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19 Dundonald Street, Barrie

FUNCTIONAL SERVICING REPORT

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1 Introduction

Tatham Engineering Limited (Tatham) has been retained by John and Pat Hargreaves to prepare a Functional Servicing Report (FSR) in support of a Zoning By-Law Amendment (ZBA) application for 19 Dundonald Street (subject site) located in the City of Barrie (City).

This report presents a municipal servicing strategy, covering:

- water supply and distribution;
- sanitary sewage collection;
- drainage and stormwater management;
- grading and landscaping; and
- utility servicing.

1.1 SITE DESCRIPTION & SURROUNDING LAND USE

The site is located approximately 150 m north of the existing signalized intersection of Collier Street and Dunlop Street East. It is bound by existing development to the north, Dundonald Street to the west, and the Duckworth Street unopened right-of-way (ROW) to the east. The location of the property is illustrated on the Site Location Plan (Figure 1), overleaf. Under existing conditions, the site consists of a single-family dwelling and woodland. The total site area is approximately 0.39 ha. The site topography is quite steep with slopes of approximately 17% towards the south.

The site is located within the Lake Simcoe Region Conservation Authority (LSRCA) watershed, but it is not located within the LSRCA regulated area. As the development will be considered a 'Major Development' in accordance with the LSRCA and the Lake Simcoe Protection Plan (LSPP), the application will be subject to LSRCA review. However, a LSRCA works permit will not be required.

1.2 PROPOSED DEVELOPMENT

The proposed development consists of one six-storey tower with 50 residential units and 61 parking spaces (including three levels of underground parking). The development will be accessed from Dundonald Street. The proposed site plan is provided in Appendix A.

The proposed development will be serviced by municipal water, sanitary, and storm services. The existing water and sanitary services to the property will be permanently capped/cut off to the satisfaction of the City.

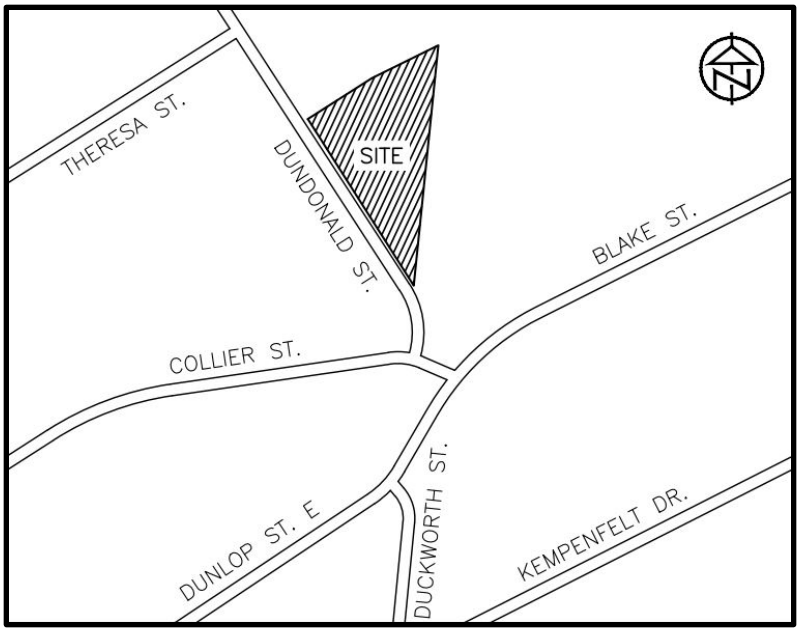


Figure 1: Site Location Plan

1.3 OBJECTIVES

The objective of this report is to present an overall servicing strategy to demonstrate the proposed development can be adequately serviced. This report will also document the preliminary stormwater management (SWM) strategy for the site, demonstrating the proposed development will not adversely affect local surface water conditions.

1.4 GUIDELINES & BACKGROUND INFORMATION

This report has been prepared in accordance with local and provincial guidelines, including the following publications:

- The Ministry of the Environment, Conservation, and Parks (MECP, formerly known as Ministry of Environment), *Stormwater Management Practices Planning and Design Manual* (March 2003);
- The MECP, *Design Guidelines for Drinking-Water Systems*, (2003);
- The MECP, *Lake Simcoe Protection Plan (LSPP)* (2009);
- Lake Simcoe Region Conservation Authority (LSRCA), *Technical Guidelines for Stormwater Management Submissions* (April 2022);
- LSRCA, *Phosphorus Offsetting Policy* (May 2023);

- City of Barrie, *Stormwater Infrastructure Design Standard* (June 2022);
- City of Barrie, *Sanitary Infrastructure Design Standard* (April 2023); and
- City of Barrie, *Drinking Water Infrastructure Design Standard* (June 2023).

This report is prepared in consideration of the following City of Barrie reports and publications:

- City of Barrie, *Wastewater Treatment Master Plan* (prepared by WSP Canada Inc.) (2019);
- City of Barrie, *Water Storage and Distribution Master Plan Update* (prepared by WSP Canada Inc.) (2019); and
- City of Barrie, *Water Supply Master Plan Update* (prepared by WSP Canada Inc.) (2019).

Information relating to existing topography, ground cover, and drainage patterns was obtained through a review of relevant background studies, available plans, base mapping, and topographic survey.

1.5 DUNDONALD STREET RECONSTRUCTION

It is our understanding based on consultation with City staff that the Dundonald Street ROW between Codrington Street and Collier Street will be reconstructed by 2028, as part of the City's Historic Neighbourhoods Strategy (HNS) Wellington D2 Neighbourhood Reconstruction Program. This project includes the reconstruction of Albert Street from Eugenia Street to Dundonald Street, as well as Amelia Street from Dundonald Street to Duckworth Street. A new 200 mm dia. watermain extended south along Dundonald Street to the Theresa Street watermain is included in the D2 project. The D2 project will also include new sanitary and storm sewers extending north from Collier Street along Dundonald Street and fronting the subject site. HNS Wellington D1 Neighbourhood Reconstruction Program project includes the reconstruction of Berczy Street from Eugenia Street to Dunlop Street East, a small section of Amelia Street east of Berczy Street, and Theresa Street. The D1 project is scheduled for completion by 2025. The preliminary design for this reconstruction has been prepared by the City (dated January 2020) and its detailed design is in progress. The servicing scheme presented in this report and as depicted on the Preliminary Site Servicing Plan (Drawing SS-1) references the City's 60%-complete servicing design and will be confirmed during detailed design. Additional discussion with the City will be required with respect to construction timing of the subject site and the reconstruction of Dundonald Street, as the site does rely on the new municipal infrastructure proposed by the City. Should the subject site proceed prior to the City's reconstruction project, discussions with the City will be required regarding cost sharing and potential developer front ending the costs of the external infrastructure improvements.

2 Water Supply & Distribution

2.1 EXISTING WATER SYSTEM

Under existing conditions there is no municipal watermain fronting the subject site. The site is located approximately 55 m south of the nearest municipal watermain at Theresa Street. There is an existing 150 mm dia. watermain on Dundonald Street to the north of the subject site, and a 100 mm dia. watermain on Theresa Street, which provide water supply and fire protection for the area. There is also a municipal watermain located approximately 40 m to the south of the site on Blake Street. The existing dwelling located on the property is serviced by a 19 mm dia. water service which is extended from the existing watermain on Theresa Street. This service will be capped and abandoned.

Although there is no watermain directly fronting the property, the site is located within Pressure Zone 2N which is serviced by the City's groundwater supply. As per Figure 4-1 in the Water Supply Master Plan Update (2019) prepared by WSP, the firm capacity of the groundwater supply (which supplies Pressure Zone 2N) is expected to have sufficient capacity to meet current and projected water demands up to 2071. Therefore, the system has sufficient supply capacity to service additional development in the area, including the subject site.

In addition, as per Table 6-3 in the Water Storage and Distribution Master Plan Update (2019) prepared by WSP, under existing conditions the water storage system which supplies Pressure Zone 2N has a deficit of 11,230,000 L. However, the local water storage deficiency is nullified as it is assumed that water storage can be shared between Pressure Zones 2N, 3N, and 3S. Assuming this, there is expected to be sufficient storage volume to service Pressure Zone 2N under the 2041 growth scenario. Therefore, there is sufficient storage volume within the municipal system to service additional development in the area, including the subject site.

2.2 PROPOSED WATER DEMANDS

The estimated population for the proposed development is 84 persons (applying the high-density unit population factor of 1.67 persons per unit as per the City's engineering standards). Water system demands have been estimated by applying Maximum Day Factor and Peak Hour factors from Table 3-1 of the MOE Design Guidelines for Drinking Water Systems.

The estimated water system demands are:

- Average Day Demand (ADD): 84 persons x 225 L/person/day = 18,900 L/day = 0.22 L/s;
- Maximum Daily Demand (MDD): 18,900 L/day x 2.75 = 51,975 L/day = 0.60 L/s; and
- Peak Hour Demand (PHD): 18,900 L/day x 4.13 = 78,057 L/day = 0.90 L/s.

2.3 FIRE PROTECTION

Firefighting water demands have been estimated for the site using the Water Supply Public Fire Protection (2020) document prepared by the Fire Underwriters Survey (FUS). Considering the preliminary stage of the proposed development, reasonable assumptions have been made with respect to non-combustible building design and construction methods in consultation with the architect. As such, the required fire flow has been estimated at 83 L/s per the detailed FUS Fire Flow Calculations provided in Appendix B and will be revised/confirmed during the detailed design stage, once additional information is available with respect to the design of the building.

A new fire hydrant flow test was completed by Vipond as the results of the first test were skewed (confirmed through correspondence with the City) by existing maintenance issues with the valves in this area and by the fact that some were not fully open. The new flow test used two nearby fire hydrants located on Dundonald Street at Theresa Street and on Eugenia Street at Dundonald Street (provided in Appendix B). Applying the equation provided in Section 4.3.2. of the City's *Drinking Water Infrastructure Design Standard*, the estimated fire flow available at 20 psi is 3,443 USgpm (217 L/s). This is greater than the FUS's estimated required fire flow of 83 L/s and the minimum required fire flow of 200 L/s for apartment buildings noted in Section 4.3.1 of the City's design standard. Detailed calculations are provided in Appendix B for reference.

2.4 PROPOSED WATER SYSTEM

The proposed development will be serviced from a new 300 mm dia. watermain which will be extended from Theresa Street and Dundonald Street to the site. A separate domestic and fire service will be provided to the site as per City standards. Detailed watermain design will be completed in coordination with the City's detailed design of the Dundonald Street (Wellington D2 Neighbourhood) reconstruction project.

2.5 WATER MODEL ANALYSIS

A local WaterCAD model was developed for the watermains which will be a part of the City's upgrades program to demonstrate that sufficient pressures and flows will be provided to the proposed development site. A pipe network was created in the model to simulate the watermains on Dundonald, Theresa, Berczy, Eugenia, Albert, and Amelia, as well as the proposed 300 mm diameter watermain to the site. The hydrant test results were used as boundary conditions using a reservoir and pump in the model. A summary of the model setup, analysis, and results, and figures of the results, are included in Appendix B.

Three scenarios were modelled as follows:

1. Existing conditions – based on the City's GIS and consisting of 100 mm and 150 mm diameter cast iron and ductile iron watermains on Dundonald, Eugenia, Albert, and Amelia.
2. Interim conditions – includes upgrades to the following streets and pipe sizes: Eugenia Street (300 mm), Berczy Street (250 mm and 200 mm), and Theresa Street (150 mm).
3. Ultimate conditions – includes the upgrades from the interim conditions scenario plus PVC pipe sizes on the following streets: Dundonald Street (250 mm), Albert Street (150 mm), and Amelia Street (150 mm).

In summary, our analysis of the model results is as follows:

- Normal operating pressures at the development site are 102 psi under all scenarios. As per City standards, a PRV will be required at the site.
- The available fire flows at the development site under existing and interim conditions are 104 L/s and 148 L/s, respectively, which exceeds the FUS required fire flow of 83 L/s but is less than the minimum of 200 L/s required by the City.
- Under the Ultimate scenario:
  - Available fire flow exceeds 200 L/s.
  - Maximum pipe velocity under a fire flow of 200 L/s is 3.05 m/s in the 250mm diameter pipe on Dundonald Street (P-2), which is less than the maximum of 5 m/s required by City standards.

A fourth scenario was modelled to consider the available flow under the interim conditions plus upgrades on Dundonald Street. Under this modified, interim conditions scenario, the available fire flow exceeds the minimum of 200 L/s required by the City.

3 Sanitary Sewage Collection

3.1 EXISTING SANITARY SYSTEM

The site is located in an area of the City serviced with a municipal sanitary sewer collection system that conveys flows to the Barrie Wastewater Treatment Facility (WWTF) located at the west end of Kempenfelt Bay on Lake Simcoe.

However, there is no existing sanitary sewer along the frontage of the site. The nearest existing sanitary sewer is approximately 40 m south of the site at Collier Street. The existing dwelling on the site is serviced by a 100 mm dia. sanitary service which connects to the existing sanitary sewer at Collier Street.

As per the Wastewater Treatment Master Plan (2019) prepared by WSP, we understand the Barrie WWTF is expected to reach its current rated capacity in 2031 based on population growth projections. It was expected to reach 80% of the rated capacity in 2021, at which time it is understood annual reports are required to be prepared to assess the function of the WWTF. As such, it is understood the WWTF has sufficient existing capacity to service additional development in the City, including the subject site.

3.2 PROPOSED SANITARY SYSTEM

To service the proposed development, and in accordance with the City's plans to reconstruct and service Dundonald Street, a 250 mm dia. sanitary sewer will be constructed within the Dundonald Street ROW, connecting to the existing downstream sewer at Collier Street/Blake Street. The proposed development will discharge sanitary sewage via a 150 mm dia. sanitary service, connected to the new sewer in Dundonald Street. A sanitary maintenance hole will be constructed on the property line to provide a sampling location, as per City standards. The proposed maintenance holes and sanitary sewer within the Dundonald Street ROW as shown on Drawing SS-1 are in accordance with the preliminary design provided by the City for the Dundonald Street reconstruction works. Refer to Drawing SS-1 for additional information.

The full flow capacity of the 150 mm dia. sanitary service is 21.54 L/s, which can accommodate the design peak flow of 0.98 L/s from the proposed development as per calculations provided below. Peak flows have been estimated as per the following:

Estimated sanitary design flows:

- Average Day Flow (ADF): 1.67 PPU x 50 units = 84 persons x 225 L/cap/day = 18,900 L/day = 0.22 L/s;
- Peak Flow (PF) (incl. infiltration) = 0.98 L/s (see Appendix C, Sanitary Flow Calculations).

Therefore, there is satisfactory capacity in the proposed service connection to service the development, as shown in the Sanitary Sewer Design Sheet. It is expected the existing local sewers in Dunlop Street East have sufficient capacity to convey sewage flows to the sanitary trunk sewers located further downstream.

The full flow capacity of the 825 mm dia. trunk sewer with a slope of 0.1% (based on available GIS information) located at Mulcaster Street and Simcoe Street is 453.92 L/s. As the peak flow generated by the site is only 0.98 L/s, representing 0.22% of the trunk sewer's full flow capacity, the City has confirmed that there is sufficient capacity to convey sewage flows to the WWTF.

4 Preliminary Stormwater Management Plan

4.1 DESIGN CRITERIA

This preliminary SWM plan is subject to the review and approval of the City and the LSRCA. Applicable SWM design criteria for the proposed development are presented below.

4.1.1 Stormwater Quality Control

Water quality controls must be provided to satisfy the MECP's *Stormwater Management Practices Planning and Design Manual*. This corresponds to providing Enhanced Protection Level water quality protection of 80% total suspended solids (TSS) removal.

4.1.2 Stormwater Quantity Control

The City requires that post-development peak flow rates be controlled to pre-development levels at any given outlet location to ensure no adverse impacts for downstream landowners. As such, water quantity controls will be provided to attenuate post-development peak flow rates to pre-development levels. In addition, as stormwater runoff generated from the site will discharge directly into the existing Dundonald Street storm sewer, post-development peak flows will be controlled to the 5-year pre-development peak flow rate (design rate for storm sewer conveyance).

4.1.3 Water Balance

As the development area is over 500 m^2, the proposed development is categorized as 'major development' under the LSPP. Therefore, best efforts must be demonstrated to maintaining pre-development infiltration rates in the post-development scenario through the completion of a water balance assessment.

A water balance assessment has been completed as part of the Hydrogeological Investigation by Central Earth Engineering.

4.1.4 Phosphorus Budget

The proposed development is expected to be subject to the Lake Simcoe Phosphorus Offsetting Policy (LSPOP), which requires all new major development to control post-development phosphorus loadings leaving their property to pre-development levels. Any remaining phosphorus load that cannot be controlled/removed will require an offsetting fee based on

LSPOP guidelines. In addition, the LSRCA requires 80% total phosphorus removal for all new major developments.

4.2 EXISTING CONDITIONS

Under existing conditions, the 0.39 ha site (Catchment 101) drains south, overland, where runoff is collected in the existing catch basin located in Dundonald Street at the Blake Street intersection. Runoff is conveyed via sewers to Lake Simcoe approximately 350 m downstream of the subject site. Two external drainage areas (Catchments 301 and 302) located north of the subject site partially drain through the site. Catchment 301 is 0.11 ha and drains to the Duckworth Street unopened ROW. Catchment 302 is 0.13 ha and drains to the Dundonald Street ROW. Existing drainage patterns are shown on the Pre-Development Drainage Plan (Drawing DP-1) provided in Appendix F.

Based on review of Ontario Soils Mapping data, the site is located in an area consisting of Tioga sand loam which is typically well draining and part of hydrologic soil group (HSG) A. This is consistent with findings of the geotechnical report prepared by Central Earth Engineering, which also identified some underlying glacial till comprising of silty sand to sand and silt with trace clay and gravel. The rational method has been used to calculate peak flow rates under pre-development conditions. The results are summarized in Table 1 while detailed calculations are provided in Appendix D.

Table 1: Pre-Development Peak Flow Rates

DESIGN STORM	PEAK FLOW [m^3/s]
2-Year	0.03
5-Year	0.04
10-Year	0.04
25-Year	0.05
50-Year	0.07
100-Year	0.08

4.3 PROPOSED CONDITIONS

Under proposed conditions, the total impervious area of the site increases from 0.07 ha to 0.24 ha due to the proposed building, driveways and parking lot areas. The site has been modelled as one controlled area (Catchment 201) with a runoff coefficient of 0.79 and one uncontrolled

area (Catchment 202) with a runoff coefficient of 0.15. Runoff generated from Catchment 201 will be collected internally and will discharge to the Dundonald Street storm sewer, as per existing conditions. Runoff generated from Catchment 202 will be collected by proposed swales along the northern and eastern property lines and conveyed to the Dundonald Street ROW. External Catchment 301 will be conveyed through the subject site via the northeast drainage swale and ultimately outlet to the Duckworth Street unopened ROW. Catchment 302 will also be conveyed through the subject site via the swale along the northern property line and ultimately outlet to the Dundonald Street ROW. Uncontrolled Catchments 202 and 302 are collected by the existing catch basin on Dundonald Street at the Blake Street intersection.

Proposed drainage patterns are shown on the Post-Development Drainage Plan (Drawing DP-2) provided in Appendix F.

The storm sewers on Dundonald Street will eventually be upgraded and upsized by the City as part of the Wellington D2 Neighbourhood Reconstruction. These future works will not be impacted by the proposed storm sewer outlet from the site.

4.3.1 Water Quantity

As all site generated runoff (Catchment 201) will discharge to the existing storm sewer network, the modified rational method was used to quantify the storage volume required to control the post-development peak flow rates to the 5-year pre-development rate, which is the peak flow received by the downstream sewers under existing conditions. A summary of the post-development peak flow rates and storage volumes are provided in Table 2. Detailed calculations are provided in Appendix D.

Table 2: Post-Development Peak Flow Rates and Storage Volumes

DESIGN STORM	PEAK FLOW [m^3/s]	STORAGE VOLUME REQUIRED [m^3]
2-Year	0.01 *(0.03)*	24.7
5-Year	0.02 *(0.04)*	36.2
10-Year	0.02 *(0.04)*	43.2
25-Year	0.02 *(0.05)*	60.0
50-Year	0.02 *(0.07)*	74.7
100-Year	0.03 *(0.08)*	90.2

Note: Values presented in italics denote existing condition peak flow rates.

As shown, a maximum storage volume of 90.2 m^3 is required to control post-development flow rates from the 1:100-year storm to the 1:5-year pre-development release rate (0.04 m^3/s). The required storage will be provided by an underground stormwater storage system located within the south driveway area. Collected runoff will be controlled to the maximum permissible release rate (0.025 m^3/s) via a 95 mm dia. Orifice to ensure that the total peak flow leaving the site remains below the 1:5-year pre-development release rate (0.04 m^3/s).

Minor Flow Conveyance: Existing Storm Sewer System

Attenuated peak flows will discharge via a 300 mm dia. storm sewer connection to the existing storm sewer within Dundonald Street, as shown on Drawing SS-1. A storm sewer design sheet has been prepared for the proposed storm sewer connection to the existing storm sewer fronting the site and is provided in Appendix D.

As there was no existing Dundonald Street storm sewer catchment plan provided, a conservative approach was taken by using the areas and runoff coefficients of the future storm sewers found in the City's Wellington D2 storm sewer design sheet and applying them to their equivalent-by-approximate-location existing sewers. This was done as the existing and future storm sewer layouts generally run parallel and mirror one another.

