing condition, a total infiltration volume of 31,400 m³ is provided, as shown below in **Table 2.4**.

Table 2.4 – Summary of Existing Infiltration Values

Wetland Catchment	Approximate Land Area (ha)	Average Annual Infiltration (m ³ /year)
3	6.3	5,400
4	18.5	22,900
6	1.6	3,100
Total	26.4	31,400

In the proposed condition, the introduction of the proposed development diminishes the existing annual infiltration when considered without any mitigation. Without mitigation the proposed development infiltration volume is approximately 12,650 m³ or an overall reduction of 64%. The without mitigation infiltration volumes for each catchment are outlined in **Table 2.5**.

Table 2.5 – Summary of Proposed Unmitigated Infiltration Values

Wetland Catchment	Proposed Infiltration (m ³ /year)	Proposed Infiltration Deficit (m ³ /year)	Percentage Change (%)
3	2,000	3,500	-64
4	9,750	13,100	-57
6	900	2,200	-71
Total	12,650	18,800	-64

As recommended in the Hydrogeological Study, low impact development measures, such as those described previously in **Section 2.3** and as noted in **Section 2.8** will be implemented, as feasible, to maintain or increase existing infiltration rates to the three existing wetland communities.

2.7.6 Phosphorus Budget

Under the Lake Simcoe Protection Plan (LSPP), a stormwater management plan must demonstrate how phosphorus loadings are minimized between existing and proposed conditions. The LSPP states that:

“Best efforts shall be employed such that any increase in loading (proposed compared to pre development) is kept to a minimum. The target is “zero” increase in loading.”

In addition to the LSPP, the LSRCA SWM Guidelines state that regardless of existing loading, the removal of 80% of the proposed annual Total Phosphorus load is required.

The remaining proposed phosphorus loading conveyed offsite (if any) is to be offset per the LSRCA Phosphorus Offsetting Policy.

The MECP database application *Lake Simcoe Phosphorus Loading Development Tool* (v2, 01-April-2012 update) was used to complete the phosphorus budget for the proposed development.

Existing Phosphorus Loadings

The existing phosphorus loading is based on the land uses per the Ecological Land Classification (ELC) community type for existing conditions shown in the Natural Heritage Evaluation, prepared by Savanta, submitted under separate cover. The existing land uses are shown on **Figure 2.5**. Based on the Phosphorus Loading Development Tool, the existing annual phosphorus loadings were calculated to be 0.49 kg/year for the North lands and 1.29 kg/year for the South lands. Refer to **Appendix C-5** for the phosphorus loading tool output.

Proposed Phosphorus Loadings

The proposed land uses for the site are shown on **Figure 2.6**. Residential lots are considered high intensity development according to the MECP Phosphorus Tool. The proposed phosphorus loading with no best management practices (BMPs) for the North and South lands were calculated to be 3.23 kg/yr and 8.64 kg/yr, respectively (refer to **Appendix C-5**).

As noted in **Table 2.1**, the minimum requirement is a reduction of 80% of proposed phosphorus loading. For the North and South lands of the proposed development, that results in 0.65 kg/yr and 1.73 kg/yr, respectively. As these loadings are larger than existing phosphorus levels, the target is to reduce proposed loadings to a minimum of the existing loading rate of 0.49 kg/yr for the North lands and 1.29 kg/yr for the South lands.

The proposed phosphorus loading with BMPs was calculated to be 0.87 kg/yr for the North lands and 1.49 kg/yr for the South lands (see **Appendix C-5**). **Table 2.6** provides a summary of the land use, BMP, and phosphorus removal efficiencies for the proposed condition.

Table 2.6: Phosphorus Budget Summary

	Phosphorus Loading (kg/yr)			
	Proposed without BMPs	Proposed with BMPs	Net Reduction due to BMP's	Existing
North	3.23	0.87	73%	0.49
South – Interim (excluding Blocks 22, 23 and 24)	5.38	0.86	85%	0.80
South - Ultimate	8.64	1.49	83%	1.29
Total	11.87	2.36	80%	1.78

As shown in **Table 2.6**, the North lands reduce proposed phosphorus loading by 73% while increasing existing loading by 0.38 kg/yr. As BMPs have been maximized for this catchment per City of Barrie criteria, it illustrates the requirement for additional removal downstream within the SWMF #6 catchment area. Per the Jones Preliminary SWM Reports for the lands to the north (**Appendix B**), there is a net reduction of approximately 1.0 kg/yr in the proposed when compared to existing. Therefore the additional 0.22 kg/yr required for the North lands to meet the minimum target of 80% reduction of proposed annual phosphorus loading. These

loadings will need to be confirmed through the detailed design of downstream infrastructure. It is noted that per **Table 2.6** the overall proposed development can meet the 80% reduction target.

The South lands have been modelled for the ultimate buildout condition, but it is noted that a large portion of the proposed development are future site plans that may have opportunities to provide additional on-site phosphorus removal. Based on the proposed BMP's in the municipal ROW's and SWMF #5, and assuming 80% reduction for the future development blocks, **Table 2.6** highlights that the minimum criteria is met. To minimize the proposed development phosphorus offsetting required, all efforts will be made through detailed design to achieve as close to zero phosphorous export as feasible.

2.8 Stormwater Management Facility #5

The proposed SWMF #5 is located adjacent to the south boundary of the existing NHS area. It is proposed to be a constructed wetland facility with two inlets and associated forebays located on the east and west ends of the pond.

2.8.1 Permanent Pool

The function of the permanent pool is to provide sediment removal from the storm runoff conveyed to the pond. SWMF #5 will be designed to provide permanent pool storage of 85 m³/ha based on MECP's Enhanced Level Protection for a constructed wetland facility having a 74% impervious drainage area (see Table 3.2, 2003 MECP Guidelines). The required permanent pool volume is 3,160 m³ based on a total area draining to the pond of 37.26 ha (**Figure 2.2**). The available permanent pool storage is 6,416 m³ (see **Figure 2.3** and calculations in **Appendix C-2**).

2.8.2 Erosion Control

The erosion control criteria is to provide a minimum of 24 hour extended detention of the runoff from a 25 mm rainfall event and will be provided in SWMF #5 for the proposed development.

With respect to SWMF #5 servicing the proposed development and the external lands to the west, the extended detention volume of 5,350 m³ will be attenuated for a minimum of 24 hours (**Appendix C-2**). This volume is greater than the 2003 MECP guidelines minimum extended detention volume of 40 m³/ha or 1,490 m³ based on the 37.26 ha drainage area. The peak release rate for the extended detention volume is approximately 0.17 m³/s.

The calculations for the extended detention component of the proposed SWMF #5 are provided in **Appendix C-2**.