As such, the existing 525 mm dia. sewer which the site's proposed storm service will connect to has a full flow capacity of 1.49 L/s. Upon receiving conveyed runoff generated by the site, this 525 mm dia. sewer will be approximately 27.4% full. Therefore, we assume there is sufficient capacity in the existing downstream storm sewers to convey the site's peak flows.

Minor Flow Conveyance: Wellington D2 Future Storm Sewer System

A second storm sewer design sheet (provided in Appendix D) has been prepared to include the City's estimated future peak flows from the Wellington D2 reconstruction project. This design sheet includes information provided by the City's Wellington D2 Storm Sewer Design Sheet, dated May 31, 2021.

Similar to the existing conditions, attenuated peak flows from the site will discharge via a 300 mm dia. storm sewer connection to the future storm sewer within Dundonald Street, as shown on Drawing SS-1 in grey. The proposed storm sewer connection from the site will connect to FUT. STM MHD5 and its downstream 525 mm dia. sewer fronting the site. As per the design sheet, this future scenario shows that there is also sufficient capacity in the future downstream storm sewers to convey the site's peak flows.

4.3.2 Water Quality

Enhanced level water quality control (corresponding to 80% TSS removal) is required for the site. Water quality controls will be provided for Catchment 201 site via a Canadian Environmental Technical Verified (CA ETV) oil-grit separator (OGS) unit and an infiltration chamber designed to be comprised of a StormTank Module (ST-18). Additional information regarding the infiltration chamber is provided below, while detailed design and sizing of the system will be provided during detailed design.

4.3.3 LSRCA Volume Control & LID Design

In accordance with LSRCA requirements, projects defined as 'major development' are required to meet the volume control requirements outlined in Section 3.2.4. of the LSRCA 2022 SWM guidelines. As such, best efforts must be provided to infiltrate, filter, or re-use runoff generated from impervious areas on site.

Due to multiple site constraints (presented in Section 3.2.6. of the LSRCA SWM Guidelines) the site will not be able to provide runoff volume control for the 25 mm runoff volume. The constraints consist of:

- zoning, setbacks or other land use requirements;
- property or infrastructure restrictions; and
- excessive cost.

As such, an alternative treatment option has been proposed in accordance with LSRCA guidelines.

Infiltration-based LID practices (i.e., infiltration chambers) are proposed for the 25 mm rainfall event from the rooftop surface. The 25 mm rainfall event on the rooftop area results in a volume of 18.3 m^3, which is equivalent to the 7.6 mm storm for the entire impervious area of the site.

- Volume = 25 mm x Rooftop Footprint = 25 mm x 733 m^2 = 18.3 m^3
- Equivalent Storm = 18.3 m^3 / (0.24 ha) = 7.6 mm

The infiltration chamber is designed to be comprised of StormTank Modules (ST-18) located a minimum 4 m away from the building and foundations, while ensuring that the minimum 1.0 m separation criteria is met between the groundwater table elevation (estimated to be at elevation of 236.28 per the Hydrogeological Report prepared by Central Earth Engineering) and the base of stone. Refer to Drawing SS-1 for a typical sketch of the LID infiltration chamber. Additional design information will be provided during detailed design.

4.3.4 Water Balance

A water balance analysis has been completed by Central Earth Engineering to assess the potential impact of the development on local groundwater and surface water resources. Their analysis determined the pre-development water balance condition results in approximately 765 m^3/year of infiltration volume and 851 m^3/year of runoff. Under post development conditions, due to the increase in impervious area, results in approximately 396 m^3/year of infiltration and 1,956 m^3/year of runoff resulting in an infiltration deficit of 369 m^3/year and a surplus of annual runoff of 1,105 m^3/year.

As mentioned, the infiltration chamber has been sized to provide infiltration for the single-event volume generated during the 25 mm storm event. Based on review of historical rainfall data for the Barrie WPCC rainfall station, the 25 mm storm event accounts for approximately 95% (936 mm) of the average annual rainfall which is equivalent to annual rainfall capture of 686 mm (480 m^3/year) which mitigates the infiltration deficit and therefore, achieves water balance requirements.

4.3.5 Phosphorus Budget

In order to comply with LSPOP requirements, a phosphorus budget for the site has been completed using the loading rates and removal efficiencies from the MECP Phosphorus Budget tool through a spreadsheet method, summarized below in Table 3.

Existing Conditions

Under existing conditions, the site has been modelled as a single land use category (low intensity development) for the purpose of the phosphorus budget calculations.

Applying the relevant loading rate of 0.13 kg/ha/year, the pre-development phosphorus load is 0.05 kg/year.

Proposed Conditions

Under proposed conditions, the site has also been modelled using the 'high intensity development – residential' land use category with a loading rate of 1.32 kg/ha/year for the developed area and the existing 'low intensity development' land use category with a loading rate of 0.13 kg/ha/year for the undisturbed area. The proposed site will include an infiltration chamber (95% removal efficiency) to treat the rooftop area and an oil-grit separator (20% removal efficiency) to treat the remaining impervious area, which results in a total removal efficiency of 38% across the site. As 80% removal is not provided, additional treatment options will be assessed at detailed design.

Applying the relevant loading rate, the post-development phosphorus load with controls is 0.21 kg/year.

A summary of the phosphorus loading rates for each scenario is provided in Table 3. Additional details and outputs are provided in Appendix E. As shown, the phosphorus offsetting fee is $14,077 plus LSRCA's 15% administration fee.

Table 3: Phosphorus Loading Summary

SCENARIO	AREA (ha)	PHOSPHORUS LOADING (kg/year)
Pre-Development	0.39	0.05
Post-Development (Without Controls)	0.39	0.34
Post-Development (With Controls)	0.39	0.21

4.4 SWM FACILITIES MAINTENANCE

Ongoing maintenance of SWM facilities is necessary to ensure continued effectiveness. The LID infiltration chamber, underground stormwater storage tank and oil-grit separator should be inspected regularly and particularly after large rainfall events to ensure the system and all its component parts are functioning properly and are in good repair. Additional O&M information will be provided at detailed design.

5 Siltation & Erosion Control Plan

Siltation and erosion controls will be implemented for all construction activities, including demolition, earthworks, material stockpiling, pavement construction, and grading operations. Details of the sedimentation and erosion control will be provided during detailed design and are summarized as follows:

- heavy duty silt control fences will be erected to control sediment movement to abutting properties and the Dundonald Street right-of-way;
- a stone mud mat will be installed at the construction entrances from Dundonald Street; and
- regular inspection of control measures will be implemented and repairs made as necessary during construction.

A preliminary Erosion & Sediment Control Plan (Drawing ESC-1) is provided in Appendix F.

6 Grading & Landscaping

The grading of the proposed development will match to the existing grades along the limits of the development. The site will be graded to suit the existing boundary conditions surrounding the site. Refer to the Preliminary Site Grading Plan (Drawing SG-1) provided in Appendix F for additional details.

7 Utilities

All utilities (electrical, gas, telecommunications) are expected to be available from Dundonald Street to service the proposed development. Further coordination will be required during the detailed design stage.

8 Summary

8.1 WATER SUPPLY & DISTRIBUTION

The site will be serviced with a 50 mm dia. domestic water service and a dedicated 150 mm dia. fire service from a proposed 300 mm dia. watermain extended from the existing watermain at Dundonald Street and Theresa Street. The municipal water system has sufficient supply and storage volumes to service the proposed development. The existing municipal watermains have sufficient capacity to provide the FUS required fire flow of 83 L/s for the proposed development. The watermain on Dundonald Street will need to be upsized to 250 mm dia. to meet the City's minimum fire flow requirement of 200 L/s.

8.2 SANITARY SEWER COLLECTION

The site will be serviced via a 150 mm dia. sanitary sewer service connected to the proposed 250 mm dia. sanitary sewer on Dundonald Street. There is sufficient capacity within the Barrie WWTF to service the proposed development.

8.3 STORMWATER MANAGEMENT PLAN

The preliminary SWM plan demonstrates the proposed development will not result in negative impacts with respect to stormwater. Post-development peak flows will be controlled to the existing 5-year flow rates via an underground stormwater storage system and orifice plate. Controlled runoff from the site will be conveyed to the existing storm sewer on Dundonald Street. Water quality controls will be provided by an oil-grit separator and infiltration chamber. The site will be serviced via a 300 mm dia. storm sewer connecting to the existing 525 mm dia. storm sewer on Dundonald Street.

8.4 SILTATION & EROSION CONTROL

Siltation and erosion controls will be provided with the proper construction mitigation efforts.

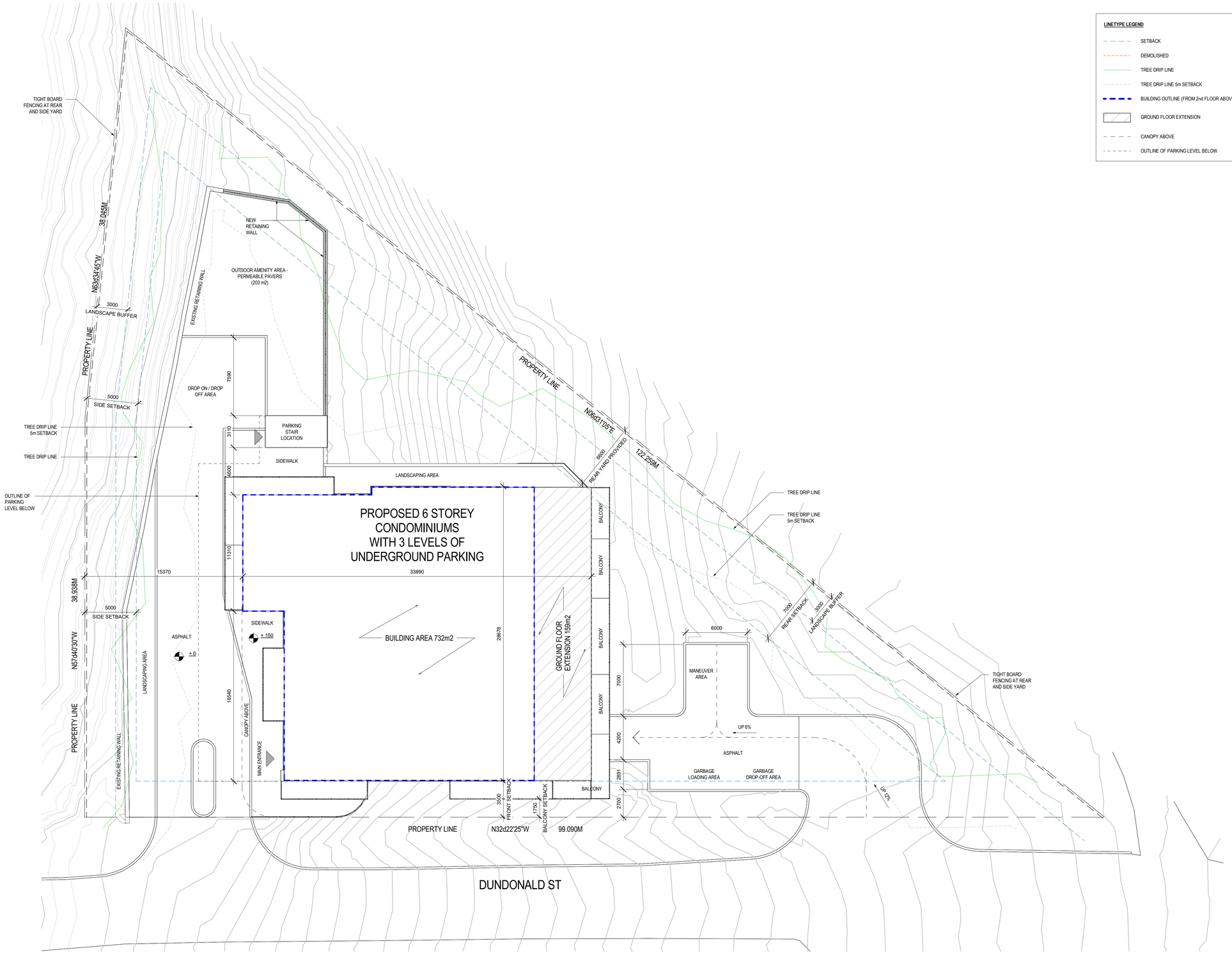
8.5 GRADING & LANDSCAPING

The grading of the proposed development will match existing perimeter grades along the limits of the development.

8.6 UTILITIES

All utilities (electrical, gas, telecommunications) are expected to be available from Dundonald Street to service the proposed development.

Appendix A:
Site Plan



1 / A1.2 SITE PLAN NOTATION

1 : 175

LINETYPE LEGEND

- SETBACK
- DEMOLISHED
- TREE DRIP LINE
- TREE DRIP LINE 5m SETBACK
- BUILDING OUTLINE (FROM 2nd FLOOR ABOVE)
- GROUND FLOOR EXTENSION
- CANOPY ABOVE
- OUTLINE OF PARKING LEVEL BELOW

BUILDING/SITE INFO:

Suites on ground floor = 5
Suites on 2nd floor = 9
Suites on typical floors (3rd to 6th) = 9x4 = 36
Total Suites = 50

Parking Spaces Required = 75
Parking Spaces Provided = 61 (1.22 / unit)

Storeys = 6
Building Height = 18.6m
Building Area = 732m2
GFA = 4,555m2

RA1-3 ZONING TABLE

	REQUIRED	PROPOSED
LOT AREA (MIN.)	1,100m2	3,880.2m2
LOT FRONTAGE (MIN.)	24m	99m
FRONT YARD (MIN.)	7m	3.5m (exception)
PARKING STRUCTURE SETBACK FROM STREET LINE (MIN.)	1.8m	3.5m
INTERIOR SIDE YARD (MIN.)	5m	15.3m
REAR YARD (MIN.)	7m	6.6m
DWELLING UNIT AREA (MIN.)	35m2+10m2/bedroom	>35m2+10m2/bedroom
LOT COVERAGE (MAX.)	35%	23.5%
PARKING AREA COVERAGE (MAX.)	35%	0% (All parking is underground / indoor)
% OF PARKING AREA IN THE FRONT YARD (MAX.)	20%	0%
LANDSCAPING (MIN.)	35%	54.7%
G.F.A. (MAX.)	100%	118% (exception)
BUILDING HEIGHT (MAX.)	30m	18.6m (from ground floor) 29.1m (from parking level 3) 23.85m (from average grade)
PARKING (MIN.)	1.5 spaces/unit = 75 spaces @ 2.7m x 5.5m (Including 3 BF spaces)	1.22 spaces/unit = 61 spaces @ 2.7m x 5.5m (Including 3 BF spaces)
DRIVE AISLE WIDTH (MIN.)	6.4m	6.4m
BARRIER FREE (MIN.)	1 Type A space @ 3.4m x 5.5m & 2 Type B space @ 3.1m x 5.5m Each barrier-free space shall contain a 1.5m access aisle	3 Type A space @ 3.4m x 5.5m
LANDSCAPED BUFFER (MIN.)	3m setback (sides & rear)	5m (majority)
FENCING (MIN.)	2m (tight board fence) *Parking with 4 or more spaces abutting residential zone*	Provided
MAX. DENSITY	150 units per hectare for lands located outside of the City Centre (Official Plan Policy)	129 units per hectare
SECONDARY MEANS OF ACCESS/LANDSCAPED OPEN SPACE	7m	7m
ACCESSORY BUILDING FRONT YARD SETBACKS (MIN.)	7m Not permitted in the front yard	> 7m
ACCESSORY BUILDING REAR & SITE YARD SETBACKS (MIN.)	0.6mm	> 3m both sides and rear
ACCESSORY BUILDING LOT COVERAGE (MAX.)	10%	0.6% = Parking Stair
ACCESSORY BUILDING/STRUCTURE HEIGHT (MAX.)	4m	3.6m

10	Issued for 2nd ZBA Application	2023 09 14
9	Re-Issued for Planner Approval	2023 05 05
8	Re-Issued for Planner Approval	2023 01 13
7	Re-Issued for Planner Approval	2022 09 13
6	Consultant Coordination	2021 01 21
5	Re-Issued for Re-Zoning	2020 11 17

ISSUES/REVISIONS

ALL DIMENSIONS TO BE CHECKED AND VERIFIED ON SITE. DISCREPANCIES TO BE REPORTED TO THE ARCHITECT. LATEST APPROVED STAMPED DRAWINGS ONLY TO BE USED FOR CONSTRUCTION.

PROJECT NORTH

ONTARIO ASSOCIATION OF ARCHITECTS
MICHAEL W. McKNIGHT
LICENCE
3808

MCL ARCHITECTS
MCKNIGHT CHARRON LIMITED

48 ALLIANCE BLVD., UNIT 110
BARRIE, ONTARIO L4M 5K3

T 705 722 6739
WWW.MCLARCHITECTS.CA

DRAWING TITLE:
SITE PLAN DIMENSIONED

PROJECT NAME:
DUNDONALD APARTMENT BUILDING
19 DUNDONALD ST.
BARRIE, ONTARIO

DATE:	September 14, 2023	PROJECT #	SHEET #
DRAWN BY:	LR	-	A1.2
SCALE:	As indicated		

Appendix B:
Water Calculations

TATHAM ENGINEERING

PROJECT	19 Dundonald Street, Barrie	FILE	420367
		DATE	29-Nov-23
SUBJECT	Water Demand Calculations	NAME	JLM
		PAGE	1 OF 1

Design Criteria (as per City of Barrie's *Drinking Water Infrastructure Design Standard*)

Demands

Per Capita Flow = 225 L/cap/day

Population Density

High Density = 1.67 PPU

Peaking Factors (from MOE Design Guidelines for Drinking Water Systems - Table 3-1)

Maximum Day Factor = 2.75

Peak Hour Factor = 4.13

Site Information

Apartment Units = 50

Total Population = 84 persons

Average Day Demand (ADD)

ADD = 18,900 L/day = 18.90 m^3/day = 0.22 L/s

Maximum Day Demand (MDD)

MDD = 18,900 L/day x 2.75

= 51,975 L/day = 51.98 m^3/day = 0.60 L/s

Peak Hour Demand (PHD)

PHD = 18,900 L/day x 4.13

= 78,057 L/day = 78.06 m^3/day = 0.90 L/s

Fire Flow (FF)

Required Fire Flow (FF)* = 83.00 L/s

*Calculation based on *Water Supply for Public Fire Protection* (2020) by Fire Underwriters Survey (FUS). Assumptions of non-combustible building design and construction methods coordinated in consultation with architect.