2.8.3 Quantity Control

SWMF #5 will control proposed flows from the site to allowable release rates outlined in **Section 2.1.2** above. Proposed hydrology modelling was completed using the VO5 model to determine the required pond volume. Refer to the CD containing VO5 hydrology model provided in **Appendix C-1**. At detailed design, the hydrology modelling will be completed

using the overall PCSWMM continuous model which will incorporate the impact of upstream LID's.

The 24-hour and 6-hour SCS Type II design storm distributions per the findings in the SIS were modelled for the proposed conditions hydrology model. A summary of the resulting storage requirements for SWMF #5 is provided in **Table 2.7**. The stage-storage-discharge characteristics of SWMF #5 are provided in **Appendix C-2**.

Table 2.7: SWMF #5 Storage Requirements

Return Period Storm	6 Hour SCS Type II		24 Hour SCS Type II	
	Discharge (m ³ /s)	Storage (m ³)	Discharge (m ³ /s)	Storage (m ³)
2 Year	0.208	7336	0.224	8310
5 Year	0.279	10899	0.351	12399
10 Year	0.385	13104	0.527	15002
25 Year	0.599	15641	0.854	17905
50 Year	0.793	17361	1.079	20259
100 Year	0.966	18998	1.265	22170

Note: Bold values indicate the more conservative (higher) proposed storage volumes

2.8.4 General Pond Design Criteria

Functional level pond grading is provided on **Figure 2.3**. The SWMF #5 design was established based on the following general criteria as outlined in the SIS and City of Barrie criteria:

- ➔ A 5 m wide maintenance access road will be provided from a proposed municipal road with a maximum longitudinal slope of 10% and a crossfall of 2% (max). It will be used to facilitate machinery to access the forebays during scheduled maintenance as well as to access the outlet structure for maintenance purposes;
- ➔ A maximum slope of 3:1 from the pond bottom to 0.5 m below the normal water level will be provided;
- ➔ A maximum slope of 6:1 from 0.5 m below and above the normal water level will be provided;
- ➔ A maximum slope of 4:1 will be provided from 0.5 m above the normal water level to the pond grading limits where not adjacent to a ROW;
- ➔ A maximum slope of 5:1 will be provided from 0.5 m above the normal water level to the pond grading limits where adjacent to a ROW;
- ➔ Maximum depth of 1.0 m above the NWL for all events less than the 10 year storm and a maximum active water level depth of 2.0 m;
- ➔ Freeboard of 0.3 m above the maximum routed water level under the Regional Storm;
- ➔ Forebay berm to have spillway invert at the NWL with a minimum top width of 1.0 m set at a height equal to or above the extended detention elevation;
- ➔ Forebay(s) to be equipped with dewatering sump(s);
- ➔ Forebay(s) shall be lined with 300 mm of 50 mm diameter crusher run rock, unless demonstrated by the geotechnical engineer that it is not necessary;

- Sediment Drying Area to be provided, where feasible, sized for a minimum of 10 years of sediment accumulation;
- Outlet structure to be designed per City of Barrie Standard BSD-78;
- Emergency spillway to be set at an elevation equal to or above the 100 year controlled water level and sized to convey the greater of the unrouted 100 year or Regional peak flow; and
- A suitable liner is required and to be installed as recommended by the geotechnical consultant (**Appendix B**).

2.9 Comparison of Allowable and Proposed Flows

The flows from SWMF #5 are controlled to the allowable release rates outlined in **Section 2.1.2** via a preliminary control structure design that utilizes two orifice controls as shown in the calculations in **Appendix C-2**. **Table 2.8** provides a comparison of allowable and proposed flows at the SWMF #5 outlet.

Table 2.8: Comparison of Allowable and Proposed Flows from SWMF #5

Return Period Storm	Allowable (m ³ /s)	Proposed (m ³ /s)
2 Year	0.224	0.224
5 Year	0.410	0.351
10 Year	0.596	0.527
25 Year	0.857	0.854
50 Year	1.081	1.079
100 Year	1.341	1.265

As shown in **Table 2.8**, the proposed flows are less than or equal to the allowable release rates for the 2 through 100 year storm events.

2.10 Storm Servicing

The storm sewer system (minor system) will be designed for the 5 year return period storm per City of Barrie standards.

The major system drainage will generally be conveyed overland along the proposed ROW's. Per the City of Barrie standards, flow depth on roads shall not exceed 0.20 m above the crown of any local road or 0.10 m above the crown on any collector road. The major system drainage from external lands (Catchments 301 – 303, **Figure 2.2**) west of the Metrolink will be captured and conveyed via a 100 year storm sewer to the proposed SWMF #5. To capture the major system drainage from the external lands will result in a 1800 mm diameter storm sewer at a slope of 1.0%. Refer to the storm design sheet in **Appendix C-6**.

The storm sewer system will typically be designed with grades between 0.5% and 5%. Throughout the proposed development, the storm sewer will be constructed at a minimum depth of 1.5 m to obvert to provide frost protection and 3.0 m where basement connections are required (if any) per City of Barrie standard drawing BSD-75A and/or BSD-75B. The

preliminary layout for the proposed storm sewer within the subject lands is provided on **Figure 2.2**. There are no anticipated crossing conflicts with the sanitary sewer per City of Barrie standards, refer to **Figure 3.1**. Basements are not to be connected to the storm sewer, unless directed by City staff. It is anticipated that to facilitate watermain crossings, the storm sewer will typically be at a depth of 2.5 m to obvert.

The storm sewer system will be designed in accordance with the City of Barrie and MECP guidelines, including the following:

- Pipes to be sized to accommodate runoff from a 5 year storm event,
- Minimum Pipe Slope 0.5 %
- Maximum Flow Velocity: 4.0 m/s,
- Minimum Flow Velocity: 0.75 m/s,
- Minimum Pipe Depth: 1.5 m to obvert (per City Standard BSD-76 or BSD-75A), 3.0 m where basement connections are required (per City Standard BSD-75B).

The rainfall intensity will be calculated as follows, where ‘i’ is the rainfall intensity (mm/hour) and A, B, and C are as per **Table 2.9**:

$$i = A / (T_c + B)^c$$

Table 2.9: Rainfall Intensity Parameters

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

2.11 Overland Flow

Major system flows will be conveyed within the municipal ROWs and overland flow blocks to both SWMF #5 and SWMF #6. Overland flow routes are shown on **Figure C-8**. Associated ROW capacity calculations are provided in **Appendix C-4** for ROWs adjacent to and overland flow routes into SWMF #5 and demonstrate that the major system flows can be safely conveyed within the proposed road and overland flow routes.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Sewer System

As illustrated in the SIS, the existing municipal sanitary sewer system accounted for this portion of the Hewitt's Secondary Plan area in which the proposed development is located, in the 825 mm diameter trunk sanitary sewer flowing north, located on an existing servicing block located at the corner of Sun King Crescent and Bourbon Circle (connection E5). As part of the overall Hewitt's Secondary Plan area development, this existing trunk has previously been extended to Mapleview Drive.

There are no existing sanitary sewers in Lockhart Road to the south.

The existing sanitary infrastructure adjacent to the Hewitt's Secondary Plan was investigated as part of the SIS. Excerpts relevant to the proposed development are included in **Appendix B**.

3.2 Proposed Sanitary Sewer System

As outlined in the SIS and FSRs for lands to the north, sanitary flows from the proposed development as well as existing and future development lands external to the proposed development will be serviced via the proposed sanitary trunk sewer running along Kneeshaw Drive. The sanitary trunk sewer on Kneeshaw Drive within the proposed development is required to extend north through the Campbell property and the Crisdawn property. As outlined in the SIS and the Functional Servicing Report for the Crisdawn property (**Appendix B**), the trunk sewer at the intersection of Kneeshaw Drive and Mapleview Drive will connect to the existing 825 mm diameter sanitary sewer via Mapleview Drive.

The external drainage through the subject site includes drainage from the future municipal recreation centre (Catchment 301, 7.28 ha, **Figure 3.2**), drainage from future medium/high density residential (Catchment 302, 3.73 ha, **Figure 3.2**), drainage from a future school block (Catchment 303, 6.19 ha, **Figure 3.2**) and drainage from future mixed used medium/high density residential (Catchment 303, 11.14 ha, **Figure 3.2**).

A future local sanitary sewer is proposed along Yonge Street to convey drainage from Catchments 301 and 302. A future trunk sewer is proposed along Yonge Street from Lockhart Road to the future servicing easement to convey drainage from Catchment 303. A future trunk sewer is proposed within Catchment 303 to convey drainage from the upstream catchments as well as drainage from Catchment 303. The future trunk sewer will connect into the proposed development via a future connection through the Metrolinx corridor to Kneeshaw Drive.

The configuration of the sanitary trunk sewer are consistent with the SIS from the north limit to the adjacent sanitary easement. From this point, the trunk sewer has been removed and replaced with a local sanitary sewer for the remainder of Kneeshaw Drive. This due to the potential future overpass of the existing Metrolinx tracks on Lockhart Road. To continue to extend the trunk sewer as identified in the SIS, the trunk sewer on Yonge Street has been extended to Lockhart Road as shown on **Figure 3.2**.

The preliminary layout for the proposed sanitary sewers within the proposed development is provided on **Figure 3.1**.

The sanitary sewer system will be designed in accordance with the City of Barrie and MECP criteria, including but not limited to:

- Residential Sanitary Generation Rate: 225 l/c/d,
- Population Density: 2.34 people/unit for townhomes and walk-up apartments, and 1.67 people/unit for apartment dwellings,
- Institutional/Commercial Demand 28 m³/day/ha,
- Design capacity: maximum 85% full flow,
- Peaking Factor: Harmon (1.5-4),
- Infiltration Rate: 0.1 L/s/ha,
- Minimum Pipe Size: 250 mm diameter,
- Minimum Pipe Cover: 2.5 m,
- Minimum Sewage Flow Velocity: 0.60 m/s, and
- Maximum Flow Velocity: 3.0 m/s.

As shown in the calculations provided in **Appendix E**, a preliminary sanitary design sheet has been completed for the proposed development and external lands based on the assumptions made in the SIS and subsequent approved FSRs as illustrated on **Figure 3.2**. The resulting flow of 58.1 L/s requires a 375 mm diameter sanitary sewer at the connection of Kneeshaw Drive and the Campbell lands to the north. As the overall drainage area and unit count is generally consistent with the SIS, the E5 connection has sufficient capacity to service the proposed development and external lands that convey flow through the proposed development.

10.0 SUMMARY

This Functional Servicing Report has been prepared in support of the Draft Plan of Subdivision application for the proposed residential development in the City of Barrie. This report outlines the means by which the site can be graded and serviced in accordance with the City of Barrie, LSRCA, Metrolinx and MECP design criteria and policies.

General Information

- The existing land use cropland;
- The site is located in the Hewitt's Creek subwatershed in the Lake Simcoe Watershed; and
- The proposed development consists of;
 - medium and high density residential,
 - stormwater management facility,
 - natural heritage area,
 - proposed roads.

Stormwater Management and Storm Servicing

- Quality Control: MECP Enhanced (Level 1) water quality protection can be provided through the use of the proposed SWMF #5 (Phase 3 lands) and SWMF #6 (Phase 1 Lands);
- Erosion Control: The runoff volume from a 25 mm rainfall event will be detained over a minimum of 24 hours by the proposed SWMF #5 (Phase 3 lands) and SWMF #6 (Phase 1 lands);
- Quantity Control: Quantity control will be provided via by the proposed SWMF #5 (Phase 3 lands) and SWMF #6 (Phase 1 lands) to the allowable unit release rates as defined in the R.J. Burnside SIS for the 2 through 100 year storm events;
- Water Budget: As recommended in the Hydrogeological Study, low impact development measures will be implemented, as feasible, to maintain or increase existing infiltration rates to the three existing wetland communities.
- Phosphorus Budget: A phosphorus budget analysis was completed using the MECP phosphorus budget tool, which shows that the proposed phosphorus export will meet the minimum criteria as set by the LSRCA;
- Storm Servicing:
 - Storm runoff will be conveyed by storm sewers designed in accordance with City of Barrie and MECP criteria;
 - Storm sewers will generally be designed for the 5 year storm event; and
 - Adequate 100 year overland flow routes will be provided.
 - Servicing will be provided to convey the flows from external lands to the west.

Sanitary Sewage Disposal

- Sanitary servicing is to be provided for the proposed development via connection point E5 per the SIS.

Water Supply

- Water servicing is proposed to be provided per the SIS.

Site Grading

- The preliminary site grading has been developed to match to the existing surrounding grades in addition to the proposed grades of adjacent sites within the Hewitt's SPA, and provide conveyance of stormwater runoff, including external drainage; and
- The preliminary lot grading will be subject to further grading design at the detailed design stage.