MDD + FF = 83.60 L/s

TATHAM ENGINEERING	Project: 19 Dundonald Street	Date:	June 28, 2023
	File No.: 420367	Designed:	JN
	Subject: Fire Flow Calculations Non-Combustible	Checked	
	Revisions:		

Fire Underwriters Survey Fire Flow Calculations

Calculation Based on 2020 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

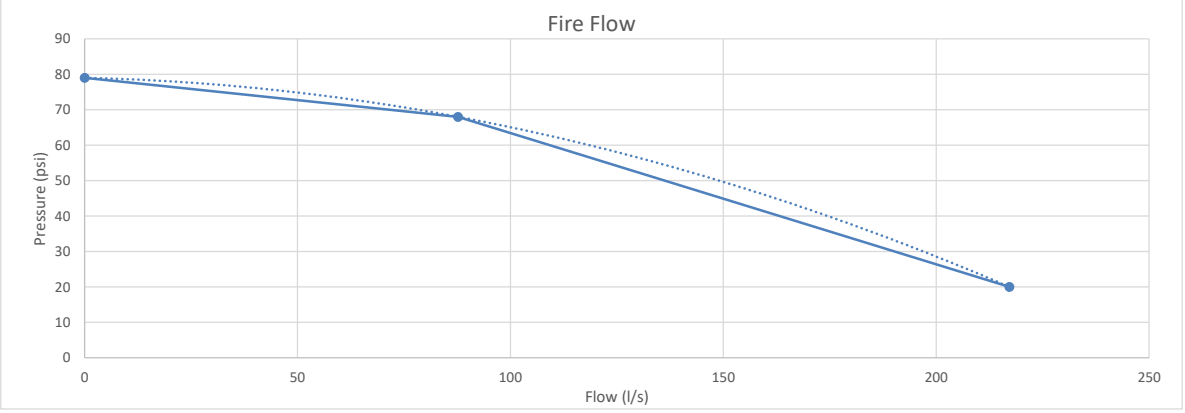
Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
		Framing Material							
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Type V - Wood Frame Construction	1.5	Non-combustible Construction	**0.8**	%	N/A	
			Type IVA - Mass Timber Construction	0.8					
			Type IVB - Mass Timber Construction	0.9					
			Type IVC - Mass Timber Construction	1.0					
			Type IVD - Mass Timber Construction	1.5					
			Ordinary Construction	1.0					
			Non-combustible Construction	0.8					
			Fire Resistive Construction	0.6					
2	Total Effective Area	Largest Floor Area				**732**	m^2	N/A	
		Percentage of the Total Area of the Other Floors for Coefficient 1.0 to 1.5			**100%**				
		Percentage of the Total Area of the Other Floors for Coefficient below 1.0:							
		a) If any vertical opening in the building are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight, **or**			**50%**	**2562**			
		b) If all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest Floor Area plus 25% of each of the two immediately adjoining floors.			**25%**				
		Total Effective Area				**3294**			
3	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (RFF= 220 x C x $A^{0.5}$)						10,000	
4	Factors Affecting Burning	**Reductions / Increases Due to Factors Affecting Burning**							
4.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	%	(1,500)	8,500
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
4.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	For a fully supervised system the conditions a), b) and c) below must be met.			-0.4	%	(3,400)	5,100
			a) Automatic sprinkler protection designed and installed in accordance with NFPA 13	-0.3	Yes				
			b) Water supply is standard for both the system and the Fire Department hose lines	-0.1	Yes				
			c) Fully supervised system	-0.1	No				
			None	0.0	No				
4.3	Separation Distance Between Units (Use 10% for 2 hour Fire Separation between adjacent units)	Exposure distance between units	North Side	Greater than 30.0 m	0.00	0	%	-	5,100
			East Side	Greater than 30.0 m	0.00				
			South Side	Greater than 30.0 m	0.00				
			West Side	Greater than 30.0 m	0.00				
4.4	Combustibility of Wood Shingle or Shake Roof Material	Surcharge for potential to spread fire	Non-combustible roofing material	0	Non-combustible roofing material	0	L/min	0	5,100
			Low risk of fire spread	2000					
			Moderate risk of fire spread	3000					
			High risk of fire spread	4000					
		Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:							5,000
5	Required Fire Flow, Duration and Volume	Total Required Fire Flow (above) in L/s:							83
		Required Duration of Fire Flow of 5,000 L/min (hrs):							1.75
		Required volume for Fire Flow of 5,000 L/min (m^3):							525

Fire Flow Test (W501 v1.1)
City of Barrie
22-Aug-2023

Hydrant Number (Residual and Static Pressure)	Residual Pressure H67	
Hydrant Number(s) (Flow)	Pitot Pressure H51	
Hydrant Street / Address (Residual and Static Pressure)	Eugenia Street at Dundonald Street	
Hydrant Street / Address (Flow)	Dundonald Street at Theresa Street	
Hydrant Locations Figure (Residual/Static and Flow)	Please refer to Vipond's "Flow Test Results"	
Date of Test (DD/MM/YYYY)	08/17/2023	
Time (HH:MM AM or PM)	Unknown	
Time (HH:MM AM or PM)	Unknown	
Company Name	Vipond Inc.	
Employee Name(s)	Len K. - T.H.	
City of Barrie Employee Name(s)	Unknown	
Static Pressure	79	psi
Residual Pressure	68	psi
Hydrant Elevation (Residual and Static Pressure)	268	m
Hydrant Elevation (Flow)	262	m
Elevation Difference (m)	6	m
Pitot Pressure - Outlet 1	17	psi
Pitot Pressure - Outlet 2		psi
Outlet Size	2.5	inch
Outlet Coefficient	0.9	
Pressure Drop Check (NFPA 291)	13.92	% Minimum pressure drop of 25% is recommended, please consider opening other outlets or flowing additional hydrants
Pressure Drop Check (AWWA M17)	11.00	psi Meets minimum pressure drop recommendation of 10 psi
Q Hydrant Flow - Outlet 1	1390.00	US gpm
Q Hydrant Flow - Outlet 2		US gpm
Q Total Flow	87.70	l/s
Pressure at Desired Fire Flow	20.00	psi
Q Outlet 1_R	3442.89	US gpm
Q Outlet 2_R		US gpm
Q $Total_R$	3442.89	US gpm
Q $Total_R$	217.21	l/s
Have any Cell formulas been changed? (Yes/No)	Yes	C28 (Q hydrant flow) was revised to measured value instead of theoretical calculation. Measured value is more conservative of actual flow scenario.
Hydrant Colour:	Blue	

Boundary Conditions (ET, Reservoir, BPS, PRV, Wells etc):
Unknown

Other Considerations (flushing, fire, operational issues, outlet coefficient etc):
Entered data for Flow Test #4.
Estimated hydrant elevations from ground elevations from Barrie GIS mapping.



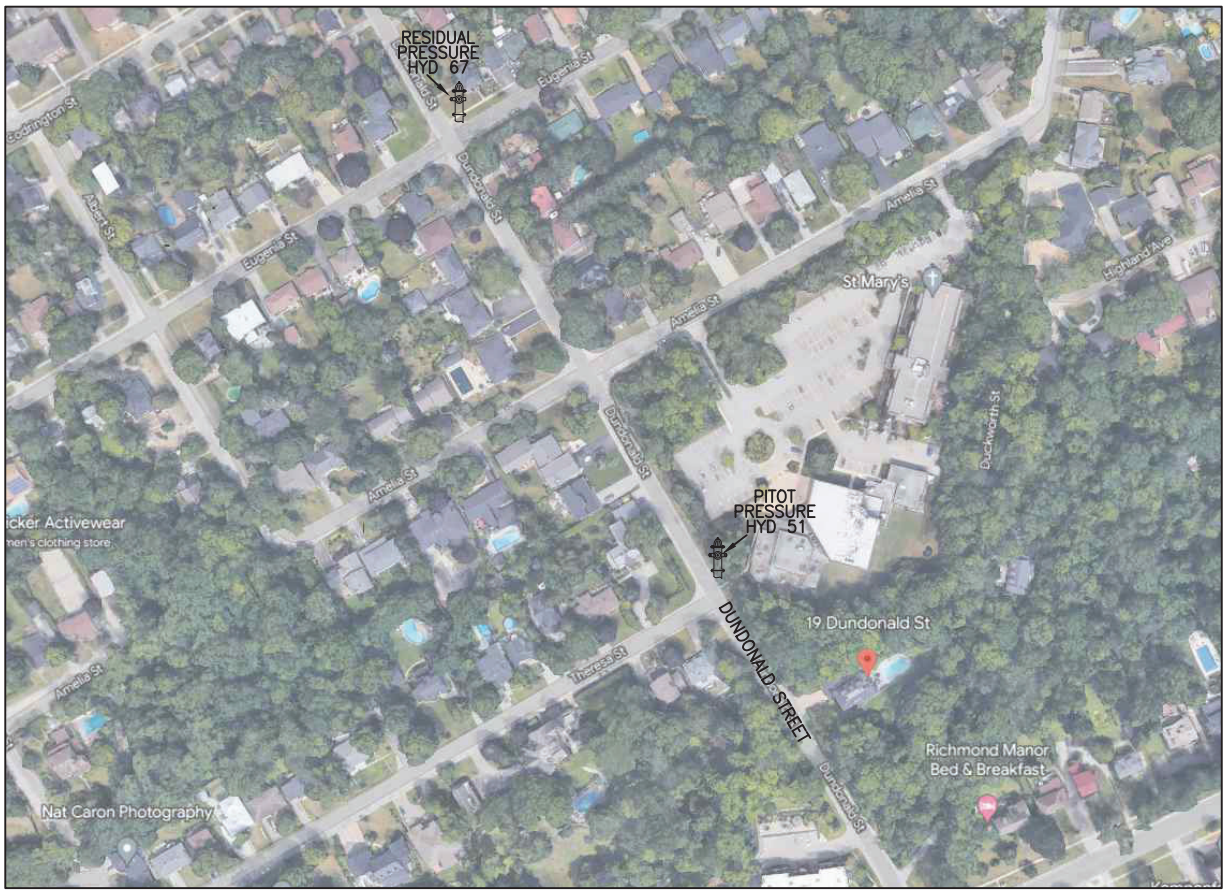
FLOW TEST RESULTS

FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

DATE : AUGUST 17, 2023

LOCATION : 19 DUNDONALD STREET
BARRIE
ONTARIO

TEST BY : LEN K. – T.H.



STATIC PRESSURE : 79 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO–EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1–1/8	0.97	78	80	328
2	1	1–3/4	0.97	74	47	610
3	1	2–1/2	0.90	72	30	924
4	2	2–1/2	0.90	68	17	1390

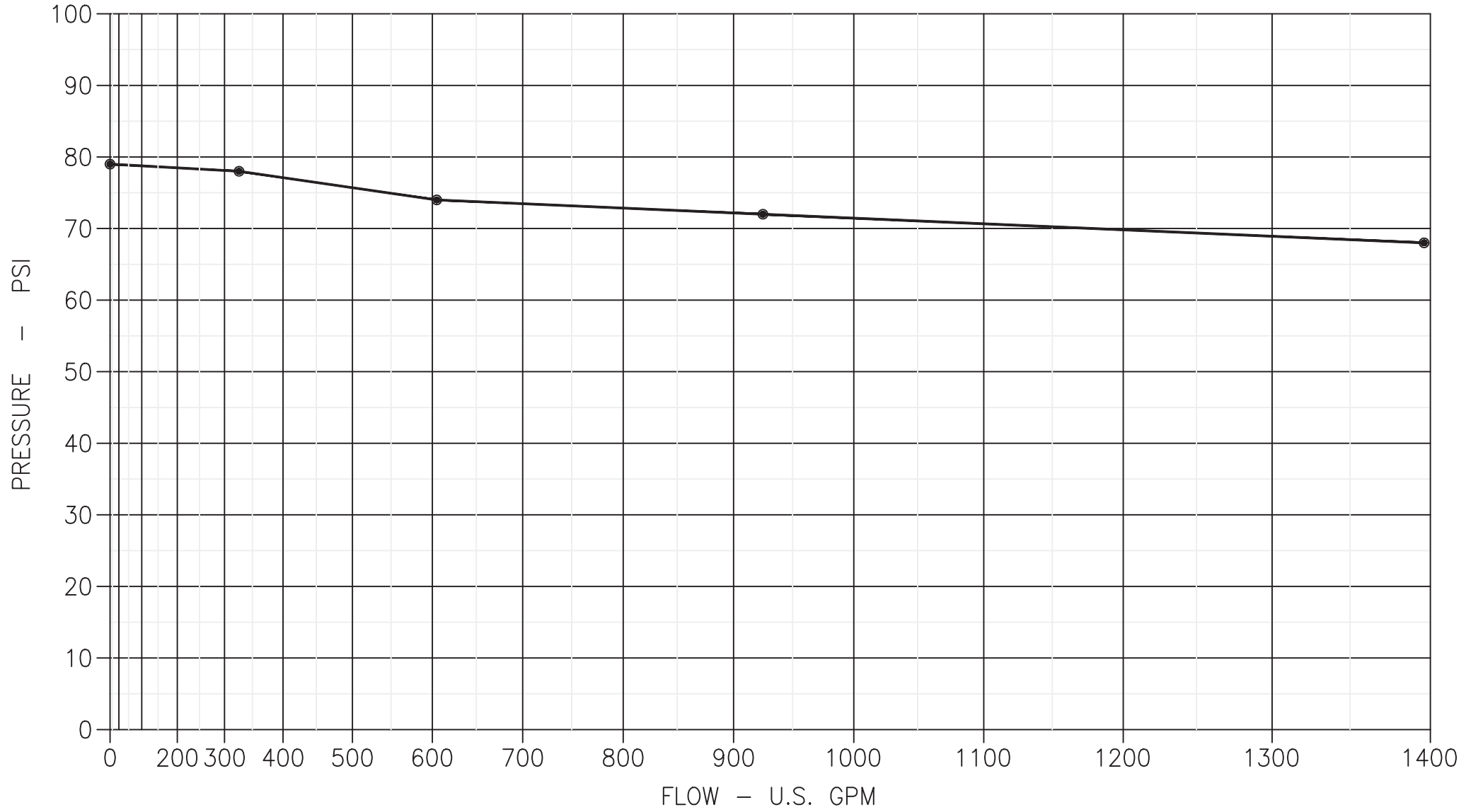
FIRST FOR FIRE, LIFE SAFETY & SECURITY

VIPOND INC

est. 1945

19 DUNDONALD STREET	BY : LEN K.– T.H.
BARRIE	OFFICE : BARRIE
ONTARIO	TEST BY : VIPOND & PUC
	DATE : AUGUST 17, 2023

STATIC:	RESIDUAL:		FLOW:
79 PSI	TEST#1 78 PSI	@	328 GPM
	TEST#2 74 PSI	@	610 GPM
	TEST#3 72 PSI	@	924 GPM
	TEST#3 68 PSI	@	1390 GPM



TATHAM ENGINEERING

PROJECT	19 Dundonald Street, Barrie	FILE	420367
		DATE	Oct 11, 2023
SUBJECT	Water Model Summary	NAME	DD / JRC
		PAGE	1 OF 1

Model Design

- The WaterCAD model pipe network was created from the City of Barrie GIS (existing pipe lengths, diameters, materials). Model elevations are based on the County of Simcoe GIS.
- The model includes watermains on Eugenia Street, Dundonald Street, Theresa Street, Berczy Street, Albert Street and Amelia Street, as shown on the figures. A proposed 300 mm watermain extends from the Dundonald St watermain to the development site. The existing conditions model includes only watermains on Dundonald, Eugenia, Albert, and Amelia.
- Hazen-Williams friction coefficients for proposed and future PVC pipes were selected using the MECP Design Guidelines. Coefficients for cast iron and ductile iron pipes were approximated to achieve model validation.
- To simulate a fire event at the development location, the City Standard minimum required fire flow of 200 L/s was applied to node J-1 at the development site.
- A fictitious reservoir and pump were added to the model north of Eugenia St. The hydrant test data was used to develop the pump curve and validate the ex. conditions model results.
  - The elevation of the reservoir is equal to the elevation at the connecting junction J-4.
  - The pump curve was generated using a Standard (3 Point) Pump Definition Type using hydrant test results and the following calculation:

    Qr = Qf * [(Hr/Hf)^0.54]

    where Qr = Flow available at the desired fire flow residual pressure

    Qf = Flow during test

    Hr = Pressure drop to residual pressure (Static Pressure minus Chosen Design Pressure)

    Hf = Pressure drop during fire flow test (Static Pressure minus Residual Pressure)

Flow during test, Qf	= 1390 U.S. gpm	= 87.7 L/s		*Used for max. operating flow*
Residual pressure during test	= 68 psi	= 47.9 m of head		*Used for max. operating head*
Static pressure during test	= 79 psi	= 55.6 m of head		*Used for shutoff head*
Chosen design pressure	= 75 psi	= 52.8 m of head		*Used for design head*

Hr	=	79 psi	-	75 psi	=	4 psi
Hf	=	79 psi	-	68 psi	=	11 psi
Qr	=	1390 U.S. gpm	*[(	4 psi /	11 psi)^	0.54]
	=	805 U.S. gpm	=	50.8 L/s		*Used for design flow*

Analysis

- The pressure at the development under MDD and PHD scenarios was 102 psi (701 kPa). As per City Standards, a PRV is required as the normal operating pressures are greater than 80 psi (552 kPa).
- The available fire flow at the development is 104 L/s under existing conditions, 180 L/s under interim conditions, and 220 L/s under ultimate conditions. This range achieves the FUS required fire flow of 83 L/s under existing conditions, and will meet the City standard fire flow requirement of 200 L/s in the ultimate build-out condition.
- The maximum pipe velocity of 5 m/s for City standards and 3 m/s for MECP Design Guidelines is expected to be met under all scenarios and build-out conditions.

Results

Existing Conditions - Static Pressure Validation

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	252.0	0.0	323.6	102	701
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	**268.0**	**0.0**	**323.6**	**79**	**545**
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-10	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-11	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-12	0.0	(N/A)	(N/A)	(N/A)	(N/A)

Note: greyed junctions are inactive in model

Existing Conditions - Residual Pressure Validation

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	252.0	0.0	279.5	39	269
J-2	262.6	87.7	279.5	24	165
J-3	262.6	0.0	301.1	55	377
J-4	**268.0**	**0.0**	**315.6**	**68**	**465**
J-5	265.2	0.0	308.6	62	425
J-6	262.5	0.0	304.1	59	407
J-7	262.5	0.0	301.7	56	383
J-8	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-10	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-11	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-12	0.0	(N/A)	(N/A)	(N/A)	(N/A)

Note: greyed junctions are inactive in model

- The hydrant tests performed at nodes J-2 and J-4 provided a static pressure of 79 psi.
  The tested residual pressure for the maximum operating flow of 1390 US gpm (88 L/s) is 68 psi.

Existing Conditions - MDD

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	**252.0**	**0.6**	**323.6**	**102**	**701**
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	268.0	0.0	323.6	79	545
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-10	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-11	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-12	0.0	(N/A)	(N/A)	(N/A)	(N/A)

Note: greyed junctions are inactive in model

Existing Conditions - AFF Under MDD

Node ID	Elev. (m)	AFF (L/s)	HGL (m)	Residual Pressure psi	Residual Pressure kPa
J-1	**252.0**	**90.1**	**323.6**	**34**	**234**
J-2	262.6	90.1	323.6	20	138
J-3	262.6	129.8	323.6	20	138
J-4	268.0	212.2	323.6	20	138
J-5	265.2	63.0	323.6	20	138
J-6	262.5	73.3	323.6	20	138
J-7	262.5	104.5	323.6	20	138
J-8	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-10	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-11	0.0	(N/A)	(N/A)	(N/A)	(N/A)
J-12	0.0	(N/A)	(N/A)	(N/A)	(N/A)

Note: greyed junctions are inactive in model

Interim Conditions - MDD

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	**252.0**	**0.6**	**323.6**	**102**	**701**
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	268.0	0.0	323.6	79	545
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	264.5	0.0	323.6	84	578
J-10	244.0	0.0	323.6	113	779
J-11	261.0	0.0	323.6	89	613
J-12	260.0	0.0	323.6	90	623

Interim Conditions - PHD

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	**252.0**	**0.9**	**323.6**	**102**	**701**
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	268.0	0.0	323.6	79	545
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	264.5	0.0	323.6	84	578
J-10	244.0	0.0	323.6	113	779
J-11	261.0	0.0	323.6	89	613
J-12	260.0	0.0	323.6	90	623

Interim Conditions - AFF Under MDD

Node ID	Elev. (m)	AFF (L/s)	HGL (m)	Residual Pressure psi	Residual Pressure kPa
J-1	**252.0**	**148.3**	**323.6**	**34**	**232**
J-2	262.6	148.4	323.6	20	138
J-3	262.6	156.3	323.6	20	138
J-4	268.0	213.2	323.6	20	138
J-5	265.2	209.5	323.6	20	138
J-6	262.5	81.7	323.6	20	138
J-7	262.5	110.4	323.6	20	138
J-8	264.5	202.8	323.6	20	138
J-10	244.0	177.7	323.6	41	281
J-11	261.0	158.9	323.6	20	138
J-12	260.0	199.9	323.6	20	138

Ultimate Conditions - MDD

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	**252.0**	**0.6**	**323.6**	**102**	**701**
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	268.0	0.0	323.6	79	545
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	264.5	0.0	323.6	84	578
J-10	244.0	0.0	323.6	113	779
J-11	261.0	0.0	323.6	89	613
J-12	260.0	0.0	323.6	90	623

Ultimate Conditions - PHD

Node ID	Elev. (m)	Demand (L/s)	HGL (m)	Pressure psi	Pressure kPa
J-1	**252.0**	**0.9**	**323.6**	**102**	**701**
J-2	262.6	0.0	323.6	87	597
J-3	262.6	0.0	323.6	87	597
J-4	268.0	0.0	323.6	79	545
J-5	265.2	0.0	323.6	83	572
J-6	262.5	0.0	323.6	87	598
J-7	262.5	0.0	323.6	87	598
J-8	264.5	0.0	323.6	84	578
J-10	244.0	0.0	323.6	113	779
J-11	261.0	0.0	323.6	89	613
J-12	260.0	0.0	323.6	90	623

Ultimate Conditions - AFF Under MDD

Node ID	Elev. (m)	AFF (L/s)	HGL (m)	Residual Pressure psi	Residual Pressure kPa
J-1	**252.0**	**200.6**	**323.6**	**33**	**225**
J-2	262.6	200.7	323.6	20	138
J-3	262.6	212.9	323.6	20	138
J-4	268.0	213.2	323.6	20	138
J-5	265.2	211.6	323.6	20	138
J-6	262.5	149.6	323.6	20	138
J-7	262.5	148.8	323.6	20	138
J-8	264.5	206.2	323.6	20	138
J-10	244.0	201.6	323.6	35	239
J-11	261.0	186.2	323.6	20	138
J-12	260.0	206.3	323.6	20	138

Pipe Characteristics, Velocities, and Losses

Interim Conditions

Pipe Characteristics				PHD		148 L/s Fire Event	
Pipe ID	Diam. (mm)	Length (m)	Roughness Coefficient	Velocity (m/s)	Friction Loss (m)	Velocity (m/s)	Friction Loss (m)
P-1	300	64	120	0.01	0	2.10	0.99
P-2	150	126	100	0.02	0	3.51	15.99
P-3	150	113	100	0.02	0	2.82	9.55
P-4	300	172	120	0.01	0	1.40	1.25
P-5	100	110	100	0.01	0	1.55	4.91
P-6	100	60	100	0.01	0	1.55	2.68
P-7	150	116	100	0	0	0.69	0.72
P-8	300	156	120	0.01	0	1.22	0.89
P-9	250	114	110	0.01	0	1.76	1.86
P-10	200	127	110	0.02	0	2.75	6.11
P-11	200	151	110	0.02	0	2.75	7.30
P-12	200	169	110	0.02	0	2.75	8.14