Respectfully Submitted:

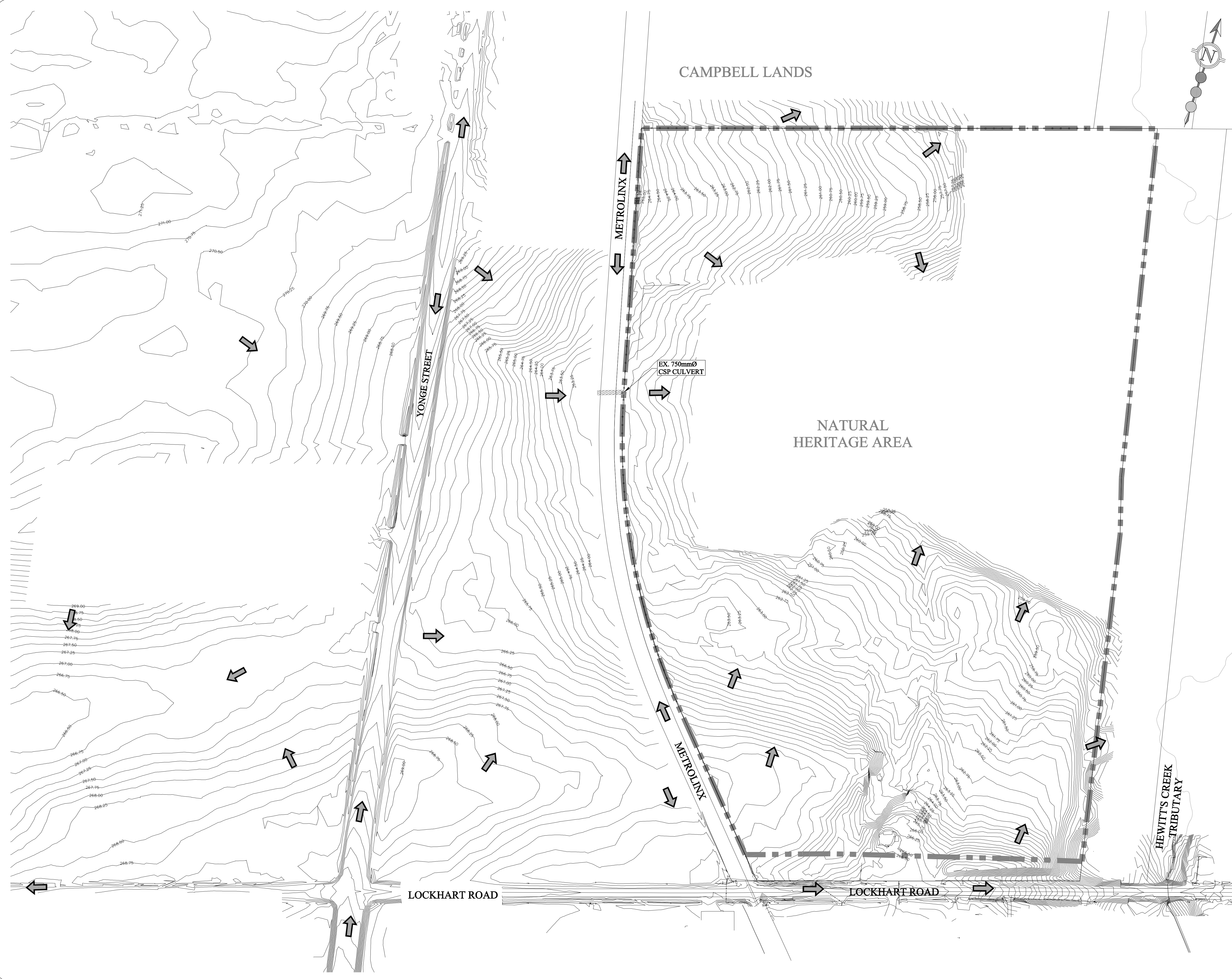
SCS Consulting Group Ltd.

Plurchet

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LEGEND:

- PROPERTY BOUNDARY
- EXISTING CONTOUR
- OVERLAND FLOW DIRECTION

*NOTE: LAYOUT IS SCHEMATIC ONLY. DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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

**750 LOCKHART ROAD
 BALLYMORE - BARRIE
 EXISTING STORM
 DRAINAGE PLAN**

DESIGNED BY: M.T.T.	CHECKED BY: J.M.P.
SCALE: 1:1500	DATE: MARCH 2019
PROJECT No: 1964	FIGURE No: 2.1

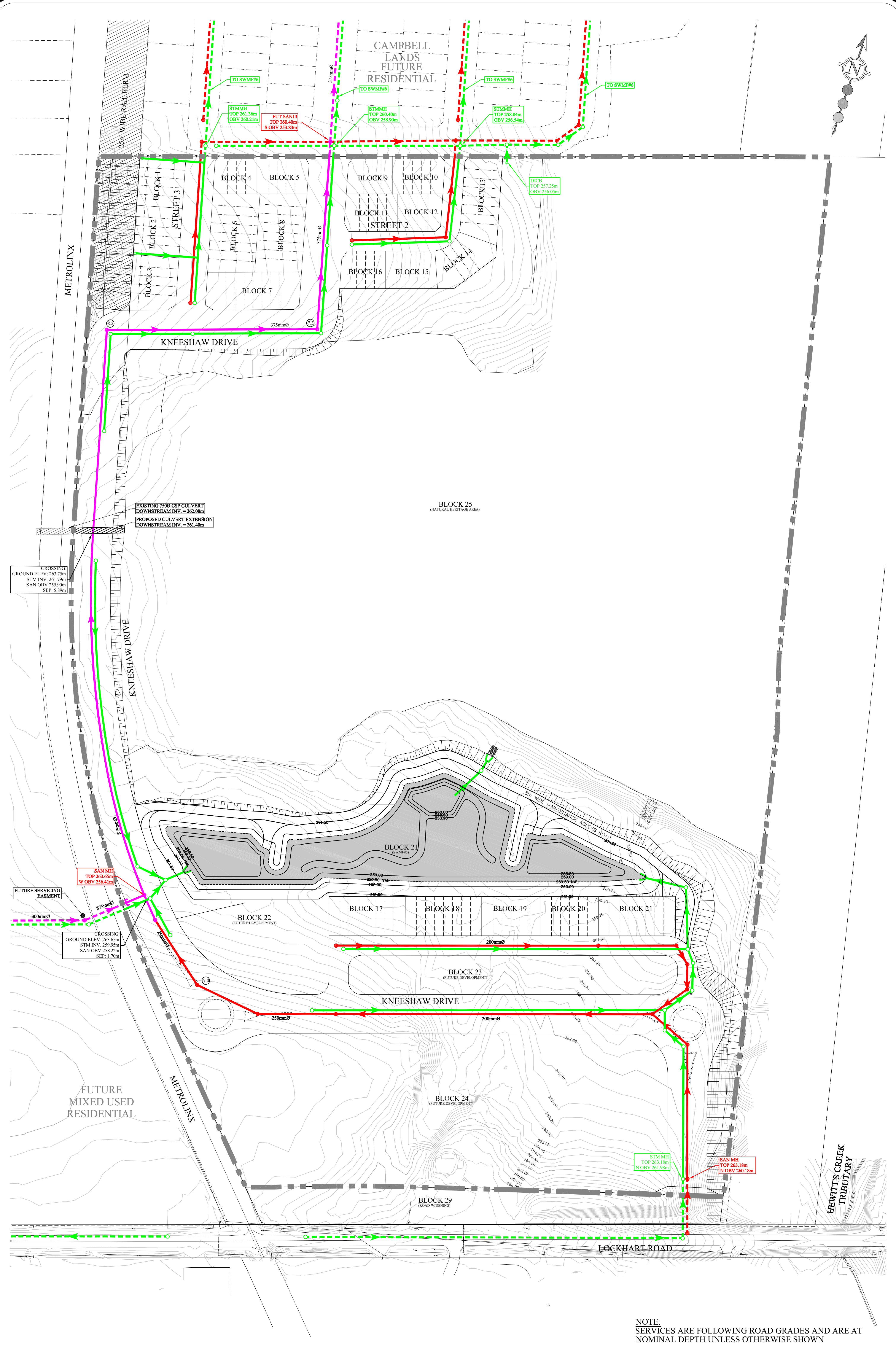
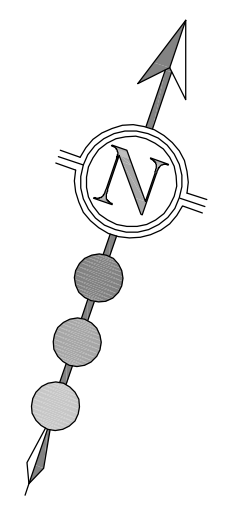


- LEGEND:**
- PROPERTY BOUNDARY
 - STORM DRAINAGE BOUNDARY
 - 30m OFFSET FROM STAKED DRIPLINE
 - MAJOR SYSTEM - OVERLAND FLOW
 - EXISTING CONTOUR
 - DRAINAGE AREA (HECTARES)
 - PERCENT IMPERVIOUSNESS
 - CATCHMENT ID
 - EXTERNAL STORM DRAINAGE AREA (HECTARES)
 - PERCENT IMPERVIOUSNESS
 - CATCHMENT ID
 - FUTURE / EXTERNAL STORM SEWER AND MANHOLE - 5 YEAR CONVEYANCE
 - STORM SEWER AND MANHOLE - 5 YEAR CONVEYANCE
 - STORM SEWER AND MANHOLE - 100 YEAR CONVEYANCE
 - FUTURE / EXTERNAL STORM SEWER AND MANHOLE - 100 YEAR CONVEYANCE
 - 100 YEAR CAPTURE LOCATION
 - REAR LOT CATCHBASIN

*NOTE: LAYOUT IS SCHEMATIC ONLY. DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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750 LOCKHART ROAD BALLYMORE - BARRIE PROPOSED STORM DRAINAGE PLAN	
DESIGNED BY: M.T.T.	CHECKED BY: J.M.P.
SCALE: 1:1500	DATE: MARCH 2019
PROJECT No: 1964	FIGURE No: 2.2



CROSSING
GROUND ELEV. 263.75m
STM INV. 261.79m
SAN OBV 255.90m
SEP. 5.87m

EXISTING 7500 CSF CULVERT
DOWNSTREAM INV. = 262.08m
PROPOSED CULVERT EXTENSION
DOWNSTREAM INV. = 261.40m

SAN MH
TOP 263.65m
W OBV 256.41m

CROSSING
GROUND ELEV. 263.65m
STM INV. 259.95m
SAN OBV 258.22m
SEP. 1.70m

STMMH
TOP 263.18m
N OBV 261.98m

SAN MH
TOP 263.18m
N OBV 260.18m

NOTE:
SERVICES ARE FOLLOWING ROAD GRADES AND ARE AT
NOMINAL DEPTH UNLESS OTHERWISE SHOWN

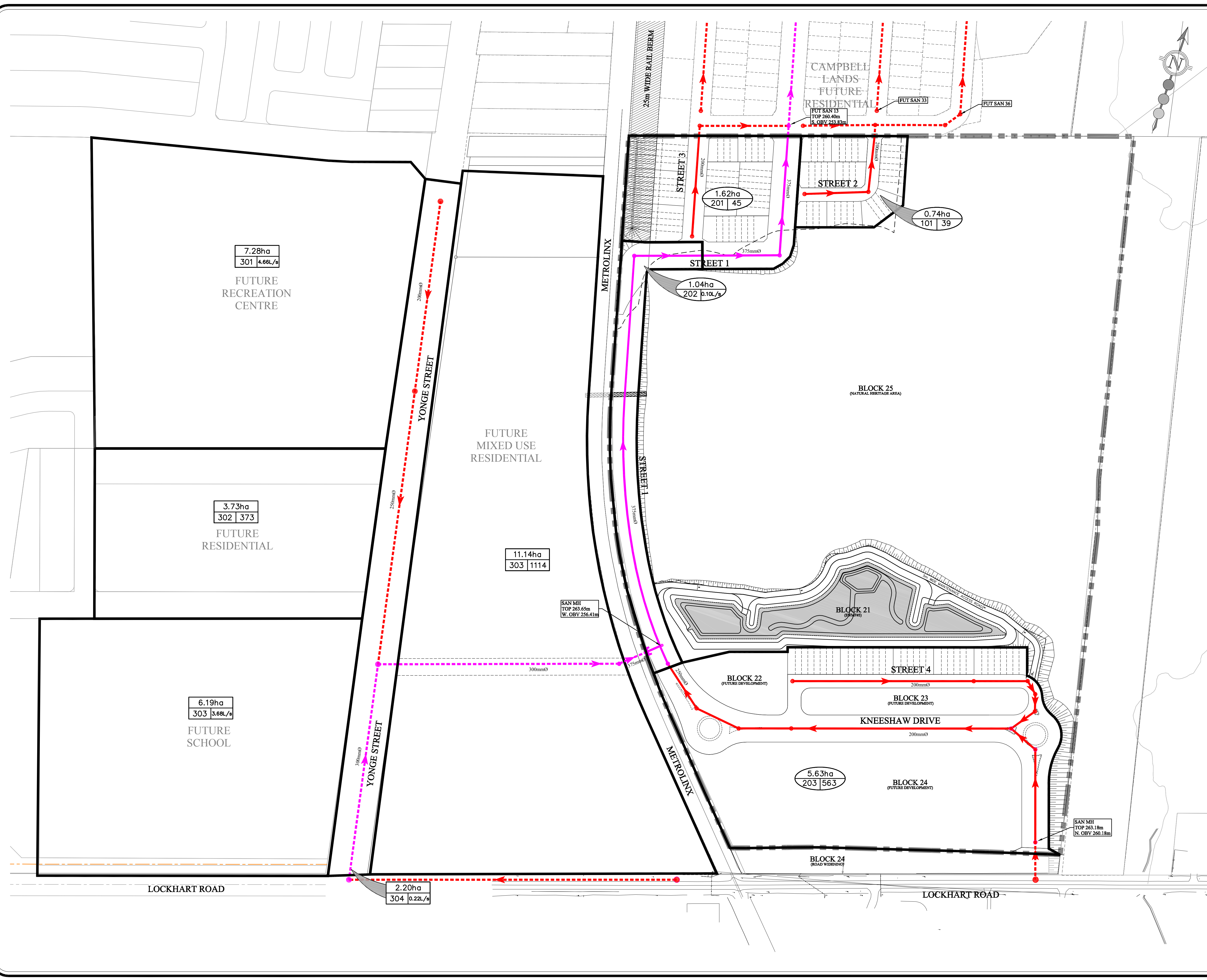
NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE