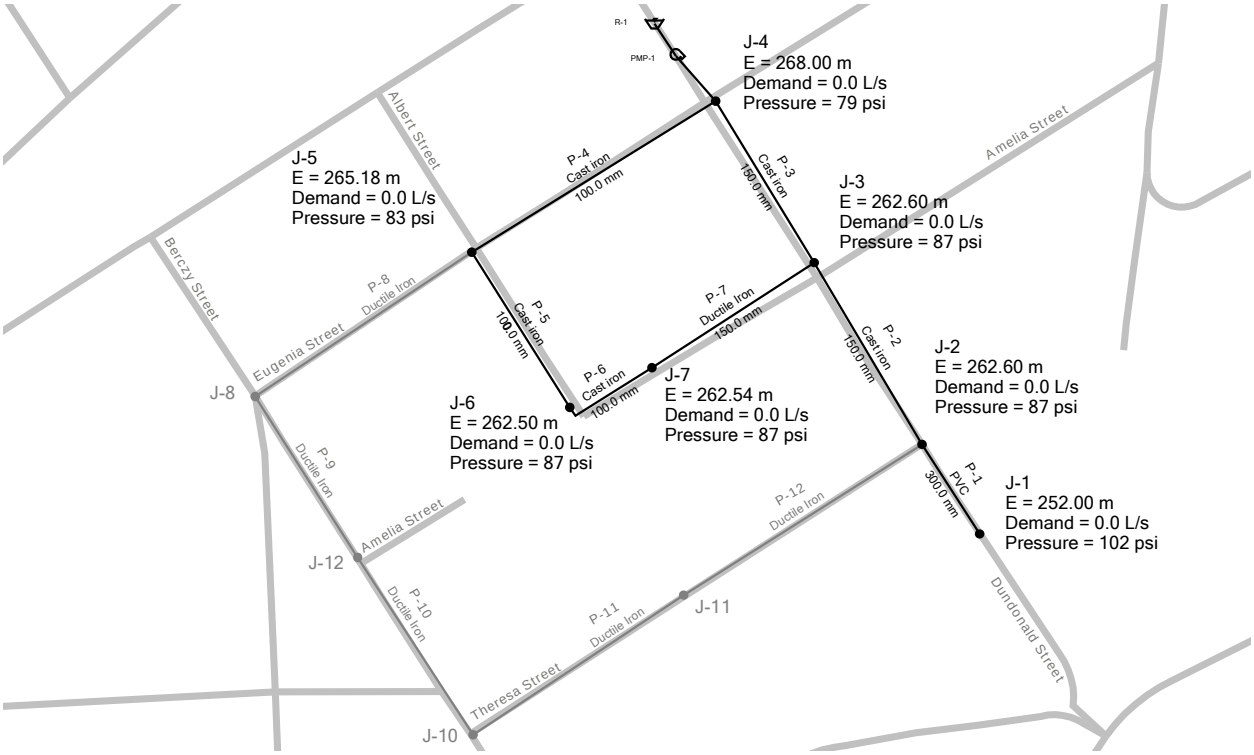
Interim Conditions Plus Dundonald Street

Pipe Characteristics				200 L/s Fire Event	
Pipe ID	Diam. (mm)	Length (m)	Roughness Coefficient	Velocity (m/s)	Friction Loss (m)
P-1	300	64	120	2.84	1.72
P-2	250	126	110	3.02	5.58
P-3	250	113	110	2.85	4.50
P-4	300	172	120	0.86	0.51
P-5	100	110	100	1.04	2.36
P-6	100	60	100	1.04	1.29
P-7	150	116	100	0.46	0.34
P-8	300	156	120	0.74	0.35
P-9	250	114	110	1.07	0.73
P-10	200	127	110	1.67	2.41
P-11	200	151	110	1.67	2.88
P-12	200	169	110	1.67	3.21

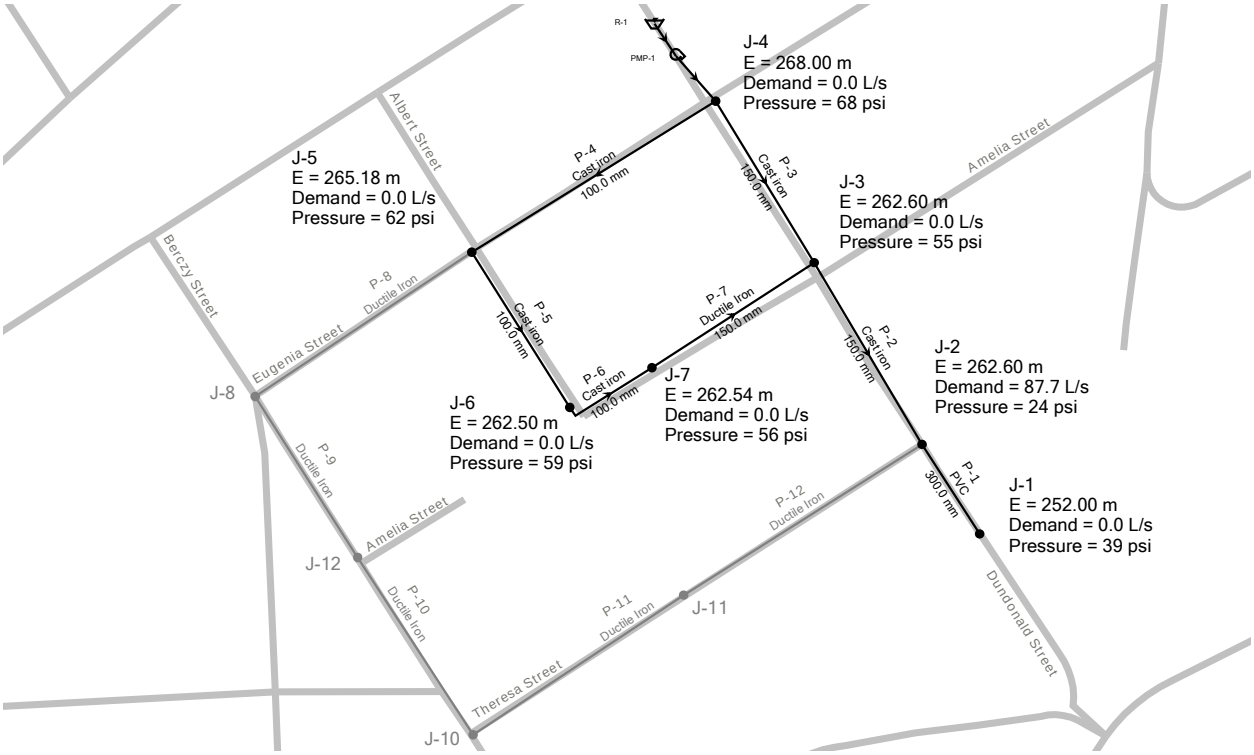
Ultimate Conditions

Pipe Characteristics				PHD		200 L/s Fire Event	
Pipe ID	Diam. (mm)	Length (m)	Roughness Coefficient	Velocity (m/s)	Friction Loss (m)	Velocity (m/s)	Friction Loss (m)
P-1	300	64	120	0.01	0	2.84	1.72
P-2	250	126	110	0.01	0	3.05	5.68
P-3	250	113	110	0.01	0	2.70	4.05
P-4	300	172	120	0	0	0.97	0.63
P-5	150	110	100	0	0	0.98	1.31
P-6	150	60	100	0	0	0.98	0.72
P-7	150	116	100	0	0	0.98	1.38
P-8	300	156	120	0	0	0.72	0.33
P-9	250	114	110	0	0	1.04	0.69
P-10	200	127	110	0.01	0	1.62	2.29
P-11	200	151	110	0.01	0	1.62	2.73
P-12	200	169	110	0.01	0	1.62	3.05

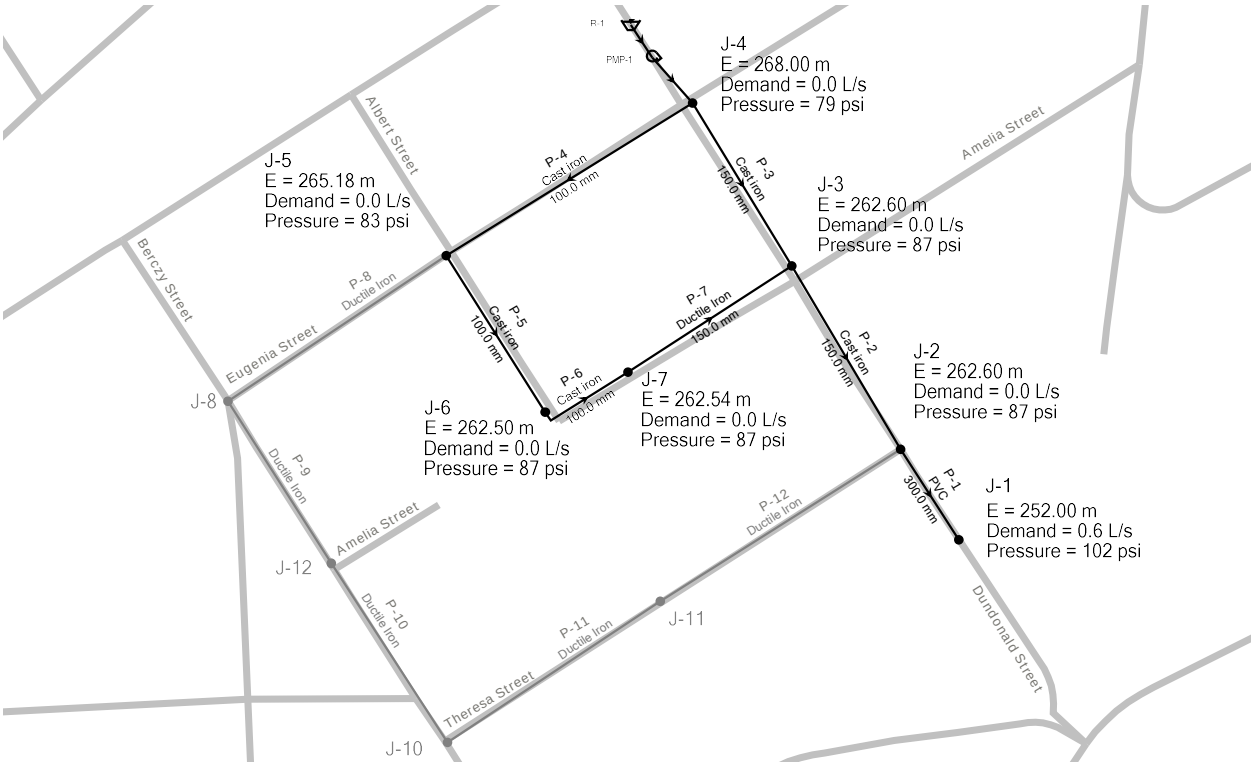
Existing Conditions Model Validation - Static Pressure



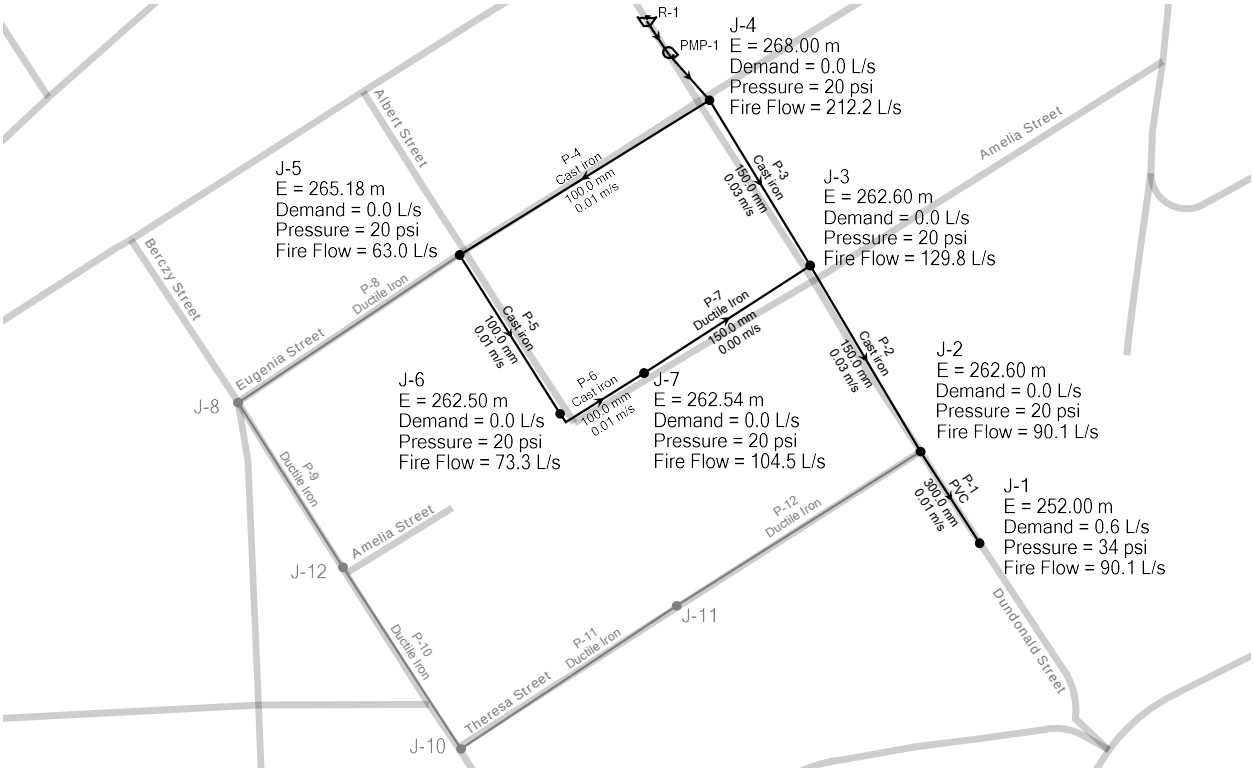
Existing Conditions Model Validation - Residual Pressure