LEGEND:	
	PROPERTY BOUNDARY
	PROPOSED SANITARY SEWER
	PROPOSED SANITARY TRUNK SEWER
	FUTURE / EXTERNAL SANITARY SEWER
	PROPOSED STORM SEWER
	FUTURE / EXTERNAL STORM SEWER
	EXISTING CONTOUR AND ELEVATION
	DEPTH OF SANITARY TRUNK SEWER OBV (m)

750 LOCKHART ROAD BALLYMORE - BARRIE	
DESIGNED BY: M.T.T.	CHECKED BY: J.M.P.
SCALE: 1:1000	DATE: MARCH 2019

PROPOSED SERVICING PLAN	
PROJECT No: 1964	FIGURE No: 3.1

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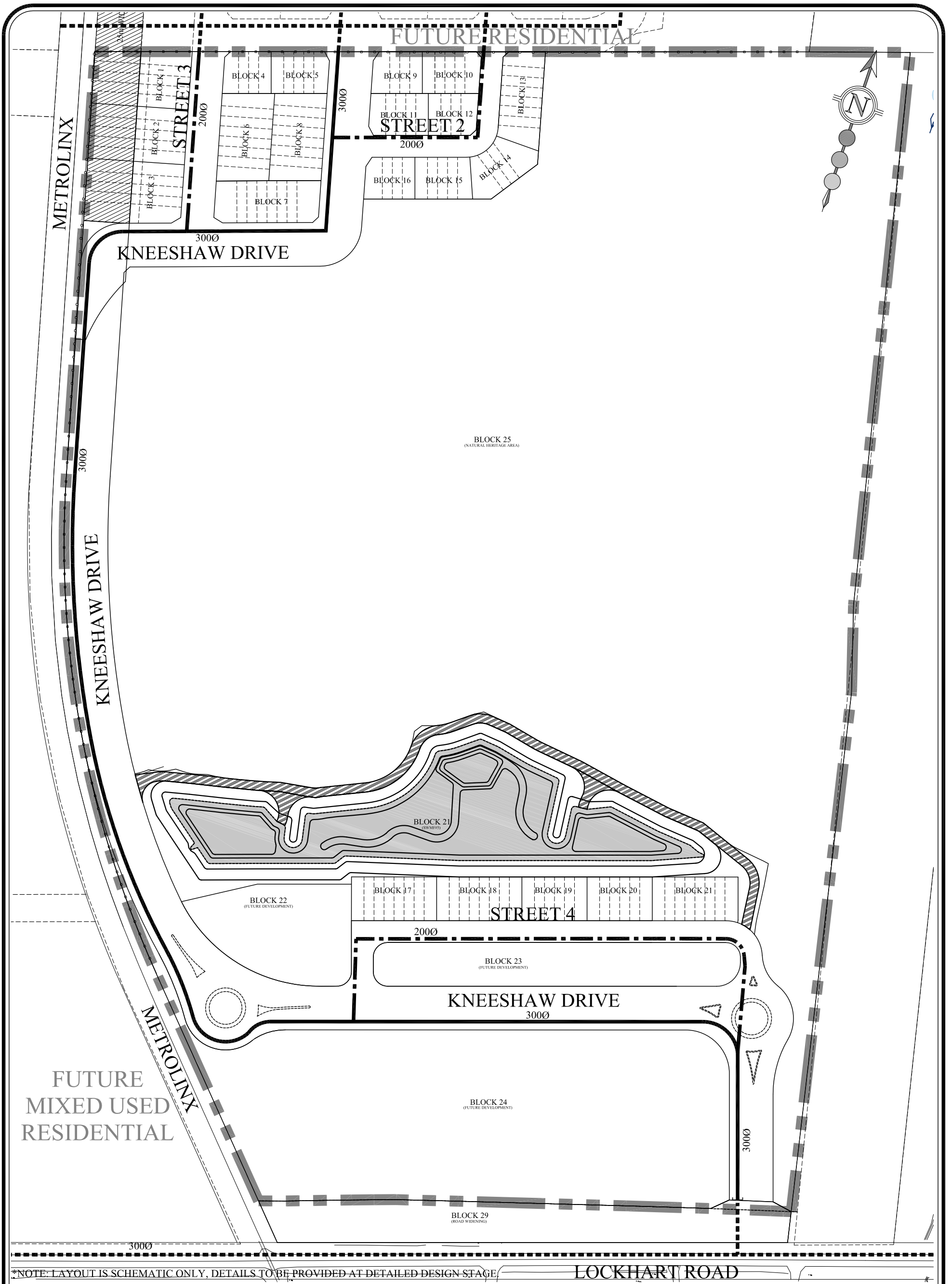
LEGEND:

	PROPERTY BOUNDARY
	SANITARY DRAINAGE BOUNDARY
	30m OFFSET FROM STAKED DRIPLINE
	PROPOSED SANITARY SEWER MANHOLE
	PROPOSED SANITARY TRUNK SEWER / MANHOLE
	FUTURE /EXTERNAL SANITARY SEWER / MANHOLE
	FUTURE /EXTERNAL SANITARY TRUNK SEWER / MANHOLE
	DRAINAGE AREA (HECTARES)
	# OF UNITS
	CATCHMENT ID
	EXTERNAL SANITARY DRAINAGE AREA (HECTARES)
	# OF UNITS
	CATCHMENT ID
	DRAINAGE AREA (HECTARES)
	FLOW (L/s)
	CATCHMENT ID
	EXTERNAL SANITARY DRAINAGE AREA (HECTARES)
	FLOW (L/s)
	CATCHMENT ID




*NOTE: LAYOUT IS SCHEMATIC ONLY. DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.


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750 LOCKHART ROAD BALLYMORE - BARRIE PROPOSED SANITARY DRAINAGE PLAN	
DESIGNED BY: M.T.T.	CHECKED BY: J.M.P.
SCALE: 1:1500	DATE: MARCH 2019
PROJECT No: 1964	FIGURE No: 3.2



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE

	PROPERTY BOUNDARY		LOCAL WATERMAIN
	LOCAL TRUNK WATERMAIN		FUTURE / EXTERNAL WATERMAIN

 <p>30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335</p>	750 LOCKHART ROAD BALLYMORE - BARRIE		PROPOSED WATER DISTRIBUTION SYSTEM	
	DESIGNED BY: M.T.T.	CHECKED BY: J.M.P.	PROJECT No: 1964	FIGURE No: 4.1
SCALE: 1:2000	DATE: MARCH 2019			



**100-Year Storm Design
750 Lockhart Road**

Ballymore, Barrie

$$\text{Rainfall Intensity (i)} = \frac{A}{(T_c + B)^c}$$

Starting T_c (min) = 10

A = 1426.408
B = 5.273
c = 0.759

Project: 750 Lockhart Road

Project No. 1964

Date: 21-Mar-19

Designed By: P.A.T.

Reviewed By: J.M.P.

P:\1964 750 Lockhart Road - Ballymore - Barrie\Design\Pipe Design\Storm\1964-Preliminary Storm Design Sheet.xlsm\Design

LOCATION			100 YEAR						TOTAL FLOW	PIPE DATA					TIME OF CONC.	ACCUM. TIME OF CONC.
STREET	MANHOLE		100-YEAR AREA (ha)	RUNOFF COEFF. "R"	"AR"	ACCUM. "AR"	RAINFALL INTENSITY (mm/hr)	ACCUM. FLOW (m3/s)	TOTAL (Qdes) (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)		
	FROM	TO														
WEST OF YONGE STREET	EXT1	STM1	12.490	0.730	9.118	9.118	180.15	4.563	4.563	100.0	0.70	1500	5.911	3.347	0.50	10.50
YONGE STREET	EXT2	STM1	5.310	0.725	3.850	3.850	180.15	1.927	1.927	100.0	0.50	1500	4.996	2.829	0.59	10.59
FUTURE MIXED USE & RES	EXT3	STM1	9.870	0.725	7.156	7.156	180.15	3.581	3.581	100.0	0.50	1500	4.996	2.829	0.59	10.59
EXTERNAL	STM1	STM2	0.000	0.000	0.000	20.123	175.05	9.785	9.785	100.0	1.00	1800	11.489	4.517	0.37	10.96
KNEESHAW DRIVE	STM2	HW1	0.000	0.000	0.000	20.123	172.02	9.616	9.616	100.0	1.00	1800	11.489	4.517	0.37	11.33
KNEESHAW DRIVE	STM3	STM4	0.000	0.000	0.000	0.000	180.15	0.000	0.000	100.0	0.50	825	1.014	1.899	0.88	10.88
STREET4	STM5	STM4	0.000	0.000	0.000	0.000	180.15	0.000	0.000	100.0	0.50	600	0.434	1.536	1.09	11.09
KNEESHAW DRIVE	STM4	HW2	0.000	0.000	0.000	0.000	171.01	0.000	0.000	100.0	0.50	900	1.279	2.012	0.83	11.91



**Sanitary Design Sheet
750 Lockhart Road**

Ballymore - Barrie

Minimum Sewer Diameter (mm) = 200 Avg. Domestic Flow (l/cap/day) = 364
 Mannings n = 0.013 Infiltration Rate (l/s/ha) = 0.1
 Minimum Velocity (m/s) = 0.60 Max. Harmon Peaking Factor = 3.8
 Maximum Velocity (m/s) = 3 Min. Harmon Peaking Factor = 2.0
 Minimum Pipe Slope (%) = 0.40 NOMINAL PIPE SIZE USED

Project: 750 Lockhart Road
 Project No. 1964
 Date: 20-Mar-18
 Designed By: P.A.T.
 Reviewed By: J.M.P.

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LOCATION			RESIDENTIAL						INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA (ha)	ACCUM. AREA (ha)	UNITS (#)	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA (ha)	ACCUM. AREA (ha)	POPULATION DENSITY (p/ha)	FLOW RATE (l/s/ha)	ACCUM. EQUIV. POPULATION	INFILTRATION (L/s)	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW (L/s)	ACCUM. AVG. DOMESTIC FLOW (L/s)	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW (L/s)	ICI FLOW (L/s)	TOTAL FLOW (L/s)	LENGTH (m)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)
	FROM	TO				PER UNIT (p/unit)	PER HA (p/ha)																				
SERVICING EASEMENT-YONGE STREET	EXT2	EXT1	0	0	0			0	0	2.2	2.2	0	0.1	0	0.2	0	0.0	0.0	3.80	0.0	0.2	0.4	30.0	300	0.40	61.1	0.86
SERVICING EASEMENT	EXT1	SAN1	14.87	14.87	1487	1.67		2483.29	2483.29	13.47	15.67	0	0.324	0	3.1	2483.29	10.5	10.5	3.51	36.7	4.6	44.4	20.0	300	0.40	61.1	0.86
KNEESHAW DRIVE	SAN2	SAN1	0	0	563	1.70		959.32	959.32	0	0	0	0	0	0.0	959.32	4.0	4.0	3.80	15.4	0.0	15.4	20.0	200	0.40	20.7	0.66
KNEESHAW DRIVE	SAN1	SAN3	0	14.87	0			0	3442.61	1.04	16.71	0	0.1	0	3.2	3442.61	0.0	14.5	3.39	49.2	4.7	57.0	100.0	375	0.40	110.8	1.00
KNEESHAW DRIVE	SAN3	SAN13	1.62	16.49	45	1.67		75.15	3517.76	0	16.71	0	0	0	3.3	3517.76	0.3	14.8	3.38	50.1	4.7	58.1	100.0	375	0.40	110.8	1.00

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

Water Balance Calculations

Proposed Conditions

Catchment ID	Area (ha)	Percent Impervious (%)	Impervious Area (ha)	Infiltration Requirement		Filtration Requirement	
				Infiltration Rainfall Depth (mm)	Required Infiltration Volume (m ³)	Filtration Rainfall Depth (mm)	Required Filtration Volume (m ³)
	(1)	(2)	(3) = '(1)x'(2)	(4)	(4)x(3)x10 m ³ /ha-mm	(6)	(6)x(3)x10 m ³ /ha-mm
201	1.33	75	1.00	5	49.9	20.0	199.5
202	2.96	75	2.22		111.0		444.0
203	4.870	75	3.65		182.6		730.5
301	0.58	8	0.05		2.3		9.3
Total	9.74		6.92		345.8		1383.3