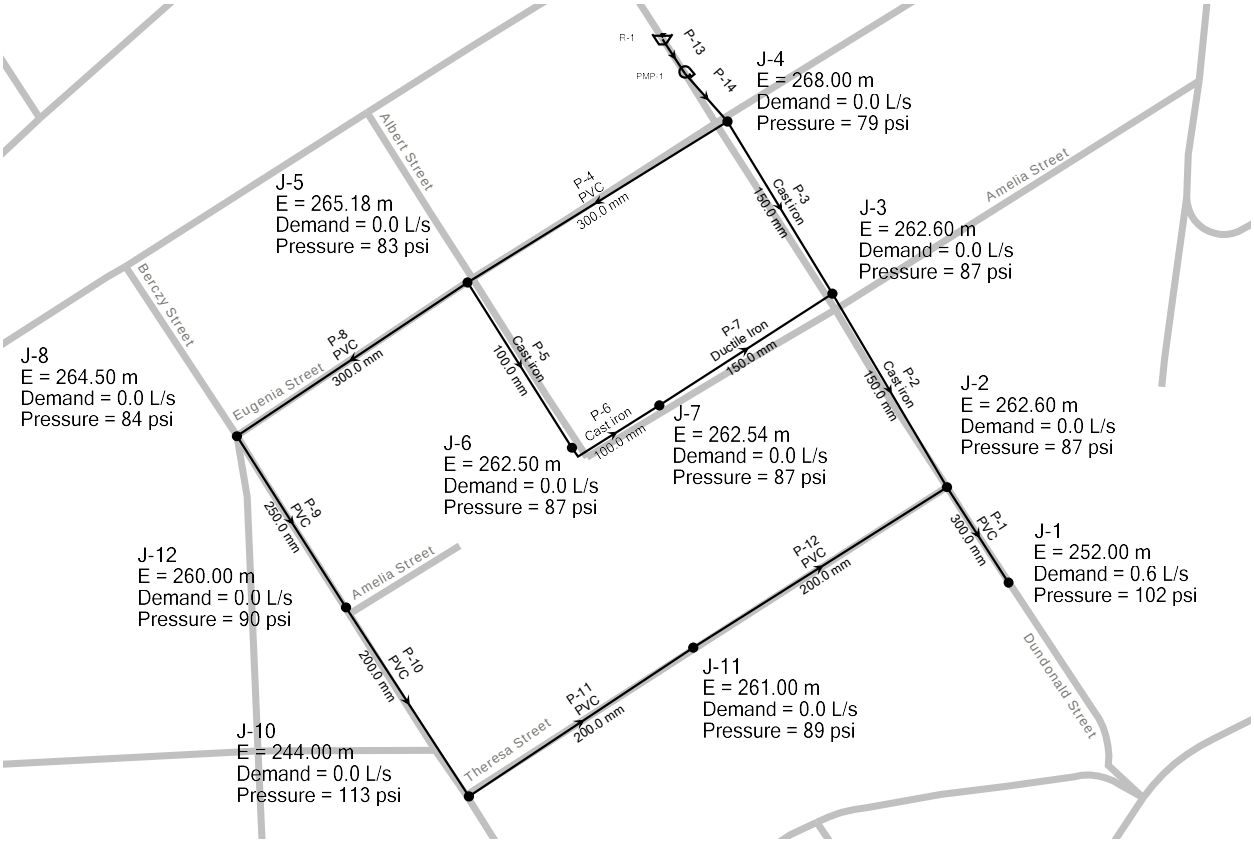
Existing Conditions - MDD



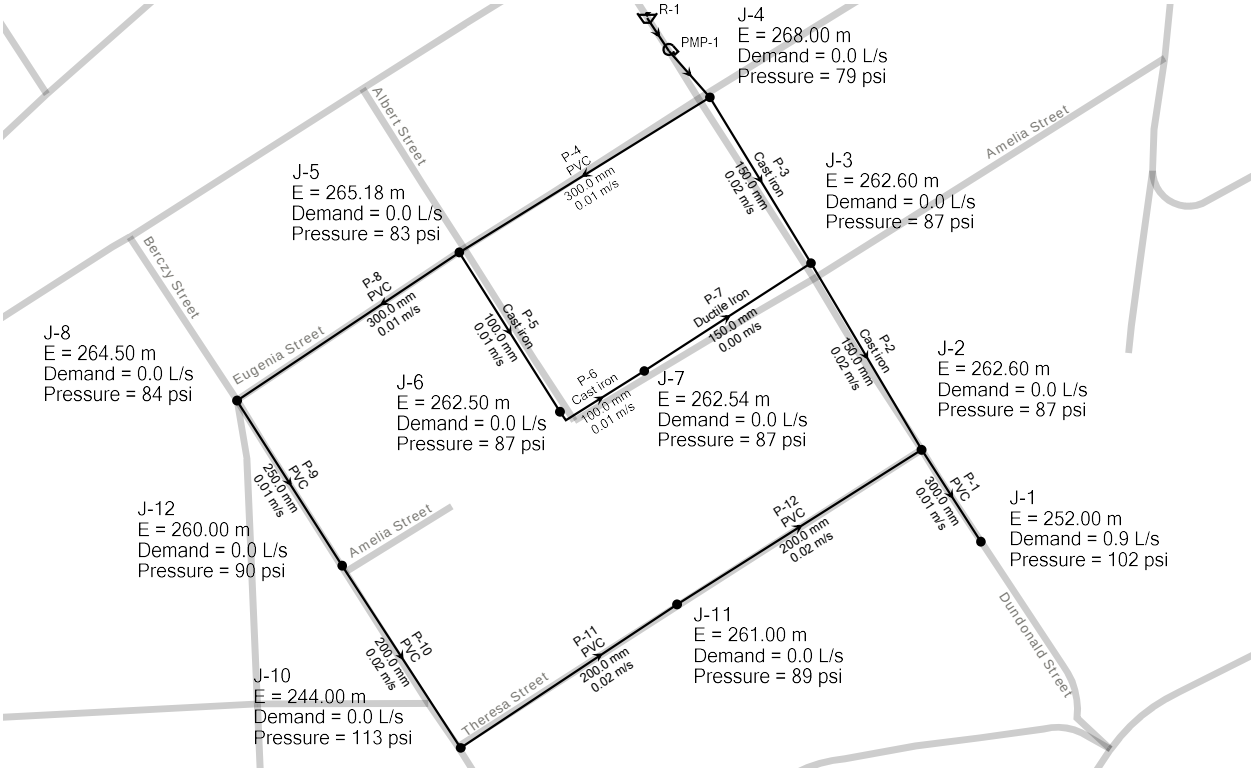
Existing Conditions - MDD + Fire Flow



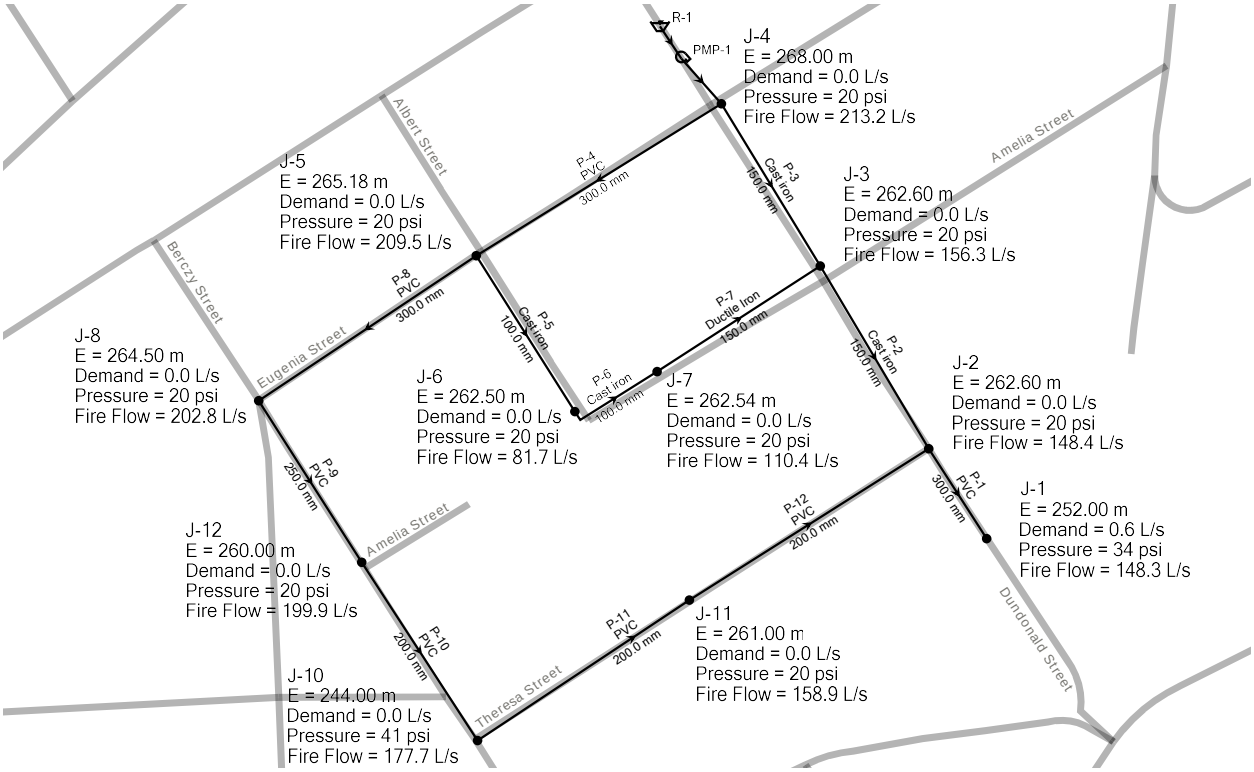
Interim Conditions - MDD



Interim Conditions - PHD

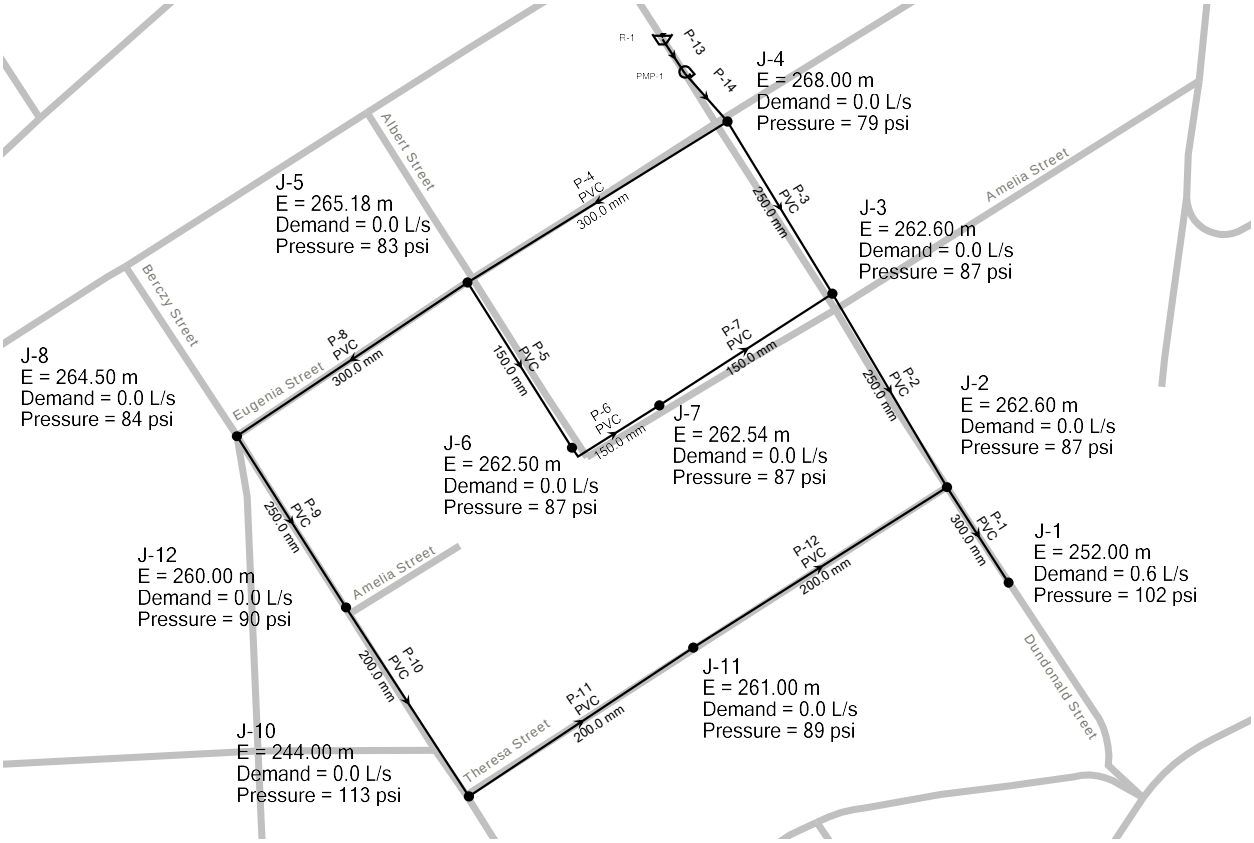


Interim Conditions - MDD + Fire Flow

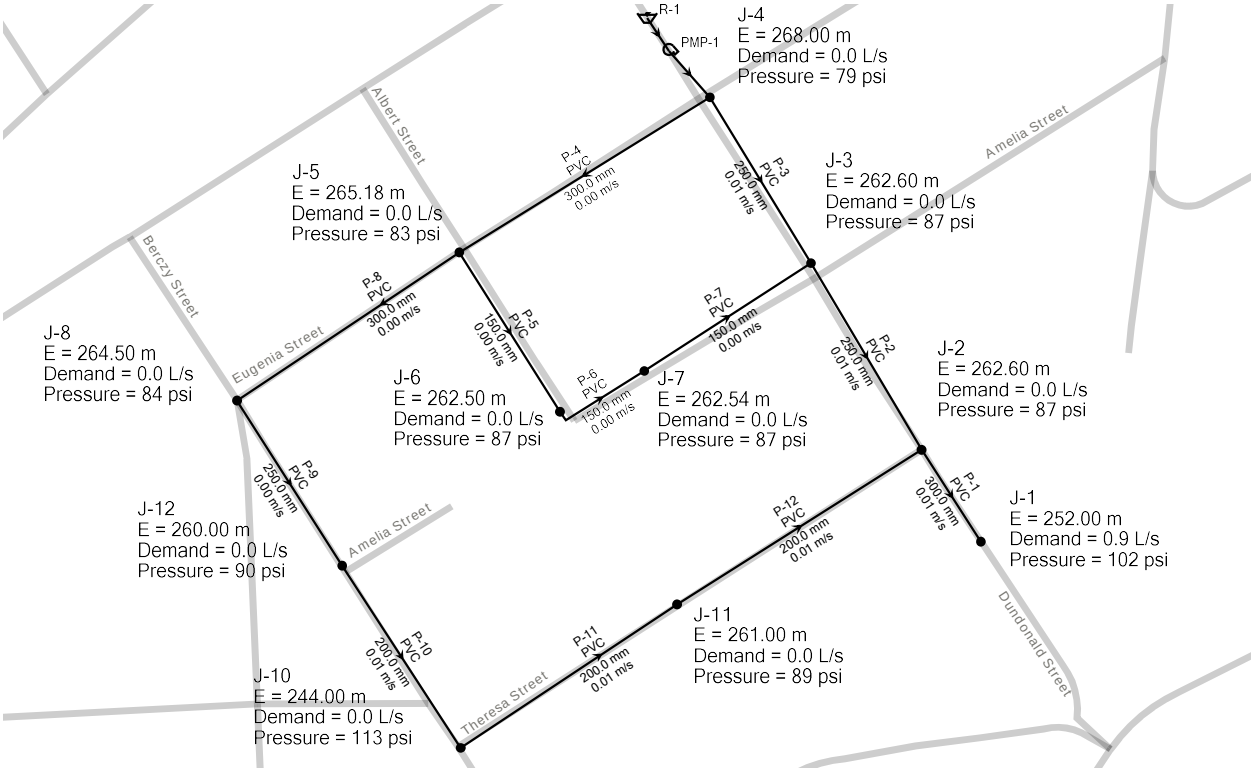


Interim Conditions - 148 L/s Fire Event

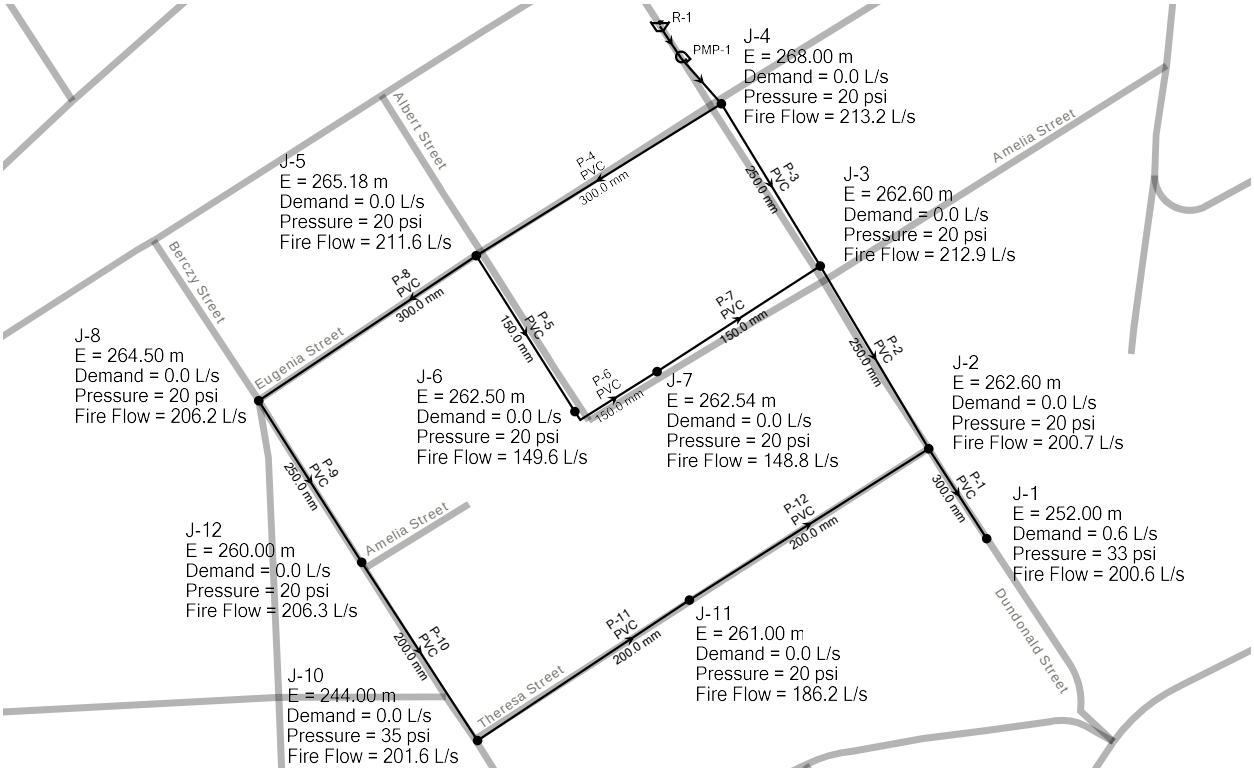
Ultimate Conditions - MDD



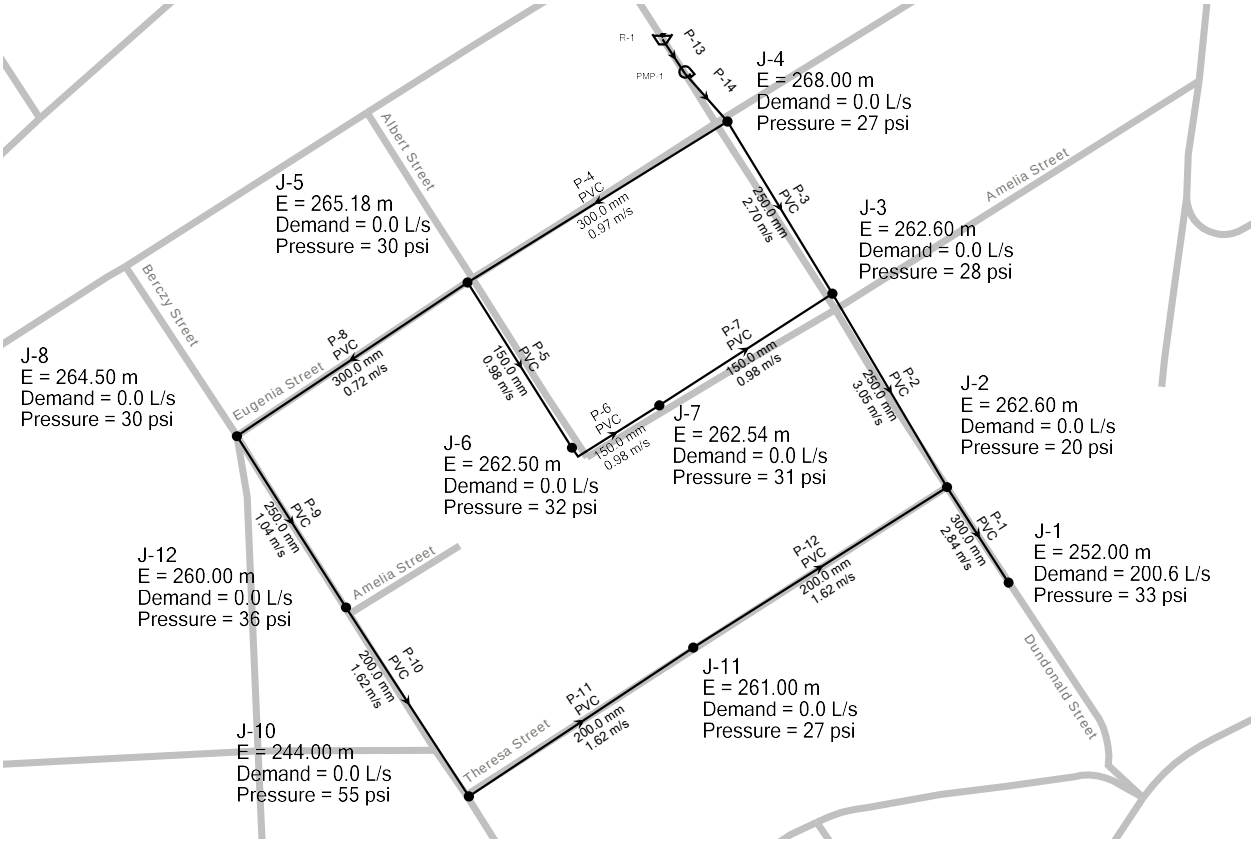
Ultimate Conditions - PHD



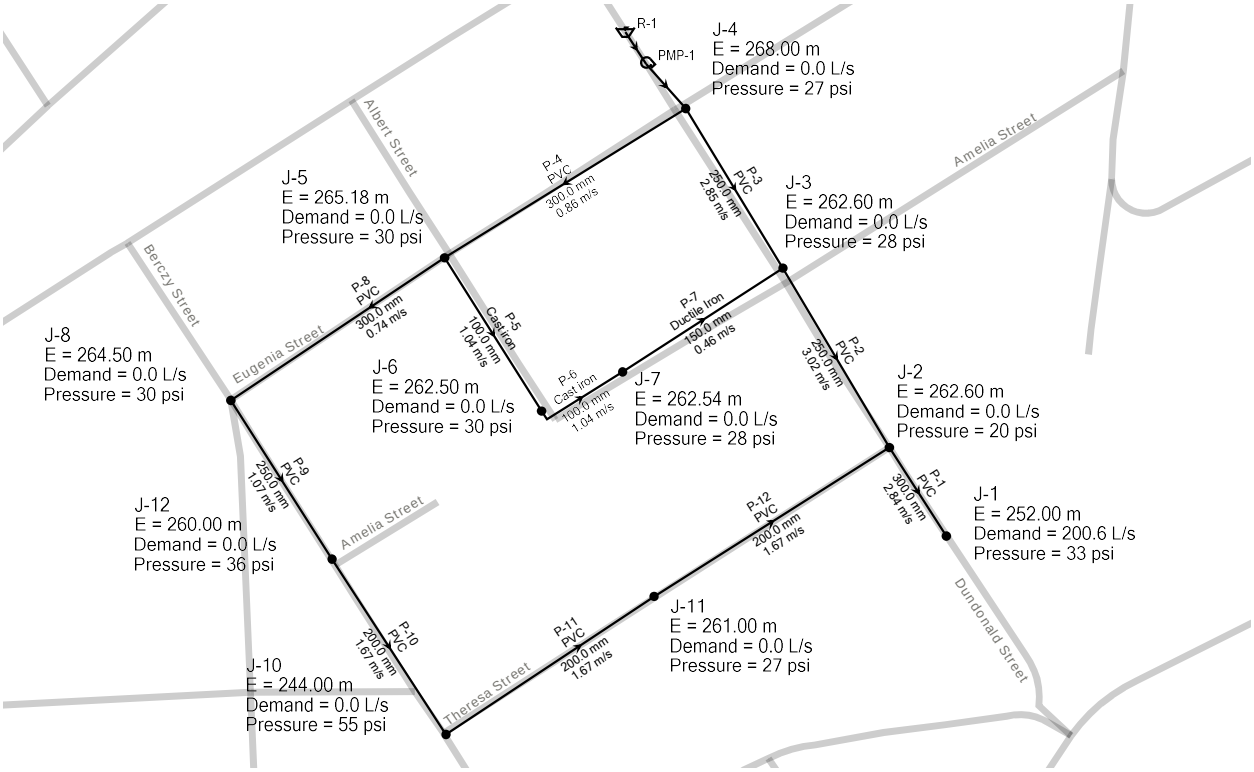
Ultimate Conditions - MDD + Fire Flow



Ultimate Conditions - 200 L/s Fire Event



Interim Conditions Plus Dundonald St - 200 L/s Fire Event



Appendix C:
Sanitary Calculations

TATHAM ENGINEERING

PROJECT	19 Dundonald Street, Barrie	FILE	420367
		DATE	August 14, 2023
SUBJECT	Sanitary Flow Calculations	NAME	JLM
		PAGE	1 OF 1

Design Criteria (as per City of Barrie's *Sanitary Infrastructure Design Standard*)

Demands				Population Density			
Per Capita Flow	=	225	L/cap/day	High Density	=	1.67	PPU
Extraneous Flow (Infiltration)	=	0.10	L/s/ha	Total Population	=	84	persons

Site Information				Peaking Factors		
Apartment Units	=	50		Residential	=	Harmon
Development Area*	=	0.39	ha		=	1+14/(4+.084^0.5)
*Used for Extraneous Flow only					=	4.26

Average Day Flow (ADF)

ADF	=	18,900	L/day	=	18.90	m^3/day	=	0.22 L/s

Peak Flow (PF)

PF	=	18,900	L/day	x	4.26			
	=	80,581	L/day	=	80.58	m^3/day	=	0.94 L/s
Extraneous Flow	=	3,456	L/day	=	3.46	m^3/day	=	0.04 L/s
Total PF (incl. Extraneous Flow)	=	84,037	L/day	=	84.04	m^3/day	=	0.98 L/s

TATHAM ENGINEERING

Sanitary Sewer Design Sheet

Project Information

19 Dundonald Street	420367

Drawing Reference

420367-SS01.dwg	August 11-23

Prepared By

JLM	August 11-23

Reviewed By

MB	November 29-23

Municipality

City of Barrie

Population Density

Capita per Unit	Low	Medium	High
	3.13	2.34	1.67

Infiltration

Infiltration (L/s/ha)	0.1

Manning's Coefficient

Pipe Material	Value
Concrete	0.013
PVC	0.013
Applied	0.013

Flow

Development Type	Average (L/cap/day)	Peaking Factor
Residential	225	Harmon
Development Type	**Average (L/ha/day)**	**Peaking Factor**
Institution	28,000	2
Commercial	28,000	2
Industrial (High)	55,000	-
Industrial (Low)	50,000	-

Notes

1) Proposed sanitary sewer information provided by City's CAD drawing for Wellington D2 future development project

Version Date: Insert Date

Version Number: 1

Engineers Seal

Street Name	Area Label/ID	Upstream Maintenance Hole	Downstream Maintenance Hole	Development Type	Population Density	Number of Units	Population (cap)	Accumulated Population (cap)	Peaking Factor	Area (ha)	Cumulative Area (ha)	Average Flow (L/s)			Peak Flow (L/s)			Proposed Sanitary Sewer							
												Development	Infiltration	Total	Development	Infiltration	Total	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)
Dundonald Street (Subject Site)	101	Condo Bldg	SAN MH1	Residential	High	50	83.5	83.5	4.26	0.39	0.39	0.22	0.04	0.26	0.93	0.04	0.97	3.6	2.0%	150	1.22	21.54	0.61	47	4.5%
Dundonald Street	102i	SAN MH1	FUT. SAN MH07	Residential				83.5	4.26	0.09	0.48	0.22	0.05	0.27	0.93	0.05	0.98	9.7	2.0%	150	1.22	21.54	0.61	47	4.5%
Dundonald Street	103i	FUT. SAN MH07	FUT. SAN MH08	Residential				83.5	4.26	0.10	0.58	0.22	0.06	0.28	0.93	0.06	0.99	51.2	12.0%	250	4.20	206.00	1.14	34	0.5%
Dundonald Street	104i	FUT. SAN MH08	FUT. SAN MH09	Residential				83.5	4.26	0.11	0.69	0.22	0.07	0.29	0.93	0.07	1.00	28.6	6.0%	250	2.97	145.67	0.89	39	0.7%
Duckworth Street	External	FUT. SAN MH09	EX. SAN MH SAL03149	Residential				83.5	4.26	0.00	0.69	0.22	0.07	0.29	0.93	0.07	1.00	64.2	7.0%	250	3.21	157.34	0.94	37	0.6%

Appendix D: Stormwater Water Management Calculations

TATHAM ENGINEERING

Modified Rational Method Calculation

Project Details

19 Dundonald Street, Barrie	420367

Prepared By

JLM	August 30, 2023

Municipality

City of Barrie

Pre-Development Analysis

Catchment ID:	101
Catchment Area (ha):	0.39
1:5-Year Runoff Coef:	0.31
Time of Conc. (min):	10

Post-Development Analysis

Catchment ID:	201	202
Catchment Area (ha):	0.24	0.15
1:5-Year Runoff Coef.:	0.79	0.15
Time of Conc. (min):	10	14

Rational Method Calculations

Design Storm		2	5	10	25	50	100
IDF Curve	A	678	854	976	1146	1236	1426
	B	4.70	4.70	4.70	4.92	4.70	5.27
	C	0.78	0.77	0.76	0.76	0.75	0.76
	i (mm/hr)	83	109	127	148	164	180
101	C	0.31	0.31	0.31	0.34	0.37	0.39
	Q (m^3/s)	0.03	0.04	0.04	0.05	0.07	0.08

Design Storm		2	5	10	25	50	100
	i (mm/hr)	83	109	127	148	164	180
201	C	0.79	0.79	0.79	0.87	0.95	0.99
	Q (m^3/s)	0.04	0.06	0.07	0.09	0.10	0.12
	i (mm/hr)	70	92	108	126	140	154
202	C	0.15	0.15	0.15	0.17	0.18	0.19
	Q (m^3/s)	0.00	0.01	0.01	0.01	0.01	0.01

Peak Flow Summary (m^3/s)

Storm	$Q_{EXISTING}$	$Q_{UNCONTROLLED}$	$Q_{CONTROLLED}$	Q_{TOTAL}	$Q_{EXISTING} - Q_{PROPOSED}$
2	0.028	0.004	0.013	0.017	0.011
5	0.037	0.006	0.015	0.021	0.016
10	0.042	0.007	0.017	0.024	0.019
25	0.055	0.009	0.020	0.029	0.026
50	0.066	0.010	0.023	0.033	0.033
100	0.076	0.012	0.025	0.037	0.039

Required Storage Volume Summary (m^3)

Duration (min)	2	5	10	25	50	100
10	18.5	25.4	29.8	39.5	48.5	56.4
20	23.3	32.8	38.6	51.9	63.6	75.0
30	**24.7**	35.5	42.1	57.2	70.4	83.6
40	24.6	**36.2**	**43.2**	59.4	73.6	88.0
50	23.7	35.9	43.1	**60.0**	**74.7**	89.9
60	22.2	34.9	42.1	59.5	74.5	**90.2**
70	20.4	33.4	40.6	58.3	73.4	89.5
80	18.4	31.5	38.6	56.5	71.6	88.1
90	16.2	29.4	36.4	54.2	69.3	86.0
100	13.8	27.0	33.8	51.6	66.6	83.4
110	11.3	24.5	31.1	48.8	63.6	80.4
120	8.6	21.8	28.2	45.7	60.3	77.2

TATHAM ENGINEERING

PROJECT	19 Dundonald Street, Barrie	FILE	420367
		DATE	August 30, 2023
SUBJECT	Runoff Coefficient Calculator	NAME	JLM
		PAGE	1 OF 2

CATCHMENT 101 (PRE-DEVELOPMENT CONDITIONS)

Runoff Coefficient

Land Use Type	Soil Type	Runoff Coefficient	Area (ha)
Impervious Area (building, driveway, pavers)	A	0.95	0.07
Woodlot, 10-30% grade	A	0.18	0.24
Lawn, >7% grade	A	0.15	0.08
		Total	0.39

Composite Runoff Coefficient: **0.31**

Source: Design Chart 1.07 - MTO Drainage Manual Part 4

Time of Concentration

Per MTO Drainage Manual, 1997

Catchment Length (m):	118.00	
Maximum Elevation (m):	258.21	
Minimum Elevation (m):	238.20	
Catchment Slope (%):	16.96 %	
Runoff Coefficient:	0.31	
Airport:	10.96	min
Bransby Williams:	4.20	min
Time of Concentration Method:	Airport	
Time of Concentration (min):	10.00	min

Where calculated T_C is less than MTO standard of 10 minutes, 10 minutes has been used

CATCHMENT 201 (POST-DEVELOPMENT CONDITIONS)

Runoff Coefficient

Land Use Type	Soil Type	Runoff Coefficient	Area (ha)
Impervious Area (building, driveway, parking lot)	A	0.95	0.19
Lawn, >7% grade	A	0.15	0.03
Permeable Pavers	A	0.25	0.02
		Total	0.24

Composite Runoff Coefficient: **0.79**

Source: Design Chart 1.07 - MTO Drainage Manual Part 4

Time of Concentration

Per MTO Drainage Manual, 1997

Catchment Length (m):	127.40	
Maximum Elevation (m):	253.75	
Minimum Elevation (m):	241.00	
Catchment Slope (%):	10.01 %	
Runoff Coefficient:	0.79	
Airport:	5.31	min
Bransby Williams:	5.28	min
Time of Concentration Method:	Bransby Williams	
Time of Concentration (min):	10.00	min

Where calculated T_C is less than MTO standard of 10 minutes, 10 minutes has been used

TATHAM ENGINEERING

PROJECT	19 Dundonald Street, Barrie	FILE	420367
		DATE	August 30, 2023
SUBJECT	Runoff Coefficient Calculator	NAME	JLM
		PAGE	2 OF 2

CATCHMENT 202 (POST-DEVELOPMENT CONDITIONS)

Runoff Coefficient

Land Use Type	Soil Type	Runoff Coefficient	Area (ha)
Lawn, >7% grade	A	0.15	0.15
		Total	0.15

Composite Runoff Coefficient: **0.15**

Source: Design Chart 1.07 - MTO Drainage Manual Part 4

Time of Concentration

Per MTO Drainage Manual, 1997

Catchment Length (m):	111.67	
Maximum Elevation (m):	254.85	
Minimum Elevation (m):	238.52	
Catchment Slope (%):	14.62	%
Runoff Coefficient:	0.15	
Airport:	13.50	min
Bransby Williams:	4.50	min
Time of Concentration Method:	Airport	
Time of Concentration (min):	13.50	min

Where calculated T_C is less than MTO standard of 10 minutes, 10 minutes has been used

CATCHMENT 301 (EXTERNAL)

Runoff Coefficient

Land Use Type	Soil Type	Runoff Coefficient	Area (ha)
Woodlot, 10-30% grade	A	0.18	0.22
Lawn, >7% grade	A	0.15	0.02
		Total	0.24

Composite Runoff Coefficient: **0.18**

Source: Design Chart 1.07 - MTO Drainage Manual Part 4

Time of Concentration

Per MTO Drainage Manual, 1997

Catchment Length (m):	51.00	
Maximum Elevation (m):	264.00	
Minimum Elevation (m):	254.88	
Catchment Slope (%):	17.88	%
Runoff Coefficient:	0.18	
Airport:	8.29	min
Bransby Williams:	1.88	min
Time of Concentration Method:	Airport	
Time of Concentration (min):	10.00	min

Where calculated T_C is less than MTO standard of 10 minutes, 10 minutes has been used

TATHAM ENGINEERING	Project :	19 Dundonald Street	Designed By:	JLM
	File:	420367	Checked By:	JG
	Municipality:	City of Barrie	Date:	2023-08-31

Proposed SWM Facility Preliminary Volume Table

Active Pool	StormTank	
Side Slopes	0	
Bottom Elev.	238.95	
Modeule Footprint (m^2)	60.00	Double stacked ST-30 (762mm) and ST-36 (914mm); Original footprint
Void Ratio	0.97	based on 1-m deep tank (ST-2036) = 125m^2

Water Level Elev.	**Depth**	**Areas**		**Storage**	
(m)	**(m)**	**Area (m^2)**	**Avg. Area (m^2)**	**Stage (m^3)**	**Cumulative Total (m^3)**
238.95	0.00	**System Invert**		0.0	0.0
239.00	0.05			2.90	2.9
239.05	0.10			2.90	5.8
239.10	0.15			2.90	8.7
239.15	0.20			2.90	11.6
239.20	0.25			2.90	14.5
239.25	0.30			2.90	17.4
239.30	0.35			2.90	20.3
239.35	0.40			2.90	23.2
239.40	0.45			2.90	26.1
239.45	0.50			2.90	29.0
239.50	0.55			2.90	31.8
239.55	0.60			2.90	34.7
239.60	0.65			2.90	37.6
239.65	0.70			2.90	40.5
239.70	0.75			2.90	43.4
239.75	0.80			2.90	46.3
239.80	0.85			2.90	49.2
239.85	0.90			2.90	52.1
239.90	0.95			2.90	55.0
239.95	1.00			2.90	57.9
240.00	1.05			2.90	60.8
240.05	1.10			2.90	63.7
240.10	1.15			2.90	66.6
240.15	1.20			2.90	69.5
240.20	1.25			2.90	72.4
240.25	1.30			2.90	75.3
240.30	1.35			2.90	78.2
240.35	1.40			2.90	81.1
240.40	1.45			2.90	84.0
240.45	1.50			2.90	86.9
240.50	1.55			2.90	89.7
240.55	1.60	**Top of Module**		2.90	92.6

Note: Volume estimated based on stacked StormTank Module 20's (Model 2036 and Model 2030)

Project:	19 Dundonald Street	Designed By:	JLM
File:	420367	Checked By:	JG
Municipality:	City of Barrie	Date:	2023-08-31

Proposed SWM Facility Preliminary Discharge Table

ORIFICE CONTROL #1
Orifice Plate

diameter =	95	mm
area =	0.0071	m^2
Orifice C =	0.63	
Invert =	238.95	m

Orifice Equation Q = C x A x (2gH)^0.5
where
Q = flow rate (cms) A = area of opening(sq. m)
C = constant H = net head on the orifice
g = Acceleration due to gravity

WEIR CONTROL
Overflow Weir

Length of Weir	N/A	m
Weir Sill Elevation	N/A	m
Weir constant K	1.6	
Side Slope (H:V)	4	

Weir Equation Q = K x L x H^1.5
where Q = flow rate (cms)
K = constant
L = length (m)
H = head on the weir (m)

Water Level	Orifice Plate		Emergency Spillway		Hydraulic Control	Total Discharge
	Head	Discharge	Head	Discharge		
(m)	(m)	(m^3)	(m)	(m^3)		(cms)
238.95	0.00		0.00	0.0000	**Orifice Plate**	0.000
239.00	0.05	0.001	0.00	0.0000	**Orifice Plate**	0.001
239.05	0.10	0.004	0.00	0.0000	**Orifice Plate**	0.004
239.10	0.15	0.006	0.00	0.0000	**Orifice Plate**	0.006
239.15	0.20	0.008	0.00	0.0000	**Orifice Plate**	0.008
239.20	0.25	0.009	0.00	0.0000	**Orifice Plate**	0.009
239.25	0.30	0.010	0.00	0.0000	**Orifice Plate**	0.010
239.30	0.35	0.011	0.00	0.0000	**Orifice Plate**	0.011
239.35	0.40	0.012	0.00	0.0000	**Orifice Plate**	0.012
239.40	0.45	0.013	0.00	0.0000	**Orifice Plate**	0.013
239.45	0.50	0.013	0.00	0.0000	**Orifice Plate**	0.013
239.50	0.55	0.014	0.00	0.0000	**Orifice Plate**	0.014
239.55	0.60	0.015	0.00	0.0000	**Orifice Plate**	0.015
239.60	0.65	0.015	0.00	0.0000	**Orifice Plate**	0.015
239.65	0.70	0.016	0.00	0.0000	**Orifice Plate**	0.016
239.70	0.75	0.017	0.00	0.0000	**Orifice Plate**	0.017
239.75	0.80	0.017	0.00	0.0000	**Orifice Plate**	0.017
239.80	0.85	0.018	0.00	0.0000	**Orifice Plate**	0.018
239.85	0.90	0.018	0.00	0.0000	**Orifice Plate**	0.018
239.90	0.95	0.019	0.00	0.0000	**Orifice Plate**	0.019
239.95	1.00	0.019	0.00	0.0000	**Orifice Plate**	0.019
240.00	1.05	0.020	0.00	0.0000	**Orifice Plate**	0.020
240.05	1.10	0.020	0.00	0.0000	**Orifice Plate**	0.020
240.10	1.15	0.021	0.00	0.0000	**Orifice Plate**	0.021
240.15	1.20	0.021	0.00	0.0000	**Orifice Plate**	0.021
240.20	1.25	0.022	0.00	0.0000	**Orifice Plate**	0.022
240.25	1.30	0.022	0.00	0.0000	**Orifice Plate**	0.022
240.30	1.35	0.023	0.00	0.0000	**Orifice Plate**	0.023
240.35	1.40	0.023	0.00	0.0000	**Orifice Plate**	0.023
240.40	1.45	0.023	0.00	0.0000	**Orifice Plate**	0.023
240.45	1.50	0.024	0.00	0.0000	**Orifice Plate**	0.024
240.50	1.55	0.024	0.00	0.0000	**Orifice Plate**	0.024
240.55	1.60	0.025	0.00	0.0000	**Orifice Plate**	0.025

TATHAM ENGINEERING	Project:	19 Dundonald Street	Designed By:	JLM
	File:	420367	Checked By:	JG
	Municipality:	City of Barrie	Date:	2023-08-31

Proposed SWM Facility Preliminary Stage-Storage-Discharge Table

Water Level (m)	PIPE FLOW Orifice Plate Discharge (m^3/s)	WEIR FLOW Overflow Discharge (m^3/s)	Hydraulic Control	Total Discharge (m^3/s)	Total Storage (m^3)
238.95		0.0000	Orifice Plate	**0.000**	0.0
239.00	0.0011	0.0000	Orifice Plate	**0.001**	2.9
239.05	0.0036	0.0000	Orifice Plate	**0.004**	5.8
239.10	0.0063	0.0000	Orifice Plate	**0.006**	8.7
239.15	0.0077	0.0000	Orifice Plate	**0.008**	11.6
239.20	0.0089	0.0000	Orifice Plate	**0.009**	14.5
239.25	0.0099	0.0000	Orifice Plate	**0.010**	17.4
239.30	0.0109	0.0000	Orifice Plate	**0.011**	20.3
239.35	0.0117	0.0000	Orifice Plate	**0.012**	23.2
239.40	0.0125	0.0000	Orifice Plate	**0.013**	26.1
239.45	0.0133	0.0000	Orifice Plate	**0.013**	29.0
239.50	0.0140	0.0000	Orifice Plate	**0.014**	31.8
239.55	0.0147	0.0000	Orifice Plate	**0.015**	34.7
239.60	0.0154	0.0000	Orifice Plate	**0.015**	37.6
239.65	0.0160	0.0000	Orifice Plate	**0.016**	40.5
239.70	0.0166	0.0000	Orifice Plate	**0.017**	43.4
239.75	0.0172	0.0000	Orifice Plate	**0.017**	46.3
239.80	0.0177	0.0000	Orifice Plate	**0.018**	49.2
239.85	0.0183	0.0000	Orifice Plate	**0.018**	52.1
239.90	0.0188	0.0000	Orifice Plate	**0.019**	55.0
239.95	0.0193	0.0000	Orifice Plate	**0.019**	57.9
240.00	0.0198	0.0000	Orifice Plate	**0.020**	60.8
240.05	0.0203	0.0000	Orifice Plate	**0.020**	63.7
240.10	0.0208	0.0000	Orifice Plate	**0.021**	66.6
240.15	0.0212	0.0000	Orifice Plate	**0.021**	69.5
240.20	0.0217	0.0000	Orifice Plate	**0.022**	72.4
240.25	0.0221	0.0000	Orifice Plate	**0.022**	75.3
240.30	0.0226	0.0000	Orifice Plate	**0.023**	78.2
240.35	0.0230	0.0000	Orifice Plate	**0.023**	81.1
240.40	0.0234	0.0000	Orifice Plate	**0.023**	84.0
240.45	0.0238	0.0000	Orifice Plate	**0.024**	86.9
240.50	0.0242	0.0000	Orifice Plate	**0.024**	89.7
240.55	0.0246	0.0000	Orifice Plate	**0.025**	92.6

TATHAM ENGINEERING

Storm Sewer Design Sheet: Existing Sewer System

Project Information

19 Dundonald Street	420367

Drawing Reference

420367-SS01.dwg	August 2023

Prepared By

JLM	August 2023

Reviewed By

JG	September 2023

Municipality

City of Barrie

Runoff Coefficient Adjustment

Equation	1	
Year	**A**	**B**
10	1.00	0.00
25	1.10	0.00
50	1.20	0.00
100	1.25	0.00

Time of Concentration

10 mins

IDF Curve Coefficients

Year	A	B	C
2	678.09	4.70	0.78
5	853.61	4.70	0.77
10	975.87	4.70	0.76
25	1146.28	4.92	0.76
50	1236.15	4.70	0.75
100	1426.41	5.27	0.76

Manning's Coefficient

Material	Value
CSP	0.024
Concrete	0.013
PVC	0.013

Notes

1) Used future storm sewer information provided by City's Wellington D2 Storm Sewer Design Sheet (dated May 31, 2021) to populate areas and runoff coefficients of the equivalent existing storm sewers, as there was no existing storm sewer catchment plan provided. The existing and future sewers run in parallel, so this approach was taken to be conservative in estimating the existing sewers' peak flows.

Version Date: Insert Date

Version Number: Insert No.

Engineer Stamp

Street Name	Area ID / Label	Upstream Maintenance Hole	Downstream Maintenance Hole	Area (ha)	5 Year Runoff Coefficient (C)	Design Storm (Year)	Adjusted Runoff Coefficient (C)	Area x Runoff Coefficient	Cumulative Area (ha)	Cumulative Area x Adjusted Runoff Coefficient	Time of Concentration (min)	Rainfall Intensity (mm/hr)	Peak Flow (m^3/s)	Manning's Roughness Coefficient	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Travel Time (min)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)	Total Time of Travel (min)
Dundonald Street	D1, D2, D3, D4	EX. STM MH00151	EX. CBMH	2.03	0.45	5	0.45	0.91	2.03	0.91	10.00	108.92	0.276	0.013	73.8	19.3%	375	6.97	0.770	6.06	0.20	255	35.9%	10.20
	D5	EX. CBMH	EX. STM MH00041	0.22	0.45	5	0.45	0.10	2.25	1.01	10.20	107.78	0.303	0.013	16.1	6.8%	375	4.14	0.457	4.14	0.06	321	66.3%	10.27
Dundonald Street (Subject Site)	Site	PROP. STM MH3	EX. STM MH00041	0.39	0.54	5	0.54	0.21	0.39	0.21	10.00	108.92	0.064	0.013	12.8	3.0%	300	2.37	0.167	2.07	0.10	209	38.0%	10.10
Duckworth Street Unopened ROW	D6	EX. STM MH00029	EX. STM MH00028	2.89	0.40	5	0.40	1.16	2.89	1.16	10.00	108.92	0.350	0.013	12.6	0.8%	525	1.78	0.385	1.78	0.12	506	90.9%	10.12
Dundonald Street	D7	EX. STM MH00041	EX. STM MH00028	0.32	0.45	5	0.45	0.14	2.96	1.37	10.27	107.43	0.408	0.013	22.9	12.0%	525	6.88	1.490	5.55	0.07	323	27.4%	10.34
Dundonald Street	D8	EX. STM MH00028	EX. STM MH00027	0.04	0.40	5	0.40	0.02	5.89	2.54	10.34	107.05	0.755	0.013	12.9	5.0%	600	4.86	1.373	4.71	0.05	479	55.0%	10.38
Collier Street	Ex. Pipe	EX. STM MH00027	EX. STM MH00026	0.05	0.40	5	0.40	0.02	5.94	2.56	10.38	106.80	0.759	0.013	11.1	1.4%	675	2.78	0.995	2.78	0.07	610	76.3%	10.45

TATHAM ENGINEERING

Storm Sewer Design Sheet: Wellington D2 Future Storm Sewer System

Project Information

19 Dundonald Street	420367

Drawing Reference

420367-SS01.dwg	August 2023

Prepared By

JLM	August 2023

Reviewed By

JG	September 2023

Municipality

City of Barrie

Runoff Coefficient Adjustment

Equation	1	
Year	**A**	**B**
10	1.00	0.00
25	1.10	0.00
50	1.20	0.00
100	1.25	0.00

Time of Concentration

10 mins

IDF Curve Coefficients

Year	A	B	C
2	678.09	4.70	0.78
5	853.61	4.70	0.77
10	975.87	4.70	0.76
25	1146.28	4.92	0.76
50	1236.15	4.70	0.75
100	1426.41	5.27	0.76

Manning's Coefficient

Material	Value
CSP	0.024
Concrete	0.013
PVC	0.013

Notes

1) Future storm sewer information provided by City's Wellington D2 Storm Sewer Design Sheet (dated May 31, 2021)

Version Date: Insert Date

Version Number: Insert No.