APPENDIX D

PHOSPHORUS BUDGET CALCULATIONS



Project DEVELOPMENT Summary

DEVELOPMENT: 989 Yonge Street (Barrie)

Subwatershed: Lovers Creek

Total Pre-Development Area (ha):	9.74	Total Pre-Development Phosphorus Load (kg/yr):	1.56
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Pre-Development Land Use	Area (ha)	P coeff. (kg/ha)	P Load (kg/yr)
Cropland	9.74	0.16	1.56

POST-DEVELOPMENT LOAD

Post-Development Land Use	Area (ha)	P coeff. (kg/ha)	Best Management Practice applied with P Removal Efficiency	P Load (kg/yr)
High Intensity - Residential	9.74	1.32	NONE	12.86

Post-Development Area Altered:	9.74			P Load (kg/yr)
Total Pre-Development Area:	9.74			
Unaffected Area:	0			
			Pre-Development:	1.56
			Post-Development:	12.86
			Change (Pre - Post):	-11.30
			725% Net Increase in Load	
			Post-Development (with BMPs):	12.86
			Change (Pre - Post):	-11.30
			725% Net Increase in Load	

APPENDIX E

SANITARY FLOW CALCULATIONS

<u>Allocated Sanitary Flow</u>	
Average Flow Rate	225 L/cap/day
Total Site Area	10.15 ha
Residential Units	120 units/ha
Residential Density	2 persons/unit
Residential Population	2,436 persons
Peaking Factor	3.52
Residential Peak Flow	22.3 L/s
Infiltration (0.1 L/s/ha)	1.0 L/s
Total Allocated Peak Sanitary Flow	23.3 L/s
<u>Proposed Sanitary Flow Calculations</u>	
Average Flow Rate	225 L/cap/day
<u>Townhouses</u>	
Residential Density - Medium Density	2.34 persons/unit
Townhouse Units	60 units
Residential Population	140 persons
Peaking Factor	4.20
<u>Condos</u>	
Residential Density - High Density	1.67 persons/unit
Condo Units	1158 units
Residential Population	1,934 persons
Peaking Factor	3.60
Residential Peak Flow	19.7 L/s
Commercial Flow Rate	28,000 L/ha/day
Commercial floor area	0.30 ha
Peaking Factor	2
Commercial Peak Flow	0.2 L/s
Total Site Area (after Lockhart Road widening)	9.72 ha
Infiltration (0.1 L/s/ha)	1.0 L/s
Total Proposed Peak Sanitary Flow	20.8 L/s



Sanitary Design Sheet
989 Yonge Street
ASA Development Inc.
City of Barrie

Project: 989 Yonge Street
 Project No. 2095
 Date: 7-Feb-20
 Designed By: M.L.M.
 Reviewed By: J.M.P.

Minimum Sewer Diameter (mm) = 200 Avg. Domestic Flow (l/cap/day) = 225 Prop. Development =
 Mannings n = 0.013 Infiltration Rate (l/s/ha) = 0.1
 Minimum Velocity (m/s) = 0.60 Min. Harmon Peaking Factor = 2.0
 Maximum Velocity (m/s) = 3
 Minimum Pipe Slope (%) = 0.40 **NOMINAL PIPE SIZE USED**

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LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA				
STREET	MANHOLE / AREA ID		AREA (ha)	ACCUM. AREA (ha)	UNITS (#)	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA (ha)	ACCUM. AREA (ha)	POPULATION DENSITY (p/ha)	FLOW RATE (l/s/ha)	ACCUM. EQUIV. POPULATION	INFILTRATION (L/s)	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW (L/s)	ACCUM. AVG. DOMESTIC FLOW (L/s)	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW (L/s)	ICI FLOW (L/s)	TOTAL FLOW (L/s)	LENGTH (m)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)
	FROM	TO				PER UNIT (p/unit)	PER HA (p/ha)																				
Future Recreational Centre	301	MH1	0	0	0			0.0	0.0	7.28	7.28	0	0.64	0	0.7	0.0	0.0	0.0	4.50	0.0	4.7	5.4	15.0	250	1.00	59.4	1.21
Future Crown Development (1012 Yonge St)	302	MH1	3.73	3.73	0		200	746	746	0	0	0	0	0	0.4	746.0	1.9	1.9	3.88	7.5	0.0	7.9	15.0	200	1.00	32.8	1.04
Future Development to North of Site	305	MH1	0.94	0.94	0		200	188.0	188.0	0	0	0	0	0	0.1	188.0	0.5	0.5	4.16	2.0	0.0	2.1	15.0	200	1.00	32.8	1.04
Proposed Townhouses	306	MH1	1.45	1.45	60	2.34		140.4	140.4	0	0	0	0	0	0.1	140.4	0.4	0.4	4.20	1.5	0.0	1.7	15.0	200	1.00	32.8	1.04
Yonge Street	MH1	MH3	2.24	8.36	0			0.0	1074.4	0	7.28	0	0	0	1.6	1074.4	0.0	2.8	3.78	10.6	4.7	16.8	210.0	300	0.40	61.1	0.86
Future School Block	303	MH2	0	0	0			0.0	0.0	6.19	6.19	0	0.59	0	0.6	0.0	0.0	0.0	4.50	0.0	3.7	4.3	100.0	200	1.00	32.8	1.04
Yonge Street	MH2	MH3	0	0	0			0.0	0.0	0	6.19	0	0	0	0.6	0.0	0.0	0.0	4.50	0.0	3.7	4.3	100.0	200	0.40	20.7	0.66
Proposed Condo Blocks	307	MH3	7.97	7.97	1158	1.67		1933.9	1933.9	0.3	0.3	0	0.65	0	0.8	1933.9	5.0	5.0	3.60	18.1	0.2	19.1	15.0	250	1.00	59.4	1.21
Municipal Servicing Easement	MH3	MH4	0	16.33	0			0.0	3008.3	0	13.77	0	0	0	3.0	3008.3	0.0	7.8	3.44	27.0	8.5	38.5	185.0	300	0.40	61.1	0.86
Metrolix Crossing	MH4	MH5	0	16.33	0			0.0	3008.3	0	13.77	0	0	0	3.0	3008.3	0.0	7.8	3.44	27.0	8.5	38.5	35.0	300	0.40	61.1	0.86
Ballymore Barrie Development	203	MH5	5.63	5.63	0		200	1126	1126	0	0	0	0	0	0.6	1126	2.9	2.9	3.77	11.0	0.0	11.6	20.0	375	0.40	110.8	1.00
Kneeshaw Drive	MH5	MH6	1.04	23	0			0.0	4134.3	0	13.77	0	0	0	3.7	4134.3	0.0	10.8	3.32	35.7	8.5	48.0	330.0	375	0.40	110.8	1.00

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