Engineer Stamp

Street Name	Area ID / Label	Upstream Maintenance Hole	Downstream Maintenance Hole	Area (ha)	5 Year Runoff Coefficient (C)	Design Storm (Year)	Adjusted Runoff Coefficient (C)	Area x Runoff Coefficient	Cumulative Area (ha)	Cumulative Area x Adjusted Runoff Coefficient	Time of Concentration (min)	Rainfall Intensity (mm/hr)	Peak Flow (m^3/s)	Manning's Roughness Coefficient	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Travel Time (min)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)	Total Time of Travel (min)
Dundonald Street	D1	Overland	FUT. STM MHD1	1.60	0.40	5	0.40	0.64	1.60	0.64	10.00	108.92	0.194	0.013	200.0									
Dundonald Street	D2	FUT. STM MHD1	FUT. STM MHD2	0.17	0.45	5	0.45	0.08	1.77	0.72	10.00	108.92	0.217	0.013	23.2	6.0%	375	3.89	0.429	3.68	0.11	290	50.5%	10.11
Dundonald Street	D3	FUT. STM MHD2	FUT. STM MHD3	0.10	0.40	5	0.40	0.04	1.87	0.76	10.11	108.33	0.228	0.013	24.0	6.0%	375	3.89	0.429	3.73	0.11	295	53.0%	10.21
Dundonald Street	D4	FUT. STM MHD3	FUT. STM MHD4	0.16	0.45	5	0.45	0.07	2.03	0.83	10.21	107.73	0.248	0.013	22.2	5.0%	375	3.55	0.392	3.55	0.10	316	63.2%	10.32
Dundonald Street	D5	FUT. STM MHD4	FUT. STM MHD5	0.22	0.45	5	0.45	0.10	2.25	0.93	10.32	107.16	0.276	0.013	21.8	5.0%	450	4.01	0.638	3.64	0.10	329	43.3%	10.42
Dundonald Street (Subject Site)	Site	PROP. STM MH3	FUT. STM MHD5	0.39	0.54	5	0.54	0.21	0.39	0.21	10.00	108.92	0.064	0.013	12.1	3.0%	300	2.37	0.167	2.07	0.10	209	38.0%	10.10
Duckworth Street Unopened ROW	D6	Overland	EX. STM MH00030	2.89	0.40	5	0.40	1.16	2.89	1.16	10.00	108.92	0.350	0.013	470.0									
Duckworth Street Unopened ROW	D6	EX. STM MH00030	EX. STM MH00029	0.00	0.40	5	0.40	0.00	2.89	1.16	10.00	108.92	0.350	0.013	46.0	8.8%	450	5.31	0.844	4.78	0.16	323	41.4%	10.16
Dundonald Street	D6	EX. STM MH00029	FUT. STM MHD6	0.00	0.40	5	0.40	0.00	2.89	1.16	10.16	108.02	0.347	0.013	12.6	0.8%	525	1.78	0.385	1.78	0.12	505	90.2%	10.28
Dundonald Street	D7	FUT. STM MHD5	FUT. STM MHD6	0.32	0.45	5	0.45	0.14	2.96	1.28	10.42	106.62	0.380	0.013	23.1	4.0%	525	3.97	0.860	3.63	0.11	386	44.1%	10.52
Dundonald Street	D8	FUT. STM MHD6	FUT. STM MHD7	0.04	0.40	5	0.40	0.02	5.89	2.45	10.52	106.05	0.723	0.013	13.0	2.9%	675	4.00	1.431	3.78	0.06	522	50.5%	10.58
Collier Street	Ex. Pipe	FUT. STM MHD7	EX. STM MH00026	0.05	0.40	5	0.40	0.02	5.94	2.47	10.58	105.74	0.727	0.013	12.5	1.6%	675	2.97	1.063	2.97	0.07	585	68.3%	10.65

TATHAM ENGINEERING

Volume Control

Project Details		Prepared By	
19 Dundonald Street	420367	JLM	31-Aug-23

LID Design Summary

Infiltration Chamber / Design

LID Measure	Infiltration
Design Rainfall Depth (mm)	25
LID Drainage Area (ha)	0.07
Total Annual Precipitation (mm)	936.0
Annual Rainfall Captured (mm)	686
Storage Volume Required (m^3)	18.3
Number of Chambers	1
Volume Required / Soakaway (m^3)	18.33
Void Ratio	0.96
Footprint of Chamber (m^2)	41.50
Depth of Chamber (m)	0.46
Volume Provided by Chamber (m^3)	18.33

(as per Climate Normals for Barrie WPCC 1998-2008)

Appendix E:
Phosphorus Budget

TATHAM ENGINEERING

PROJECT	19 Dundonald Street	FILE	420367
		DATE	2023-08-31
SUBJECT	Phosphorus Budget Assessment	DESIGNED	JLM
		CHECKED	JG

Phosphorus Loading

			Existing		Proposed	
LAND USE CATEGORY	Existing Phosphorus Loading Rate (kg/ha/year)	Future Phosphorus Loading Rate (kg/ha/year)	Existing Area (ha)	Existing Phosphorus Loading (kg/year)	Area (ha)	Phosphorus Load (kg/year)
Cropland	0.19	0.19	0.00	0.00	0.00	0.00
Hay-Pasture	0.07	0.07	0.00	0.00	0.00	0.00
Turf-Sod	0.12	0.12	0.00	0.00	0.00	0.00
High Intensity Development - C/I	1.82	1.82	0.00	0.00	0.00	0.00
High Intensity Development - R	1.32	1.32	0.00	0.00	0.24	0.32
Low Intensity Development	0.13	0.13	0.39	0.05	0.15	0.02
Quarry	0.08	0.08	0.00	0.00	0.00	0.00
Unpaved Road	0.83	0.83	0.00	0.00	0.00	0.00
Forest	0.05	0.05	0.00	0.00	0.00	0.00
Transition	0.06	0.06	0.00	0.00	0.00	0.00
Wetland	0.05	0.05	0.00	0.00	0.00	0.00
Open Water	0.26	0.26	0.00	0.00	0.00	0.00
Total			0.39	0.05	0.39	0.34

Controls

	Removal Efficiency (%)		Proposed		
Area contributing to Infiltration control	Infiltration Chamber	OGS	Uncontrolled Phosphorus Load (kg/year)	Area (ha)	Controlled Phosphorus Load (kg/year)
Developed Area (Catchment 201)					
High Intensity Development - Residential - Rooftop (Controlled)	95%		0.09	0.07	0.00
High Intensity Development - Residential - Remaining Developed Area (Controlled)		20%	0.23	0.17	0.18
Total High Intensity Development - Residential (Total Controlled)	-	-	**0.32**	**0.24**	**0.19**
Undisturbed Area (Catchment 202)					
Low Intensity Development - Residential (Untreated)			**0.02**	**0.15**	**0.02**
Total Phosphorus (No Controls)					**0.34**
Total Phosphorus (With Controls)					**0.21**

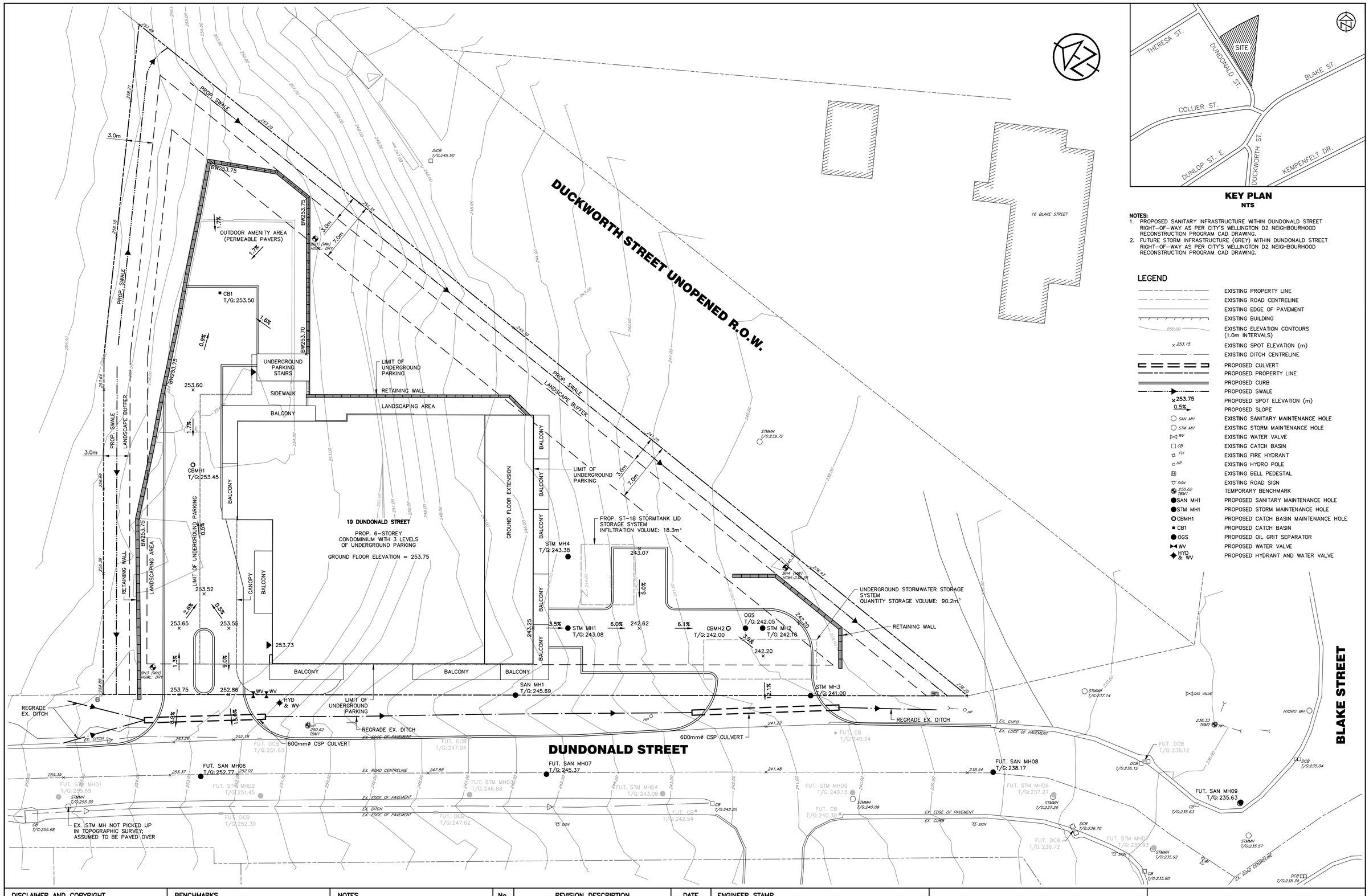
Summary

Existing Phosphorus Load	0.05	kg/year
Post-Development Phosphorus Load (No Controls)	0.34	kg/year
Post-Development Phosphorus Load (With Controls)	0.21	kg/year

Phosphorus Offsetting Policy

Phosphorus Deficit (Post-Dev With Controls - Existing P Load)	0.16	kg/year
Offset Calculation (2.5 * P Deficit * $35,770/kg/year)	**$ 14,007.17**	
Offset Calculation, including 15% Administration Fee	**$ 16,108.25**	

Appendix F: Drawings



KEY PLAN
NTS

NOTES:
1. PROPOSED SANITARY INFRASTRUCTURE WITHIN DUNDONALD STREET RIGHT-OF-WAY AS PER CITY'S WELLINGTON D2 NEIGHBOURHOOD RECONSTRUCTION PROGRAM CAD DRAWING.
2. FUTURE STORM INFRASTRUCTURE (GREY) WITHIN DUNDONALD STREET RIGHT-OF-WAY AS PER CITY'S WELLINGTON D2 NEIGHBOURHOOD RECONSTRUCTION PROGRAM CAD DRAWING.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING ROAD CENTRELINE
- EXISTING EDGE OF PAVEMENT
- EXISTING BUILDING
- 250.00 EXISTING ELEVATION CONTOURS (1.0m INTERVALS)
- ×253.15 EXISTING SPOT ELEVATION (m)
- EXISTING DITCH CENTRELINE
- PROPOSED CULVERT
- PROPOSED PROPERTY LINE
- PROPOSED CURB
- PROPOSED SWALE
- ×253.75 PROPOSED SPOT ELEVATION (m)
- 0.5% PROPOSED SLOPE
- SAN MH EXISTING SANITARY MAINTENANCE HOLE
- STM MH EXISTING STORM MAINTENANCE HOLE
- WV EXISTING WATER VALVE
- CB EXISTING CATCH BASIN
- FH EXISTING FIRE HYDRANT
- HP EXISTING HYDRO POLE
- EXISTING BELL PEDESTAL
- SIGN EXISTING ROAD SIGN
- 250.62 TBM1 TEMPORARY BENCHMARK
- SAN MH1 PROPOSED SANITARY MAINTENANCE HOLE
- STM MH1 PROPOSED STORM MAINTENANCE HOLE
- CBMH1 PROPOSED CATCH BASIN MAINTENANCE HOLE
- CB1 PROPOSED CATCH BASIN
- OGS PROPOSED OIL GRIT SEPARATOR
- WV PROPOSED WATER VALVE
- HYD & WV PROPOSED HYDRANT AND WATER VALVE

DISCLAIMER AND COPYRIGHT

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

BENCHMARKS

TBM#1 – ELEVATION 250.623m
TOP OF IRON BAR IN HYDRO POLE, IMMEDIATELY SOUTH OF EXISTING DRIVEWAY OF SUBJECT SITE. NORTHING 4916300.2770m, EASTING 605312.3163m

TBM#2 – ELEVATION 236.329m
TOP OF IRON BAR IN HYDRO POLE ON NORTHEAST CORNER OF DUNDONALD ST. AND COLLIER ST.. NORTHING 4916212.6774m, EASTING 605368.2033m

NOTES

SITE PLAN PREPARED BY MCL ARCHITECTS; DATED JUNE 15, 2023.

TOPOGRAPHIC SURVEY COMPLETED BY BETTER MEASURES; DATED SEPTEMBER 9, 2021.

No.	REVISION DESCRIPTION	DATE
1.	ISSUED FOR ZBA (1ST SUBMISSION)	DEC 9/21
2.	ISSUED FOR ZBA (2ND SUBMISSION)	NOV 30/23

ENGINEER STAMP

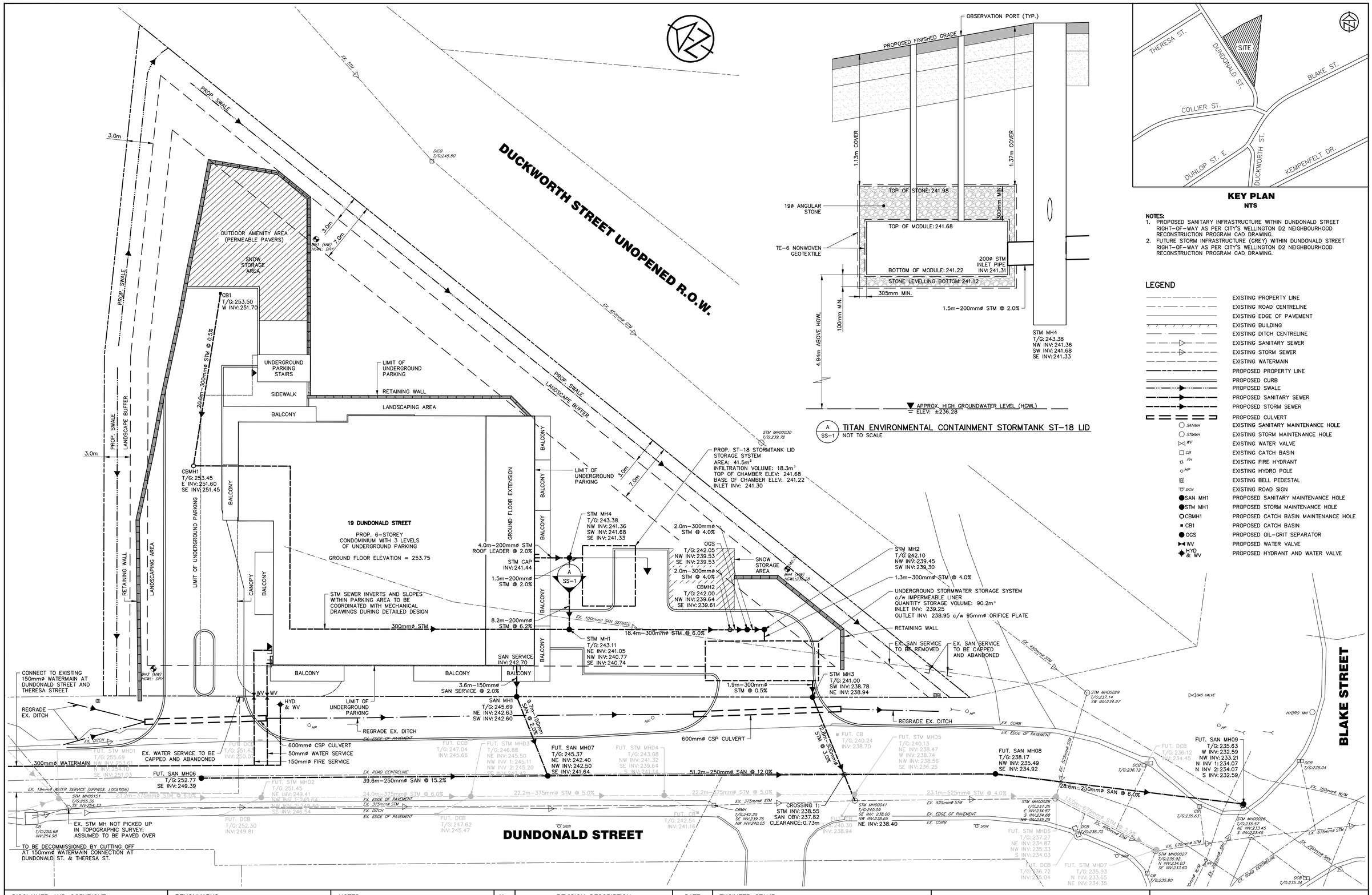
19 DUNDONALD STREET
CITY OF BARRIE

PRELIMINARY SITE GRADING PLAN

TATHAM ENGINEERING

DESIGN: MB	FILE: 420367	DWG: SG-1
DRAWN: JLM	DATE: OCT 2021	
CHECK: NM	SCALE: 1:200	

Drawing Name: 420367-SG01.dwg, Plotted: Nov 30, 2023



A / SS-1 TITAN ENVIRONMENTAL CONTAINMENT STORMTANK ST-18 LID
NOT TO SCALE

KEY PLAN
NTS

NOTES:
1. PROPOSED SANITARY INFRASTRUCTURE WITHIN DUNDONALD STREET RIGHT-OF-WAY AS PER CITY'S WELLINGTON D2 NEIGHBOURHOOD RECONSTRUCTION PROGRAM CAD DRAWING.
2. FUTURE STORM INFRASTRUCTURE (GREY) WITHIN DUNDONALD STREET RIGHT-OF-WAY AS PER CITY'S WELLINGTON D2 NEIGHBOURHOOD RECONSTRUCTION PROGRAM CAD DRAWING.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING ROAD CENTRELINE
- EXISTING EDGE OF PAVEMENT
- EXISTING BUILDING
- EXISTING DITCH CENTRELINE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- PROPOSED PROPERTY LINE
- PROPOSED CURB
- PROPOSED SWALE
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED CULVERT
- SANMH: EXISTING SANITARY MAINTENANCE HOLE
- STMMH: EXISTING STORM MAINTENANCE HOLE
- WV: EXISTING WATER VALVE
- CB: EXISTING CATCH BASIN
- FH: EXISTING FIRE HYDRANT
- HP: EXISTING HYDRO POLE
- EXISTING BELL PEDESTAL
- SIGN: EXISTING ROAD SIGN
- SAN MH1: PROPOSED SANITARY MAINTENANCE HOLE
- STM MH1: PROPOSED STORM MAINTENANCE HOLE
- CBMH1: PROPOSED CATCH BASIN MAINTENANCE HOLE
- CB1: PROPOSED CATCH BASIN
- OGS: PROPOSED OIL-GRIT SEPARATOR
- WV: PROPOSED WATER VALVE
- HYD & WV: PROPOSED HYDRANT AND WATER VALVE

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BENCHMARKS

TBM#1 – ELEVATION 250.623m
TOP OF IRON BAR IN HYDRO POLE, IMMEDIATELY SOUTH OF EXISTING DRIVEWAY OF SUBJECT SITE.
NORTHING 4916300.2770m, EASTING 605312.3163m

TBM#2 – ELEVATION 236.329m
TOP OF IRON BAR IN HYDRO POLE ON NORTHEAST CORNER OF DUNDONALD ST. AND COLLIER ST..
NORTHING 4916212.6774m, EASTING 605368.2033m

NOTES

SITE PLAN PREPARED BY MCL ARCHITECTS; DATED JUNE 15, 2023.

TOPOGRAPHIC SURVEY COMPLETED BY BETTER MEASURES; DATED SEPTEMBER 9, 2021.

No.	REVISION DESCRIPTION	DATE
1.	ISSUED FOR ZBA (1ST SUBMISSION)	DEC 9/21
2.	ISSUED FOR ZBA (2ND SUBMISSION)	NOV 30/23

ENGINEER STAMP

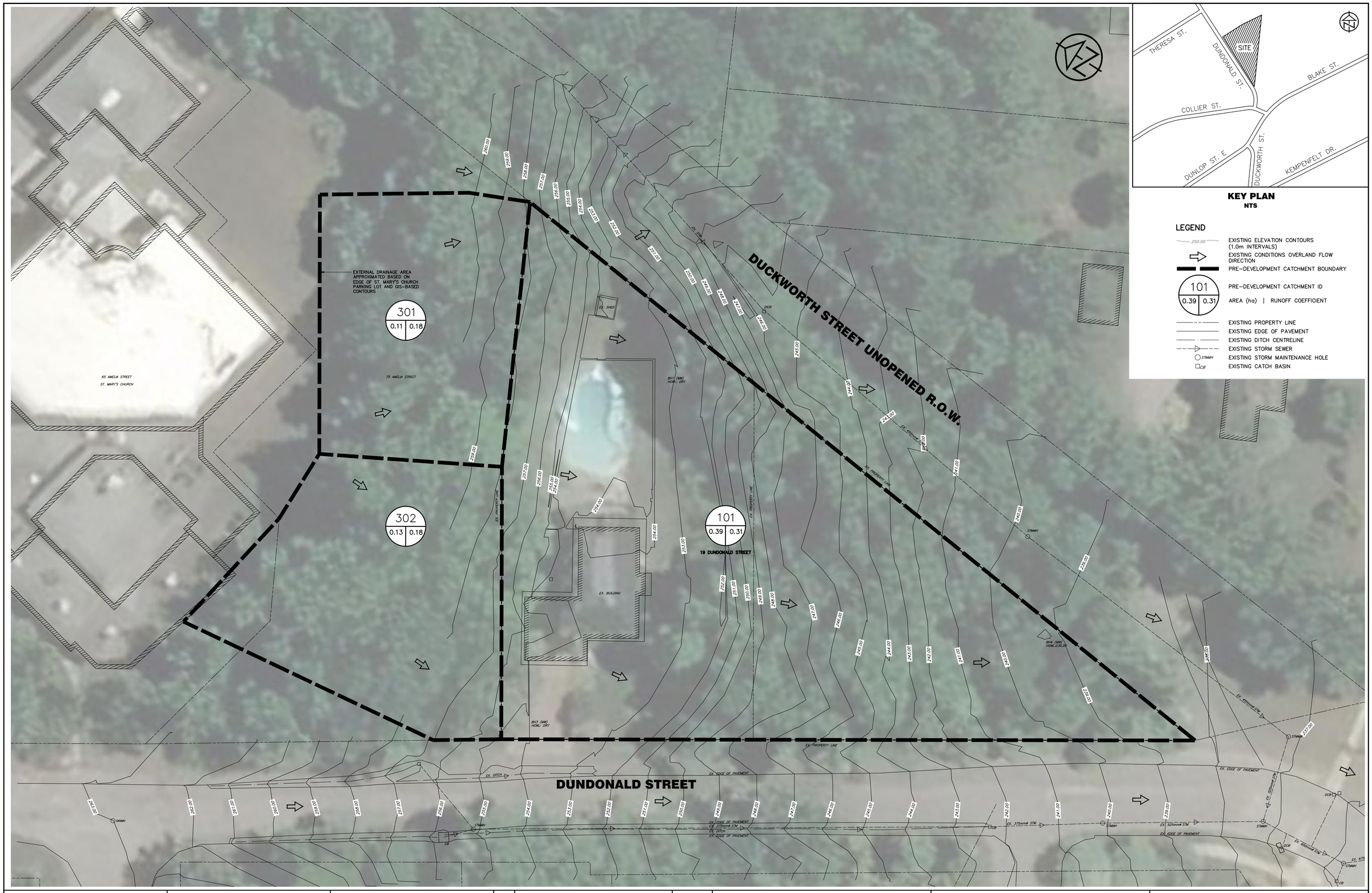
19 DUNDONALD STREET
CITY OF BARRIE

PRELIMINARY
SITE SERVICING PLAN

TATHAM ENGINEERING

DESIGN: MB	FILE: 420367	DWG: SS-1
DRAWN: JLM	DATE: OCT 2021	
CHECK: NM	SCALE: 1:200	

Drawing Name: 420367-SS01.dwg, Plotted: Nov 30, 2023



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ENGINEER STAMP

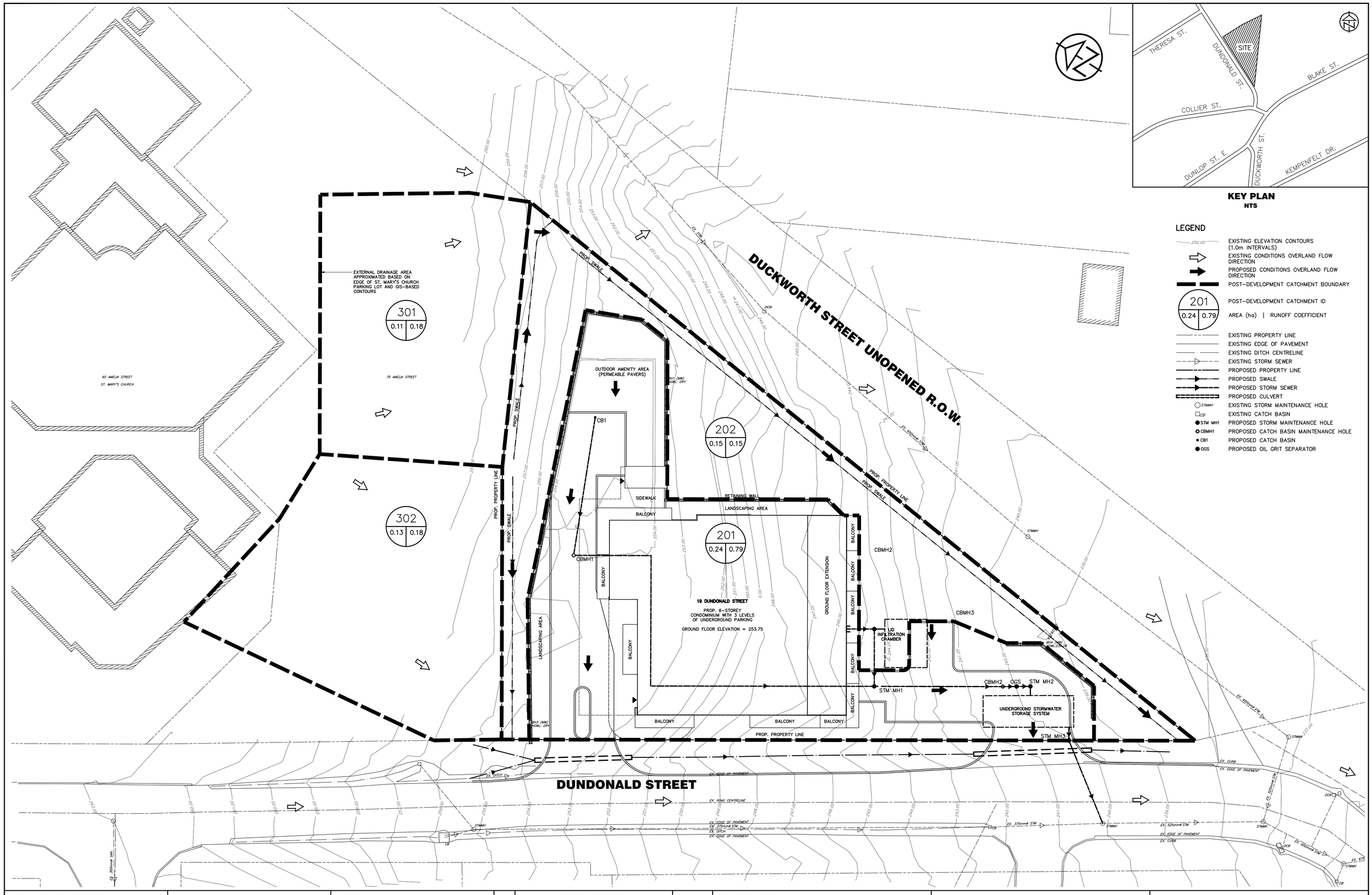
19 DUNDONALD STREET
CITY OF BARRIE

PRE-DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: MB	FILE: 420367	DWG: DP-1
DRAWN: JLM	DATE: OCT 2021	
CHECK: NM	SCALE: 1:200	

Drawing Name: 420367-DP01.dwg, Plotted: Nov 30, 2023



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TATHAM ENGINEERING LIMITED CLAIMS COPYRIGHT TO THIS DRAWING WHICH MAY NOT BE USED FOR ANY PURPOSE OTHER THAN THAT PROVIDED IN THE CONTRACT BETWEEN THE OWNER/CLIENT AND THE ENGINEER WITHOUT THE EXPRESS CONSENT OF TATHAM ENGINEERING LIMITED.

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ENGINEER STAMP

19 DUNDONALD STREET
CITY OF BARRIE

POST-DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: MB	FILE: 420367	DWG: DP-2
DRAWN: JLM	DATE: OCT 2021	
CHECK: NM	SCALE: 1:200	

Drawing Name: 420367-DP02.dwg, Plotted: Nov 30, 2023

LEGEND

- 250.00 — EXISTING ELEVATION CONTOURS (1.0m INTERVALS)
- EXISTING CONDITIONS OVERLAND FLOW DIRECTION
- SILT FENCE
- EXISTING PROPERTY LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH CENTRELINE
- STMMH — EXISTING STORM MAINTENANCE HOLE
- CB — EXISTING CATCH BASIN
- EXISTING TREE

NOTES:

A. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE UNTIL ALL DISTURBED AREAS HAVE BEEN STABILIZED. EROSION AND SEDIMENT CONTROL MEASURES THAT ARE DESIGNED TO CONTROL RUNOFF FROM SPECIFIC AREAS MUST BE INSTALLED PRIOR TO ANY DISTURBANCE OF THAT PART OF THE SITE. THE LOCATION OF ALL EROSION AND SEDIMENT CONTROL WORKS TO BE REVIEWED ON SITE AND MAY BE REVISED AS DIRECTED BY THE CONTRACT ADMINISTRATOR.

B. EROSION AND SEDIMENT CONTROL SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF BARRIE ENGINEERING STANDARDS AND THE LAKE SIMCOE REGION CONSERVATION AUTHORITY'S "SECTION 5.0: EROSION AND SEDIMENT CONTROL" OF ITS "TECHNICAL GUIDELINES FOR STORMWATER MANAGEMENT SUBMISSIONS" (APRIL 2022).

C. THE CONTRACTOR MAY CONSIDER ALTERNATIVE EROSION AND SEDIMENT CONTROL MEASURES. SUCH MEASURES MUST BE PRESENTED IN WRITING TO THE ENGINEER FOR APPROVAL BY THE CITY OF BARRIE.

D. THE CONTRACTOR SHALL HAVE MATERIALS AVAILABLE ON-SITE TO REPAIR SEDIMENT AND EROSION CONTROL MEASURES IN THE EVENT OF UNFORESEEN CONDITIONS: HIGH WATER, EXTREME RAINFALL EVENTS, ETC.

E. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE INSPECTED, CLEANED AND MAINTAINED BY THE CONTRACTOR AFTER EACH STORM EVENT. ALL WORKS WILL BE INSPECTED BY THE ENGINEER BI-WEEKLY AND AFTER EACH MAJOR STORM EVENTS.

F. SEDIMENT AND EROSION CONTROL REPORTS ARE REQUIRED AND SHALL BE COMPLETED BI-WEEKLY AND AFTER EACH MAJOR STORM EVENT.

G. CONSTRUCTION OF ALL EROSION AND SEDIMENT CONTROL WORKS ARE TO BE IN ACCORDANCE WITH THE FOLLOWING STEPS (AS REQUIRED):
   1. INSTALL STONE MUD MAT IN ACCORDANCE WITH D710 OF THE CITY'S STANDARD DRAWINGS.
   2. INSTALL SILT FENCE IN ACCORDANCE WITH P1233 OF THE CITY'S STANDARD DRAWINGS.
   3. INSTALL TEMPORARY CATCH BASIN SEDIMENT TRAPS LOCATIONS SHOWN ON DWG. ESC-1 AND AS DIRECTED BY THE ENGINEER. SEDIMENT TRAPS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. ALL CATCH BASINS TO REMAIN SCREENED UNTIL BASE COURSE ASPHALT IS PLACED AND LOT GRADING IS COMPLETE.

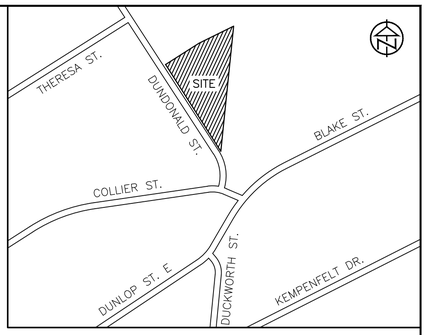
H. ALL CONSTRUCTION VEHICLES TO ACCESS SITE USING THE DESIGNATED CONSTRUCTION ENTRANCE.

I. EROSION AND SEDIMENT CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR ONCE GROUND COVER IS ESTABLISHED AND LANDSCAPING IS COMPLETE AND AS APPROVED BY THE ENGINEER.

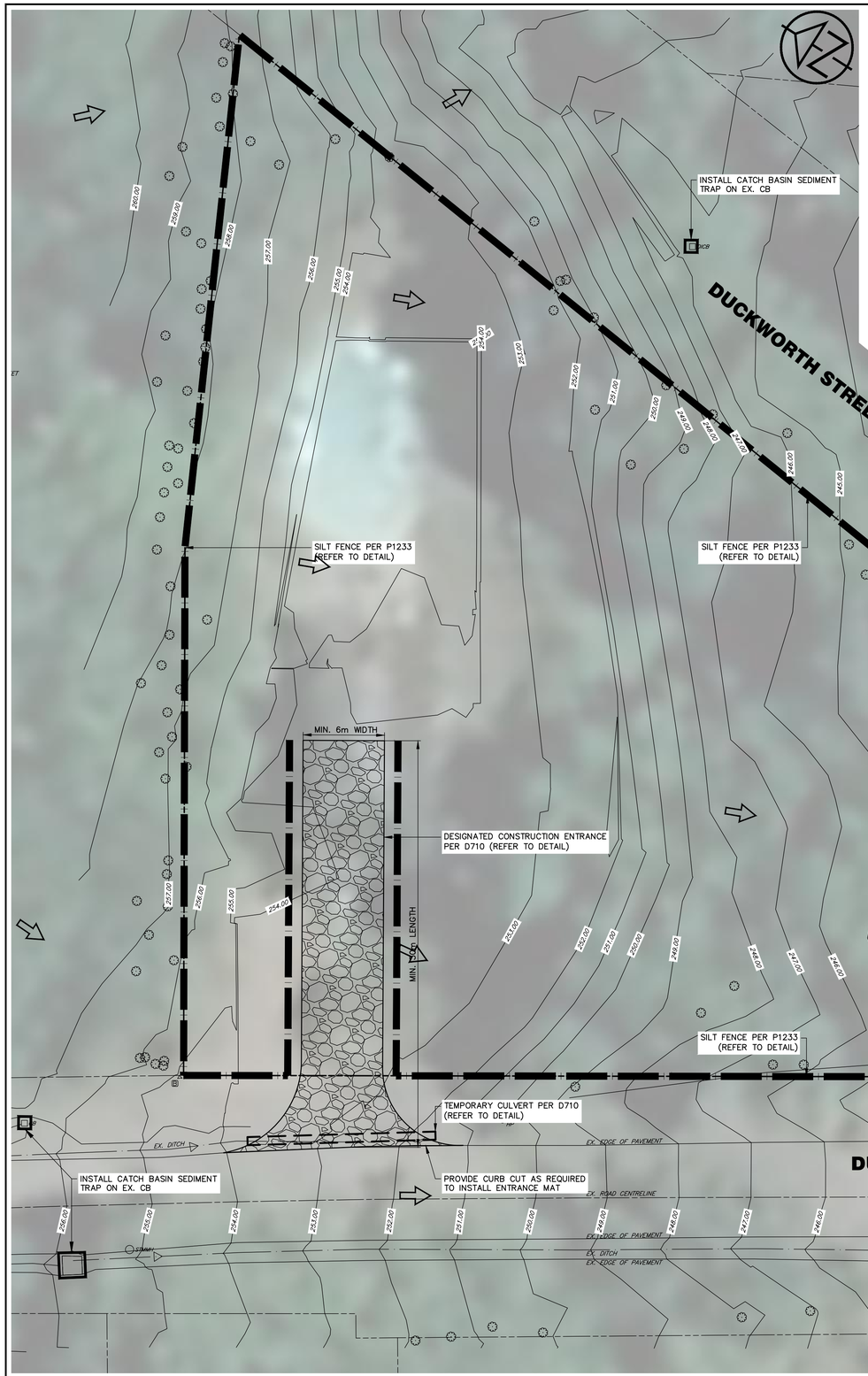
J. ALL STOCKPILE LOCATIONS ARE TO BE APPROVED BY THE ENGINEER. CONTRACTOR TO PROVIDE SNOW FENCE OR APPROVED EQUAL ACROSS ALL CONSTRUCTION ENTRANCES DURING PERIODS OF INACTIVITY.

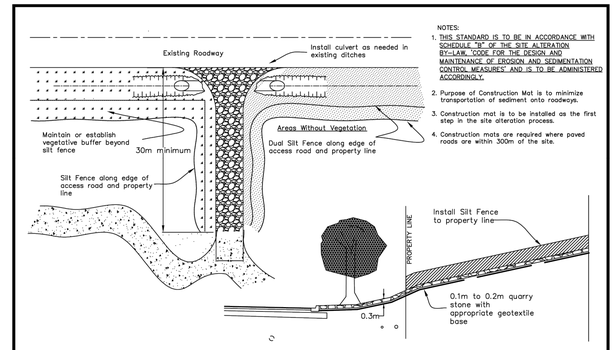
K. CONSTRUCTION AREAS THAT EXCEED 30 DAYS OF INACTIVITY SHALL BE STABILIZED BY SEEDING. THIS SHALL INCLUDE STOCKPILES OF FILL AND TOPSOIL.

L. ALL TEMPORARY SWALES WHICH ARE ANTICIPATED TO EXIST FOR OVER 30 DAYS ARE TO BE STABILIZED WITH SEED OR ANOTHER METHOD AS DIRECTED BY THE ENGINEER.



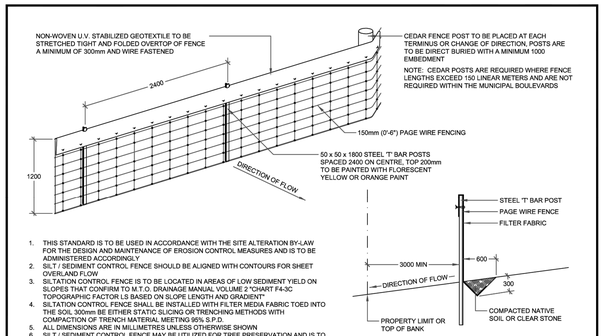
KEY PLAN
NTS





NOTES:
1. THIS STANDARD IS TO BE IN ACCORDANCE WITH SCHEDULE 'B' OF THE SITE ALTERATION BY-LAW, "CODE FOR THE DESIGN AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES" AND IS TO BE ADMINISTERED ACCORDINGLY.
2. Purpose of Construction Mat is to minimize transportation of sediment onto roadways.
3. Construction mat is to be installed as the first step in the site alteration process.
4. Construction mats are required where paved roads are within 300m of the site.

Barrie	Construction Entrance	REV No. 2	DATE: APR 2023
			SCALE: N.T.S
			D710



1. THIS STANDARD IS TO BE USED IN ACCORDANCE WITH THE SITE ALTERATION BY-LAW FOR THE DESIGN AND MAINTENANCE OF EROSION CONTROL MEASURES AND IS TO BE ADMINISTERED ACCORDINGLY
2. SILT / SEDIMENT CONTROL FENCE SHOULD BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW
3. SILTATION CONTROL FENCE IS TO BE LOCATED IN AREAS OF LOW SEDIMENT YIELD ON SLOPES THAT CONFIRM TO M.T.O. DRAINAGE MANUAL VOLUME 2 "CHART F4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT"
4. SILTATION CONTROL FENCE SHALL BE INSTALLED WITH FILTER MEDIA FABRIC TOED INTO THE SOIL 300mm BE EITHER STATIC SLICING OR TRENCHING METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 95% S.P.D.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN
6. SILT / SEDIMENT CONTROL FENCE MAY BE UTILIZED FOR TREE PRESERVATION AND IS TO BE USED IN CONJUNCTION WITH P1231, P1232 AND P1235

Barrie	FENCE SILTATION CONTROL	REV No. 3	DATE: APR 2023
			SCALE: N.T.S
			P1233

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CITY OF BARRIE

EROSION & SEDIMENT CONTROL PLAN

TATHAM ENGINEERING

DESIGN: MB	FILE: 420367	DWG: ESC-1
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Drawing Name: 420367-ESC01.dwg, Plotted: Nov 30, 2023